

2020 年长安大学 CSCD 论文产出概况

长安大学图书馆学科服务工作组

2021 年 6 月

目 录

第一章 数据来源与简介.....	1
1.1 数据库来源.....	1
1.2 CSCD 数据库简介.....	1
第二章 2020 年长安大学 CSCD 论文产出概况.....	2
2.1 CSCD 论文统计及学院分布概况.....	2
2.1.1 CSCD 论文统计及学院分布概况.....	2
2.1.2 2020 年 CSCD 论文的发文作者及所属单位分布.....	3
附录:各单位发表的 CSCD 论文详细情况.....	17

第一章 数据来源与简介

1.1 数据库来源

本报告的数据来源于 CSCD（中国科学引文数据库SM），论文检索时间范围：2020 年 1 月-2020 年 12 月；报告检索及筛选条件：第一作者单位署名为长安大学的论文；报告中论文的检索及被引频次采集日期：2021 年 6 月 2 日。

1.2 CSCD 数据库简介

中国科学引文数据库（Chinese Science Citation Database，简称 CSCD）。作为国内首个引文数据库，CSCD 覆盖近 1,200 种来自中国的顶尖学术出版物，并将其嵌入到 Web of Knowledge 平台中，目前已包含从 1989 年至今的论文记录将近 370 万条，引文记录超过 1,700 万条，每年新增 25 万条数据。覆盖学科内容涉及数学、物理、化学、天文学、地学、生物学、农林科学、医药卫生、工程技术、环境科学和管理科学等诸多领域出版的中英文科技核心期刊和优秀期刊。2017-2018 版本，中国科学引文数据库遴选了核心期刊 1229 种，其中中国出版的英文期刊 201 种，中文期刊 1028 种。中国科学引文数据库来源期刊分为核心库和扩展库两部分，其中核心库 887 种（以备注栏中 C 为标记）；扩展库 342 种（以备注栏中 E 为标记）。

大多数论文信息（标题、作者、来源出版物）均提供简体中文和英文两种语言版本。约 40%的条目包含英文摘要，超过 60%的引文是英文。

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第二章 2020 年长安大学 CSCD 论文产出概况

2.1 CSCD 论文统计及学院分布概况

2.1.1 CSCD 论文统计及学院分布概况

2020 年，CSCD 数据库收录的长安大学作为作者单位发表的科研论文有 684 篇，以长安大学为第一作者单位发表的 CSCD 论文有 627 篇，分别分布在 16 个学院。各学院发表的论文情况详见表 1。

表 1 2020 年长安大学各学院 CSCD 论文发文情况

序号	单位名称	2020 年 CSCD 论文数量
1	公路学院	130
2	材料科学与工程学院	61
3	地质工程与测绘学院	86
4	建筑工程学院	59
5	水利与环境工程学院	56
6	信息工程学院	36
7	电子与控制工程学院	20
8	汽车学院	39
9	工程机械学院	32
10	地球科学与资源学院	48
11	经济与管理学院	4
12	理学院	21
13	建筑学院	9
14	人文学院	4
15	运输工程学院	12
16	土地工程学院	5
17	其他	5
合计		627

注：上表中的数据统计均为第一作者为“长安大学”的 CSCD 论文

从表 1 各学院的发文情况来看，2020 年我校 CSCD 论文发文量分布在各个学院，它们分别是公路学院、材料科学与工程学院、地质工程与测绘学院、建筑工程学院、水利与环境学院、信息工程学院、电子与控制工程学院、汽车学院、工程机械学院、地球科学与资源学院、经济与管理学院、理学院、建筑学院、人文学院、运输工程学院、土地工程学院等 16 个学院，其中公路学院 2020 年发表的论文被 CSCD 数据库收录最多，共 130 篇。

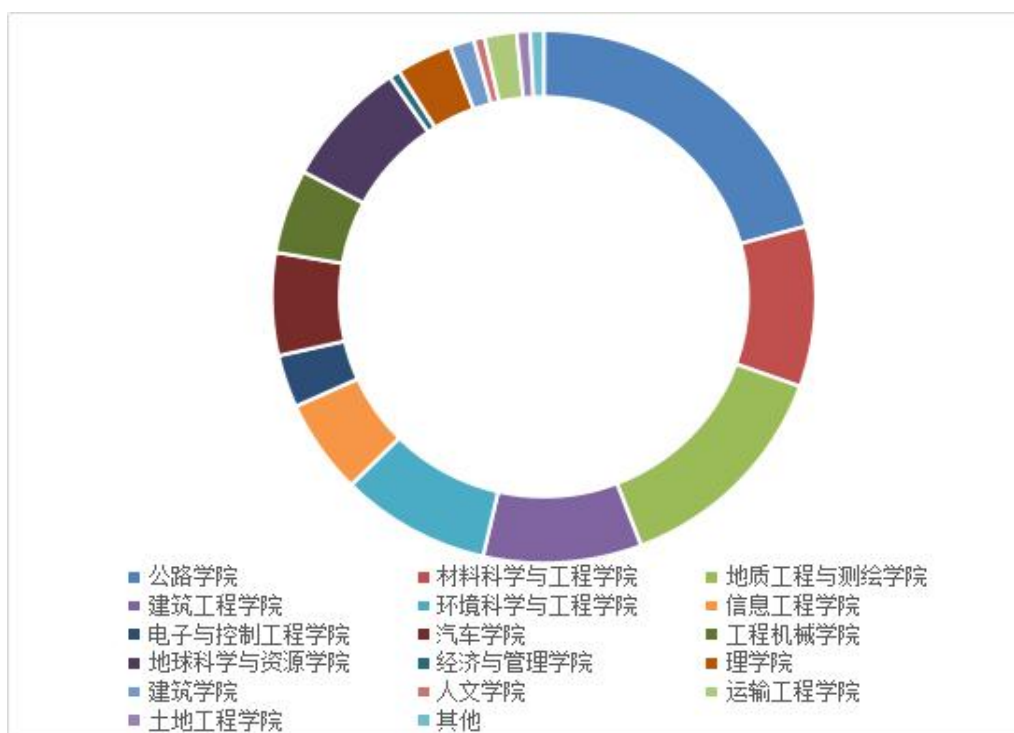


图 1 2020 年长安大学各单位 CSCD 文发表情况图

2.1.2 2020 年 CSCD 论文的发文作者及所属单位分布

2020 年我校发表的 627 篇 CSCD 论文中，发文量在 3 篇以上的作者有 22 人，其中公路学院 9 人、建筑工程学院 6 人、汽车学院 2 人、地质工程与测绘学院 1 人、工程机械学院 1 人、地质工程与测绘学院 1 人、电子与控制工程学院 1 人、信息工程学院 1 人，详见表 2。

表 2 2020 年长安大学发表 CSCD 论文数量 3 篇以上的作者及所属单位分布

序号	作者	发文数量	所属单位
1	潘兵宏	5	公路学院
2	张争奇	4	公路学院

3	冯忠居	3	公路学院
4	李哲	3	公路学院
5	王春生	3	公路学院
6	王永东	3	公路学院
7	杨晓华	3	公路学院
8	杨雅勋	3	公路学院
9	赵越	3	公路学院
10	彭建兵	3	地质工程与测绘学院
11	王毅红	7	建筑工程学院
12	赵均海	4	建筑工程学院
13	王彤	3	建筑工程学院
14	邢国华	3	建筑工程学院
15	熊二刚	3	建筑工程学院
16	颜卫亨	3	建筑工程学院
17	任帅	3	信息工程学院
18	李刚	5	电子与控制工程学院
19	李耀华	5	汽车学院
20	蒋进科	3	汽车学院
21	李嘉波	4	工程机械学院
22	刘兰剑	3	人文学院

对各学院 CSCD 论文第一作者发文统计如下：

表 3 公路学院

序号	中文名	发文数量	序号	中文名	发文数量
1	潘兵宏	5	50	任伟	1
2	张争奇	4	51	任永祥	1
3	冯忠居	3	52	申爱琴	1

4	李哲	3	53	沈正峰	1
5	王春生	3	54	石州	1
6	王永东	3	55	时元绪	1
7	杨晓华	3	56	舒涛	1
8	杨雅勋	3	57	宋家乐	1
9	赵越	3	58	唐鹏	1
10	沙爱民	2	59	田崇明	1
11	袁高昂	2	60	田中男	1
12	董芸秀	2	61	汪海年	1
13	李加武	2	62	王朝辉	1
14	李宇	2	63	王春	1
15	彭波	2	64	王峰	1
16	王星	2	65	王文真	1
17	武芳文	2	66	王晓明	1
18	戴学臻	2	67	王亚琼	1
19	袁东东	2	68	王志超	1
20	张驰	2	69	魏亚辉	1
21	张莎莎	2	70	邬晓光	1
22	白桦	1	71	谢永利	1
23	陈建勋	1	72	胥勋辉	1
24	陈谦	1	73	许江波	1
25	崔志猛	1	74	杨少伟	1
26	段兰	1	75	叶飞	1
27	凡涛涛	1	76	叶宏宇	1
28	房娜仁	1	77	虞子楠	1
29	冯威	1	78	袁高昂	1

30	高江平	1	79	袁帅	1
31	高启栋	1	80	张琛	1
32	高文博	1	81	张增平	1
33	郭聚坤	1	82	赵静	1
34	郭文龙	1	83	赵鑫	1
35	韩鑫	1	84	郑木莲	1
36	郝宪武	1	85	周敕	1
37	何静斌	1	86	周勇军	1
38	何启龙	1	87	周志军	1
39	洪军	1	88	朱伟庆	1
40	胡大琳	1	89	刘龙旗	1
41	姜磊	1	90	刘梦梅	1
42	蒋应军	1	91	刘梦梅	1
43	金辉	1	92	刘永健	1
44	孔凡磊	1	93	刘玉	1
45	雷俊安	1	94	罗刚	1
46	李家春	1	95	罗彦斌	1
47	刘斌清	1	96	马印平	1
48	刘国锋	1	97	潘飞	1
49	刘江	1			

表 4 材料科学与工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	陈华鑫	2	26	李闯	1
2	耿九光	2	27	李彦明	1
3	况栋梁	2	28	李祖仲	1
4	牛冬瑜	2	29	刘德鑫	1

5	盛燕萍	2	30	刘小婷	1
6	宋莉芳	2	31	任旭强	1
7	熊锐	2	32	宋晓珩	1
8	张蕾涛	2	33	苏兴华	1
9	张学敏	2	34	孙增智	1
10	赵秦阳	2	35	田海涛	1
11	张勇	2	36	田耀刚	1
12	陈宏	1	37	王梦梦	1
13	丁晨阳	1	38	王兆丰	1
14	傅珍	1	39	王子匀	1
15	高莉宁	1	40	伍思豫	1
16	高顺	1	41	邢明亮	1
17	郭亚杰	1	42	颜录科	1
18	韩玉涛	1	43	杨泽慧	1
19	何锐	1	44	于晓晨	1
20	扈培臻	1	45	张斌英	1
21	黄巨龙	1	46	赵国华	1
22	黄利保	1	47	赵雪雪	1
23	姜超平	1	48	周小荣	1
24	解静	1	49	周振君	1
25	赖歆玥	1	50	雷宁静	1

表 5 地质工程与测绘学院

序号	中文名	发文数量	序号	中文名	发文数量
1	彭建兵	3	42	康尘云	1
2	魏峥嵘	3	43	康海伟	1

3	陈楠	2	44	李同录	1
4	黄强兵	2	45	李宇磊	1
5	刘邦晓	2	46	刘晓亮	1
6	邵广周	2	47	刘争宏	1
7	王丽霞	2	48	鲁宝亮	1
8	王智伟	2	49	潘登丽	1
9	赵益祯	2	50	齐彦福	1
10	吴博	2	51	乔志甜	1
11	周静静	2	52	宋宇飞	1
12	周阳	2	53	孙长明	1
13	赵益祯	2	54	田镇	1
14	李华	2	55	王飞	1
15	白相文	1	56	卫童瑶	1
16	曹红业	1	57	魏家旺	1
17	常江	1	58	夏增选	1
18	陈立权	1	59	徐明祥	1
19	陈沛	1	60	徐强	1
20	成玉祥	1	61	许力	1
21	杜建涛	1	62	杨丽叶	1
22	高浩源	1	63	杨龙伟	1
23	高旺旺	1	64	杨武召	1
24	高晓	1	65	杨耘	1
25	高阳	1	66	杨正辉	1
26	高志傲	1	67	岳聪	1
27	韩冬冬	1	68	翟越	1
28	韩冬建	1	69	翟张辉	1

29	胡东明	1	70	张继锋	1
30	胡鹏	1	71	张勤	1
31	胡羽丰	1	72	张祥东	1
32	黄达	1	73	张义蜜	1
33	黄伟亮	1	74	朱敏	1
34	姜刚	1	75	金嘉林	1
35	蒋光伟	1	76	何国辉	1

表 6 建筑工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	王毅红	7	25	叶艳霞	1
2	赵均海	4	26	袁春博	1
3	王彤	3	27	兰官奇	1
4	邢国华	3	28	李芳涛	1
5	熊二刚	3	29	刘康安	1
6	颜卫亨	3	30	刘禹阳	1
7	周天华	2	31	孟庆龙	1
8	周绪红	2	32	乔朋	1
9	黄华	2	33	秦朝刚	1
10	袁春燕	2	34	苏佶智	1
11	张常光	2	35	孙艺嘉	1
12	白亮	1	36	田威	1
13	柴少波	1	37	魏慧	1
14	常召群	1	38	温馨	1
15	段留省	1	39	吴函恒	1
16	谷雅秀	2	40	吴涛	1
17	何皎洁	1	41	吴涛	1

18	杨利伟	1	42	邹昱瑄	1

表 7 水利与环境学院

序号	中文名	发文数量	序号	中文名	发文数量
1	巴利萌	1	29	李倩	1
2	陈望	1	30	李雯晴	1
3	陈阳	1	31	李欣艳	1
4	党文文	1	32	刘铭	1
5	冯文文	1	33	刘珊	1
6	霍世璐	1	34	刘威	1
7	霍文博	1	35	罗杰	1
8	李俊霞	1	36	马雄德	1
9	李盼根	1	37	庞家驹	1
10	刘珊	1	38	乔晓英	1
11	邱立萍	1	39	乔雅绮	1
12	王浩	1	40	任涛	2
13	王振威	1	41	孙亚乔	1
14	谢雯文	1	42	唐继张	1
15	杨斌	1	43	汪晶发	1
16	张剑	1	44	王燕	1
17	张瑞旭	1	45	卫栋慧	1
18	张王超	1	46	谢亚平	1
19	钟哲	1	47	杨法暄	1
20	周及	1	48	杨文娟	1
21	邓若兰	1	49	余娅婷	1
22	段磊	1	50	余玉聪	1
23	耿艺成	1	51	张驰	1

24	胡恩	1	52	张瑞旭	1
25	胡海洋	1	53	赵昊	1
26	黄腾腾	1	54	赵倩	1
27	李傲雯	1	55	郑乐	1
28	席丹	1			

表 8 信息工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	任帅	3	17	裴莉莉	1
2	孙朝云	2	18	屈八一	1
3	马峻岩	2	22	屈立成	1
4	陈卫卫	1	23	唐心瑶	1
5	陈颖	1	24	王伟	1
6	樊海玮	1	25	王卫星	1
7	冯兴乐	1	26	王晰	1
8	郭兰英	1	27	王钰	1
9	惠飞	1	28	魏永强	1
10	康军	1	29	吴骅跃	1
11	孔方方	1	30	武非凡	1
12	李俊彦	1	31	徐磊	1
13	刘鑫一	1	32	杨澜	1
14	柳有权	1	33	杨露	1
15	马静	1	34	赵祥模	1
16	马素刚	1	35	张心睿	1

表 9 电子与控制工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	李刚	5	12	文常保	1
2	代亮	2	13	徐娟	1
3	李坤伦	2	14	徐先峰	1
4	梁华刚	2	15	张弢	1
5	黄鹤	1	16	赵忠杰	1
6	雷旭	1	17	周熙炜	1
7	李光辉	1			

表 10 汽车学院

序号	中文名	发文数量	序号	中文名	发文数量
1	李耀华	5	19	王润民	1
2	蒋进科	3	20	王姝	1
3	牛世峰	2	21	王童	1
4	兰海潮	1	22	魏洪贵	1
5	李彬	1	23	魏朗	1
6	李猛	1	24	肖梅	1
7	李晓虎	1	25	徐婷	1
8	李旋	1	26	徐宇	1
9	邓雷	1	27	许凡	1
10	高扬	1	28	闫晟煜	1
11	胡大伟	1	29	张海伦	1
12	林国庆	1	30	张瑞宾	1
13	刘晶郁	1	31	张硕	1
14	刘通	1	32	张新锋	1
15	马小龙	1	33	张一西	1

16	沈小燕	1	34	赵建有	1

表 11 工程机械学院

序号	中文名	发文数量	序号	中文名	发文数量
1	李嘉波	4	14	吕景祥	1
2	曹学鹏	2	15	马兵	1
3	马登成	2	16	钦杰	1
4	魏孟	2	17	司癸卯	1
5	栾飞	2	18	孙坤霄	1
6	赵晓运	2	19	索雪峰	1
7	包翔宇	1	20	万一品	1
8	丛卓红	1	21	王驰凯	1
9	封硕	1	22	张晨光	1
10	高康平	1	23	张军	1
11	耿麒	1	24	张泽宇	1
12	廉政	1	25	赵悟	1
13	耿麒	1	26	樊海龙	1

表 12 地球科学与资源学院

序号	中文名	发文数量	序号	中文名	发文数量
1	孟茹	2	25	司国浩	1
2	赵虹	2	26	王硕	1
3	陈强	1	27	王霞	1
4	陈亚亚	1	28	王晓峰	1
5	陈永康	1	29	吴海燕	1
6	程三友	1	30	吴金华	1
7	丁坤	1	31	吴小力	1

8	董晓宇	1	32	肖良	1
9	樊双虎	1	33	杨慧	1
10	范媛媛	1	34	杨俊杰	1
11	郭俊锋	1	35	杨亮彦	1
12	韩珂	1	36	杨兴科	1
13	韩玲	1	37	杨秀清	1
14	贺小元	1	38	尹春涛	1
15	焦建刚	1	39	张贵山	1
16	康明	1	40	张恒	1
17	李海	1	41	张庭瑜	1
18	李军军	1	42	赵帮胜	1
19	李荣	1	43	周艳龙	1
20	李永军	1	44	刘涛涛	1
21	梁积伟	1	45	牛泽鹏	1
22	梁一行	1	46	彭仁	1
23	刘宝星	1	47	邵雅静	1

表 13 经济与管理学院

序号	中文名	发文数量	序号	中文名	发文数量
1	陈真永	1	3	王奕淇	1
2	李武强	1	4	杨琦	1

表 14 理学院

序号	中文名	发文数量	序号	中文名	发文数量
1	郑素佩	2	11	舒红	1
2	常凡凡	1	12	王虎	1
3	陈童	1	13	王慧	1

4	方舒	1	14	王令	1
5	高云樵	1	15	王英辉	1
6	郭庆春	1	16	徐世强	1
7	靳明珠	1	17	杨辉	1
8	李志民	1	18	姚如洋	1
9	刘洪超	1	19	张倩	1
10	刘亚红	1	20	赵小刚	1

表 15 建筑学院

序号	中文名	发文数量	序号	中文名	发文数量
1	陈稳亮	1	6	吕楠	1
2	樊禹江	1	7	余侃华	1
3	李琛	1	8	赵敬源	1
4	李凌	1	9	丁华	1
5	刘伟	1			

表 16 人文学院

序号	中文名	发文数量
1	蔡洁	1
2	刘兰剑	3

表 17 运输工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	马超群	2	6	李维佳	1
2	王建伟	2	7	马书红	1
3	徐明非	2	8	袁长伟	1
4	陈文强	1	9	张娜	1

5	董傲然	1			

表 18 土地工程学院

序号	中文名	发文数量	序号	中文名	发文数量
1	戈晨曦	1	4	张晓钰	1
2	李蕴琪	1	5	周煜杰	1
3	王晓峰	1			

附录:各单位发表的 CSCD 论文详细情况

公路学院

第 1 条, 共 130 条

作者: Zhou Zhijun; Zhang Zhipeng; Guo Tao; Xu Tianyu

作者: 周志军; 张志鹏; 郭涛; 徐天宇

标题: Layered compactness detection method of reinforcement the of loess subgrade

标题: 黄土路基补强分层压实度检测方法

来源出版物: 铁道科学与工程学报 卷: 17 期: 12 页: 3052-3062 出版年: 2020

文献号: 1672-7029(2020)17:12<3052:HTLJBQ>2.0.TX;2-P

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文献类型: Article

作者关键词: Road engineering; loess subgrade; hydraulic compaction method; model test; improvement depth

作者关键词: 道路工程; 黄土路基; 液压夯实法; 模型试验; 有效压实深度

摘要: In order to obtain the layer compactness of subgrade more quickly and effectively, this paper took loess subgrade as an example, and proposed the idea of detecting the subgrade layer compactness achieved by the hydraulic compactor. Based on the theory of layered compaction, the basic model of hydraulic compaction was established and the relationship between the initial layered compactness and the compacted layered compactness was deduced. A full-scale model test of hydraulic compaction was designed and carried out. The results show that the compaction effect can be ignored when the depth is more than about 1.5 m. The layered interface settlement of subgrade and ground settlement have the characteristics of stage change, which are bounded by 0.8~1.2 m and 6~9 tamping times respectively. The concept of improvement depth was introduced and its regression formula was established. The Boltzmann function relationship among ground settlement, improvement depth and layered interface settlement was obtained by regression method. The relationship among compacted layered compactness, layered interface settlement and ground settlement was obtained by linear regression method. The calculation formula of the initial layered compactness of subgrade was deduced and the method for detecting the compactness of loess subgrade was formed. The hydraulic compaction method was applied in a practical project, and the error between the calculation result and the detection result of sand filling method was within 2%.

摘要: 为了快速有效地检测路基分层压实度,以黄土路基为例,提出通过液压夯实机的夯击补强作用来检测路基分层压实度的思路。基于分层压实理论,建立液压夯实的基本模型并推导了夯前和夯后分层压实度的关系,设计并开展液压夯实足尺模型试验。研究结果表明:深度超过约 1.5 m 时,压实效果可以忽略;路基分层界面沉降量和表层夯沉量具有阶段性变化特征,分别以 0.8~1.2 m 和 6~9 击为界限。引入有效压实深度的概念并建立其回归公式;采用回归方法得到了表层夯沉量、有效压实深度和分层界面沉降量之间的玻尔兹曼函数关系;采用线性回归方法得到了夯后分层压实度与分层界面沉降量及表层夯沉量之间的关系;推导出夯前路基本层压实度计算公式,形成了黄土路基补强分层压实度检测方法。将液压夯实法运用于实体工程,其计算结果和灌砂法检测结果的误差在 2% 以内。

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第 2 条, 共 130 条

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作者: 张莎莎; 王旭超; 杨晓华; 陈伟志; 周强

标题: Cumulative effect of saline construction water on engineering properties of subgrade filling material

标题: 含盐施工用水对路基填料工程特性的累加效应

来源出版物: 交通运输工程学报 卷: 20 期: 6 页: 71-81 出版年: 2020

文献号: 1671-1637(2020)20:6<71:HYSYGYS>2.0.TX;2-7

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文献类型: Article

作者关键词: subgrade engineering; gravelly sulfate saline soil; large-scale compression test; salt expansion test; collaps test; construction water; cumulative effect

作者关键词: 路基工程; 砾类硫酸盐渍土; 大型压缩试验; 盐胀试验; 溶陷试验; 施工用水; 累加效应

摘要: Large-scale compression tests, salt expansion tests, and collapsibility tests were performed under the conditions of construction water with different salt addition times and types for gravelly sulfate saline soil with different sulfate salt contents. Test preparation was based on the site investigation, and samples with different types and times of saline construction water were prepared. The variation characteristics of deformation over time were observed under the condition of a 400-kPa load, single-time temperature decrease, and adding water, respectively. The influence mechanism of adding multiple times of saline construction water on the engineering properties of gravelly sulfate saline soil was analyzed. Research results show that the compression deformation of gravelly sulfate saline soil first increases and then gradually stabilizes as the times of saline

construction water increases. The compression modulus shows a typical three-stage variation law, which is independent of the type of saline construction water. Under the influence of cooling, with the gradual addition of sulfate-containing construction water, the salt expansion of gravelly sulfate saline soil tends to become stable after an obvious increase, and the maximum dilatation increases by 7.9 times. The addition of chlorine-containing construction water decreases the salt expansion and then gradually stabilizes. The ultimate salt expansion was only 1/13 that of the original saline soil. Moreover, the addition of saline construction water has an obvious cumulative effect on the salt expansion characteristics of gravelly sulfate saline soil. With the increasing times of saline water additions, the collapse deformation of soil samples shows a rule of accumulation. Therefore, even if the salt content in construction water from a saline area is low, the cumulative effect from multiple uses of construction saline water is obvious and will have a negative influence on the subgrade engineering characteristics. Preventive measures should be taken during the construction process. 4 tabs, 12 figs, 35 refs.

摘要: 针对不同含盐量的砾类硫酸盐渍土,开展了在加入不同次数、不同含盐类型的施工用水工况下的大型压缩试验、盐胀试验、溶陷试验;试验以现场调查数据为依据,基于现场原位土配制了加入不同含盐施工用水类型、不同加入次数的试验土样,观测不同土样分别在 400kPa 荷载条件下、单次降温条件下以及加水溶陷条件下的变形量随时间的变化特点;分析了多次添加含盐施工用水对砾类硫酸盐渍土工程性质的影响机理。研究表明:随着含盐施工用水加入次数的增加,砾类硫酸盐渍土的压缩变形呈现先增大后逐渐稳定的趋势,其压缩模量表现出典型的 3 阶段变化规律,且这种规律与含盐施工用水的含盐类型无关;在降温影响下,含硫酸盐施工用水的逐渐加入使砾类硫酸盐渍土的盐胀量呈现先显著增加后趋于稳定的趋势,盐胀量最大增加了 7.9 倍,含氯盐施工用水的逐步加入使土样的盐胀量先明显降低后趋于稳定,最终盐胀量仅为原盐渍土盐胀量的 1/13,且含盐施工用水的加入对砾类硫酸盐渍土的盐胀特性有明显累加效应;随着含盐施工用水加入次数的增加,土样的溶陷变形呈不断累加趋势。可见,盐渍土地区含盐施工用水中的易溶盐即使含量较少,但多次使用产生的累加效应明显,亦会对路基工程特性产生较大影响,在施工过程中需采取预防措施。

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第 3 条, 共 130 条

作者: Jiang Lei; Liu Yongjian; Long Xin; Wang Wenshuai; Ma Jinping

作者: 姜磊; 刘永健; 龙辛; 王文帅; 马印平

标题: Fatigue assessment of joints in concrete-filled rectangular hollow section composite truss bridges based on hot spot stress method

标题: 基于热点应力法的矩形钢管混凝土组合桁梁桥节点疲劳评估

来源出版物: 交通运输工程学报 卷: 20 期: 6 页: 104-116 出版年: 2020

文献号: 1671-1637(2020)20:6<104:JYRDYL>2.0.TX;2-H

来源出版物: Journal of Traffic and Transportation Engineering 卷: 20 期: 6 页: 104-116 出版年: 2020

文献号: 1671-1637(2020)20:6<104:JYRDYL>2.0.TX;2-H

文献类型: Article

作者关键词: bridge engineering; concrete-filled rectangular hollow section; composite truss bridge; joint; hot spot stress method; fatigue assessment

作者关键词: 桥梁工程; 矩形钢管混凝土; 组合桁梁桥; 节点; 热点应力法; 疲劳评估

摘要: In order to accurately assess the fatigue behaviour of joints in concrete-filled rectangular hollow section steel tubular composite truss bridges,the hot spot stress method was introduced. The hot spot stress range at the weld toe can be determined by the planar frame model,spatial frame model,and three-dimensional solid model.Based on 52fatigue test data of joints,the hot spot stress range-cycle number curves were obtained through the regression analysis.A concretefilled rectangular hollow section steel tubular composite truss bridge located at the Huangyan highway was selected as the typical case,the fatigue behaviour of the joint was assessed,and original design details were optimized.Research results show that compared with the concretefilled rectangular hollow section steel tubular joint on the top of the pier,the hot spot stress range in the rectangular hollow section joint at mid-span is higher,which equals to 60.1MPa, and occurs on the main surface of the chord.However,it is less than the allowable value of 71MPa determined according to Eurcode,thereby the design of the joints met the requirements. The optimization of design details on the fatigue vulnerable joint at mid-span is carried out.After filling the hollow section with concrete,the local joint stiffness changed,resulting in a more uniform stress distribution at the weld toe intersection.The hot spot stress ranges of brace and chord surface decrease by 25.1% on average.The post-weld treatment of the original designed joint can effectively eliminate the initial tensile stress of the welding and improve the fatigue performance of the joint.The hot spot stress ranges in the brace and chord surface decreased by 14.9%on average.Using spatial frame model to assess the fatigue behaviour of optimized joint at mid-span,the maximum hot spot stress ranges on the brace and chord are 58.9and 54.1MPa, respectively,both less than the results of 45.2and 47.1 MPa calculated by using the threedimensional solid model.It demonstrats that the result obtained by using the spatial frame model is more conservative,and the fatigue effects of different hot spots can not be calculated as accurately as the three-dimensional solid model,nor can the initial position of fatigue cracking be judged accurately.2tabs,18figs,35refs.

摘要: 为准确评估矩形钢管混凝土组合桁梁桥节点疲劳性能,引入热点应力法,可通过平面杆系模型、空间杆系模型和三维实体模型计算节点焊趾处的热点应力幅,并通过对 52 个节点疲劳试验数据回归分析,拟合得到热点应力幅-循环次数曲线;选取陕西黄延高速一座矩形钢管混凝土组合桁梁桥为典型案例进行节点疲劳评估,并对原有节点设计方案的构造进行优化。研究表明:相比于墩顶矩形钢管混凝土节点,跨中矩形钢管节点热点应力幅更大,为

60.1MPa,发生在主管表面,但是小于欧洲规范 Eurcode 中的容许疲劳强度 71MPa,满足疲劳设计要求;对跨中疲劳易损节点进行设计构造优化,原设计矩形钢管节点变为矩形钢管混凝土节点后,管内混凝土改变了节点局部刚度,使相贯线焊趾处应力分布均匀,支、主管表面热点应力幅平均降低 25.1%,对原设计节点进行焊缝后处理,可有效消除焊接初始拉应力,改善节点疲劳性能,支、主管表面热点应力幅平均降低 14.9%;采用空间杆系模型对优化后的跨中矩形钢管混凝土节点进行疲劳评估,支、主管表面最大热点应力幅分别为 58.9、54.1MPa,大于三维实体模型计算得到的支管和主管表面最大热点应力幅 45.2、47.1MPa,空间杆系模型计算结果偏保守,且无法像三维实体模型一样准确计算不同热点位置的疲劳效应,也无法准确判断疲劳开裂起始位置。

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标 题 : Corrosion damage and bearing characteristics of bridge pile foundations under dry-wet-freeze-thaw cycles in alpine salt marsh areas

标题: 高寒盐沼泽区干湿-冻融循环下桥梁桩基腐蚀损伤与承载特性

来源出版物: 交通运输工程学报 卷: 20 期: 6 页: 135-147 出版年: 2020

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文献类型: Article

作者关键词: 桥梁工程; 桩基; 现场试验; 室内试验; 数值仿真; 干湿-冻融循环; 腐蚀损伤; 承载特性

摘要: To explore the corrosion damage characteristics of bridge pile foundation in Qinghai area

under dry-wet-freeze-thaw cycles, relying on the Dexiang Expressway Project, the reinforcement and concrete specimens were embedded in the field to subjected to freeze-thaw cycles for one year. The laboratory test was used to conduct the dry-wet-freeze-thaw cycles on concrete specimens for 225 times. The variation rules of concrete mass, anti-erosion coefficient, relative dynamic elastic modulus, compressive strength, micro-mechanism and reinforcement corrosion rate at different positions and different cycle times were compared and analyzed. The numerical simulation was conducted to analyze the bearing capacity change rule of unprotected pile foundation over 20 years, and protection measurements for bridge pile foundations in alpine salt marsh areas were proposed. Research result shows that as the embedment depth increases, the correlation degree of anti-erosion coefficient of pile foundation concrete specimens in the field increases, and the maximum value is 0.93. As time increases, the maximum compressive strength loss rate of pile foundation concrete specimens is 38.20%. The areal corrosion rate of reinforcement at the depth of 0.25 m is the largest, and the value is 91%. Coating epoxy resin on the surface can effectively reduce the corrosion rate of reinforcement. The mass changes of pile foundation concrete specimen and reinforcement are not obvious. In the 225th dry-wet-freeze-thaw cycles, the corner of pile foundation concrete specimen falls off and cracks appear around, but the mass change is small. The relative dynamic elastic modulus reduces by 39.10%, the anti-erosion coefficient reduces to 0.51, the compressive strength loss rate of concrete is 65.88%. Failure nearly occurs in the interior because of the presence of Friedel salt and other expansive substances. As the spalling thickness and corrosion depth increase, the bearing capacity of pile foundation in the first eight years remains essentially unchanged. After eight years, its bearing capacity gradually decreases. Without proper maintenance, the bearing capacity of pile foundation will reduce by 34.45% by the 20th year. It is suggested that the key protection measures should be taken for pile foundations after 8 years of service. 9 tabs, 27 figs, 31 refs.

摘要: 为探明青海地区桥梁桩基在干湿-冻融循环条件下的腐蚀损伤特性, 依托德香高速公路工程, 在现场埋设钢筋和混凝土试件进行干湿-冻融循环 1 年, 采用室内试验将混凝土试件进行干湿-冻融循环 225 次, 对比分析了不同位置和不同循环时间条件下混凝土质量、抗侵蚀系数、相对动弹性模量、抗压强度、微观机理以及钢筋锈蚀率的变化规律; 采用数值仿真分析了未防护桩基 20 年内承载力变化规律, 并提出了高寒盐沼泽区桥梁桩基防护措施。研究结果表明: 随着试件埋设深度的增加, 现场桩基混凝土试件的抗侵蚀系数相关度增大, 最大值为 0.93; 随着时间的增加, 桩基混凝土试件的抗压强度最大损失率为 38.20%, 埋深 0.25 m 处钢筋的面积锈蚀率最大, 为 91%; 表面涂抹环氧树脂可以有效减少钢筋锈蚀率, 桩基混凝土试件与钢筋的质量变化不明显; 干湿-冻融循环 225 次时, 桩基混凝土试件的边角处出现脱落, 四周出现裂纹, 但质量变化较小, 相对动弹性模量降低了 39.10%, 抗侵蚀系数降低到 0.51, 混凝土的抗压强度损失率为 65.88%, 其内部因出现 Friedel 盐等膨胀性物质而趋于破坏; 随着剥落厚度和腐蚀深度的增加, 前 8 年桩基的承载力基本不变, 8 年后其承载力逐步降低, 若不进行维护, 第 20 年桩基承载力降低 34.45%; 建议在桩基服役 8 年后, 要进行重点防护。

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作者: 赵鑫; 张洪伟; 杨晓华; 来弘鹏; 王学营; 赵晓亮

标题: Heat transfer characteristics for temperature of simple harmonic quantity in the cold-region tunnel and sensitivity of influencing factors

标题: 寒区隧道温度简谐波传热特征与影响因素的敏感性

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文献类型: Article

作者关键词: tunnel engineering; temperature of simple harmonic quantity; temperature amplitude; phase shift; sensitivity analysis

作者关键词: 隧道工程; 温度简谐波; 温度振幅; 相位移; 敏感性分析

摘要: In order to investigate the spatial-temporal changing laws of temperature field in cold region tunnels, a radial heat transfer model was established of temperature of simple harmonic quantity in the cold-region tunnel according to the time and space scales from the perspective of waves. Moreover, the radial heat transfer expression of temperature of simple harmonic quantity in the cold-region tunnel was deduced based on Fourier's laws of heat transfer. Based on the temperature test results of Xing'anling Highway Tunnel, the feasibility of the radial heat transfer expression of temperature of simple harmonic quantity was verified. Distribution characteristics of temperature of simple harmonic quantity in radial depth and its variation with freeze-thaw cycles were analyzed. The sensitivity factor for this temperature was normalized to each influence factor

using the system stability analysis method. Analysis result shows that within the tunnel radial depth of 0.00-4.00m, the temperature amplitude has a range of 11.67°C-0.45°C and it decays as a negative exponential function. The temperature phase shift has a range of 0.00-75.24d and it increases as a proportional function. The average annual temperature increases linearly and has a range of -0.62°C-1.98°C. Affected by the annual warming trend of temperature at the tunnel site, the average annual temperature on the tunnel wall at the entrance increases by approximately 0.75 °C from 2016 to 2019, which increasing every year with the freeze-thaw cycles. The average annual temperature is greatly affected by the freeze-thaw cycles within a depth of 2.00m, but less affected at depths beyond 2.00m. The temperature amplitude on the tunnel wall at the entrance decreases by 1.48 °C from 2016 to 2019, and that attenuates every year with the freeze-thaw cycles. The temperature amplitude decays faster below the depth of 2.00m, but slower above 2.00m. The day phase on the tunnel wall at the entrance is delayed by 7.20d from 2016 to 2019, which continues to rise every year within freeze-thaw cycles. The sensitivities of temperature of simple harmonic quantity to each influence factor from high to low are temperature amplitude and average annual temperature of tunnel wall, ice content, water content and porosity of surrounding rock, specific heat capacity and thermal conductivity of skeleton particles. 3 tabs, 8 figs, 42 refs.

摘要: 为探究寒区隧道温度场的时空演化规律,以波的视角从时间尺度和空间尺度建立了寒区隧道温度简谐波径向传热模型,基于傅里叶传热定律推导了寒区隧道温度简谐波径向传热表达式;依托兴安岭公路隧道温度测试结果,验证了温度简谐波径向传热表达式的可行性,分析了温度简谐波沿隧道径向深度的分布特征与随冻融周期的变化规律;采用系统稳定分析法,研究了温度简谐波对各影响因素归一化的敏感度因子。研究表明:沿隧道径向深度 0.00~4.00m,温度振幅呈负指数函数形式衰减,变化范围为 11.67°C~0.45°C;温度相位呈正比例函数形式增大,变化范围为 0.00~75.24d;年平均温度呈线性升高的趋势,变化范围为 -0.62°C~1.98°C;受隧道区气温逐年变暖趋势的影响,隧道进口端壁面年平均温度从 2016~2019 年升高了约 0.75°C,年平均温度随冻融周期逐年增大,2.00m 深度内年平均温度受冻融周期影响较大,超过 2.00m 年平均温度受冻融周期影响相对较小;隧道进口端壁面温度振幅从 2016~2019 年衰减了 1.48°C,温度振幅随冻融周期逐年衰减,2.00m 深度内温度振幅衰减较快,超过 2.00m 温度振幅衰减较慢;隧道进口端壁面日相位从 2016~2019 年延迟了 7.20d,日相位随冻融周期逐年增大。温度简谐波对各影响因素的敏感性由高到低依次为壁面温度振幅、壁面年平均温度、围岩含冰率、围岩含水率、围岩孔隙率、骨架颗粒的质量热容量与导热系数。

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标题: Mixed ventilation design system combined cross passage with single shaft in extra-long highway tunnel

标题: 特长公路隧道横通道结合单风井混合式通风设计体系

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作者关键词: tunnel engineering; mixed ventilation mode; design system; air-exchange cross passage; fan power comparison

作者关键词: 隧道工程; 混合通风方式; 设计体系; 换气横通道; 风机功率比较

摘要: In order to reduce the construction and operation costs of highway tunnel ventilation systems, and solve the problem of limited applicable length for the complementary ventilation system, a complementary ventilation system was applied to the sectional longitudinal ventilation mode. A mixed ventilation mode combined air-exchange cross passage with a single shaft was proposed. Based on tunnel ventilation theory, the calculation formulas for this mode were deduced. Combined with tunnel ventilation design procedures, a design process from selecting the air shaft position, calculating the designed air volume, selecting the cross passage position, calculating the air exchange ratio of cross passage to checking the pollutant concentration was developed. The applicability of the mixed ventilation mode was then analyzed according to tunnel structure form and wind demand of left-right line tunnels. An engineering case study was conducted on the practicability of the mixed ventilation mode. The mixed ventilation mode was compared with the conventional sectional longitudinal ventilation mode in terms of the construction scale and operation energy consumption. Analysis result shows that compared with conventional sectional longitudinal ventilation mode, the proposed mixed ventilation mode adds two air-exchange cross passages and a smoke exhaust passage in terms of tunnel structure and reduces part of connection access and a ventilation shaft. Therefore, the overall scale of the structure and the preliminary construction cost are reduced, and the problem of complementary ventilation mode limited by the

length of fire smoke exhaust in extra-long highway tunnels is effectively solved at the same time. In terms of operation energy consumption, when vehicle speed in the tunnel is $60\text{km}\cdot\text{h}^{-1}$, the mixed ventilation mode is more efficient because of the utilization of the traffic wind pressure and the reduction of the need for mechanical ventilation power in the tunnel. Although the energy consumption of jet fans increases, the energy consumption of axial fans reduces by 25.00%, and the total power reduces by 10.85%. The operation energy consumption of tunnel is effectively reduced, which brings significant economic benefits. 5 tabs, 7 figs, 30 refs.

摘要: 为了降低公路隧道通风系统土建与运营费用,解决互补式通风系统适用长度有限的问题,将互补换气系统应用于分段式纵向通风方式中,提出了换气横通道结合单风井的混合通风方式;在隧道通风理论的基础上,推导了适用于混合通风方式的计算公式;结合隧道通风设计程序,给出了从风井位置确定、设计风量计算、横通道位置确定、横通道换气比计算到污染物浓度校核的设计流程,从隧道结构形式和左、右洞的需风量两方面,分析了混合通风方式的适用条件;结合工程案例,分析了混合通风方式的实用性,对比了常规分段式纵向通风方式和混合通风方式的土建规模和运营能耗。研究表明:与常规分段式纵向通风方式相比,在隧道结构方面,混合通风方式增加 2 个换气横通道和 1 个排烟通道,减少部分联络通道和 1 座通风井,从而降低了土建总体规模,减少了初期土建投资费用,同时解决了互补通风方式在特长公路隧道应用中受火灾排烟长度限制的问题;在运营能耗方面,当车速为 $60\text{km}\cdot\text{h}^{-1}$ 时,混合通风方式充分利用隧道内的交通风升压力,减少了机械通风动力的需求,虽然隧道内射流风机能耗功率有较大增加,但轴流风机能耗功率降低了 25.00%,总功率减小了 10.85%,隧道运营通风能耗得到有效降低,具有显著的经济效益。

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标题: Review of Shield Tunnel Backfill Grouting Tests and Its Diffusion Mechanism

标题: 盾构隧道壁后注浆试验与浆液扩散机理研究进展

来源出版物: 中国公路学报 卷: 33 期: 12 页: 92-104 出版年: 2020

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作者关键词: tunnel engineering; backfill grouting; review; model test; slurry diffusion mechanism

作者关键词: 隧道工程; 壁后注浆; 综述; 模型试验; 浆液扩散机理

摘要: Backfill grouting in shield tunnels has the effect of controlling stratum deformation and ensuring uniform pressure on the segments. However, phenomena such as tunnel floating, segment damage, and broken bolt subject to shear force often occur during backfill grouting. The control of the slurry construction parameters is closely related to the effect of grouting. To achieve the expected grouting effect, it is of great practical significance to study the diffusion mechanism of the slurry during the backfill grouting process and propose a reasonable construction control strategy for backfill grouting. Based on the work carried out by scholars at home and abroad on the diffusion mechanism of grouting slurry, this paper summarizes three aspects, i.e., field measurement, model tests, and theoretical analyses, and analyzes the progress and deficiencies of existing research. In terms of field measurements, the current commonly used monitoring methods are ground penetrating radar (GPR) nondestructive methods and buried instrument methods. Indoor model tests include overall model tests and local model tests, while the overall model tests is mainly used to simulate the synchronous backfill grouting construction in the shield tunneling process, and the local model tests is mainly used to analyze the slurry consolidation deformation and pressure dissipation. In regard to theoretical analyses, researchers primarily study the slurry diffusion process from the aspects of the characteristics of shield tail gap, slurry fluid characteristics and the slurry-soil interaction mechanism. The slurry diffusion process can be summarized as four stages: filling diffusion, penetration diffusion, compaction diffusion and splitting diffusion. Theoretical models of filling diffusion are mainly ring-shaped filling diffusion and fan-shaped filling diffusion. Theoretical models of penetration diffusion include spherical penetration diffusion and cylindrical penetration diffusion. Theoretical models of compaction diffusion include spherical compaction diffusion and columnar compaction diffusion. The splitting diffusion process is rarely considered. Numerical simulation studies focus on the influence of pressure of grout acting on segment and ground settlement caused by shield tunnel grouting injection. Finally, this paper provides an outline of the developing trend of the diffusion mechanism of shield tunnel backfill grouting from aspects of cross-section form of shield tunnel, stratum adaptability of the theoretical model, unified diffusion model, and microscopic mechanism of slurry diffusion.

摘要: 盾构隧道壁后注浆具有控制地层变形、确保管片受力均匀等作用,但壁后注浆施工中也常出现隧道上浮、管片破损、螺栓剪断等现象,壁后注浆效果与注浆施工参数的控制密切相关。为达到预期注浆效果,深入研究壁后注浆过程中浆液的扩散机理,提出合理的壁后注浆施

工控制策略具有重要现实意义。基于目前国内外学者在盾构隧道壁后注浆浆液扩散机理方面所开展的工作,从现场实测、模型试验、理论分析 3 个方面进行梳理总结,分析现有研究的进展和不足。在现场实测方面,目前常用的监测手段是探地雷达无损检测法和埋设仪器法;室内模型试验包括整体模型试验和局部模型试验,整体模型试验主要用于模拟盾构掘进过程中的同步注浆施工,局部模型试验主要用于分析浆液固结变形以及压力消散过程;在理论分析方面,当前主要从盾尾间隙特征、浆液流体特性以及浆液-土体相互作用机理研究浆液扩散过程,浆液扩散过程可概括为充填、渗透、压密和劈裂 4 个阶段,充填注浆浆液的扩散模型主要是环形充填扩散和扇形充填扩散,渗透注浆浆液的扩散模型有球面渗透扩散和柱面渗透扩散,压密注浆浆液的扩散模型有球形压密扩散和柱形压密扩散,劈裂注浆过程很少考虑;在数值计算方面主要侧重于研究盾构壁后注浆对管片受力和地表沉降的影响。最后,分别从盾构隧道断面形式、理论模型的地层适应性、统一扩散理论模型、浆液扩散微观机理等方面展望了盾构隧道壁后注浆浆液扩散机理研究的发展趋势。

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作者关键词: tunnel engineering; large-deformation control; in-situ experiment; double primary linings; supporting mechanism

作者关键词: 隧道工程; 大变形控制; 现场试验; 双层初期支护; 支护机制

摘要: To explore the large-deformation control technology and reasonable support forms for a large-span highway tunnel in chlorite schist, based on the Lianchengshan Tunnel of the Baoji-Hanzhong Expressway in Shaanxi Province, the deformation of surrounding rock and the stress of supporting structure under three primary support forms of single I22b, double I22b and double HK200b steel sets were in-situ measured, the deformation-controlled effects of different primary support forms were compared and analyzed, and the large-deformation control method and support system of large-span highway tunnels in soft rock were proposed. The study results indicate that the combined support system of "large deformation allowance + double HK200b steel sets + large-diameter long foot reinforcement bolt + deep invert" can effectively control large-deformation disasters in the tunnel and prevent the clearance invasion of primary lining and the multiple reconstruction of steel sets. To avoid the local instability and local reinstallation caused by insufficient stiffness, the stiffness of the first steel rib should not be too weak. The contact pressures of the second primary lining and secondary lining account for 61% and 40% of the ground pressure, respectively. It has a significant effect on optimizing structural stress and preventing floor heave by adjusting the invert curvature. Based on a statistical analysis of the ground pressure and radial displacement of the test sections in the Lianchengshan Tunnel, the characteristic curves of the surrounding rock and support under different supporting phases and stiffnesses were established. The dynamic interaction mechanism between the surrounding rock and support and the supporting mechanism of the large-deformation control method of "multilayer and staged strong support" were revealed. Combined with the engineering practice of large-deformation treatment in the Lianchengshan Tunnel, the large-deformation control technology of "three-bench method with reserved core soil + large deformation allowance, multilayer and staged strong support + large-diameter long foot reinforcement bolt + deep invert," the large-deformation control concept of "no clearance invasion, no support reconstruction, no damage to the compaction zone," and the construction principle of "quick excavation and quick support with larger section and fewer steps" were proposed and summarized. The research results can provide a significant reference for the large-deformation control of similar soft rock tunnels.

摘要: 为了探索泥质片岩地层大跨度公路隧道大变形控制技术及合理支护形式,以陕西省宝(鸡)汉(中)高速公路连城山隧道工程为依托,针对采用单层 I22b、双层 I22b 和双层 HK200b 钢架的 3 种初期支护形式,通过对围岩变形和支护结构受力进行现场量测,对比分析了不同初期支护形式的变形控制效果,提出了大跨度公路隧道软岩大变形控制方法和支护体系。研究结果表明:"大预留+双层 HK200b 钢架分次强支护+大管径长锁脚锚管+深仰拱"联合支护体系能有效控制隧道大变形灾害,避免初期支护变形侵限及频繁拆换拱;该支护体系中第 1 层初期支护钢架的刚度不宜太弱,以避免因其刚度不足导致的局部失稳和局部拆换问题;试验断面第 2 层初期支护的接触压力约占第 1 层初期支护围岩压力的 61%,二次衬砌接触压力约占第 1 层初期支护围岩压力的 40%;调整仰拱曲率对于优化结构受力和防治仰拱底鼓作用显著;基于对连城山隧道试验断面围岩压力和径向位移的统计分析,建立了不同支护阶段和不同刚度下的围岩-支护特征曲线,揭示了围岩与支护的相互动态作用机制和"多层分次强支护"大变形控制方法的支护作用机制;结合连城山隧道大变形处置实践,总结提出了"三台阶留核心土法+大

预留、多层、分次支护+大管径长锁脚锚管+深仰拱"的大变形控制技术、"不侵限、不换拱、不破坏压密区"的大变形防控理念及"大断面、少分步、快挖快支"的施工原则。研究成果可为类似软岩隧道大变形控制提供重要借鉴。

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标题: Mechanical Calculation Model and Research on Construction Mechanical Behavior of Middle Diaphragm in Upper Bench CD Method for Super-large Span Tunnel

标题: 超大跨度隧道上台阶 CD 法中隔壁力学计算模型及施工力学行为研究

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作者关键词: tunnel engineering; mechanical behavior; computational model; middle diaphragm; upper bench CD method; super-large span

作者关键词: 隧道工程; 力学行为; 计算模型; 中隔壁; 上台阶 CD 法; 超大跨度

摘要: To study the construction mechanical behavior of the middle diaphragm structure during the construction of a super-large span tunnel by sequential excavation method, this study was based on the Letuan Tunnel of the Shandong Binlai Expressway reconstruction and expansion project and established a mechanical calculation model of the steel frame of primary support and middle diaphragm with bearing load and deformation. The support system is equivalent to the three times

statically indeterminate hinge free arch-beam fixed structure with movable support with considering the internal force transfer, deformation coordination, and arch foot displacement between the side wall steel frame and the middle diaphragm. In addition, the mechanical behavior of the middle diaphragm in the construction of a super-large span tunnel by the upper bench CD method was analyzed by a combination of theoretical analysis, field test, and mechanical model calculation. The results show that the settlement of the arch crown and surrounding convergence at the monitoring section experienced three main stages: rapid growth, slow deformation, tending to stability, and finally a relatively stable state. Each deformation value was less than 150 mm, which was the limit established in the design. The stress of the steel frame is mainly affected by the construction process and the change in the constraint conditions of the support structure, and the stress of each measuring point is below 235 MPa. The relative error between the calculated results of the mechanical model and measured data is 12.6%. The axial force of the steel frame is always under pressure during the construction of the upper bench, and the maximum value occurs at the arch foot of the steel rib. Under the influence of back-guide hole excavation, the axial force of the middle diaphragm steel rib increases, and the axial force of the primary support steel frame decreases. The bending moment of a majority of the steel rib is positive, and that of the vault part is negative. Affected by the excavation of the back-guide hole, the positive bending moment and the positive bending moment area of the middle diaphragm steel rib are reduced. Simultaneously, the positive bending moment area of the primary support steel rib is reduced, and the bending moment near the arch foot of the steel rib is negative. The entire steel frame structure is in the state of eccentric compression. Affected by the back-guide hole excavation, the small eccentric compression area of the middle diaphragm steel rib and primary support steel rib move, and the proportion of small eccentric compression length of the two steel ribs increases.

摘要: 为研究超大跨度隧道分部开挖法施工中隔壁结构的施工力学行为,以山东滨莱高速公路改扩建工程双向八车道乐疃隧道为依托,基于初期支护钢架与中隔壁钢架之间的内力传递、变形协调及拱脚变位,将支护体系等效为支座可移动的三次超静定无铰拱-梁固接结构,建立了上台阶先导初期支护钢架-中隔壁钢架共同承载变位力学计算模型,采用理论分析、现场测试和力学模型计算相结合的方法,对超大跨度隧道上台阶 CD 法施工时中隔壁的力学行为进行分析。研究结果表明:拱顶沉降和周边收敛主要经历急剧增长、缓慢变形和趋于稳定 3 个阶段,且各变形值均小于设计预留变形量 150 mm;受施工工序和结构约束条件变化的影响,钢架内外侧应力整体呈现出先急剧变化后逐渐趋于稳定的规律,各测点应力小于型钢屈服强度 235 MPa;力学模型计算结果和现场实测数据的平均相对误差为 12.6%,且规律基本一致;钢架轴力在上台阶施工过程中始终为受压,且最大值均在钢架拱脚处,受后导开挖影响,中隔壁钢架轴力增大,初期支护钢架轴力减小;先导开挖时钢架弯矩大部分部位为正,拱顶部位为负,受后导开挖影响,中隔壁钢架正弯矩值及正弯矩区域减小,同时初期支护钢架正弯矩区域减小,钢架拱脚附近弯矩出现负值;钢架结构整体处于偏心受压状态,受后导开挖影响,中隔壁钢架和初期支护钢架小偏心受压区域均发生移动,且两者钢架小偏心受压长度占比增大。

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标题: Static Wind Stability of Long-Span Asymmetric Suspension Bridge

标题: 大跨度非对称悬索桥的静风稳定性研究

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作者关键词: bridge engineering; suspension bridge; asymmetric; static wind stability; instability critical state; instability process

作者关键词: 桥梁工程; 悬索桥; 非对称; 静风稳定性; 失稳临界状态; 失稳过程

摘要: In order to study the internal mechanism of the static wind instability of the long-span asymmetric suspension bridge,taking a suspension bridge with a main span of 628 m as the background,the corresponding ANSYS finite element model was established to analyze the static wind stability.Considering the nonlinear influence of the structure system and the static load,the instability process and critical state of bridge under static wind load were analyzed by double iteration method.The results show that the instability process of the long-span asymmetric suspension bridge is that the static wind displacement of the main beam increases nonlinearly,which leads to the increase of the relative vertical displacement of the main cable and suspender,and the stress of the main cable and suspender decreases continuously until the main cable and the suspender are close to the relaxation state and lose stability.The static wind instability mode is a complex threedimensional instability state,in which the main girder is symmetric transverse bending and symmetric torsion,and the vertical displacement also has a great influence on it.The internal mechanism of static wind instability is that the increase of additional

wind attack angle leads to the nonlinear increase of lifting moment and lifting force,the torsion deformation of main beam and the vertical displacement of cable,which leads to the decrease of cable stress and even local relaxation,and finally leads to the significant reduction of gravity stiffness of the bridge structure.

摘要: 为研究大跨非对称悬索桥的静风失稳的内在机理,以主跨 628 m 的某悬索桥为背景,建立相应 ANSYS 有限元模型进行静风稳定性分析。考虑到结构体系自身和静力荷载的非线性影响,采用两重迭代法分析了桥梁在静风荷载作用下的失稳过程和临界状态。结果表明:大跨度非对称悬索桥的失稳过程是主梁静风位移非线性增大,导致主缆和吊杆的相对垂直位移增大,使得主缆和吊杆的应力不断减小,直至主缆和吊杆接近松弛形态而失稳;静风失稳形态是以主梁发生对称横弯和对称扭转为主,同时竖向位移也有较大影响的复杂对称弯扭耦合的三维失稳状态;静风失稳内在机理是由于附加风攻角的增大导致升力矩和升力非线性增大,主梁扭转变形和缆索的竖向位移也不断增大从而导致缆索应力下降出现局部松弛化,最终导致该桥梁结构重力刚度大幅降低。

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标题: Thermal-oxygen aging effects on viscoelastic properties of high viscosity modified asphalt

标题: 热氧老化作用对高黏改性沥青黏弹特性的影响

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作者关键词: road engineering; high viscosity modified asphalt; aging; high temperature; low temperature; medium temperature

作者关键词: 道路工程; 高黏改性沥青; 老化; 高温; 低温; 中温

摘要: To study the thermal-oxygen aging effects on viscoelastic properties of high viscosity modified asphalt,two high viscosity modifiers were selected to prepare high viscosity modified

asphalt in the laboratory. The rolling thin film oven test and the pressurized aging vessel test were selected to simulate the short-term and long-term aging of two kinds of high viscosity modified asphalt, respectively. Then, a scanning electron microscope was used to investigate the thermal-oxygen aging effects on the microstructure of high viscosity modified asphalt. Finally, the temperature sweep test, the flexural creep stiffness test, and the linear amplitude sweep test were used to study the effects of thermal-oxygen aging on the high- and low-temperature viscoelastic properties and the medium-temperature fatigue properties of the high viscosity modified asphalt. The results show that, the effects of long-term aging on the viscoelastic properties of high viscosity modified asphalt are greater than that of short-term aging. In terms of microstructure, thermal-oxygen aging mainly affects the properties of high viscosity modified asphalt from two aspects, the volatilization of light components, and the swelling and degradation of the high-viscosity modifier. From the perspective of macroscopic performance, under high-temperature conditions, thermal-oxygen aging will increase the complex shear modulus of high viscosity modified asphalt, decrease the phase angle and the high-temperature viscoelastic index Z , and increase the anti-rutting ability. Under low-temperature conditions, thermal oxidative aging reduce the ratio of creep stiffness to creep rate m/S and the creep compliance derivative of high viscosity modified asphalt, indicating that the low-temperature deformation ability of high viscosity modified asphalt become worse. At low-temperature, the effect of temperature on the deformation capacity of high viscosity modified asphalt is much greater than that of the aging degree. The effect of thermal oxidative aging increases the yield stress of high viscosity modified asphalt at medium-temperature, indicating that the fatigue life is reduced.

摘要: 为了研究热氧老化作用对高黏改性沥青黏弹特性的影响,选择 2 种高黏改性剂制备高黏改性沥青。首先,分别对其进行旋转薄膜加热试验和压力老化容器加速沥青老化试验,模拟短期老化和长期老化现象;然后,采用扫描电镜观察热氧老化作用对高黏改性沥青微观结构的影响;最后,采用温度扫描试验、弯曲蠕变劲度试验及线性振幅扫描试验,分别研究了热氧老化作用对高黏改性沥青高低温黏弹特性及中温疲劳特性的影响。结果表明:长期老化对高黏改性沥青性能的影响大于短期老化对其性能的影响;从微观结构来说,热氧老化作用主要从 2 个方面影响高黏改性沥青性能,即轻质组分的挥发和高黏改性剂的溶胀、降解;从宏观性能来看,高温状态下,热氧老化作用使高黏改性沥青的复数剪切模量增大,相位角减小,高温黏弹性指标 Z 减小,抗车辙能力增加;低温状态下,热氧老化作用导致高黏改性沥青的蠕变速率与蠕变劲度之比(m/S)降低,蠕变柔量导数减小,低温变形能力变差,且在低温状态下温度对高黏改性沥青变形能力的影响远大于老化程度的影响;中温状态下,热氧老化作用使高黏改性沥青的屈服应力增大,疲劳寿命减小。

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作者: 李加武; 徐润泽; 党嘉敏; 朱长宇; 王子建

标题: Field measurement of basic wind characteristics of trumpet river valley

标题: 喇叭口河谷地形基本风特性实测

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作者关键词: bridge engineering; wind characteristic; field wind speed monitoring; wind profile; complex terrain

作者关键词: 桥梁工程; 风场特性; 现场实测; 风速剖面; 复杂地形

摘要: In order to further study the wind field characteristics of complex terrain, and at the same time obtain the wind parameters at the actual bridge site, the topography of the trumpet valley was taken as the research object for a six-month field measurement. In this area, rivers enter into flat areas from mountainous areas. Therefore, such river valleys have both the characteristics of mountain valleys and plains, and the landforms were complex. During the measurement, a three-dimensional scanning wind lidar was used to make multi-point measurements in the river valley. The measurement points were arranged based on a local two towers cable-stayed bridge. A virtual wind measuring tower was installed every 141 m along the axis of the bridge, for a total of 4 virtual wind towers. And wind profiles of these 4 measuring points were obtained. Finally, wind profiles at different locations, the average wind speed and direction at different locations and different heights in the trumpet river valley were obtained, and the wind field characteristics under the terrain were obtained through analysis. The results show that the wind speed is accelerated at a certain height, and this phenomenon mainly occurs in the middle and lower height of the river valley. The cause is related to the change of the incoming wind direction and the terrain. The wind profile of the trumpet valley is more complicated than the model listed in the wind-resistant design specification for highway bridges (JTG T 3360-01-2018), and it is difficult to describe with the existing model. But it can still be described with the power function. Affected by the incoming current and the surrounding terrain, at the height of the bridge deck, the wind speed at the mid-span position is greater than the wind speed on sides when wind speed is high. Affected by the direction

of the incoming flow and the terrain, there are differences in the wind direction at different locations at the height of the bridge deck. When the atmospheric wind direction is northwest, the wind direction in the valley changes greatly from low altitude to high altitude. When the atmospheric wind direction is southeast, the difference in the vertical direction of the wind direction in the valley is small. The results obtained in this paper are quite different from the current description of wind characteristics in the specification, so these results can supplement the content of the specification and also provide a reference for the prediction of wind characteristics in complex terrain.

摘要: 为了研究复杂地形的风场特性,同时获得实际桥址处的风参数,以喇叭口河谷地形为研究对象,进行了为期6个月的现场实测。河流在该区域由山区进入平坦地区,因此该类河谷既有山区峡谷特点又有平原的地貌特点,地形地貌复杂。实测过程中使用三维扫描式激光雷达在河谷内进行多点观测,依托当地1座双塔斜拉桥进行测点布置。沿桥轴线方向每隔141 m设置1个虚拟测风塔,总计4个虚拟测风塔,即可得到这4个测点处的风速剖面。最终得到喇叭口河谷内不同位置的风剖面,以及不同位置、不同高度处的平均风速和风向,分析得到该地形下的风场特性。研究表明:在一定高度处风速有加速现象,此现象主要发生于河谷中下部,其成因与来流风向变化及地形有关;喇叭口河谷地形风剖面比《公路桥梁抗风设计规范》(JTG T 3360-01-2018)(简称规范)所列的模型复杂,难以用现有模型进行描述,但仍可以用幂函数进行描述;受来流及周围地形地貌影响,高风速时桥面高度处跨中位置的风速要大于两侧风速;桥面高度处不同位置的风向受来流方向和地形的影响存在差异;大气风向为西北方时,谷内风向角由近地面到高空变化较大,大气风向为东南方时,谷内风向角垂直方向上差异较小。所得观测结果与目前规范对风特性的描述存在较大差异,可对规范内容进行补充,同时也可作为复杂地形下的风特性预测提供参考。

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第 13 条, 共 130 条

作者: Yuan Shuai; Feng Dewang

作者: 袁帅; 冯德旺

标题: Computational Limit Analysis of Shield Tunnel Face with a Consideration of Permeability Anisotropy

标题: 考虑渗透系数各向异性的盾构隧道开挖面稳定性数值极限分析

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作者关键词: stability of excavation face; anisotropy of permeability; limit analysis; seepage force

作者关键词: 开挖面稳定性; 渗透系数各向异性; 极限分析; 渗透力

摘要: The shield method is widely applied in the construction of subways and instability of the excavated surface of shield tunnels will be induced if insufficient support pressure is exerted, resulting in significant economic losses and casualties. The hydraulic states will be changed by the excavation and the induced water flow not only introduces the seepage force but also deteriorates the mechanical behavior of the surrounding soils. Therefore, more attention should be paid to the stability of the tunnel face under seepage conditions. The permeability of the surrounding soils is mostly simplified to be isotropic, which is in fact anisotropic due to the effect of the depositional environments. Based on the bounding theory, a three-dimensional computational limit analysis method is established by the combination of the simplex strain finite element method and the semi-definite programming. Through the incorporation of seepage analysis, the effect of permeability anisotropy on the seepage field, the limit supporting pressure and the collapse mechanism of the shield tunnel face is discussed. The present paper can provide important guidance to the construction of shield tunnels.

摘要: 城市地铁隧道普遍采用盾构法施工,盾构掘进过程中密封舱支护力不足会引起开挖面的突然坍塌,造成重大人员伤亡和财产损失。隧道开挖会造成周围地层水力环境改变,引起地下水渗流,不仅在开挖面前方土体中产生渗透力,也使得围岩力学性质弱化,大大增加了盾构隧道开挖面失稳的风险。现有工作一般假定土体渗透系数为各向同性以简化计算,然而,土在沉积的过程中由于各种因素的影响会产生各向异性,即渗透特性与所选取的方向有关。基于极限分析理论,结合有限元四面体单元和半正定锥规划,建立三维数值极限分析方法。在此基础上,结合渗流分析,研究渗透系数各向异性条件下盾构隧道开挖面附近渗流场及开挖面极限支护力的变化规律,分析渗透系数比对开挖面破坏模式的影响,为盾构隧道安全施工提供重要的参考。

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作者: Yuan Gaoang; Li Dewen; Pan Junli; Hao Peiwen

作者: 袁高昂; 李德文; 潘军利; 郝培文

标题: Influence Factors and Simulation of Anti-reflection Crack of Large Stone Porous Asphalt Mixes

标题: 大粒径透水沥青混合料抗反射裂缝影响因素及仿真研究

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文献类型: Article

作者关键词: large stone porous asphalt mixes (LSPM); anti-reflection crack; overlay tester (OT); height; air void content; numerical analysis

作者关键词: 大粒径透水沥青混合料; 抗反射裂缝; 路面抗裂缝性能测试; 高度; 空隙率; 数值分析

摘要: Overlay tester (OT) tests were carried out with different gradations, sample heights and air void to quantitatively evaluate anti-reflection crack performance of large stone porous asphalt mixes (LSPM) in this paper. Maximum load loss rate, first cycle load loss rate and loading cycle of 50% load loss rate were adopted for analysis, and anti-reflection crack prediction models based on sample height and air void were put forward. Finite element analysis of cohesion zone model in OT test was carried out to study the mechanism of different factors affecting anti-reflection crack. Results show that the load loss rate can be estimated by the natural logarithm model. The anti-reflection crack performance of LSPM-30 with different gradations can be more effectively evaluated with first cycle load loss rate and loading cycles of 50% load loss rate. The air void of samples has a more significant influence on the anti-reflection crack of LSPM-30 than that of the height, and the height of the anti-reflection crack samples in OT test is recommended to be no less than 70mm in this study. The results of numerical analysis show that the crack type is I crack induced by the higher tensile stress/strain at the crack tip, which is mainly distributed in the interior of asphalt mortar and the interface between asphalt mortar and aggregate.

摘要: 为了定量评价大粒径透水沥青混合料(large stone porous asphalt mixes,LSPM)的抗反射

裂缝性能,开展了不同级配、试样高度和空隙率条件下的室内路面抗裂缝性能测试(overlay tester,OT)试验,分别采用最大荷载损失率、第一周期荷载损失率和 50%荷载损失率加载周期数 3 个指标进行评价,建立了基于试样高度和空隙率的抗反射裂缝疲劳寿命预估模型;进而开展 OT 试验的内聚力模型有限元分析,对不同因素影响抗反射裂缝的试验过程开展研究.结果表明:荷载损失率可以通过对数模型进行预估;采用第一周期荷载损失率和 50%荷载损失率下加载周期数更能有效地评估不同级配 LSPM-30 的抗反射裂缝性能;试样孔隙率对 LSPM-30 抗反射裂缝具有更显著影响,推荐 LSPM-30 的 OT 试验抗反射裂缝试样高度不小于 70mm;数值分析结果表明裂缝是由于裂尖的拉应力/应变较大而诱发的张开型裂缝,主要分布于沥青胶结料内及沥青胶结料和集料的界面处.

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作者: Guo Wenlong; Shan Chenglin; Liang Peng

作者: 郭文龙; 单成林; 梁鹏

标题: Study on Testing Mechanism and Application of Tension under Anchor for External Prestressing Strand by Reverse Tension Method

标题: 体外束锚下张拉力反张法测试机理及应用

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文献类型: Article

作者关键词: bridge engineering; external prestress; tension; reverse tension method; mechanism; practical test method

作者关键词: 桥梁工程; 体外预应力; 张拉力; 反张法; 机理; 实用测试方法

摘要: In view of the lack of reliable testing methods for the effective tension of end anchor of

external prestressed strand,the mechanical mechanism of testing the tension of end anchor by the reverse tension method was revealed based on the mechanical mechanism of mechanical equilibrium and deformation coordination. And the theoretical testing error under the most unfavorable conditions was analyzed,and the applicable conditions of the method were pointed out. Finally,based on the most commonly used construction machines and equipment in the construction site,a practical test method and system composition were put forward and verified on the indoor static load anchorage test machine. The test results show that the sensitivity of different parameter curves in judging tension force under strand anchor is: force-displacement curve > force-time curve > displacement-time curve. The test accuracy of the proposed method can meet the requirements of engineering accuracy.

摘要: 为解决钢绞线锚下有效张拉力缺乏可靠随机抽检方法的问题,从力学平衡和变形协调条件出发,推导了反张法检测单根钢绞线锚下张拉力的力学机理,分析了其最不利条件下的理论测试误差,指出了该方法的适用条件。最后结合常用施工机具和设备,提出了一种非常实用的测试方法和系统组成,并在室内静载锚固试验机上进行了验证。试验结果表明:采用该方法测试钢绞线锚下张拉力时,夹片与锚具拉脱临界时刻前后不同参数曲线的敏感性依次是:力-位移曲线>力时程曲线>位移时程曲线,该方法的测试精度能够满足工程精度要求。

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作者: 张驰; 胡涛; 侯宇迪; 翟艺阳; 向德龙

标题: Crash Risk Evaluation Model Based on Brake Heating for Trucks under Continuous Downhill Road Conditions

标题: 基于制动毂温升的连续下坡货车事故风险评价模型

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作者关键词: crash risk; continuous downhill; brake heating; temperature gradient; multiple nonlinear regression

作者关键词: 事故风险; 连续下坡; 制动毂温度; 温度梯度; 多元非线性回归

摘要: An innovative model based on brake heating for crash risk evaluation was proposed to quantitatively evaluate the driving risk of trucks on continuous downhill. First, considering the risk of chain accidents caused by the continuous reduction of truck braking performance, the brake heating of the brake hub was used to represent the key risk cause of the crash accidents, and the truck accident rate was used to represent the risk accident. Then, taking the continuous downhill in Ya'an-Xichang section of Beijing-Kunming highway as the research section, the risk cause and risk accident were quantified by numerical simulation of the brake heating, and the inner connection between braking temperature, temperature gradient and accident rate was revealed by correlation analysis. Finally, the crash risk measurement equation was constructed by using multiple nonlinear regression method to fit the surface function, and the crash risk evaluation model was established in combination with the risk classification criteria. The results show that the Cumulative Logistic function can better explain the changing law of the truck crash risk on downhill. The average error between the final model evaluation result and the actual accident is 0.288, and the accuracy rate is 80.87%. The evaluation model shows high accuracy and can provide reference for scientific decision-making in traffic safety management and control of continuous downhill sections.

摘要: 为量化评估高速公路连续下坡的货车行车风险,提出了基于货车制动毂温升的事故风险评价模型。首先,考虑货车下坡时制动性能持续降低诱发链式事故的风险,用制动毂温升表征货车下坡的关键风险致因,用货车事故率表征风险事故;然后,以京昆高速雅安至西昌段的连续下坡为研究路段,通过制动毂温升数值模拟进行了风险致因和风险事故的量化,利用相关性分析揭示了制动毂温度-温度梯度-事故率的内在联系;最后,采用多元非线性回归法拟合曲面函数,构建了事故风险度量方程,并结合风险分级标准建立了事故风险评价模型。结果表明:累积 Logistic 函数能够较好的解释货车下坡事故风险的变化规律,模型评价结果与实际事故的平均误差为 0.288,准确率达到 80.87%,模型精度较高,可为连续下坡路段的交通安全管控提供科学决策的依据。

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标题: Coupled Discrete-continuous Simulation and Analysis of Dynamic Interactions Between Hammer and Pavement

标题: 基于离散-连续耦合的落锤-路面动态相互作用研究

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作者关键词: PFC5.0 Suite; FLAC 3D; road engineering; impact acceleration; coupled discrete-continuous method; hammer-pavement interaction model; PFC5.0 Suite; FLAC 3D

作者关键词: 道路工程; 冲击加速度; 离散-连续耦合法; 落锤-路面相互作用模型

摘要: As typical low-or medium-speed collisions,hammer impacts have become an important engineering mechanical problem.In highway engineering,impact forces from hammers are commonly used to achieve engineering goals of compaction,reinforcement,micro-cracking,crushing,and inspection;however,their detrimental effects should be avoided.A coupled discrete-continuous model based on PFC5.0 Suite and FLAC~(3D) was developed to simulate the dynamic interactions between the hammer and pavement to explore the mechanism of their underlying dynamic interaction.The acceleration data of hammer were collected and analyzed by considering both the destructive and non-destructive cement pavement conditions.From the simulation results of the non-destructive pavement

conditions, it is observed that: ① in each impact acceleration curve, there are multiple peaks and troughs which are closely related to the pavement and hammer parameters; ② the peak acceleration values are positively correlated with both falling height and cement concrete modulus, whereas they are inversely correlated with the hammer mass; ③ the falling height of the hammer has negligible effects on the impact durations, whereas the hammer mass significantly increases the impact durations. From the simulation results of the destructive pavement conditions, it is observed that: ① the pavement destructions are closely related to the feature points of the impact acceleration curves; ② with the increasing degree of pavement destruction, the corresponding acceleration decreases with greater impact duration; ③ the falling height could result in pavement surface damage, whereas the hammer mass mainly results in damage to the pavement bottom. It is believed that the hammer acceleration values and pavement destruction features are closely correlated. These correlations are applicable for pavement distress detection, pavement crushing, and pavement micro-cracking. Additionally, the results could establish a solid foundation for further machinery development.

摘要: 落锤冲击是一种典型的中低速碰撞,也是现今工程技术中的重要力学问题。在公路工程领域,一方面利用落锤产生的巨大瞬时冲击力达到压实、加固、微裂、破碎、检测等目的,另一方面是避免过大的冲击力对结构物产生破坏作用。为了探索落锤-路面动态相互作用规律,基于 PFC5.0 Suite 和 FLAC~(3D)构建了离散-连续耦合模型,模拟无损和有损状态下水泥路面板承受落锤冲击过程中加速度的变化规律。通过路面无损状态下的仿真结果分析发现:①落锤冲击加速度曲线拥有多个波峰和波谷,且均与路面和落锤参数具有相关性;②冲击加速度峰值与落锤高度和水泥板模量正相关,而与落锤质量负相关;③落锤高度对冲击持续时间影响不大,而落锤质量将显著增长冲击持续时间。通过路面有损状态下的仿真结果分析,发现:①冲击加速度曲线特征点与路面破损状态密切相关;②随着水泥面板破损程度增大,冲击加速度值整体减小,冲击持续时间延长;③落锤高度和质量对路面破损模式的影响差异较大,前者主要引起表面破损,而后者主要引起底部破损。研究认为:落锤冲击加速度特征值与路面破损程度和破损模式之间存在密切的关联,相关研究结果可用于路面破损检测、破碎或微裂状态评价等实际工程中,同时也可作为工程器械的改进和研发提供基础支撑。

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标题: Compatibility and Enhancement Mechanism of Phase-change Microcapsules Modified Asphalt Based on Molecular Dynamics

标题: 基于分子动力学的相变微胶囊与沥青相容性及增强机理研究

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作者关键词: road engineering; phase-change microcapsule; molecular dynamics; graphene; compatibility; tensile strength

作者关键词: 道路工程; 相变微胶囊; 分子动力学; 石墨烯; 相容性; 抗拉强度

摘要: The microcapsule method is an important means of encapsulation of phase change materials (PCM).Molecular dynamics methods were used to investigate the phase change mechanism of phase change microcapsules modified asphalt to improve the low-temperature performance of asphalt pavement after adding phase change microcapsules.The compatibility and tensile strength after mixing were simulated and analyzed for the four-component asphalt (As,R,S,Ar),melamine formaldehyde resin (MF),four-component asphalt and MF blend,four-component asphalt and graphene (CG) blend,and MF and CG systems.The solubility parameters and cohesive energy densities were calculated for 17 molecular systems,such as the mixing,asphalt,asphalt and MF blending,and asphalt and CG blending systems,respectively.The four components of MF,CG,and asphalt were analyzed.The influence of MF and CG on the tensile strength of the four-component asphalt was evaluated according to the law of compatibility change.The PCM molecular model with three different microstructures using MF as the wall material and n-tetradecane as the core material,and that with two different microstructures using the graphene composite melamine formaldehyde resin (CGMF) as the wall material and n-tetradecane as the core material were used to simulate the phase-transition performance during the heating process.The effects of wall thickness and core volume on the PCM phase-transition performance were analyzed,and the thermal efficiency of different types of wall material PCM was compared.The effect of CG on the thermal efficiency of PCM was further analyzed by simulating the phase change performance of PCM with CGMF as the wall material during the cooling process.The results show that the use of

CGMF as a wall material to prepare PCM can improve the thermal efficiency of PCM. The energy efficiency of CGMFPCM2031 increases by an average of 141.15% compared with MFPCM2026. Adding PCM as a wall material to the asphalt system can increase the compatibility and tensile strength between the components of asphalt, and enhance the low-temperature crack resistance of asphalt systems.

摘要: 微胶囊法是相变材料(PCM)封装的一种重要手段,为了改善加入相变微胶囊后沥青路面的低温性能,采用分子动力学方法,对相变微胶囊的相变机制、与沥青共混后的相容性和抗拉强度等进行模拟分析。对沥青四组分(As,R,S,Ar)、三聚氰胺甲醛树脂(MF)、沥青四组分与MF共混体系、沥青四组分与石墨烯(CG)共混体系、MF与CG共混体系、沥青体系、沥青与MF共混体系、沥青与CG共混体系等17个分子体系分别进行了溶度参数和内聚能密度计算,分析了MF,CG与沥青四组分之间的相容性变化规律,评价了MF,CG对沥青四组分抗拉强度的影响。对以MF为壁材、正十四烷为芯材的3种不同微观结构PCM分子模型和以石墨烯复合三聚氰胺甲醛树脂(CGMF)为壁材、正十四烷为芯材的2种不同微观结构PCM分子模型进行了升温过程相变性能模拟研究,分析了壁材厚度、芯材体积大小对PCM相变性能的影响,并比较了不同种类壁材PCM的热效率。通过对CGMF为壁材的PCM降温过程的相变性能模拟研究,进一步分析了CG对PCM热效率的影响。研究结果表明:采用CGMF为壁材制备PCM,可以提升PCM的热效率,CGMFPCM2031的能量效率比MFPCM2026平均增加141.15%,在沥青体系中加入CGMF为壁材的PCM,可以提高沥青组分之间的相容性和抗拉强度,有利于增强沥青体系的低温抗裂性能。

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标题: Research progress on engineering properties of coarse-grained saline soil

标题: 粗颗粒盐渍土工程特性研究进展

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作者关键词: subgrade engineering; coarse-grained saline soil; engineering characteristic; road performance; salt expansion; collapse; freeze-thaw

作者关键词: 路基工程; 粗颗粒盐渍土; 工程特性; 路用性能; 盐胀; 溶陷; 冻融

摘要: Based on the distribution of saline soil, the environmental protection feature and the importance of rational utilization of coarse-grained saline soil were expounded. In view of the single-factor salt expansion test results, combined with the multi-factor interaction salt expansion test, the effects of five factors such as soil, water, salt, temperature and force on the salt expansion of coarse-grained saline soil were analyzed. According to the comparison of on-site and laboratory collapse test results, the typical laws of collapse characteristics of coarse-grained saline soil were concluded. The results of the freeze-thaw cycle test of coarse-grained saline soil under different working conditions were also summarized, and the existing improvement methods of saline soil were refined. The research directions of engineering characteristics of coarse-grained saline soil were proposed. Research result shows that the physical and mechanical properties of coarse-grained saline soil are related to its particle composition and salt content. The granule gradation of coarse-grained saline soil is also different in different regions. Temperature, salt content, salt type, moisture content, initial density and overburden load are all key factors that affect the salt expansion of coarse-grained saline soil, while certain interactions occur among these factors. It is suggested that when coarse-grained saline soil is used as a subgrade filler, the influence of various factors on salt expansion should be carefully considered, and the factors that inhibit salt expansion should be effectively utilized. Both on-site and laboratory collapse tests are identified as effective methods to determine the saline soil collapse rate. However, the laboratory collapse tests need to be improved and standardized with consideration of the particle effect of coarse-grained saline soils. The freeze-thaw cycle test can approximately simulate the actual working conditions and directly reflect the laws of temperature, moisture and deformation of coarse-grained saline soil. In the design of test scheme, various environmental factors in the actual project should be comprehensively considered, and the combination of different factors has a significant impact on the freeze-thaw cycle test results. When improving the engineering properties of coarse-grained saline soil, the on-site materials should be fully utilized, and volcanic ash and fly ash have better improvement effects. Establishing a four-field fully coupled model of water-heat-salt-force is considered as a fundamental step to improve the salt expansion mechanism of coarse-grained saline soil. 1 tab, 17 figs, 88 refs.

摘要: 从盐渍土的分布状况出发,阐述了合理利用粗颗粒盐渍土的环保性和重要性;基于单因素盐胀试验结果,结合多因素交互作用下的盐胀试验,分析了土、水、盐、温、力5要素对粗颗粒盐渍土盐胀量的影响效果;通过现场和室内溶陷试验结果对比,概括了粗颗粒盐渍土溶陷

特性的典型规律;梳理了不同工况下粗颗粒盐渍土冻融循环试验成果,完善了粗颗粒盐渍土现有的改良方法,提出了粗颗粒盐渍土工程特性的研究方向。研究表明:粗颗粒盐渍土的物理力学性质与其颗粒组成和含盐量关系密切;地域不同,粗颗粒盐渍土的颗粒级配亦有所差别;温度、含盐量、含盐类型、含水率、初始密度和上覆荷载均是影响粗颗粒盐渍土盐胀量的重要因素,且存在一定的交互作用;建议在将粗颗粒盐渍土用作路基填料时,应充分考虑各个因素对盐胀量的影响,有效利用具有抑制盐胀作用的因素;现场和室内溶陷试验均是测定盐渍土溶陷率的有效方法,但粗颗粒盐渍土室内溶陷试验需要在考虑土体颗粒粒径效应的基础上完善、规范;冻融循环试验可近似模拟粗颗粒盐渍土的实际工况,直观反映其温度、水分与变形等规律,但在进行试验方案设计时,需综合考虑实际工程中的各种环境因素,不同因素的组合对冻融循环试验结果影响较显著;在进行粗颗粒盐渍土工程特性改良时,应充分利用现场材料,火山灰、粉煤灰等具有较好的改良效果;应建立水-热-盐-力四场全耦合模型以进一步完善粗颗粒盐渍土盐胀机理。

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标题: Regulating effect of detonator location in blast-holes on transmission of explosion energy in rock blasting

标题: 岩石爆破中孔内起爆位置对爆炸能量传输的调控作用研究

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作者关键词: rock blasting; detonator location; explosion energy; transmission; regulating effect

作者关键词: 岩石爆破; 起爆位置; 爆炸能量; 传输; 调控作用

摘要: Based on the numerical simulation of a cylindrical explosive charge, the acting mechanism of the detonator location is analyzed from the views of the transmission of explosion energy and the distribution of blasting stress field. Meanwhile, the on-site blasting experiment investigation is also conducted. Finally, the spatial distribution of the explosion energy as well as the blasting outcome under three different traditional detonator locations (including top, bottom and mid-point locations) is comprehensively evaluated. As a result, an improved scheme for the layout of in-hole detonators is proposed. The results indicate that the detonator location plays an important role in the transmission of explosion energy, and it determines the spatial distribution of the explosion energy along the blast-hole axis. The explosion energy is preferentially transmitted to the front direction of the detonation wave. In bench blasting, the explosion energy is preferentially transmitted to the hole-collar under bottom initiation, and it can form relatively better blasting crater. Moreover, the bottom initiation can reduce the damage and disturbance towards the rock mass below the hole-bottom, but it may induce serious toe rocks or under break. The problems of poor rock fragmentation and toe rocks at the hole-bottom can be relieved if moving the detonator upwards, as some explosion energy is transmitted to the hole-bottom in this case. The traditional recommendation of the bottom initiation is not always the best choice, whereas the detonator location should be regulated in time according to special engineering purposes and onsite situations so as to achieve the optimal utilization of the explosion energy.

摘要: 从爆炸能量传输和爆炸应力场分布的角度,结合柱状药包爆破过程的数值模拟,揭示了起爆位置的影响作用机制,并开展了现场爆破试验研究,综合评价了上部、底部及中部3种传统起爆位置下爆炸能量的空间分布及爆破效果,设想了一种改进的孔内起爆雷管布置方案。结果表明,起爆位置对传入炮孔周围岩体的爆炸能量具有一定的调控作用,爆炸能量偏向于爆轰波传播的正向传输,起爆雷管的位置决定着爆炸能量沿炮孔轴向的分布。在台阶爆破中,孔底起爆时,爆炸能量偏向于孔口传输,可形成较为理想的爆破漏斗,且能减轻对孔底岩体的损伤与扰动,但其易于形成根底或造成欠挖,而适当上调雷管位置,会使部分爆炸能量向孔底传输,有助于加强孔底岩体的破碎及减少根底。以往多推荐的孔底起爆并非总是最优选择,应根据不同的工程目的及现场情况,适时地调整起爆雷管的位置,以充分发挥其对爆炸能量传输的调控作用,从而实现对炸药能量的优化利用。

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标题: Highway Vehicle-bridge Interaction Analysis System Based on Isoparametric Mapping and Improved Binary Search

标题: 基于等参映射与改进折半法的公路车桥耦合分析系统

来源出版物: 湖南大学学报. 自然科学版 卷: 47 期: 11 页: 29-37 出版年: 2020

文献号: 1674-2974(2020)47:11<29:JYDSYS>2.0.TX;2-T

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文献类型: Article

作者关键词: bridge; vehicle-bridge interaction analysis; finite element model; inter-history iteration; improved binary search; isoparametric mapping

作者关键词: 桥梁; 车桥耦合分析; 有限元模型; 全过程迭代; 改进折半查找; 等参映射

摘要: To reduce the computing work and improve the efficiency of vehicle-bridge coupling analysis when using traditional fully coupled method, a high efficiency highway vehicle-bridge interaction analysis system was established based on improved binary search and isoparametric mapping. The finite element model of the bridge was simulated using ANSYS, the multiple refined dynamic vehicles were modeled in MATLAB, and the inter-history iteration method was used to analyze the bridge subsystem and vehicle subsystem separately. The quadrilateral isoparametric mapping and improved binary search method were introduced for quick determination of interpolation coefficient and loading position of vehicle-bridge contact point to realize the quick automatic loading of wheel load. Based on the spring-mass model passing through a simply supported beam and a running test of a long-span suspension bridge, the proposed analysis system was compared with the classical numerical analysis method, measured data and traditional time step iteration method. The results show that the proposed analysis system exhibits a good computing efficiency and accuracy and rapid convergence, which can provide a reference for the bridge spatial response analysis under large and highly random traffic flow.

摘要: 针对传统全耦合车桥耦合分析计算量大、效率低的问题,基于等参映射及改进折半法建立公路车桥耦合分析系统.采用 ANSYS 建立桥梁有限元模型,利用 MATLAB 建立多种精细化车辆动力分析模型,采用全过程迭代法分别求解桥梁子系统与车辆子系统.为实现车轮荷载快速自动加载,引入四边形等参映射和改进折半查找法确定车桥接触点的插值系数和加载位置.基于弹簧-质量模型过简支梁算例及某大跨悬索桥行车试验,将该分析系统与经典数值分析

方法、实测数据以及传统的时间步迭代方法进行对比.研究表明,所建立的车桥耦合分析系统具有较好的分析精度和计算效率,迭代过程收敛速度较快,可为高流量、高随机车辆荷载下桥梁结构空间响应分析提供参考.

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作者: 冯忠居; 李铁; 冯凯; 董芸秀; 陈慧芸; 胡海波

标题: Bearing Characteristics of Pile Foundation Based on Mohr-Coulomb Criterion in Strongly Alkaline Marsh Area

标题: 基于 Mohr-Coulomb 的强盐沼泽区桩基承载特性探讨

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文献类型: Article

作者关键词: pile foundations; ultimate bearing capacity; strongly alkaline marsh area; chloride ion; corrosion thickness; Mohr-Coulomb criterion; elastoplastic constitutive model

作者关键词: 桩基工程; 极限承载特性; 强盐沼泽区; 氯离子; 腐蚀厚度; Mohr-Coulomb 准则; 弹塑性本构模型

摘要: A elastoplastic constitutive model based on Mohr-Coulomb criterion was constructed to explore the limit bearing characteristics of bridge pile foundation in strongly alkaline marsh area based on the transformation among strength, cohesion, and internal friction angle. First of all, the water curing strength and corrosion strength of pile foundation concrete were measured by field test and laboratory test. The internal chloride ion concentration of concrete was measured by EDS analysis and element analysis. The convection depth of chloride ions inside the concrete was

determined by an indoor electron microscopy test. In subsequence, the concrete specimens in the corrosive alkaline environment are divided into the spalling zone, the corroded zone and the non-corroded zone. The relation between corrosion depth and post-corrosion strength of concrete exposed one year was calculated by formula. Results demonstrated that with the increase of ratio of corrosion thickness to diameter of uncorroded pile, the ultimate bearing capacity of the transverse axial direction of a single pile reduced gradually, but the reduction gradually attenuated. The increase of pile length helped little to the improvement of ultimate bearing capacity of single pile transversely. The vertical ultimate bearing capacity of single pile also decreased gradually, and such decline also slowed down. Within the same range of corrosion thickness, the reduction of vertical ultimate bearing capacity of large-diameter single pile was greater than that of small-diameter single pile.

摘要: 为了探究强盐沼泽区桥梁桩基的极限承载特性, 采用桩基混凝土试件现场试验以及室内实验测得了桩基混凝土水养强度以及腐蚀强度, 采用能谱仪(EDS)分析以及元素分析测得了桩基混凝土内部氯离子含量, 采用室内电镜试验测得了桩基混凝土内部氯离子对流深度。将腐蚀性盐离子环境中的桩基混凝土试件划分为剥蚀区、腐蚀区和未蚀区, 运用公式计算的方法得到现场暴露 1 a 桩基混凝土的腐蚀厚度与腐蚀后强度的关系。通过桩基混凝土强度与黏聚力 c 、内摩擦角 ϕ 之间的转换, 建立了基于 Mohr-Coulomb 的强盐沼泽区桥梁桩基弹塑性本构模型, 对强盐沼泽区桩基极限承载特性进行分析。结果表明: 随着蚀径比的增大, 单桩横轴向极限承载力逐渐降低, 但降幅逐渐变缓; 桩长增加对单桩横轴向极限承载力提升较小; 随着蚀径比的增大, 单桩竖向极限承载力逐渐降低, 但降幅逐渐变缓; 桩长不变, 相同腐蚀厚度变化范围内, 大直径单桩竖向极限承载力降幅大于小直径单桩竖向极限承载力降幅。

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作者: Li Yu; Chen Ming; Zhao Guohui

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标题: Study on parameters of seismic isolated simple-supported beam bridges with HDR under pulse-type near-field earthquake

标题: 脉冲型近场地震下 HDR 隔震简支梁桥参数研究

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文献类型: Article

作者关键词: near-field earthquake motion; high damping rubber (HDR) bearing; seismic isolated simple-supported beam bridge; equivalent single-pier model; equivalent isolated degree

作者关键词: 近场地震动; 高阻尼橡胶(HDR)支座; 隔震简支梁桥; 等效单墩模型; 等效隔震度

摘要: In order to study impacts of design parameters of simple-supported beam bridges on seismic response under pulse-type near-field earthquake motion, equivalent single-pier model of seismic isolated simple-supported beam bridges with HDR bearing were built by using SAP2000. Then, with typical near-field earthquake motions as inputs, change curves of seismic response of HDR beam bridges influenced by pier height and mass and equivalent isolated degree were obtained. The results show that the shorter the pier is, the larger equivalent period of beam bridges will increase. The higher it is, the greater peak displacement is. Meanwhile, seismic isolation effect of HDR is reduced when pier is more than 35 m high. Increase of pier mass has a adverse effect on it. Moreover, equivalent isolated degree of HDR has strong correlation with near-field seismic response of these beam bridges. When it is <2.0 , seismic isolation effect will be bad but will improve along with increase of equivalent isolated degree when it is >3.0 .

摘要: 为研究脉冲型近场地震动作用下简支梁桥设计参数对其隔震后地震响应的影响, 采用结构分析软件 SAP2000 建立设置高阻尼橡胶(HDR)支座的隔震简支梁桥等效单墩模型, 以典型近场地震动作为输入, 得出桥墩高度、桥墩质量和等效隔震度对 HDR 隔震简支梁桥的近场地震动响应的变化曲线。研究结果表明: 桥墩越矮, HDR 隔震简支梁桥的等效周期增幅就越大; 桥墩越高, HDR 隔震简支梁桥的梁体位移峰值也就越大; 当墩高大于 35 m, HDR 隔震效果不明显; 桥墩质量的增大对 HDR 隔震效果不利; HDR 隔震简支梁桥的近场地震动响应与等效隔震度有很强相关性, 即当等效隔震度小于 2.0 时, HDR 隔震效果较差; 而当等效隔震度大于 3.0 时, HDR 隔震效果则随等效隔震度增加而增强。

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标题: Operational efficiency of new stereo roundabouts

标题: 新型立体环形交叉口的运行效率研究

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文献类型: Article

作者关键词: traffic engineering; roundabout; VISSIM simulation; delay; gap-acceptance theory; intersection design

作者关键词: 交通工程; 环形交叉口; VISSIM 仿真; 延误; 间隙-接受原理; 交叉口设计

摘要: The conventional roundabouts can effectively avoid traffic conflicts. However, as the number of vehicles increases, insufficient capacity begins to appear. To solve this problem, a new type of roundabout is proposed by setting lane roundabouts on two levels with right-hand turning bypasses. By using VISSIM software, the stereo roundabouts are compared with the actual conventional roundabouts and simple interchanges. The evaluation results show that compared with the conventional roundabouts, the stereo roundabout reduces the average delay of the road network by 91.78%, the total number of conflicts decreases by 73.4%. Compared with the simple interchange, the efficiency of the stereo roundabouts is improved in all directions except the east-west direction. Through further analysis of the traffic volume that stereo roundabouts can adapt to, it shows that the stereo roundabout can effectively improve the traffic capacity when the traffic volume at each entrance is less than 2 000 pcu/h. As the right turn ratio increases and the left turn ratio decreases, the improvement of traffic efficiency is more obvious. Besides, the applicability of stereo roundabout is also analyzed based on the construction cost, floor space and construction feasibility. Under certain circumstances with large traffic demand, no distinction between primary and secondary roads, insufficient project budget for the construction of interchange, and limited land available, the operation efficiency and traffic safety of road network can be effectively improved by building or rebuilding stereo roundabouts.

摘要: 常规环形交叉口能够有效避免交通冲突,但随着机动车数量的增加,出现了通行能力不足的问题。提出一种新型立体环形交叉口,通过设置上下两个环圈来解决环形交叉口通行效率较低的问题。利用 VISSIM 仿真软件,从通行效率和行车安全方面进行模拟,发现相较于常规环形交叉口,新型立体环形交叉口使路网的平均延误降低 91.78%,冲突总次数降低 73.4%;与简易立交对比发现,新型立体环形交叉口除东西直行方向的通行效率降低外,其余方向均有所提高。进一步分析新型环形交叉口的适应交通量表明,当各入口的交通量小于 2 000 pcu/h 时,立体环形交叉口能有效提高通行能力,随着右转比例提高,左转比例降低,通行效率的提升更加

明显.结合建造成本、占地规模及建造可行性,分析了立体环形交叉口的适用性.在交通量需求较大、相交道路没有主次之分、工程预算不足以修建立体交叉以及可利用土地范围有限等情况下,通过新建或改建成立体环形交叉口可以有效改善路网的运行效率和行车安全.

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作者: 王永东; 胡强; 张化川

标题: Research on the Mechanical Characteristics of Curved Pipe Jacking Construction Based on Active Deviation Correction

标题: 基于主动式纠偏的曲线顶管施工力学特性研究

来源出版物: 地下空间与工程学报 卷: 16 期: 5 页: 1511-1520,1528 出版年: 2020

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文献类型: Article

作者关键词: curved pipe jacking construction; active deviation correction; jacking friction resistance; pipeline plane angle; pipe soil contact state

作者关键词: 曲线顶管施工; 主动式纠偏; 顶进摩阻力; 管线平面夹角; 管土接触状态

摘要: Curved pipe jacking construction technology is increasingly used in municipal pipeline engineering. Based on the analysis of the construction mechanism of curved pipe jacking construction,three kinds of pipe correction programs were proposed and compared. Combined with the construction characteristics of active deviation correction program,the compression force between pipe and soil during the construction process of the threedimensional curve pipe jacking

was calculated and analyzed. The calculation formula of the jacking friction resistance during the pipe jacking process was deduced. Three friction resistance influencing factors, including the pipeline plane angle, pipeline radius and pipe diameter, were analyzed. Considering the effect of grouting outside the pipe on the contact state between the pipe and soil, the earth pressure effect coefficient was introduced to modify the jacking friction resistance formula. By comparing and analyzing the field measured values of the jacking friction resistance, the standard recommended value and the formula calculated value, the proposed value range of the soil pressure action coefficient was given. The research results showed that the active deviation correction scheme was superior to the other two deviation correction schemes in terms of pipe joint attitude adjustment, construction disturbance control and pipe lining stress level. The pressing force between pipe and soil was a three-dimensional complex state during pipe jacking construction, which cannot be superimposed. The angle of the pipeline plane had a significant influence on the rotational friction of the pipe joint. The radius of the pipeline had a certain influence on the lateral thrust friction and the rotational friction of the pipe joint, while the pipe diameter mainly affected the value of the friction caused by ground. The contact state of the pipe and soil is real, and the range of the soil pressure action coefficient was roughly between 0.2 and 0.6.

摘要: 曲线顶管施工技术在市政管线工程中得到越来越广泛的应用。在分析曲线顶管施工机理的基础上,提出并对比分析了3种管节纠偏方案,进而结合主动式纠偏方案的施工特点,对三维曲线顶管施工过程中管土间挤压作用力进行计算分析,并推导了管节顶进摩阻力计算公式,其后对管线平面夹角、管线半径及管径大小3个摩阻力影响因素进行单因素分析。考虑管外注浆对管土接触状态的影响,进而引入土压力作用系数对顶进摩阻力计算公式进行修正,并通过对比分析顶进摩阻力的现场实测值、规范建议值及公式计算值,给出了土压力作用系数的建议取值范围。研究表明:主动式纠偏方案在管节姿态调整、施工扰动控制及管身衬砌受力等方面优于其他两种纠偏方案;顶管施工过程中管土间的挤压作用力呈三维复杂状态,不能进行简单的叠加;管线平面夹角对管节转动摩阻力有显著影响,管线半径对侧向顶推摩阻力和管节转动摩阻力均有一定的影响,而管径大小则主要影响地层土压力摩阻力的数值;管土接触状态是真实存在的,其土压力作用系数的取值范围大致在0.2~0.6之间。

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作者: 刘龙旗; 毛雪松; 肖亚军; 吴谦; 聂孟兰

标题: Effect of Water Content on Shear Characteristics of Landslide Deposit Subgrade Fillers

标题: 含水率对坡积体路基填料剪切特性影响试验研究

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作者关键词: road engineering; landslide deposit; test research; water content; shear characteristic; jumping phenomenon; equivalent-cohesion

作者关键词: 道路工程; 坡积体; 试验研究; 含水率; 剪切特性; 跳跃现象; 等效黏聚力

摘要: Landslide deposits are a kind of soil-rock mixture formed by erosion, transport, and deposition of rivulets on a slope surface. Water content has an important influence on its mechanical strength characteristics. Therefore, this research aims to study the mechanisms of landslide deposit samples under different water contents by analyzing the characteristics of the stress-strain, "jumping" phenomenon, volumetric strain, and shear strength parameters in Lueyang County, China via large-scale direct shear tests. The investigation results show that landslide deposits in Lueyang area are widely distributed and mostly of a complex origin and structure. Material composition, structure, and rainfall are the main factors affecting their engineering characteristics. The large-scale direct shear test results show that the stress-strain curves of the specimens with lower water content can be divided into a linear elastic stage, shear stage, and failure stage, while specimens with higher water content only have the first two stages. The "jumping" phenomenon of lower water content specimens mainly occurs in the early stage of the shearing process, while the higher water content specimens mainly occur in the late stage. The lower water content specimens display dilatant behavior under low normal stress; the dilatancy value may become smaller with increasing normal stress. While specimens with higher water content show shrinkage behavior, both showed shrinkage behavior under high normal stress; the shrinkage value increases by increasing water content. This indicates that the intercept of the Mohr failure envelope of the sample should be called the "pseudo-cohesion or equivalent-cohesion", not simply "cohesion". The equivalent-cohesion value increases first and then decreases with the increase of water content, while the internal friction angle decreases first and then increases. Finally, a bilinear shear strength criterion for soil-rock mixtures is proposed.

摘要: 坡积体是由坡面细流的侵蚀、搬运和沉积作用形成的一种土石混合体,含水率对其力学强度特性有重要影响。以陕西汉中略阳坡积体为研究对象,通过大型直剪试验分析坡积体重塑样在不同含水率条件下的应力应变特性、剪切"跳跃"特性、体积应变特性及抗剪强度参数变化规律。调研结果表明:略阳地区坡积体具有分布广、规模大、成因和结构构造复杂等分布特征,物质组成、结构构造和降雨是影响其工程特性的主要因素。室内大型直剪试验结果表明:含水率较低试样的应力-应变曲线可分为线弹性、局部剪切和剪切破坏 3 个阶段,而含水

率较高试样只有前 2 个剪切阶段;低含水率试样的剪切"跳跃"现象主要发生在剪切初期,高含水率试样主要发生在剪切后期;低含水率试样在低应力下整体表现为剪胀,随着正应力的增加,剪胀量变小,而高含水率试样则表现为剪缩;高应力条件下试样全部表现为剪缩,且剪缩量随着含水率的增加而增大;剪切试样的抗剪强度整体上都是随着含水率的增大而降低,但降低幅度不大;试样的抗剪强度参数用内摩擦角和"等效黏聚力"表征,"等效黏聚力"随着含水率的增加先增大后减小,而内摩擦角则先减小后增大;土石混合填料抗剪强度曲线呈双线性变化。

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作者: Jin Hui; Xu Yue; Jiang Fenghua; Cheng Jiaxi

作者: 金辉; 徐岳; 姜凤华; 程嘉稀

标题: Bending Behavior Experiment of RC Beams with U-shaped Steel and Concrete Composite Reinforcement

标题: 锚贴 U 形钢板-混凝土组合加固 RC 梁的抗弯试验

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作者关键词: bridge engineering; anchored U-shaped steel and concrete composite reinforcement; experimental study; ultimate bending capacity

作者关键词: 桥梁工程; 锚贴 U 形钢板-混凝土组合加固; 试验研究; 极限抗弯承载力

摘要: To study the flexural performance of reinforced concrete beams strengthened with anchored U-shaped steel and concrete composite, five beams and one unstrengthened beam were designed for the bending test. The major design parameters were included loading history, longitudinal length of shaped-steel, thickness of shaped-steel and screw bolt space. The loading instrument was 1 000 kN beam-column loading system, the strains were collected by static strain analysis system, and the deflections were measured by electromechanical dial indicators. The section strains, mid-span section deflections, the slippages between shaped-steel and old concrete, cracking propagation of test beam under loads were respectively measured. Based on the assumption of plane cross-section, the formulas of bearing capacity of the test beam were derived, the results of model test and theoretical analysis were compared. The experimental results show that compared to unreinforced contrast beams, the cracking moment and ultimate bending capacity of RC beams strengthened by anchored U-shaped steel and concrete composite can be increased by 50% and 1 time respectively. The longitudinal reinforcement length of steel-plate have obvious effects on the reinforcement effect, the greater the range of reinforcement, the more significant the stiffness increase; The shear strength of the section at the truncated part of the reinforcement should be fully considered in the reinforcement scope to avoid the failure mode of the specimen from plastic bending to brittle shear failure mode; comparing the results of test beams with screw bolts spacing of 15 cm and 30 cm, it is found that as long as the screw bolts spacing meets the structural requirements, there is little influence on the bearing capacity of specimens, but certain obvious influence on the development of cracks; The closer the screw bolts spacing is, the smaller the development of cracks will be; With increase in the area of the added steel plates, the flexural bending capacity is also improved. In view of the flexural bending capacity of reinforced concrete beams by moderate destruct form, the calculation formula for the ultimate bending capacity is derived. The relative difference between the theoretical value and experimental value is within 10%.

摘要: 为了研究锚贴 U 形钢板-混凝土组合加固钢筋混凝土梁的抗弯性能, 设计 5 根加固梁和 1 根对比梁进行抗弯试验。试件的主要设计参数包括有无加载历史、钢板纵向加固长度、钢板厚度和螺杆间距。加载仪器采用 1 000 kN 梁柱加载系统, 应变采集使用静态应变分析系统, 挠度采用机电百分表测量。试验过程中, 观测记录试验梁在荷载作用下截面应变、跨中挠度、加固部分与原混凝土之间的相对滑移、裂缝的产生与发展。基于平截面假定, 推导试验梁的极限抗弯承载力计算公式, 并对比模型试验与理论分析结果。试验结果表明: 与未加固的对比梁相比, 锚贴 U 形钢板-混凝土组合加固后的试验梁其开裂弯矩提高近 50%, 极限抗弯承载力提高约 1 倍; 钢板纵向加固长度对梁的整体刚度有显著的影响, 加固范围越大刚度提升越显著; 加固范围应充分考虑加固部分截断处截面的抗剪能力, 避免使试件从塑性弯曲破坏模式变成脆性剪切破坏模式; 对比螺杆间距 15 cm 与 30 cm 试验梁的结果发现, 只要符合构造要求的螺杆间距对试件的承载能力影响很小, 但对裂缝开展有一定的影响, 螺杆间距越密其裂缝开展明显变小; 随着加固钢板面积增大, 抗弯承载力也随之提高。针对加固后适筋破坏的 RC 梁, 推导了极限抗弯承载力计算公式, 利用公式计算出的极限抗弯承载力的理论值与试验值相对差值均在 10% 以内。

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作者: 胡大琳; 徐怀存; 张航; 陈峰; 查斌

标题: Analysis on influence of initial bending stress on bearing capacity of reinforced concrete beam after freeze-thaw carbonization

标题: 初始弯曲应力对冻融-碳化后钢筋混凝土梁承载力影响分析

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作者关键词: 桥梁工程; 承载力; 荷载试验; 钢筋混凝土梁; 弯曲应力; 有限元仿真

摘要: In order to research the influence of bending stress on the bearing capacity of existing reinforced concrete bridges under the interaction of freeze-thaw and carbonization, reinforced concrete beams were designed and made, bending stress of the test beams was loaded with a self-designed load holding device, the test beams were placed in the environmental laboratory for freeze-thaw carbonization coupling corrosion, then load test was carried out on the test beams after the corrosion. The fracture analysis, strain characteristic analysis and bearing capacity of test beams at different bending stress levels were studied. The finite element numerical model of the reinforced concrete test beam was established, and analysis results were compared with that of experiment. The results show that with the increase of initial bending stress level of the two groups of test beams, the failure pattern of the test beams will change from one main crack to multiple cracks, ductility of the test beam is significantly reduced. The compressive strain slope and tensile strain values of the mid-span will gradually increase, the mid-span strain distribution no longer fully conforms to plane cross-section assumption. By analyzing the load-displacement curve of the

test beam,when increase of concrete strength grade,the ability of the test beam to resist corrosion of carbonization and freeze-thaw improves significantly.As the bending stress level increases,the bearing capacity(yield bending moment,ultimate bending moment)of the test beams will decrease and will be approximately linear.Through the comparative analysis between ANSYS finite element numerical simulation and the measured data of bearing capacity of the test beams,modified coefficient ϕ of the constitutive behaviors of reinforced concrete beams under different bending stress levels after the interaction of freeze-thaw and carbonization is concluded.The results of the test and numerical analysis can provide a reference and a simplified analysis method for the bearing capacity analysis and evaluation of the reinforced concrete bridges servicing in the cold zone.5tabs,13figs,32refs.

摘要: 为研究弯曲应力对冻融-碳化作用下在役钢筋混凝土梁桥承载力的影响,设计并制作了8片钢筋混凝土梁,采用自行设计的持荷装置对试验梁进行弯曲应力加载,并置于环境实验室中进行冻融-碳化耦合腐蚀,再对腐蚀后的试验梁进行荷载试验。对不同弯曲应力水平下的钢筋混凝土试验梁进行裂缝分析、应变特征分析和承载力的研究,并建立有限元数值模型,将其与试验结果进行对比分析。研究结果表明:随着初始弯曲应力水平的增加,2组试验梁破坏形态由1条主裂缝变为多条裂缝并存,并且延性明显降低;跨中压应变斜率及拉应变均逐渐增大,跨中应变分布已经不能完全符合平截面假定。根据试验梁的荷载位移曲线可知,混凝土强度等级的提高明显提升了试验梁抗冻融-碳化腐蚀的能力;弯曲应力水平增加会导致试验梁的承载力(屈服弯矩、极限弯矩)降低,且其大致呈线性关系。通过 ANSYS 有限元数值模拟与试验梁的承载力实测数据对比,归纳出冻融-碳化作用下不同弯曲应力水平对钢筋混凝土梁材料本构的修正系数 ϕ ,可为严寒区在役钢筋混凝土桥梁承载力衰减分析评估提供参考和简化分析方法。

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作者: Wang Feng; Zheng Xiaodong; Xiong Chuan; Li Jiawu

作者: 王峰; 郑晓东; 熊川; 李加武

标题: Wind-resistant design of clad construction scaffolding

标题: 覆面施工脚手架抗风设计

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文献类型: Article

作者关键词: civil engineering; wind load; wind tunnel experiment; scaffolding; wind resistance design

作者关键词: 土木工程; 风荷载; 风洞试验; 脚手架; 抗风设计

摘要: To study the wind loads characteristics acting on clad construction scaffolding in wind tunnel experiment, the past researches and the most unfavorable condition were considered, a floor-type scaffolding with the 100% solidity ratio cladding was selected as the prototype. Effects of scaffolding geometry, building openings and interference effects of a neighboring building were studied. The rigid models were made to collect the wind pressure time histories acting on the surface of the cladding of scaffolding in wind tunnel, and the wind pressure distributions and characteristics were studied. Mean wind force coefficient for the entire scaffolding was calculated based on the data processing and experiment analysis, and the comparison was made among the Chinese standard, British standard and the experiment results. Finite element model was established and analyzed with the wind loads collected in wind tunnel experiment. The reaction force time histories acting on the ties between the scaffolding and building were calculated. The largest peak tensile forces and the gust loading factors were estimated for different scaffolding geometries. The interference effects of a neighboring building on the largest peak tensile force on tie members were studied. The interference factors were calculated for different neighboring building locations and scaffolding geometries. The suggestions for the wind resistant design of the clad construction scaffolding were proposed based on the analysis results. The results show that the largest positive and negative mean wind force coefficients are 1.41 and -1.51, respectively, which are larger than the max value 1.3, that recommended by the Chinese and British standards. The largest gust loading factor is 4.1 due to fluctuating wind effect under the condition that the building is partially enclosed by scaffolding. The largest gust loading factor is 2.7, when the building is fully enclosed by scaffolding. When the neighboring building is located in front of the measuring scaffolding, the increment of wind loads may reach to 66%. 2 tabs, 9 figs, 30 refs.

摘要: 为了分析覆面施工脚手架的风荷载特性, 结合已有研究成果, 并考虑最不利情况, 以使用 100% 挡风率覆面结构的脚手架为研究对象, 开展脚手架布置形式、建筑开孔率和周边建筑物风干扰效应等参数影响下的风洞试验。通过刚体模型测压试验, 测得各工况下脚手架覆面结构表面上的风压时程, 分析作用在其结构上的风压特性及其变化规律。结合试验分析和数值计算得到脚手架整体平均风力系数, 并与现行的中国和英国规范建议值进行对比。建立脚手架结构的有限元模型, 利用风洞试验测得的风压时程进行加载分析, 得到各工况下脚手架连墙件的内力响应时程。估算各工况下所有连墙件中的最大极值拉力, 计算阵风荷载因子并分析脚手架布置形式对其影响规律。研究周边建筑对作用在连墙件上最大极值拉力的风干扰效应,

计算周边建筑物在不同位置时和不同脚手架布置形式下的干扰因子。综合分析结果,并给出覆面施工脚手架的抗风设计建议。研究表明:在所有试验工况下,最大正平均风力系数为1.41,最大负平均风力系数为-1.51,超过了中国和英国规范的最大建议值1.3;半包围布置脚手架的脉动风效应显著,阵风荷载因子最大值可达4.1,若脚手架布置形式为全包围时,最大阵风荷载因子为2.7;当干扰建筑物位于脚手架结构正前方时的干扰效应尤为显著,最大荷载增量可达66%。

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作者: 田崇明; 叶飞; 宋桂锋; 王庆龙; 赵猛; 何彪; 王坚; 韩兴博

标题: On Mechanism of Crystal Blockage of Tunnel Drainage System and Preventive Countermeasures

标题: 隧道排水系统结晶堵塞机理及防治措施初探

来源出版物: 现代隧道技术 卷: 57 期: 5 页: 66-76,83 出版年: 2020

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文献类型: Article

作者关键词: Highway tunnel; Drainage sytem; Crystallization; Investigation and survey; Mechanism; Engineering suggestion

作者关键词: 公路隧道; 排水系统; 结晶; 调研; 机理; 工程建议

摘要: Crystal blockage in tunnel drainage pipe brings much trouble to tunnel construction and operation. Through field investigation and literature research, this paper analyzes the mechanism of crystallization and blockage of tunnel drainage pipe, and puts forward prevention suggestions. The main conclusions are as follows: The crystallization of tunnel drainage pipe is segmental, the crystallization of NaHCO_3 underground water is serious in the tunnel under construction, the crystal composition is CaCO_3 , the pH and alkalinity of the solution flowing out of the primary support and drainage pipe are very high. In general, the lower the water flow rate, the greater the amount of crystallization. The crystallization and blockage of tunnel drainage pipe can be divided into four processes, i.e. chemical reaction between groundwater and shotcrete, concrete erosion by groundwater, crystal precipitation in drainage pipe solution and deposition blockage. In practical engineering, the four processes may occur simultaneously and interact with each other. The main factors affecting the crystallization and blockage of tunnel drainage pipe include the type of groundwater, the characteristics of shotcrete, the physical and chemical conditions of crystallization of drainage solution and the deposition condition of drainage pipe. Finally corresponding engineering suggestions are proposed from two perspectives of waterproof and drainage design and construction control.

摘要: 隧道排水管结晶堵塞给隧道施工及运营带来了极大的困扰。文章通过现场调研和文献调研方式,对隧道排水管结晶堵塞机理进行分析,并提出工程防治建议。主要结论为:隧道排水管结晶具有区段性,在建隧道中 NaHCO_3 型地下水结晶现象严重,结晶体成分为 CaCO_3 ,初期支护、排水管流出溶液 pH、碱度很高;一般情况下,水流流速越小,结晶量越大;隧道排水管结晶堵塞可以分为地下水与喷射混凝土化学反应、地下水对混凝土的侵蚀、排水管溶液中析出晶体和沉积堵塞四个过程,实际工程中可能同时发生,并相互影响;隧道排水管结晶堵塞主要影响因素为地下水类型、喷射混凝土特性、排水管溶液析晶的物理化学条件和排水管沉积条件;最后从防排水设计、施工控制两个角度提出了工程防治建议。

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作者: Wang Zhichao; Xie Yuan; Xie Yongli

作者: 王志超; 谢远; 谢永利

标题: Analysis of Mechanical Properties of Innovative Support System in Loess Tunnels

标题: 黄土隧道新型支护结构施工力学性能分析

来源出版物: 现代隧道技术 卷: 57 期: 5 页: 125-135 出版年: 2020

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文献类型: Article

作者关键词: Loess tunnel; Steel-concrete composite structure support system; Steel arch; Mechanical property; Construction optimization

作者关键词: 黄土隧道; 钢-混组合结构支护体系; 钢架; 力学性能; 施工优化

摘要: To satisfy the construction safety of loess tunnels in special sections, it is important to strengthen the initial support to intervene in the stress state of surrounding rocks as soon as possible. Based on the exploration of a new support structure, this paper proposes the steel-concrete composite structure support system. By changing the stiffness ratio between the initial support and the secondary lining, the support strength can be provided at the initial stage of construction, so as to reduce the occurrence of loose pressure. ANSYS software is used to establish a three-dimensional excavation model, the bearing characteristics and component parameters of the steel arch of the composite support structure are analyzed from the perspective of the overall and local forces, and the supporting performance is evaluated through comparison with the common support system. The results can provide reference for the study of the new support structure of loess tunnels.

摘要: 为了满足特殊区段下黄土隧道的施工安全,强化初期支护使之尽早干预围岩应力状态尤为重要。基于对新型支护结构的探索,文章提出了钢-混组合结构支护体系,通过改变初期支护与二次衬砌的刚度比例,在施工初期提供较大的支护强度,从而减少松动荷载的产生。采用 ANSYS 建立三维地层开挖模型,从整体和局部受力的角度分析了组合结构钢架的承载特性及构件参数,并通过与常用支护体系进行施工对比分析,对各自的支护表现进行了评价。结果可为黄土隧道新型支护结构的研究提供参考。

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作者: Yang Shaowei; Wu Jiyun; Pan Binghong

作者: 杨少伟; 吴佶昀; 潘兵宏

标题: Probability of Drivers Missing Roadside Traffic Sign Information on the Inner Lane of Six-Lane Expressway

标题: 六车道高速公路内侧车道驾驶员错过路侧交通标志信息的概率研究

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 9 页: 38-45 出版年: 2020

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文献类型: Article

作者关键词: traffic engineering; roadside traffic sign; occlusion; missing traffic sign information; VISSIM traffic simulation

作者关键词: 交通工程; 路侧交通标志; 遮挡; 错过交通标志信息; VISSIM 交通仿真

摘要: When the driver of a small vehicle on the inner lane of the expressway discovered and read the roadside traffic sign information, due to the reasons such as the parallel of multiple vehicles, the driver's sight may be blocked by the large vehicle on the outer lane, which caused the driver to miss important traffic information. Therefore, the probability of the small vehicle driver's sight on the inner lane blocked by the large vehicle on the outer lane within the scope of traffic sign recognition was studied and the probability calculation model for the driver missing the roadside traffic sign information was established, which was based on the shortest time required for the driver to read traffic signs, the distribution of vehicle headway, the geometric relationship between the driver's sight and vehicles and lanes, and the principle of calculus. The proposed model was tested by VISSIM traffic simulation software. The results show that the change of the traffic volume of the small vehicles on the inner lane has less influence on the probability of the small vehicle driver missing the traffic sign information. The increase of the total number of large vehicles on the outer lane will increase the probability of the small vehicle driver on the inner lane missing the traffic sign information. When the speed of small vehicles on the inner lane is constant, the increase of the speed of large vehicles on the outer lane will reduce the probability of the small vehicle driver on the inner lane missing traffic signs. When the speed of large vehicles on the outer lane is constant, the probability of the driver of the small vehicle missing the traffic sign information increases as the speed of the small vehicle on the inner lane increases. In the case of the equal speed difference between the inner and outer lanes, the probability of small vehicle drivers missing traffic signs decreases with the increase of vehicle speed.

摘要: 高速公路上内侧车道小型车辆驾驶员在发现和阅读路侧交通标志信息时,因多车并行等原因,会出现驾驶员视线被外侧车道上大型车辆所遮挡情况,导致驾驶员错过重要的交通信息。为此,基于驾驶员认读交通标志所需的最短时间、车辆车头时距分布、驾驶员视线与车辆、车道形成的几何关系及微积分原理,对交通标志视认范围内内侧车道小型车辆驾驶员视线被外侧车道大型车辆遮挡概率进行研究,建立驾驶员错过路侧交通标志信息的概率计算模型,并通过 VISSIM 交通仿真软件对该模型进行检验。结果表明:内侧车道上小型车辆交通量的变化对小型车辆驾驶员错过交通标志信息的概率的影响较小;外侧车道大型车辆总量的增加会使内侧车道小型车辆驾驶员错过交通标志信息的概率增大;内侧车道小型车辆在速度一定的情况下,外侧车道大型车辆速度的提高会降低内侧车道小型车辆驾驶员错过交通标志信息的概率;外侧车道大型车辆在速度一定的情况下,小型车辆驾驶员错过交通标志信息的概率随着内侧车道上小型车辆速度的提高而增大;内外侧车道上车辆在等速差的情况下,小型车辆驾驶员错过交通标志信息的概率随着车速的增加而降低。

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作者: 杨晓华; 李嘉璐; 李斌; 张莎莎

标题: Centrifugal Model Test on Force and Deformation Characteristics of Corrugated Steel Pipe Culvert under High-filled Embankment

标题: 高填方路堤下钢波纹管涵受力与变形特征离心模型试验

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作者关键词: road engineering; force and deformation characteristic; centrifugal model test; corrugated steel pipe culvert; high fill

作者关键词: 道路工程; 受力变形特征; 离心模型试验; 钢波纹管涵; 高填方

摘要: In order to find out the force behavior and the deformation rule of corrugated steel pipe culvert under high-filled embankment, the influences of different factors on the axial and circumferential stresses and deformation characteristics of the corrugated steel pipe culvert are studied by centrifugal model test method. These factors include embankment filling height, angle between embankment main line and culvert diameter. The result indicates that (1) The axial stress and the circumferential stress of the peak (or valley) at different measuring points on the top, the side and the bottom of the corrugated steel pipe culvert show the opposite change rules of tension and compression, and the axial (or circumferential) stresses of the peak and the valley also show opposite change rules of tension and compression. The maximum tensile stress and compressive stress of the corrugated steel culvert under prototype condition is 59.85 MPa and - 59.06 MPa, the culvert is still at the elastic stress stage, meeting the design requirements. (2) The axial and circumferential stresses at different measuring points on the culvert increase slowly with the increase of the angle between them and the main line of the embankment. When the angle increases from 30° to 90°, the maximum tensile and compressive stresses increase by 25.90% and 30.57% respectively. (3) The change of culvert diameter has obvious influence on the stress of each measuring point on the culvert. When the culvert diameter increases from 3.0 m to 4.4 m, the maximum tensile and compressive stresses increase by 55.05% and 63.49% respectively. (4) The stress at each measuring point changes linearly with the increase of embankment filling height. When the embankment filling height increases from 14 m to 16 m and 20 m, the maximum tensile stress at each measuring point of the culvert is 1.21 times and 1.40 times the value under prototype working condition, and the maximum compressive stress is 1.08 times and 1.23 times the value under prototype working condition. (5) When the embankment filling height is 26 m, the maximum tensile/compressive stress and the maximum tensile/compressive strain of the corrugated steel pipe culvert is 251.89 MPa, - 302.65 MPa and 1 199.49 muepsilon, - 1 441.17 muepsilon respectively, the culvert enters the yield state.

摘要: 为探明高填方路堤下钢波纹管涵结构的受力性状与变形规律,采用离心模型试验的方法,研究了不同路堤填筑高度、与路堤主线夹角及涵管直径对钢波纹管涵轴向、环向受力及变形特征的影响。研究表明:在钢波纹管涵涵顶、涵侧及涵底不同测点位置处,波峰(或波谷)的轴向应力与环向应力呈拉、压相反的变化规律,波峰的轴向应力(或环向应力)和波谷的轴向应力(或环向应力)亦呈拉、压相反的变化规律,原型工况下钢波纹管涵的最大拉、压应力分别为 59.85 MPa 和 - 59.06 MPa,涵管尚处于弹性受力阶段,满足设计使用要求;钢波纹管涵各测点的轴向、环向应力均随其与路堤主线夹角的增大呈缓慢增大的趋势,夹角从 30°增大到 90°时,最大拉、压应力分别增长了 25.90%和 30.57%;涵管直径的变化对钢波纹管涵各测点应力影响非常明显,当涵管直径由 3.0 m 增大到 4.4 m 时,最大拉、压应力分别增长了 55.05%和 63.49%;各测点应力随路堤填筑高度的增加呈线性变化趋势,当路堤填筑高度由 14 m 增加到 16,20 m 时,钢波纹管涵各测点最大拉应力分别是原型工况下的 1.21 倍、1.40 倍,最大压应力分别是原型工况下的 1.08 倍、1.23 倍;当路堤填筑高度为 26 m 时,钢波纹管涵的拉、压应力与应变最大值分别为 251.89、- 302.65 MPa 和 1 199.49 muepsilon, - 1 441.17 muepsilon,涵管进入屈服状态。

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作者: 杨雅勋; 杨福利; 陈东

标题: Application of Improved Response Surface Method in Modification of Bridge Structure FE Model

标题: 改进响应面法在桥梁结构有限元模型修正中的应用

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文献类型: Article

作者关键词: bridge engineering; finite element model; improved response surface method; tied arch bridge; significance analysis

作者关键词: 桥梁工程; 有限元模型; 改进响应面法; 系杆拱桥; 显著性分析

摘要: In order to obtain the accurate finite element calculation models of bridge structures and provide the benchmark finite element models for health monitoring and re-analysis of mechanical performance, the modification methods of bridge structure finite element models are studied, and an improved response surface method combining second-order polynomial and radial basis function is proposed. This method is applied to the modification of the finite element model of a tied arch bridge. Selecting the pavement thickness, the elastic moduli and densities of arch ribs, main girder, beams and hangers of the bridge as the parameters to be corrected, the test design is conducted by using D-optimal test design method, and the analysis of variance on a series of sample points obtained from the experimental design is conducted. The parameters that significantly affect the deflection of each measuring point and the frequency of each order are screened out by F test method, the improved response surface model is established, and the response values about design parameters are calculated. The objective function is constructed

based on the static and dynamic test data obtained from the field test. The objective function is optimized and solved to obtain the optimal solution of each parameter, which is substituted into the initial finite element model to complete the modification of the initial finite element model. The result shows that (1) The elastic modulus of each member and its quadratic term and the thickness of the deck pavement have a highly significant influence on the deflection. The elastic modulus and the densities of some members have a significant influence on the frequency. The response surface model fitted with more significant parameters has higher accuracy. The error between the calculated value of the modified finite element model and the measured value of the field test is significantly reduced. (2) The modified finite element model of the tied arch bridge is more consistent with the actual structure, and can be used as a reference finite element model. It can be used as a benchmark finite element model, which is of great significance and practical value for future health monitoring, static and dynamic performance analysis, and damage identification of bridge structures.

摘要: 为了获得精确的桥梁结构有限元计算模型,提供健康监测和受力性能再分析的基准有限元模型,对桥梁结构有限元模型修正方法进行研究,提出以二阶多项式与径向基函数相结合的改进响应面法。将该方法应用到一座系杆拱桥的有限元模型修正中,选择该桥的铺装层厚度、拱肋、主梁、横梁及吊杆的弹性模量和密度作为待修正参数,采用 D-最优试验设计方法进行试验设计,对试验设计得到的一系列样本点进行方差分析。以 F 检验法筛选出对各测点挠度和各阶频率影响显著的参数,建立改进后的响应面模型,并计算出关于设计参数的响应值。结合现场试验得到的静动力测试数据构造目标函数,对目标函数进行优化求解得到各参数的最优解,代入到初始有限元模型中,完成对初始有限元模型的修正。结果表明:各构件的弹性模量及其二次项和铺装层厚度对挠度影响高度显著,一些构件的弹性模量和密度对频率影响显著,以显著性较高的参数拟合的响应面模型具有较高的精度,修正后的有限元模型的计算值与现场试验实测值的误差显著降低。修正后的系杆拱桥有限元模型与实际结构更加吻合,可作为基准有限元模型,对今后桥梁结构的健康监测、静动力性能分析、损伤识别具有重要意义和实用价值。

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作者: 潘兵宏; 赵悦彤; 温长鹏; 杨婵君; 梅杰

标题: Study on Highway Intersection Angle Based on Driver's Visual Characteristics and Stopping Sight Distance

标题: 基于驾驶人视觉特性和停车视距的公路平面交叉角度研究

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作者关键词: traffic engineering; highway intersection angle; geometric design; stopping sight distance; dynamic visual characteristic

作者关键词: 交通工程; 公路平交交叉角度; 几何设计; 停车视距; 动态视觉特性

摘要: Highway intersections are often subject to oblique crossing angle due to terrain restrictions. As the Design Specification for Highway Alignment does not specify enough intersection angles, when the oblique crossing angle is too small, the drivers in the acute quadrant is restricted by the maximum view field, and the requirement of parking sight distance cannot be guaranteed, which may lead to frequent accidents. In order to study the reasonable value of the oblique angle of intersection, the angle calculation model is established by using the analytical geometry method. First, by analyzing the dynamic visual characteristics of the driver at intersection, the visual field is determined based on the dynamic visual field of the human eye combining with the twisting of the driver's head twisting. Then, starting from the driver's visual angle on the crossed road and assuming that the driver's view field covers the sight triangle of the intersection, considering the situations of the vehicle going straight and turning left, the calculation models are established respectively to solve the nonlinear parameter equations. The result shows that the minimum value of the intersection angle is closely related to the design speed of the crossed road. Comparing the calculation results of the model in the 2 cases, it is found that when the design speed of the main road is not smaller than 40 km/h, the left-turn of the vehicle on the crossed road is the main situation that restrict the minimum intersection angle, and the driving speed at the moment when the driver observes the conflicting vehicles on the main road increases with the design value of the left-turn radius on the intersection. However, the increase of the turning radius will not cause a certain decrease in the minimum intersection angle, indicating that the intention to improve the driver's visibility on the intersection by increasing the designed left-turn radius is invalid. The road with the middle belt is helpful to improve the drivers' visibility when the design speed of the main crossed road is constant. When the design speed of the main road is lower than 40 km/h, the main situation of restricting the minimum intersection angle is the straight driving of the vehicle on the crossed road. Finally, the recommended value of the intersection angle based on the design speed of the main road is proposed to meet the safety of vehicle driving on the intersection.

摘要: 公路平面交叉受地形限制常存在斜交情况, 由于《公路路线设计规范》针对平交交角的规定不够细化, 当平交斜交角度过小时, 处于锐角象限的驾驶人受最大视野的限制, 无法保障停车视距的要求, 从而导致事故频发。为了研究平交斜交角度合理取值, 采用了解析几何法建

立交角计算模型。首先通过分析驾驶人在平交的动态视觉特性,基于人眼动态视野结合驾驶人头部扭转,确定了视野范围。其次从被交路驾驶人视角出发,以驾驶人视野覆盖平交视距三角形为前提条件,考虑车辆直行和左转两种情况,分别建立计算模型,求解非线性参数方程。结果表明:公路平交交角最小值与相交公路设计速度密切相关。比较两种情况下模型对应计算结果,发现当主路设计速度大于等于 40 km/h,被交路车辆左转为限制平交交角最小值的主要情况,且被交路驾驶人观测到主路冲突车辆时刻的行驶速度随平交左转弯半径设计值增大而增大,但转弯半径增大不会引起平交交角最小值一定下降,这表明意图通过增大左转弯半径设计值来改善驾驶人在平交通视性是无效的,主被交路设计速度一定时,设有中间带的道路有益于改善平交通视性。当主路设计速度低于 40 km/h,被交路车辆直行为限制平交交角最小值的主要情况。最后提出了基于主路设计速度的平交叉角度建议值,以满足平交行车安全。

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标题: Seismic energy response of the seismic isolated beam bridge with HDR bearing under near-field ground motions

标题: 近场地震下 HDR 隔震梁桥的地震能量响应

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作者关键词: near-field ground motion; high damping rubber bearing; seismic isolated bridge; seismic energy response

作者关键词: 近场地震; 高阻尼橡胶支座; 隔震桥梁; 地震能量响应

摘要: Based on the seismic energy equilibrium equation and one simple-supported beam bridge, a finite element analysis model of seismic isolated beam bridge with high damping rubber(HDR)bearing was built by using SAP 2000 and some typical near-field ground motions were selected for excitation. So the effect of the stiffness hardening ratio η on the peak moment at the bottom of pier, seismic input energy response and its hysteretic energy dissipation capacity were studied under E1 earthquake. The effect of the plastic hinge on near-field seismic energy and its distribution were also studied under E2 earthquake. The results showed near-field seismic response could be effectively reduced through HDR under E1 earthquake. And HDR was also fit for the seismic isolation design of the beam bridge under a nearfield ground motion. And η should not be too large; otherwise the hysteretic energy dissipation capacity of HDR could be decreased. The effect of η on near-field seismic input energy EI and hysteretic dissipation was little. The effect of η on damping dissipation was large. EI was increased by the increasement of ductility, though its increasement was little. A seismic design with a limited ductility could be applied in the pier of the seismic isolated beam bridge with HDR under E2 earthquake. The pier could not be damaged and the seismic response also decreased effectively. On the peak moment at the bottom of pier, response and its hysteretic energy dissipation capacity were studied under E1 earthquake.

摘要: 在地震能量平衡方程的基础上,以某公路简支梁式桥为研究对象,采用 SAP 2000 建立了高阻尼橡胶支座(HDR)隔震梁桥的有限元模型.选取典型近场地震动记录作为输入,在 E1 地震下,分析了 HDR 支座刚度硬化比 η 对墩底弯矩峰值、近场地震能量响应及其滞回耗能能力的影响.在 E2 地震下,研究了墩底塑性铰对近场地震能量响应及其分配规律的影响.结果表明,在 E1 地震下,HDR 支座能有效降低近场地震作用力,适用于近场地震作用下的梁式桥的隔震设计,但 η 不能太大,否则会降低其滞回耗能能力. η 对 HDR 隔震梁桥的近场地震总输入能和滞回耗能的影响很小,而对阻尼耗能的影响显著.整体延性的增加会导致地震总输入能增大,但增幅较小.在 E2 地震下针对 HDR 隔震梁桥的桥墩进行有限延性的抗震设计不会对桥墩造成损坏,还能够有效减小结构的地震响应.

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标题: Evaluation on Performance of Asphalt Pavement Based on Support Vector Machine

标题: 基于支持向量机的沥青路面性能评价

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作者关键词: asphalt pavement; performance evaluation; machine learning; support vector machine

作者关键词: 沥青路面; 性能综合评价; 机器学习; 支持向量机

摘要: Focusing on the shortcomings of traditional models,a pavement performance evaluation model based on support vector machine (SVM) was proposed to comprehensively evaluate the performance of asphalt pavement. The method to determine the asphalt pavement performance training set and training labels was also proposed. At the same time,three optimization models,namely cross-validation (CV),particle swarm optimization (PSO),and genetic algorithm (GA),were used to optimize the penalty parameter C and the kernel function parameter g which have effects on the accuracy of models,and their accuracy rate can reach to 99.60%,96.67%,94.77% respectively. The results show that the best parameters obtained by cross-validation optimization have the highest accuracy. Finally,taking the 23 maintenance sections of Guangyun Expressway as an example,the support vector machine model and Technical Evaluation Standard for Highway Technology are respectively used to evaluate comprehensive performance of the pavement. The results show that the model proposed in this paper is more suitable for practical application.

摘要: 为了合理地对沥青路面性能进行综合评价,针对传统模型的不足,提出了支持向量机(SVM)路面性能综合评价模型、沥青路面性能训练集及训练标签的确定方法。同时,分别采用交叉验证(CV)、粒子群算法(PSO)、遗传算法(GA)3种优化模型对影响模型精度关键的惩罚参数C与核函数参数g进行寻优,其准确率分别为99.60%,96.67%,94.77%,可见交叉验证寻优所得到的最佳参数分类精确率最高。最后以广东省某高速公路23个养护路段为例,分别使用支持向量机模型与《公路技术状况评定标准》对路面性能进行综合评价。结果表明,使用本模型所得到的评价结果更符合实际。

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标题: Optimization of aerodynamic performance of H-section hangers

标题: H 型吊杆气动性能优化研究

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作者关键词: H-section hangers; galloping; vortex-induced vibration (VIV); wind tunnel tests; perforation ratio; aerodynamic stabilizer

作者关键词: H 型吊杆; 驰振; 涡振; 风洞试验; 开孔率; 气动稳定板

摘要: Aerodynamic instabilities of H-section hangers of Jialing River Bridge, Chongqing were investigated through sectional model wind tunnel tests. Effects of opening rate of web and wing on aerodynamic performance of hangers were studied during lower opening rate of web and wing under different opening conditions were studied using CFD numerical simulation. Meanwhile, in order to avoid the risk of pressure bars' instability, a new vibration-suppressing measure using aerodynamic stabilizers at sides of web was proposed for the first time, and the optimal size parameters of aerodynamic stabilizers were obtained with multi-condition contrastive tests. The vibration suppression mechanism of aerodynamic stabilizers was explained with galloping coefficient and visualization figures of flow field to verify the effectiveness of the new vibration-suppressing measure. Results showed that galloping phenomenon exists in the original section and it still exists for a single opening section of web or wing with a lower opening rate; simultaneous opening of web and wing can eliminate galloping but generate vertical bending vortex-induced vibration (VIV); there exists a preferable interval for web perforation ratio to eliminate galloping and reduce amplitude of VIV; amplitude of VIV can be reduced with increase in opening rate of wing; galloping and VIV can be simultaneously eliminated when opening rate of web is 5.6% and that of wing is about 16.7%; the measure of aerodynamic stabilizers can effectively avoid galloping of H-section hangers but generate vertical bending VIV; values of parameters B_1/B and B_2/B have great influence on hangers' VIV performance, there exists galloping phenomenon when $B_1/B < 0$, within their effective influence ranges of B_1/B and B_2

B_1/B , the greater the parameters B_1/B and B_2/B , the better the VIV-suppressing effect, when $B_1/B = 1/3$ and $B_2/B = 2/3$, there is neither galloping nor VIV in section of hangers.

摘要: 针对 H 型吊杆易发生驰振失稳的问题,以曾家岩嘉陵江大桥 H 型吊杆为研究背景,通过节段模型测振试验和 CFD 数值模拟的方法分别研究了腹板、翼板在较低开孔率下单独开孔以及腹板、翼板同时开孔时开孔率对吊杆气动性能的影响规律;同时为规避开孔断面可能出现压杆失稳的风险,首次提出了在腹板两侧设置气动稳定板的抑振措施,通过多工况对比试验得到气动稳定板尺寸参数的最优取值,并从驰振系数及流场可视化图的角度解释了气动稳定板的抑振机理,证明了此新型抑振措施的有效性。整体结果表明:原断面存在驰振现象;腹板或翼板在较低开孔率下单独开孔并不能避免驰振的发生;腹板和翼板同时开孔能消除驰振现象,但一定程度上会产生竖弯涡振现象,增大翼板开孔率可降低涡振幅值,但腹板开孔率并不是越高越好,而是存在一个较优区间,腹板和翼板开孔率分别为 5.6% 和 16.7% 左右时可在抑制驰振的同时消除涡振现象。气动稳定板措施可有效避免驰振的发生,但会滋生小幅度的竖弯涡振现象,稳定板底部与腹板之间的相对缝隙距离 B_1/B 以及稳定板顶部与翼板间相对竖直距离 B_2/B 均对吊杆涡振性能有很大影响,其中 $B_1/B < 0$ 时无法抑制驰振现象,在有效影响范围内两个无量纲参数的值越大对于涡振的抑振效果越好;当 $B_1/B = 1/3$ 且 $B_2/B = 2/3$ 时,吊杆断面既无驰振也无涡振现象发生。

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标题: Tensile performance of concrete filled square steel tube exterior-diaphragm connections stiffened with PBL

标题: PBL 加劲型方钢管混凝土外隔板式节点受拉性能试验研究

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作者关键词: PBL; concrete filled square steel tubular connection; PBL; exterior-diaphragm; tensile performance; experimental research; stress distribution

作者关键词: 方钢管混凝土节点; 外隔板; 受拉性能; 试验研究; 应力分布

摘要: To obtain the tensile performance and preliminarily validate the seismic behavior of a novel type of concrete filled square steel tube (CFSST) exterior-diaphragm connections stiffened with PBL, tensile experiments on six CFSST connection specimens were carried out, including the ordinary CFSST connections, ordinary CFSST exterior-diaphragm connections, novel CFSST exterior-diaphragm connections stiffened with PBL and CFSST connections stiffened by PBL and with exterior-diaphragm removed. By comparing the failure modes, initial stiffness, yield load and ultimate load, deformation components, strain and stress distribution of branch plates or diaphragm of different specimens, the improvement due to the PBL ribs and the effects of removing the exterior-diaphragm on tensile performance of novel connection specimens were studied emphatically. It is found that, compared to ordinary CFSST connection and CFSST exterior-diaphragm connection specimens, CFSST exterior-diaphragm connection specimens stiffened with PBL, due to applications of both exterior-diaphragm and PBL ribs, possess much higher initial stiffness, yield load and ultimate load, relieved deformation concentration and much uniform strain and stress distribution in connection region. Hence, the novel type of connection has excellent load transmission capacity of tension in steel beam flanges, so that the connections should possess excellent seismic behavior due to the failure mode of yielding of beam ends. After removing exterior-diaphragm from the novel CFSST connections stiffened with PBL, however, initial stiffness, yield load and ultimate load, and strain and stress uniformity in branch plates were reduced, and the load transmission capacity was decreased. The research results laid the basis for further researches on calculation method of tensile capacity and seismic behavior of connections.

摘要: 为得到新型 PBL 加劲型方钢管混凝土外隔板式框架节点的受拉性能、并初步验证其抗震性能,开展了 6 个方钢管混凝土节点试件的受拉试验,试件类型包括普通方钢管混凝土节点、普通方钢管混凝土外隔板式节点、新型的 PBL 加劲型方钢管混凝土外隔板式节点以及去除外隔板后的 PBL 加劲型方钢管混凝土节点。通过对比分析各试件的破坏特征、初始刚度、屈服和极限荷载、变形组成、支板或隔板应变与应力分布,着重研究了 PBL 纵肋的设置对新型节点受拉性能的改善,以及去除外隔板对新型节点受拉性能的影响。研究结果表明:相较于普通方钢管混凝土节点和普通方钢管混凝土外隔板式节点试件,PBL 加劲型方钢管混凝土外隔板式节点试件由于同时设置了外隔板和 PBL 纵肋,因此其在拉力作用下不仅初始刚度、屈服荷载和极限荷载得到大幅度提升,而且节点区域的变形集中得到了明显的缓解,节点附近的应变和应力分布变得更加均匀。因此,新型框架节点具有优越的传递钢梁翼缘拉力的能力,可以实现地震作用下的梁端屈服破坏模式,应具有优越的抗震性能。而在新型节点的基础上去掉外隔板后,试件的初始刚度、屈服和极限荷载、节点区域附近的应变和应力分布均匀程度均有一定程度的降低,即其传递钢梁翼缘拉力的能力有所降低。该文研究成果可为进

一步开展新型节点的受拉承载力计算方法、节点抗震性能的研究奠定基础。

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标题: Triaxial shear mechanical properties of reinforced foam lightweight soil

标题: 加筋泡沫轻质土三轴剪切力学特性

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作者关键词: soft soil subgrade; reinforced foam lightweight soil; triaxial shear test; stress-strain relation; crack closure model; residual strength

作者关键词: 软土路基; 加筋泡沫轻质土; 三轴剪切试验; 应力-应变关系; 裂纹闭合模型; 残余强度

摘要: Through the triaxial shear test, the shear mechanical properties of polypropylene fiber reinforced foam lightweight soil under different reinforcement ratios and confining pressures were compared. The relationships between the strength parameters of the reinforced lightweight foamed soil and the reinforcement rate and confining pressure were investigated. The crack propagation law of reinforced lightweight foamed soil was obtained, and the stress-strain full curve equation was established. The constitutive equations for the strength parameters of foam lightweight soil in terms of reinforcement ratio and confining pressure were proposed. The experimental results with different reinforcement ratios were analyzed through the data normalization. The stress-strain full curve equation of reinforced foam lightweight soil was obtained. The functional relationships

between the parameters of the curve equation and the two variables(reinforcement rate and confining pressure)were obtained.Analysis result shows that the triaxial shear strength and cohesion of reinforced foamed lightweight soil emerge a trend that increases first and then decreases with the increase of the reinforcement rate,and reach the peak values when the reinforcement rate reaches 0.75%.While the reinforcement ratio has limited influence on the internal friction angle of reinforced foam lightweight soil,which indicates that the function of fiber affects the strength of reinforced foam lightweight soil by changing the cohesive force of the material.The strength reduction rate presents an obvious descend trend with the increase of the reinforcement rate,at most,it decreases from about 40%to about 10%,and then keeps stable.When the reinforcement rate is kept constant,the ultimate strength and residual strength of reinforced foamed lightweight soil present an increase trend with the confining pressure.Through analyzing the volume crack curve,it is found that the reinforced lightweight foamed soil is mainly subjected to four stages when it is damaged:compression, cracking,crack restriction because of the fiber tension,and pulling out of fiber due to the large crack extension.When the reinforced foam lightweight soil reaches the yield stage by two crack development processes:the stable and unstable growth of crack.Due to the lack of reinforcement,the failure type of foam lightweight soil belongs to brittle failure,hence,there is no instability growth stage of crack.

摘要: 通过三轴剪切试验,对比在不同加筋率和围压下,聚丙烯纤维加筋泡沫轻质土的剪切力学特性;研究了泡沫轻质土各强度参数与加筋率、围压之间的关系,获取了加筋泡沫轻质土裂纹扩展规律,建立了应力-应变全曲线方程,提出了加筋泡沫轻质土各强度参数关于加筋率和围压的本构方程;将不同加筋率的试验数据归一化处理后进行分析,得到了加筋泡沫轻质土的应力-应变全曲线方程,获取了曲线方程中各参数关于加筋率、围压 2 个变量之间的函数关系。分析结果表明:加筋泡沫轻质土三轴剪切强度和黏聚力均随加筋率增加呈现先增加后减小的趋势,在加筋率达到 0.75%时达到峰值;加筋泡沫轻质土的内摩擦角受加筋率影响较小,说明纤维作用主要是通过改变材料黏聚力来影响加筋泡沫轻质土的强度;而强度降低率随着加筋率增加呈现明显的下降趋势,最大从 40%左右降低至 10%左右时达到稳定;加筋率一定时,加筋泡沫轻质土的极限强度和残余强度均随着围压的升高呈增加趋势;经过分析体积裂纹曲线发现加筋泡沫轻质土破坏时主要经历受压、产生裂缝、纤维承受拉力限制裂缝、裂缝扩展张力过大纤维拔出 4 个阶段,而加筋泡沫轻质土达到屈服阶段时往往包括裂纹的稳定扩展阶段和裂纹的不稳定扩展阶段 2 个裂纹发育过程,由于缺乏筋材,泡沫轻质土属于脆性破坏,因此,没有裂纹不稳定增长阶段。

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作者关键词: bridge engineering; customized transport vehicle; reliability theory; steel strand stay cable; safety assessment; strength degradation process

作者关键词: 桥梁工程; 大件运输车载; 可靠度理论; 钢绞线斜拉索; 安全评估; 强度退化

摘要: The strength degradation simulation method of steel strand stay cable within the damage process of "fretting-corrosion-fatigue" was established based on existing research to realize its safety assessment under the load of a customized transport vehicle(CTV).The dual-level safety assessment method under the CTV load was established,according to the implications of operational safety of stay cable,in which the two limit states corresponding to the condition that the safety cannot satisfy the code requirement and the condition of brittle failure.The determination method of the target reliability index of the dual-level safety assessment was also proposed.Finally,the applications of the simulation method of strength degradation of steel strand stay cable and the dual-level safety assessment method were illustrated through a case study.The results show that the strength degradation procedure of the steel strand stay cable can be successfully simulated by the proposed method.The tensile strength decreases by 5% under the fretting wear process before the corrosion process,and the tensile strength decreases to 72.6% of the original value over a 30-years service period.The target reliability index of the first-level safety assessment is suggested to be 3.09.The determination of the value of the second-level assessment

should consider the influence of normal operation load and the average annual frequency of CTV authorization. Considering the difficulty of controlling the passage of a CTV over a long-span bridge, the safety assessment should include the impact of the load of normal traffic. Additionally, the live load model based on general or dense operating states has little influence on the assessment result. The proposed dual-level safety assessment method can be used as a point of reference for the assessment of the safety of key components of long-span bridges under CTV load.

摘要: 为实现大件运输车载下退化钢绞线斜拉索安全评估,首先,在总结已有研究成果的基础上建立了"微动-腐蚀-疲劳"损伤历程下的钢绞线斜拉索强度退化模拟方法;其次,根据斜拉索运营阶段安全性的内涵,依据可靠度理论建立了大件运输车载下的两层次安全评估方法,两层次安全评估极限状态分别对应于不满足规范要求安全储备的状态及拉索断裂破坏,明确了两层次安全评估目标可靠指标的确定方法;最后,以一个实例分析对所构建的钢绞线斜拉索强度退化模拟方法及两层次安全评估方法的应用进行说明。结果发现:采用所构建的模拟方法可顺利实现对钢绞线斜拉索强度退化过程的模拟,钢绞线斜拉索在腐蚀过程开始之前,其抗拉强度会在微动磨损进程下损失约 5%,一般大气环境下,服役 30 年时抗拉强度退化至初始水平的约 72.6%;第 1 层次安全评估目标可靠指标可选择为 3.09,第 2 层次安全评估目标可靠指标的确定应同时考虑正常运营荷载及年均大件运输车辆授权通行次数的影响;考虑到大件运输车辆通过大跨桥梁时严格交通管制的艰难程度,安全评估过程应考虑正常交通荷载的影响,考虑一般运行状态或密集运行状态活载模型对安全评估结果的影响较小。所建立的两层次安全评估方法可为大件运输车载下大跨桥梁关键构件安全评估提供参考。

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作者: 沈正峰; 李加武; 王峰; 高广中; 胡兆同

标题: Buffeting response characteristics of the double main girder section suspension bridge with variable slot width ratios

标题: 变槽宽比双主梁断面悬索桥抖振响应特性

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作者关键词: buffeting; suspension bridge; variable slot width ratios; multimode coupled frequency domain; aerodynamic admittance; cross spectrum

作者关键词: 抖振; 悬索桥; 变槽宽比; 多模态耦合频域; 气动导纳; 交叉谱

摘要: To study the buffeting response of the double main girder section suspension bridge with variable slot width ratios, the frequency domain and time domain buffeting calculation methods are proposed considering both the self-excited force and buffeting force changing along the span direction. Based on a landscape bridge, the influence of the aerodynamic admittance function, mean wind speed and turbulence wind cross spectrum on buffeting response is investigated in frequency domain analysis. The causes of the difference in buffeting response under different kinds of aerodynamic admittance functions are discussed. In the time domain analysis, the nonlinear effects of aerodynamic force are considered by updating the static wind load coefficient at each load step, where the structural geometric nonlinear effect is also taken into account. The results indicate that the time domain calculation method considering the change of aerodynamic parameters along the span direction can capture the local peak buffeting response of the single cable plane in the mid-span. Comparing the results of the two calculation methods shows that the calculated value of the buffeting response in time domain is greater than that in frequency domain in the vertical direction and smaller than that in frequency domain in the torsional direction. In addition, the buffeting response considering the change of aerodynamic parameters along the span direction is greater than that calculated by using the aerodynamic parameters of the mid-span section, which is mainly caused by the change of buffeting force. The change of self-excited force along the span direction has little effect on the buffeting response. Therefore, it is safer to consider changes of aerodynamic parameters along the span direction in buffeting analysis in the actual project.

摘要: 为了研究变槽宽比双主梁断面悬索桥抖振响应, 提出考虑自激力和抖振力沿展向变化的频域和时域抖振计算方法, 对某景观大桥进行抖振分析。频域法研究了气动导纳函数、平均风速、脉动风交叉谱对抖振响应的影响, 分析不同类型气动导纳函数对抖振响应的影响差异及原因。时域法通过在每个荷载步更新三分力系数进而更新气动力, 并考虑结构的几何非线性效应。计算结果表明: 考虑气动力展向变化的时域法能够捕捉到跨中单索面位置的局部峰值; 时域抖振响应计算值在竖向大于频域计算值, 在扭转方向要小于频域计算值; 考虑气动力展向变化计算的抖振响应要大于采用跨中断面气动参数计算的抖振响应, 其主要由抖振力的展向变化产生, 自激力的展向变化对其影响较小, 在实际工程中考虑气动力展向变化进行抖振分析更加安全。

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标题: Dynamic response of pile foundation under pile-soil-fault coupling effect in meizoseismal area

标题: 强震区桩-土-断层耦合作用下桩基动力响应

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作者关键词: geotechnical engineering; piles foundation; shaking table test; dynamic response; meizoseismal area; near fault

作者关键词: 岩土工程; 桩基础; 振动台试验; 动力响应; 强震区; 近断层

摘要: In order to study the dynamic response characteristics of pile foundation under the pile-soil-fault coupling effect, four different types of seismic waves with the peak acceleration of 0.35g are selected for shaking table test. The acceleration response, relative displacement of pile top, bending moment of pile body and damage of pile foundation under different types of seismic waves are studied. The test results show that the parameters of the pile on hanging wall are obviously larger than those on the footwall of the fault, showing the hanging wall effect. The peak acceleration of pile top is greater than that of pile bottom, and the upper soil layer has filtering effect on the input seismic wave. The acceleration response of pile top has hysteresis compared with that of pile bottom. The acceleration at the top of the pile and the amplification coefficient α of the peak acceleration are the largest for the El-Centro wave. The α difference between the hanging wall and footwall is the largest for the Kobe wave. The peak values of relative displacement of pile top and bending moment of pile foundation are the largest for the Kobe wave. The bending moment of pile body is larger at the soil interface. When different types of seismic wave are applied, the peak value of bending moment of pile body does not exceed the bending capacity of pile body. It is suggested that the pile foundation of bridge near fault in strong earthquake area can be checked according to different seismic waveforms.

摘要: 为研究桩-土-断层耦合作用下桩基动力响应特性,利用振动台试验选取 0.35g 地震动峰值加速度时 4 种类型地震波,研究断层上下盘桩基加速度响应、桩顶相对位移、弯矩及桩基损伤情况。试验表明:断层上盘桩基各项参数明显大于断层下盘,呈现出上盘效应;桩顶峰值加速度大于桩底峰值加速度,上部土层对输入地震波具有滤波作用;桩顶加速度响应相较于桩底具有滞后性;桩顶峰值加速度与桩顶加速度放大系数 α 在输入 El-Centro 波时最大;上、下盘 α 差值在输入 Kobe 波时最大;弯矩和桩顶相对位移峰值在输入 Kobe 波时最大;弯矩在土层分界面处较大,输入不同地震波时弯矩峰值均未超过桩身抗弯能力;提出了强震区近断层桩基可根据验算内容选取合理地震波进行验算的抗震设计建议。

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标题: Decision Sight Distance Calculation Model of Expressway Interchange Exit

标题: 高速公路互通式立交出口识别视距计算模型

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作者关键词: 交通工程; 识别视距; 车道变换; 高速公路

摘要: A lane transformation-based sight distance calculation model for highway identification was proposed, along with the characteristics and demands of actual traffic flow in the diverging area. In the model, the reaction time of recognition from inner side lane to exit and the distance required by drivers to transform lanes once are considered. The results show that different from the Design Specification for Highway Alignment, the model defined the driving behavior meaning and ranges of decision sight distance. Nevertheless, the recommended minimum decision sight distance calculated by the model is of unique selectivity.

摘要: 从分流区实际驶出交通流的特点和需求出发, 提出了基于车道变换的高速公路出口识别视距计算模型。计算模型中考虑了驾驶人从内侧车道识别到出口的反应时间, 以及驾驶人一次换道需要的距离。结果表明: 和《路线设计规范》相比, 该计算模型明确了识别视距构成的驾驶行为意义, 界定了识别视距的范围, 推荐的最小识别视距具有唯一选择性。

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作者: 舒涛; 黄平明; 魏家乐

标题: Key Design Techniques for Temporary Piers of Yumenkou Huanghe River Highway Bridge

标题: 禹门口黄河公路大桥临时墩设计关键技术

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作者关键词: cable-stayed bridge; steel-concrete composite girder; balanced cantilever construction; wind-resistant stability; temporary pier; temporary hinge; finite element method; structural design

作者关键词: 斜拉桥; 钢-混组合梁; 双悬臂施工; 抗风稳定性; 临时墩; 临时铰; 有限元法; 结构设计

摘要: The Yumenkou Huanghe River Highway Bridge is a steel-concrete composite girder cable-stayed bridge with a main span of 565m. The bridge has two pylons, with stay cables fanned out in double cable planes. The bridge also features its no-auxiliary-pier side spans. The main girder was assembled by the balanced cantilever method using slewing deck crane, with maximum length of the balanced two cantilevers reaching 200m. To improve the wind-resistant performance and reduce safety risk, the side spans were fitted out with temporary piers. Based on the analysis of design complexities and the prerequisite of ensuring the safe load bearing condition of temporary piers during the whole construction process, the locations of the temporary piers were set in the spans besides pier No.11 and pier No.12, 160m from the center of the pylon column. Each temporary pier comprises the pile foundation, steel tubular pier shaft, load bearing beam and transverse restraints, and the heights of the two temporary piers are 39.6m and 41.3m, respectively. The temporary piers and the steel main girder are temporarily hinged together, with the temporary piers locked and dismantled after the second-round tensioning of the stay cable 13 and the installation of steel main girder Z18, respectively. MIDAS Civil 2019 was used to establish the spatial model of the full bridge to analyze the load bearing behavior of the temporary piers and the displacement of the steel main girder. And the construction process was monitored in real time. The results show that the temporary piers are in safe loading condition and the structure is reliable.

摘要: 禹门口黄河公路大桥为主跨 565m 双塔双索面钢-混组合梁斜拉桥, 边跨设计无辅助墩。

主梁采用全回转桥面吊机双悬臂拼装施工,最大双悬臂长度达 200m,边跨需增设临时墩,以提高施工期结构抗风性能、降低安全风险。通过设计难点分析,以施工全过程临时墩受力安全为原则,确定在 11 号和 12 号墩边跨侧距塔柱中心 160m 处设临时墩(由桩基础、钢管墩身、承重梁和横向限位等组成),其高度分别为 39.6m 和 41.3m;临时墩与钢主梁采用临时铰(允许纵向位移)连接;临时墩的锁定和解除时机分别为 13 号斜拉索二张后和 Z18 号钢主梁安装后。采用有限元软件 MIDAS Civil 2019 建立全桥空间模型分析临时墩受力及钢主梁位移,并进行施工过程实时监测。结果表明:临时墩受力安全,结构可靠。

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标题: Study on Cross Passage Interval of Bigger Single-hole Highway Tunnel

标题: 长大双洞公路隧道联络通道间距设置研究

来源出版物: 地下空间与工程学报 卷: 16 期: 4 页: 1142-1152 出版年: 2020

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作者关键词: Highway tunnel; single-hole two-way; fire hazard; contact passage; Monte-Carlo

作者关键词: 公路隧道; 双洞单向; 火灾; 联络通道; 蒙特卡洛

摘要: In order to determine the spacing of contact passage in single-hole two-way highway tunnel in a more effective and economic way,this research first combined PHOENICS calculation software to establish the calculation model of an extra-long single-hole two-way highway channel,and at the same time,a simulation study was carried out for the fire smoke field and temperature field in the tunnel. Based on the amended Crane model and FED mortality model,it took high-temperature-CO taking damage as the principle,and further amended the fire temperature and CO concentration by means of infinitesimal integral,and thus the life loss value

model during the escape process was deduced. Further, this research was based on the experimental study of personnel evacuation in the fire carried out by Benelux, a Dutch scholar, in the tunnel, and combined the distribution of evacuation time and evacuation speed for the escape personnel given by Monte-Carlo method. It later simultaneously combined the study results for calculation, and finally obtained the relation curve between spacing of contact passage -personal death probability. We get the conclusion from the research that: in case of a fire in single-hole two-way highway tunnel, only when the ventilation velocity exceeds the critical wind speed, it will help the control of downstream temperature and CO concentration. Otherwise, the ventilation may have negative effect on escape of downstream personnel. When surrounding air speed is 0 m/s and escape distance is 200 m, the failure probability for personnel escape is 1.008 65%; and as the surrounding air speed reaches 2.0 m/s and escape distance is 400 m, the failure probability of personnel escape reaches the maximum, 3.319 91%. At last, by combining the risk evaluation grade, we obtained that the spacing of contact passage in extra-long single-way tunnel should be less than 320 m.

摘要: 为了更有效且经济地对双洞单向公路隧道联络通道的设置间距进行确定, 本研究首先结合 PHOENICS 计算软件建立了某特长双洞单向公路隧道的计算模型, 并对隧道内的火灾烟雾场及温度场进行了模拟研究; 进而以修正的 Crane 模型及 FED 死亡模型为基础, 以高温- CO 叠加伤害为原则, 通过微元积分的手段对火灾温度及 CO 浓度进行了进一步的修正, 从而推导出了人员逃生过程中的生命损失值模型; 再以荷兰学者在 Benelux 隧道内所进行的火灾人员疏散实验研究为基础, 结合蒙特卡洛法给出了逃生人员的疏散时间及疏散速度的分布情况, 最终将以上所得研究结果进行联立, 得出了联络通道间距人员死亡概率关系曲线。研究表明: 双洞单向公路隧道发生火灾时, 其通风风速超过临界风速时才会有利于下游温度及 CO 浓度的控制, 否则通风将会对下游人员的逃生形成负作用。当环境风速为 0 m/s 且逃生距离为 200 m 时, 人员逃生失败概率为 1.008 65%; 当环境风速为 2.0 m/s 且逃生距离为 400 m 时, 人员逃生失败概率最大, 其大小为 3.319 91%。最终结合风险评价等级得出了长大双洞隧道联络通道间距应小于 320 m 为宜。

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作者: 董芸秀; 冯忠居; 冯凯; 文军强; 何静斌

标题: Effect of Road Embankment Overburden with Weak Interlayer on Bridge Pile Foundation and Its Treatment Methods

标题: 下伏软弱夹层路基堆载对桩基影响及处治方法

来源出版物: 地下空间与工程学报 卷: 16 期: 4 页: 1219-1229 出版年: 2020

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作者关键词: geotechnical engineering; stacking; weak intercalation; bridge pile foundation; in-situ monitoring; numerical simulation; stress and deformation

作者关键词: 岩土工程; 堆载; 软弱夹层; 桥梁桩基; 现场监测; 数值模拟; 受力与变形

摘要: Based on the project Mali River II Bridge, the stress and displacement law of the pile foundation of bridge adjacent to high fill roadbed were studied by field monitoring and numerical simulation method. The mechanical characteristics of pier 1 and pier 3 of the bridge with the active cutting to reduce load and adding anti-slide pile were analyzed, and the corresponding treatment methods were put forward. The results show that the lateral compression of the weak interlayer has a significant effect on the pier top displacement, pile displacement and soil resistance of the adjacent bridge under the action of the backfill of the subgrade. After unloading, the top displacement of pier 1 reduces by 94.90%~95.09%, and the displacement of pile top reduces by 94.74%~94.66%, and the maximum soil resistance of pile side reduces by 86.89%~94.88%. After the anti-slide pile is installed, the top displacement of pier 3 reduces by 75.05%~80.04%, the displacement of pile top reduces by 71.75%~81.38%, and the maximum soil resistance around the pile reduces by 39.99%~40.03%. The influence of abutment backfill on the middle pile is small, and that on the side pile is large. The bearing capacity of side piles can be improved properly during design.

摘要: 依托马里河 II 桥实体工程, 采用现场监测和数值模拟方法, 研究了高填路基邻近桥梁桩基受力及变位规律, 分析了主动削方减载和增设抗滑桩前后该桥 1 号和 3 号桥墩桩基础受力特性, 提出了相应的工程处治方法。研究表明: 在台背路基堆载填土作用下, 软弱夹层侧向挤压作用对邻近桥梁的墩顶位移、桩身位移、桩周土抗力均有显著影响; 卸载后 1 号墩的墩顶位移减少 94.90%~95.09%, 桩顶位移减少 94.74%~94.66%, 桩周最大土抗力减少 86.89%~94.88%; 设置抗滑桩后 3 号墩的墩顶位移减少 75.05%~80.04%, 桩顶位移减少 71.75%~81.38%, 桩周最大土抗力减少 39.99%~40.03%; 台背填方对中间桩的影响较小, 对边侧桩的影响较大, 设计时可适当提高边侧桩的承载性能。

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标题: High Temperature Rheological Properties of Warm Mixed Asphalt

标题: 温拌沥青高温流变性能研究

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作者关键词: warm mix asphalt; high temperature rheology; dynamic shear rheological(DSR); multi-stress creep recovery(MSCR)

作者关键词: 温拌沥青; 高温流变; 动态剪切流变; 多应力蠕变恢复

摘要: In order to investigate the high temperature rheological properties of warm mix asphalt, Evotherm3G and EC120 were added into the matrix and SBS modified asphalt to prepare the samples. Dynamic shear rheological(DSR) test and multi-stress creep recovery(MSCR) test were used to evaluate the high temperature rheological properties of warm mix asphalt before and after short-term aging. The results show that Evotherm3G increases the phase angle of asphalt, reduces the complex modulus and rutting factor, while EC120 reduces the phase angle of asphalt and increases the complex modulus and rutting factor of modified asphalt. Evotherm3G increases the strain of asphalt, reduces the creep recovery rate of asphalt, and improves the non-recoverable creep compliance of asphalt. EC120 reduces the strain of asphalt, improves the creep recovery rate of asphalt and reduces the non-recoverable creep compliance of asphalt. Through grey correlation analysis, the grey correlation degree between non-recoverable creep compliance and rutting factor is 0.995, which can reflect the high temperature performance of asphalt to a certain degree.

摘要: 为了研究温拌剂对沥青高温流变性能的影响, 将温拌剂 Evotherm3G 和 EC120 添加到基质沥青和 SBS 改性沥青中以配制温拌沥青, 采用动态剪切流变(DSR)试验和多应力蠕变恢复(MSCR)试验对短期老化前后温拌沥青的高温流变性能进行了分析. 结果表明: Evotherm3G 增加了沥青的相位角, 降低了复数模量和车辙因子; EC120 降低了沥青的相位角, 增大了复数模

量和车辙因子;Evotherm3G 增加了沥青的应变,降低了蠕变恢复率,提高了不可恢复蠕变柔量;EC120 降低了沥青的应变,提高了蠕变恢复率,降低了不可恢复蠕变柔量.通过灰色关联分析可知,不可恢复蠕变柔量与车辙因子的灰色关联度为 0.995,在一定程度上可以反映沥青的高温性能.

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标题: Mix proportion design of cement-soil stabilized RAP mixture based on temperature domain

标题: 基于温度域的水泥土稳定 RAP 混合料配合比设计

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作者关键词: road engineering; RAP; temperature domain; lime soil content; strength standard; recommended value of mix proportion

作者关键词: 道路工程; 回收沥青路面材料; 温度域; 灰土掺量; 强度标准; 配合比建议值

摘要: In order to solve the problem that the strength of cement stabilized RAP mixture base layer mixed with lime soil was not applicable to the technical specifications for highway asphalt pavement recycling(JTG/T 5521-2019)in China,the 7 d unconfined compressive strength test was used to study the compressive strength of cement-soil stabilized RAP mixture at different

temperatures. Based on the influence law of strength, the strength standard of cement-soil stabilized RAP base layer based on temperature domain was proposed. The influence of temperature on the amount of lime soil, cement dosage and cold-recycled mixture in the ageing period were analyzed, the strength standard of the material were analyzed, and the recommended value of the mix design of the cement-soil stabilized RAP mixture based on the temperature domain was proposed. The results show that the unconfined compressive strength of cement-soil stabilized RAP cold recycled mixture should be no less than 2.9 MPa for secondary and below roads, the unconfined compressive strength of cement-soil stabilized RAP mixture at different temperatures is similar, which show a decrease when RAP content increase, and the optimal RAP content is 70%. The unconfined compressive strength of the cement stabilized RAP mixture decrease with the increase of the amount of lime soil, and the reasonable dosage range of the lime soil is 0% to 40%. The addition of cement can significantly improve the mechanical strength of the cold recycled mixture, and its early strength increases greatly, but as the cement dosage increases, its reinforcing effect on the mechanical properties of the mixture is gradually weakened, so the cement dose should be controlled from 4.5% to 5.5%, the addition of lime soil has an adverse effect on the cold recycled mixture. With the addition of lime soil, the mechanical strength of the cold recycled mixture gradually decreases, and when the amount of lime soil is below 20%, the rate of strength reduction is small. As the amount of lime soil increases, the reduction rate of mechanical strength is greater. Therefore, the optimum dosage of lime soil is 10% to 20%, the strength of cement-soil stabilized cold recycled mixture is mainly formed in the early days, and the addition of lime soil is detrimental to the early strength of the cold recycled mix. 6 tabs, 12 figs, 27 refs.

摘要: 为解决掺入灰土的水泥土稳定回收沥青路面材料(RAP)混合料基层强度不适用中国《公路沥青路面再生技术规范》(JTG/T 5521-2019)的问题,通过7 d无侧限抗压强度试验,研究不同温度下RAP掺量对水泥土稳定RAP混合料抗压强度的影响规律,提出基于温度域的水泥土稳定RAP基层强度标准值;分析温度对不同灰土掺量、水泥掺量、养生龄期下冷再生混合料性能的影响规律,提出基于温度域的水泥土稳定RAP混合料的强度标准及其配合比设计建议值。研究结果表明:对中、轻交通荷载等级公路,水泥土稳定RAP冷再生混合料无侧限抗压强度应不小于3.2 MPa;不同温度下水泥土稳定RAP混合料的无侧限抗压强度变化规律相近,即随RAP掺量增大而降低,RAP最佳掺量(质量分数,下同)为70%,水泥土稳定RAP混合料的无侧限抗压强度随灰土掺量增大而降低,且灰土的合理掺量范围为0%~40%;水泥的加入能够显著提高冷再生混合料的力学强度,且其前期强度增长较大,但随着水泥掺量的增加,其对混合料力学性能的增强效果逐渐减弱,水泥的掺量应控制在4.5%~5.5%;灰土的加入对冷再生混合料有不利影响,其冷再生混合料的力学强度逐渐降低,且灰土掺量在20%以下时,混合料的强度降低率较小,随着灰土掺量的增大,其力学强度的降低率增大,灰土的最佳掺量为10%~20%;水泥土稳定冷再生混合料的强度形成主要在初期,且灰土的加入对冷再生混合料的早期强度不利。

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标题: In-situ Model Test of Cantilever and Full-buried Anti-slide Single Piles in Loess Slope

标题: 黄土边坡悬臂式与全埋式单桩抗滑桩现场模型试验

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作者关键词: road engineering; loess slope; in-situ model test; anti-slide pile; soil pressure on pile side; bending moment of pile shaft

作者关键词: 道路工程; 黄土边坡; 现场模型试验; 抗滑桩; 桩侧土压力; 桩身弯矩

摘要: Taking the single row anti-slide piles in the slope along the G65w expressway in northern Shaanxi as the research object, the in-situ reduced-scale model tests on the cantilevered and full-buried single antislade piles in loess slopes of expressway are performed. The loading transfer processes and the failure modes of the single anti-slide piles under the action of landslide thrust under these 2 embedding conditions are studied. The horizontal and vertical displacements on the pile top, the soil pressure on pile side and the bending moment of pile shaft during horizontal loading are measured. The horizontal displacement on the pile top is used as a criterion to determine the loading deformation stage of the anti-slide piles. The result shows that (1) According to the displacement result, the stress process of the model piles is divided into 3 stages, including zero displacement stage, effective deformation stage and failure stage, and the dividing points of these 3 stages are the critical starting load and the critical anti-slide load. (2) Both cantilever pile and fullburied pile belong to the failure mode of plastic cracking. The cantilever pile is a plastic single hinge cracking failure, and the failure point is located at about $2/3$ of the pile. While the full-buried pile exits 2 failure points, which are located at $1/3$ and $1/2$ of the pile. (3) The critical anti-slide load of the full-buried pile is 89 kN, which is about 7.2% higher than that of the cantilever type (83 kN). Compared with the cantilever pile, the full-buried pile has a longer stage of effective deformation. The test result can provide test support for the design, calculation

and damage warning of the 2 anti-slide piles in the loess slope.

摘要: 以陕北地区 G65w 高速公路沿线边坡中的单排抗滑桩为研究对象,在高速公路黄土边坡上进行了悬臂式与全埋式单桩抗滑桩现场缩尺模型试验。研究悬臂式和全埋式两种不同的埋设条件下,单桩抗滑桩在滑坡推力作用下受力变形至破坏过程,测定水平加荷过程中的桩顶水平、竖向位移值,桩侧土压力分布形式以及桩身弯矩。并以位移结果确定抗滑桩的受力变形阶段。试验结果表明:根据位移结果,将模型桩受力过程划分 3 个阶段,即抗滑桩未变形阶段、抗滑桩有效变形阶段、抗滑桩失效阶段,3 个阶段的分界点分别为临界启动荷载和临界阻滑荷载。两类模型桩均属塑性开裂的破坏模式,其中悬臂式模型桩为塑性单铰开裂破坏,破坏点约为桩的 2/3 处。全埋式模型桩存在两个开裂破坏点,分别在桩身约 1/3 和 1/2 处。全埋式模型桩的临界阻滑荷载为 89 kN,比悬臂式的临界阻滑荷载(83 kN)高出约 7.2%,且全埋式模型桩有更长的有效变形阶段。试验结果可为黄土边坡中两种埋设方式的抗滑桩的设计计算和破坏预警提供试验支持。

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标题: Comprehensive Evaluation and Prediction of Large Deformation of Muzhailing Highway Tunnel

标题: 木寨岭公路隧道大变形综合评价预测

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文献类型: Article

作者关键词: tunnel engineering; large deformation prediction; fuzzy comprehensive evaluation; analytic hierarchy process (AHP); fast identification; soft and weak interbedded rock mass

作者关键词: 隧道工程; 大变形预测; 模糊综合评价; 层次分析法; 快速识别; 软弱互层岩

体

摘要: Based on the fuzzy comprehensive evaluation method and AHP, combining with the statistical results of large deformation of Muzhailing highway tunnel under complex geological conditions, a fuzzy hierarchical comprehensive evaluation method suitable for fast classification prediction of large deformation of soft and fractured surrounding rock tunnel in construction stage is proposed. This method divides the tunnel deformations into 5 grades: no large deformation, slightly large deformation, medium large deformation, severely large deformation and extremely serious large deformation. It chooses occurrence, strength, integrity and groundwater of rock stratum, which have significant influence on large deformation of tunnel and can be obtained quickly in the tunnel construction stage, as the classification and evaluation indicators of large deformation. In order to fully consider the influence of 4 indicators on large deformation, dip angle of structural plane, angle between structural plane direction and tunnel axis, the point load strength, the proportion of soft rock on tunnel face, the average thickness of rock stratum on tunnel face, the RQD value of rock mass, the outflow per 1 m along tunnel and groundwater characteristics are selected for classification and prediction. The proposed method, Chen Ziquan method, Meng Lubo method and Jethwa method are applied to 5 large deformation sections of Muzhailing Tunnel for engineering verification and comparative analysis. The result shows that the actual deformation exceeds the upper limit values of Chen's and Meng's prediction ranges up to 2.4 times and 4.4 times of the upper limit respectively, the measured deformation values of large deformation of tunnel are all within the large deformation range predicted by this method. The engineering practice of this prediction method in the deformation section of Muzhailing Highway Tunnel shows that this method has strong engineering applicability and high accuracy, which provides a new method and a new idea for classification and prediction of large deformation in soft and fractured surrounding rock tunnel.

摘要: 基于模糊综合评价法与层次分析法,结合木寨岭公路隧道复杂地质条件下隧道大变形的统计结果,提出了适用于软弱破碎围岩隧道施工阶段大变形快速分级预测的模糊层次综合评价方法。该方法将隧道变形分为无大变形、轻微大变形、中等大变形、严重大变形和极严重大变形 5 个等级,选取了对隧道大变形影响显著且在隧道施工阶段能够快速获得的岩层产状、强度、完整性和地下水作为大变形的分级和评价指标。为了充分考量 4 类指标对大变形的影响,共选取了结构面倾角、结构面走向与洞轴线夹角、点荷载强度、掌子面软岩比例、掌子面岩层平均厚度、岩体 RQD 值、每延米洞长出水量、地下水特征 8 项亚级指标对大变形进行分级预测。将本方法与陈子全法、孟陆波法和 Jethwa 法应用于木寨岭隧道 5 个大变形段进行了工程验证与对比分析。结果表明:实际变形量超过陈法和孟法预测范围上限值的变形量最大可达上限值的 2.4 倍和 4.4 倍,隧道大变形实测变形值均位于本研究方法预测的大变形范围内。本预测方法在木寨岭公路隧道变形段的工程实践表明:该方法的工程适用性强,准确度高,可为软弱破碎围岩隧道大变形的分级和预测提供一种新方法和新思路。

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标题: Calculation of Transverse Load Distribution of Multi-beam Short Box Girder Bridge Considering Influence of Torsional Resistance

标题: 考虑抗扭性能影响的多梁式矮箱梁桥荷载横向分布计算

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作者关键词: bridge engineering; multi-beam low box girder bridge; rigid-jointed beam method; finite element calculation; transverse load distribution; field test

作者关键词: 桥梁工程; 多梁式矮箱梁桥; 刚接梁法; 有限元计算; 荷载横向分布; 场地试验

摘要: To calculate the transverse load distribution of a multi-beam low box girder bridge, both the rigid-jointed beam method and numerical calculations are generally adopted. However, these methods do not consider the torsion of the main girder and the wing plate. Hence, the rigid-jointed beam method and finite element modeling calculation analysis can not accurately simulate the characteristics of the structure, which creates some deviations in the evaluation of the technical condition and bearing capacity of the bridge. In this study, based on the calculation method of the load transverse distribution by the rigid-jointed beam method, a calculation method of load transverse distribution suitable for a multi-beam low girder bridge is proposed by considering the restrained torsion action of the main beam and wing plate when forming the flexibility coefficient matrix. To verify the correctness of the method, a 20 m prefabricated box girder bridge was sampled, and verifies the correctness of this method by using the considering torsional stiffness and not considering torsional stiffness of rigid-jointed beam methods, the finite element numerical simulation method, the field test results. The results show that the accuracy of the calculation results for the load transverse distribution method adopted in this study is higher than that of the calculation method of the rigid-jointed beam method without considering the torsion of the main girder and wing plate of the box girder. Additionally, it is closer to the mechanical characteristics of a real bridge compared to the traditional calculation method. Meanwhile, the calculation results of

grillage and plate element models are basically the same as calculation results of the transverse distribution presented in this study. In evaluating the transverse distribution of deflection or strain, the three methods were relatively close. This shows that the calculation results of the transverse distribution presented in this study are closer to the field test values than those of the grillage and plate element models. Furthermore, the deviation between the calculated results and the experimental values of the transverse distribution under the three methods is less than 20%. Above all, in the field test and evaluation of the bridge bearing capacity, the numerical calculation method of the complex finite element model can be replaced by the method presented in this study, which provides a more accurate theoretical reference for the field test of a prefabricated low box girder bridge and evaluation of bridge technique condition and bearing capacity.

摘要: 目前对于多梁式矮箱梁桥的荷载横向分布计算采用刚接梁法,或采用有限元软件建立模型计算,但以上 2 种方法都未将抗扭刚度的影响考虑在内。因此,以上采用的 2 种计算分析方法不能对结构的特性进行准确模拟计算,也不能十分准确地对桥梁技术状况以及承载能力进行评价。为此,基于传统刚接梁计算荷载横向分布方法,在建立柔度系数矩阵时加入考虑主梁和翼板的约束扭转作用,提出一种适用于多梁式矮箱梁桥的荷载横向分布计算方法。为验证该方法的正确性,以某 20 m 跨径预制 PC 箱梁桥为对象,采用考虑抗扭刚度、未考虑抗扭刚度的刚接梁法和有限元数值模拟方法(梁格模型和板单元模型)计算其荷载横向分布系数,并与场地试验(中载和偏载 2 种工况)实测结果进行验证对比。结果表明:所提出的横向分布计算方法比未考虑箱梁主梁和翼板扭转的刚接梁法计算精度更高,也更接近实桥受力特点;同时,梁格模型、板单元模型与所提出的横向分布计算方法所得计算结果整体趋势基本上一致,相比于有限元数值模拟计算结果,采用该横向分布计算方法所得应变和挠度横向分布与实测结果更为接近,且偏差都在 20% 以内;该方法可在现场场地试验和桥梁承载能力评定中替代复杂的有限元数值计算方法,为预制矮箱梁桥场地试验和桥梁技术状况及其承载能力的评定提供较为准确的理论参考依据。

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标题: FATIGUE STRENGTH OF TYPICAL DETAILS IN ORTHOTROPIC STEEL BRIDGE DECK

标题: 正交异性钢桥面板典型细节疲劳强度研究

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作者关键词: bridge engineering; orthotropic steel bridge deck; fatigue strength; fatigue test; anti-fatigue design; fatigue assessment

作者关键词: 桥梁工程; 正交异性钢桥面板; 疲劳强度; 疲劳试验; 抗疲劳设计; 疲劳评估

摘要: In order to reasonably determine the fatigue strength of an orthotropic steel bridge deck, the fatigue test achievements at home and abroad are analyzed, and the effective fatigue test data is selected. Combined with fatigue cracking mechanism of typical details, fatigue strength categories (fatigue strength corresponding to 2 million cycles) for orthotropic steel bridge deck are proposed, which adapts to the anti-fatigue design and construction level of China. Research results show that: the fatigue strength of deck-to-rib detail is greatly influenced by the weld type, which belongs to Category 50 for fillet weld and Category 60 for partial penetration weld; for the rib-to-diaphragm detail, the fatigue strength of the welded toe of the diaphragm is Category 70, and that of the longitudinal rib web is Category 55; the fatigue strength of diaphragm cutout detail belongs to Category 70; the fatigue strength of rib-to-rib detail is closely relevant to the splice gap, which indicates that Category 40 is suitable for the splice gap less than 3 mm, Category 70 is suitable for the splice gap between 4 mm and 6 mm, and Category 100 is suitable for the splice gap between 8 mm and 12 mm. The fatigue strength of diaphragm weld toe in rib-to-diaphragm detail, of diaphragm cutout detail and of rib-to-rib detail is consistent with the categories in current JTGD64 specification of China. The fatigue strength of deck-to-rib detail and of rib wall weld toe in ribto-diaphragm detail is lower than that of the categories in JTGD64 specification. When performing the antifatigue design or the fatigue assessment for orthotropic steel bridge decks, reasonable fatigue strength categories should be determined by the comprehensive factors of the detail structure, manufacture quality, actual service state and others.

摘要: 为合理确定正交异性钢桥面板疲劳强度,该文对国内外疲劳试验成果进行分析,确定有效的钢桥面板疲劳试验数据,结合典型细节疲劳开裂机理,提出适应于中国抗疲劳设计与建造水平的钢桥面板疲劳强度等级(200万次循环对应的疲劳强度)。研究表明:顶板与纵肋连接细节疲劳强度受焊缝型式影响较大,采用角焊缝连接时疲劳强度为50级,采用部分熔透焊缝连接时为60级;纵肋与横隔板连接细节横隔板焊趾处疲劳强度为70级,纵肋腹板焊趾处为55级;横隔板挖孔细节疲劳强度为70级;纵肋拼接细节疲劳强度与拼装间隙密切相关,拼装间隙小于3mm时疲劳强度为40级,拼装间隙4mm~6mm时疲劳强度为70级,拼装间隙8mm~12mm时疲劳强度为100级。纵肋与横隔板连接细节横隔板焊趾处、横隔板挖孔细节和纵肋拼接细节疲劳强度与现行中国JTGD64规范一致,而顶板与纵肋连接细节、纵肋与横隔板连接细节纵肋腹板焊趾处疲劳强度低于JTGD64中的疲劳强度等级。在进行正交异性钢桥面板抗疲劳设计或疲劳评估时,应综合考虑细节构造、制造质量以及实际使用状况等因素,采用合理的疲劳强度等级。

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作者: Dong Yunxiu; Feng Zhongju; Feng Kai; Wang Mengmeng; Tang Boxue

作者: 董芸秀; 冯忠居; 冯凯; 王蒙蒙; 唐博学

标题: Calculation and Analysis of Influence Range of Vibrotation Piles on Damaged Bridge

标题: 振冲沉桩对受损桥梁的影响范围计算与分析

来源出版物: 应用基础与工程科学学报 卷: 28 期: 4 页: 981-992 出版年: 2020

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作者关键词: geotechnical engineering; vibrotation pile; excitation force; compaction effect; influence range

作者关键词: 岩土工程; 振冲沉桩; 激振力; 挤土效应; 影响范围

摘要: The massive construction of the bridge across the river has an increasingly prominent impact on the existing waterway. Ship collision with bridge frequently occurs. What is the influence of temporary support platform construction for repairing and strengthening the damaged bridge on the disturbance of the damaged bridge? Is there a security issue? All of them are urgent problems to be solved to deal with the damaged bridge. Based on the practical case of the vibroflotation pile construction with the temporary support platform in the ship collision repairing project of Maodaomen large bridge, the influence of the construction disturbance of vibroflotation pile on the foundation soil and the adjacent damaged bridge is analyzed. According to the Safety Regulations for Blasting (GB 6722-2014) and the Chinese Seismic Intensity Scale (GB/T 17742-2008), the

influence range of pile foundation vibration construction is obtained by taking the maximum allowable velocity value as the criterion. Based on the cavity expansion theory, the compaction effect of construction vibration is analyzed, and the minimum safe distance allowable value of 11m for the vibration construction of temporary supporting platform pile foundation is given. Based on the nonlinear time-history analysis of numerical simulation, reasonable excitation force parameters are determined for practical engineering. It is suggested that the excitation force amplitude A should not be greater than 300kN and the excitation force frequency f should not be less than 10Hz. It provides a new idea and method for solving this kind of engineering problem.

摘要: 跨江河大桥的大量兴建对既有航道的影响日益凸显, 船撞桥梁的事故频繁发生. 受损桥梁修复与加固所需要的支护平台施工对受损桥梁产生的扰动影响程度如何? 有无安全性问题? 这些均为处理受损桥梁亟待解决的问题. 结合磨刀门特大桥船撞事故修护工程中临时支护平台桩基沉桩施工的实际案例, 分析了振冲沉桩施工扰动对地基土及邻近受损桥梁的影响. 根据爆破安全规程(GB 6722-2014)和中国地震烈度表(GB/T 17742-2008), 以最大速度容许值作为判据得到了桩基振动施工的影响范围; 基于小孔扩张理论分析了施工振动的挤土效应, 并综合考虑给出了临时支护平台振冲沉桩施工的最小安全距离容许值为 11m; 运用数值模拟非线性时程分析, 针对实际工程确定了合理的激振力参数, 建议激振力振幅 A 不大于 300kN、激振力频率 f 不小于 10Hz, 为解决此类工程问题提供一种新思路和方法.

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作者: Cui Zhimeng; Fan Xiang; Xie Yongli

作者: 崔志猛; 范祥; 谢永利

标题: Study on shear failure characteristics of non-coplanar combination joints

标题: 非共面组合节理剪切破坏特征研究

来源出版物: 铁道科学与工程学报 卷: 17 期: 6 页: 1411-1421 出版年: 2020

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作者关键词: combined joint; direct shear; the angle of the combined joint; micro-cracks

作者关键词: 组合节理; 直剪; 组合节理夹角; 微裂隙

摘要: To explore the failure law of non-coplanar combination joints under shear load, the laboratory test and numerical calculation methods were used to establish the samples and numerical models of combined joints of the different angles respectively. And those tests under the same load and shear rate test were carried out. Then, the shear results, shear stress curves and micro-cracks of different angle joints were compared and analyzed by the combination of test and numerical methods. At the same time, the micro-crack generation process, the relationship between the combined joint angles of different samples and peak value and residual shear stresses were analyzed separately. The results are given as follows: 1) The transfixion mode of the adjacent combined joint was related to the angle of the combined joints. When the angle was less than or equal to 90° , the transfixion of the adjacent combined joint abode by the principle of proximity; when the angle was greater than 90° , the right end of the crack in a joint intersection that is moved down and finally reached the lower tip. 2) With the increase of the angle, the damage types of the micro-cracks were mainly changed from shear failure to shear-tension damage. Moreover, after the transfixion of combined joint with larger angles, secondary cracks dominated by tensile failure were produced. 3) The peak value of the shear stress curve is negatively correlated with the residual value. The peak shear stress is positively correlated with the angle of the combined joint and the residual stress is negatively correlated.

摘要: 为探究非共面组合节理在剪切荷载作用下的破坏规律,利用室内试验和数值计算的方法建立不同夹角的组合节理试样和数值模型,并进行相同荷载和剪切速率的测试。以试验和数值相结合的方法,对不同夹角的节理剪切结果、剪切应力曲线和微裂隙进行对比分析。同时对微裂隙产生过程、不同试样的组合节理夹角与其峰值和残余剪应力的关系分别进行分析。研究表明:相邻组合节理的贯通方式与组合节理的夹角有关,当夹角小于或等于 90° 时,相邻组合节理的贯通遵循就近原则;当夹角大于 90° 时,贯通裂纹右侧终端由组合节理交叉点向下移动并最终到达下部尖端;随着夹角的增大,产生微裂隙的破坏方式由剪切破坏为主逐渐转为由拉剪破坏为主,并且,对于夹角较大的组合节理贯通之后,会产生以张拉破坏为主的次生裂纹;剪应力曲线的峰值与残余值呈负相关,峰值剪应力与组合节理夹角呈正相关而残余应力与之呈负相关。

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作者: Wang Chaohui; Shu Cheng; Han Bing; Fu Yi; Zhou Liwei

作者: 王朝辉; 舒诚; 韩冰; 傅一; 周骊巍

标题: Research progress of high modulus asphalt concrete

标题: 高模量沥青混凝土研究进展

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文献类型: Review

作者关键词: road engineering; high modulus asphalt concrete; performance evaluation; mechanical property; road performance

作者关键词: 道路工程; 高模量沥青混凝土; 性能评价; 力学性能; 路用性能

摘要: To further improve the durability of pavement and road materials, promoting the application of high modulus asphalt concrete(HMAC), existing research and application results in China as well as foreign research were reviewed. The relative standards and evaluation indexes of HMAC in France, Europe and China were compared. The conversion results of high modulus technology and technical indexes were clarified. With the comparison of mechanical properties and pavement performance of HMAC prepared by low-grade hard asphalts, blended asphalts, and polyolefins (admixtures), suggestions were put forward to improve its low-temperature performance. The results show that the relevant standards of HMAC in various countries stipulate that the dynamic modulus should be greater than 14GPa. However, the transformation of HMAC in different countries distinguishes between the forming methods and performance verification tests of specimens. Dynamic modulus, stability, and rutting depth are often used to evaluate the high-temperature performance of HMAC prepared abroad, of which the average values are 15 836MPa, 7 393 times/mm and 2.34mm, respectively. In China, dynamic modulus and dynamic stability are the main high-temperature performance indicators. Among these three methods, the dynamic modulus of low-grade hard asphalt HMAC is the highest, with a mean value of 20 827MPa, but the dynamic stabilities and fatigue properties of admixture HMAC are the best, with a mean value of 11 640 times/mm and 146 173 times(400*10⁻⁶ strain levels). The differences between the road performance of mixtures with different admixtures is evident. Most HMACs have poor crack resistance at low temperatures, which could be improved by adding rubber powder, PE, etc. Considering the development limitations of low-grade hard asphalts in China, it is

necessary to find suitable additives and improve the low-temperature performances of mixtures to promote the development of HMAC.

摘要: 为进一步提升路面结构与材料的耐久性,促进高模量沥青混凝土(high modulus asphalt concrete,HMAC)的研究与应用,系统梳理了国内外现有研究与应用成果,对比法国、欧洲及中国 HMAC 相关规范与评价指标,总结分析国内外试件成型方式及技术指标差异;全面调查了国内外 HMAC 相关研究动态,总结了各国高模量技术体系转换成果,对比评价了中国采用低标号(硬质)沥青、自调和沥青、添加聚烯烃类物质(外掺剂)3 种方法制备的 HMAC 力学性能及路用性能,并针对其低温性能缺点提出了改善建议。结果表明:国内外 HMAC 相关规范对动态模量均要求大于 14GPa,部分国家引入高模量技术后结合本国实情对技术体系进行了转换,导致不同地区试件成型方法与性能验证试验呈差异化;国外制备的 HMAC 高温性能多采用动态模量、动稳定度及车辙深度等指标评价,均值分别可达 15836MPa、7393 次/mm、2.34mm;中国则主要考虑动态模量与动稳定度等指标,其中采用低标号沥青时动态模量最高,均值可达 20827MPa,采用外掺剂时动稳定度、疲劳寿命最优,均值分别可达 11640 次/mm、146173 次(应变 400×10^{-6}),使用不同种类外掺剂的混合料路用性能差距明显;HMAC 低温抗裂性能普遍较差,可掺入胶粉、聚乙烯等助剂予以提升。鉴于中国低标号沥青发展的局限,合理优选性能稳定的外掺剂并改善混合料低温性能是促进 HMAC 发展的基础。

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作者: Wu Xiaoguang; Wei Junjie

作者: 邬晓光; 魏俊杰

标题: Calculation of Load Transverse Distribution Coefficient of Wide Assembled Box Girder Bridge

标题: 宽幅装配式箱梁桥荷载横向分布系数计算

来源出版物: 沈阳建筑大学学报. 自然科学版 卷: 36 期: 1 页: 76-85 出版年: 2020

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作者关键词: assembled bridge; load transverse distribution; energy analogy; elastic braced non thrust frame; solid finite element

作者关键词: 装配式桥梁; 荷载横向分布; 能量比拟原理; 弹性支撑无推力框架; 实体有限元

摘要: In order to improve the accuracy and applicability of the calculation of the load transverse distribution coefficient of the wide fabricated box girder bridge, the calculation method of the elastic braced non thrust frame is proposed. By calculating the strain energy of the assembled box girder bridge under unit load, based on the principle of energy analogy, the corresponding elastically supported non-thrust frame and its stiffness parameters are obtained. Then the transverse load distribution coefficients of elastically supported non-thrust frame columns are calculated by plane bar finite element method, and the transverse load distribution coefficients of the main girders of the wide assembled box girder bridge are obtained. Taking an assembly box girder bridge with a width-span ratio of 0.87 in Guizhou as the background, the calculation methods of G-M method, ANSYS finite element method and elastically supported non-thrust frame method are adopted respectively. and compares with the results of load test of real bridge. The calculation results of equivalent elastically supported non-thrust frame are close to those of load test method, and the error is less than 10%. Compared with the results of G-M method and ANSYS finite element method, the calculation results of equivalent elastically supported non-thrust frame are more accurate, convenient and efficient. Equivalent elastically braced non-thrust frame model can accurately calculate the transverse load distribution coefficient of assembled box girder bridge with large width-span ratio, and it has good applicability for general assembled box girder bridge with wide-span ratio and meets the actual engineering requirements.

摘要: 目的提出弹性支撑无推力框架计算方法,以提高宽幅装配式箱梁桥荷载横向分布系数计算的准确性与适用性.方法通过计算装配式箱梁桥在单位荷载作用下的应变能,基于能量比拟原理,得到其对应的弹性支撑无推力框架及其刚度参数;再利用平面杆系有限元计算弹性支撑无推力框架柱的荷载横向分布系数,从而得到宽幅装配式箱梁桥各主梁的荷载横向分布系数;以贵州某一宽跨比为 0.87 的装配式箱梁桥为背景,分别采用 G-M 法、ANSYS 有限元数值方法、弹性支撑无推力框架算法计算,并与实桥荷载试验计算结果进行比较分析.结果等效弹性支撑无推力框架计算得到的荷载横向分布系数与荷载试验法结果较为接近,误差在 10% 以内,与 G-M 法、ANSYS 有限元数值方法计算结果相比,不仅精确度高且更加方便高效.结论等效弹性支撑无推力框架模型能准确计算大宽跨比装配式箱梁桥荷载横向分布系数,且对于一般宽跨比装配式箱梁桥具有较好的适用性,满足工程实际要求.

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标题: Research on Grouting Defects of Prestressed Tunnel Based on Impact-echo Method

标题: 基于冲击回波法的预应力孔道压浆缺陷探究

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作者关键词: grouting defect; impact-echo method; finite element simulation; field test; frequency signal

作者关键词: 压浆缺陷; 冲击回波法; 有限元模拟; 现场试验; 频率信号

摘要: Aiming at the problem of tunnel grouting defect in post tensioned prestressed concrete members, the influence of the main factors such as the pipe material, defect size, the position of the defect critical surface position and the position of the prestressed steel bar on the results of the impact-echo method for detecting the concrete tunnel grouting defects is studied. This paper takes the single layer prestressed pipe as the research object. ABAQUS finite element software is used for numerical simulation calculation of the influencing factors, which is verified by comparison with the field test. The results show that the material of the pipe has influence on test results. The test error of metal pipe is less than that of PVC pipe. The defect size has influence on the frequency signal, with the increase of defect size, the frequency signal drifts to low frequency. The location of the critical section of the defect has some influence on the test results, it is difficult to test under the working condition of the web plate. The prestressed steel has no influence on the test results. The defect size and the location of the defect interface have some influence on the test results, while the prestressed steel has no influence on the test results. The results in this paper provides some technical guidance for the detection of defects in grouting tunnels, and provides relevant theoretical support for further research in this field.

摘要: 目的针对后张法预应力混凝土构件中孔道压浆缺陷问题,研究管道材质、缺陷大小、缺陷临界面位置及预应力钢筋位置等主要因素对冲击回波法检测混凝土孔道压浆缺陷结果的影响规律.方法以单层布置的预应力管为研究对象,采用 ABAQUS 有限元软件对影响因素进行数值模拟计算,并与现场试验进行对比验证.结果表明:管道材料对测试结果有影响,金属波纹管比 PVC 管测试结果误差更小;缺陷大小对频率信号有影响,随着缺陷尺寸的增大,频率信号向低漂移;缺陷临截面位置对测试结果有一定影响,腹板工况下测试难度较大;预应力钢筋对测试结果无影响.结论缺陷大小、缺陷临界面位置对测试结果有一定影响,预应力钢筋对结果无影响.所得结果对压浆孔道检测缺陷提供了一定的技术指导,并为该方向的进一步研究提供相关的理论支持.

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标题: Optimization analysis of auxiliary pier of cable-stayed bridge with unequal height pylons

标题: 高低塔斜拉桥辅助墩的优化分析

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文献类型: Article

作者关键词: bridge engineering; cable-stayed bridge with unequal height pylons; auxiliary pier; regression analysis; moving load; optimized analysis

作者关键词: 桥梁工程; 高低塔斜拉桥; 辅助墩; 回归分析; 移动荷载; 优化分析

摘要: Because of pylons with unequal height, the mechanical characters of the structure should be considered when the auxiliary pier of long span cable-stayed bridge with unequal height pylons is set up. To investigate the relationship between the number and position of the auxiliary pier and the mechanical behavior of long span cable-stayed bridge with unequal height pylons, a finite element model of cable-stayed bridge with unequal height pylons is constructed as the research object, the variation regularity of effects caused by different positions of single auxiliary pier is fitted on the basis of regression analysis. According to the results, the mechanical behavior of long span cable-stayed bridge with unequal height pylons can be improved by setting auxiliary pier and the bending moment and displacement of side span girder and high pylon under live load decrease obviously, but the improvement effect brought by increasing the number of auxiliary pier is greatly weakened as compared with that of a single auxiliary pier. Thus, single auxiliary pier is the best choice with comprehensive consideration. The bending moment and displacement of side span girder and pylon also are influenced by different position of single auxiliary pier, and there is an optimal position. However, when the position of the auxiliary pier changes within a certain range, the variation trend of comprehensive response of the structure caused by the position change is not obvious. When limited by external conditions, the position of the auxiliary pier can be flexibly selected according to the analysis results.

摘要: 高低塔斜拉桥由于双塔不对称,设置辅助墩时需要综合考虑结构的受力状况.为研究辅助墩设置与大跨度高低塔斜拉桥受力之间的关系,以高低塔斜拉桥为研究对象建立有限元模型,分析辅助墩设置数量及位置对结构产生的影响,基于回归分析拟合单个辅助墩位置变化对结构响应影响的规律,进行单个辅助墩位置优化分析.研究表明,辅助墩的设置有利于改善高低塔斜拉桥的整体受力,可明显降低在移动荷载作用下高塔边跨主梁及高塔的弯矩和位移,但辅助墩的数量增加后,改善效果相比单个辅助墩大幅减弱,设置单个辅助墩是最佳选择.单个辅助墩位置的改变对高塔边跨主梁及高塔的弯矩和位移影响较为明显,且存在最佳位置,但当辅助墩位置位于一定范围内时,位置改变带来的结构综合响应变化并不明显,受限于外部条件时辅助墩位置亦可根据分析结果灵活选择.

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标题: Study on Optimal Layout of Strain Sensors for Continuous Rigid Frame Bridges Based on Full-Life Cycle

标题: 基于全寿命周期的连续刚构桥应变传感器优化布置研究

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文献类型: Article

作者关键词: full-life cycle; matching fitness; strain modal guarantee criterion; genetic algorithm; key sectionmethod

作者关键词: 全寿命周期; 匹配适应度; 应变模态保证准则; 遗传算法; 关键截面法

摘要: Aiming at the problems of the independent arrangement of strain sensors of continuous rigid

frame bridges in the construction and operation stages, we used shell elements instead of traditional beam elements to establish a finite element model of continuous rigid frame bridges. We improved the traditional genetic algorithm, using matching fitness and the key section method, and proposed a sensor optimization method for continuous rigid frame bridges with a full life cycle. Taking a four-span continuous rigid-frame bridge as an example of the optimal layout, the strain sensor optimization method proposed in this paper was used to optimize the layout of the strain sensors of the bridge, and the strain modal criterion was used as the evaluation criterion to compare it with other traditional methods. The results showed that the method described in this paper was superior to other methods and could be used as a strain sensor layout method for continuous rigid frame bridges in full life cycle.

摘要: 针对连续刚构桥建设与运营阶段的应变传感器独立布置问题, 采用壳单元代替传统的梁单元建立连续刚构桥有限元模型, 以匹配适应度和关键截面法对传统的遗传算法进行改进, 提出了适用于全寿命周期的连续刚构桥的传感器优化布置方法. 以某四跨连续刚构桥为优化布置实例, 采用该应变传感器优化方法, 对该桥的应变传感器进行了优化布置, 以应变模态保证准则为评价准则, 与其他的传统方法进行对比分析, 结果表明该方法优于其他几种方法, 可作为全寿命周期连续刚构桥的一种应变传感器布置方法.

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标题: Study on Interface Shear Mechanism between Structures and Standard Sand

标题: 结构物-标准砂界面剪切机理试验研究

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作者关键词: standard sand; roughness; structure; shear strength; interfacial friction angle

作者关键词: 标准砂; 粗糙度; 结构物; 抗剪强度; 界面摩擦角

摘要: Surface roughness of pile foundation and particle size of sand play an important role in the shaft resistance of pile in sand strata. The interface shear test of standard sand with wood plate, steel plate and concrete plate were performed using an improved direct shear apparatus to investigate the interface shear stress-shear displacement curves, composition of the interface shear strength and interface friction angle. Test results indicated that the shear stress-displacement relationship can be fitted by the logarithmic-power function model. Logarithmic model is used in hardening stage and power function model is used in softening stage. The ratio between the peak shear stress and the peak shear stress of the model ranges from 0.92 to 1.02. The peak shear stress increases with average sand filling depth, and the most increase of the peak shear stress is found from interface I of without lines to interface II of with lines. The shear strength of interface with engraved lines is provided by the region of without lines, the grain edge and the sand in the grain. The area without lines is the largest, followed by the grain edge, and the sand in the grain is the smallest. The interfacial friction angle of wood, steel and concrete with standard sand ranges from 11 to 23°, 14 to 23°, 22 to 27°, respectively. The research results can provide experimental reference for shaft resistance estimation in sand strata.

摘要: 桩基表面粗糙程度与砂粒径大小对砂土层桩侧摩阻力有显著影响。本文利用改装的室内直剪仪开展了不同粗糙界面的木板、钢板、混凝土板与北京标准砂间的直剪试验, 研究界面剪切应力剪切位移关系、界面抗剪强度构成和界面摩擦角变化规律。结果表明: 剪切应力位移关系可用对数幂函数模型拟合, 硬化阶段采用对数模型, 软化阶段采用幂函数模型, 模型峰值剪切应力与试验峰值剪切应力的比值集中在 0.92 ~ 1.02 之间; 峰值剪切应力与平均灌砂深度呈正相关关系, 其从未刻纹路的界面 I 到刻有纹路的界面 II 增加值最大; 刻有纹路的界面抗剪强度由未刻纹路区域、纹路棱角和纹路内的砂三部分提供, 未刻纹路区域提供的抗剪强度最大, 纹路棱角次之, 纹路内的砂最小; 木、钢和混凝土与标准砂的界面摩擦角分别集中在 11° ~ 23°、14° ~ 23° 和 22° ~ 27° 范围内。研究成果可为砂土层桩侧摩阻力估计提供试验参考。

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作者: 王星; 屈建荣; 夏永旭; 王蕾; 郑云辉

标题: Study on the Human Evacuation and Rescue in Single Highway Tunnel for Subtended Traffic with Fire

标题: 单洞双向公路隧道火灾人员疏散救援研究

来源出版物: 地下空间与工程学报 卷: 16 期: 3 页: 944-954 出版年: 2020

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作者关键词: PHOENICS; Pathfinder; road tunnel; single-tunnel for subtended traffic; fire; evacuation and rescue; PHOENICS; Pathfinder

作者关键词: 公路隧道; 单洞双向; 火灾; 疏散救援

摘要: In order to study the escape of people inside a single highway tunnel for subtended traffic in case of fire, this study first established a calculation model of a super-long single tunnel for subtended traffic combined with the PHOENICS calculation software. In addition, this study selected a total of 27 fire calculation working conditions under 5 MW, 20 MW and 30 MW with reference to the actual situation, and then obtained the smoke field, temperature field, CO, visibility and wind speed control of the fire through calculation. Based on the above research results and with the help of Pathfinder's personnel evacuation software, this study put Crane revised model and FED death model as base and high temperature-CO superimposed injury as principle, furthermore, 10 typical calculation conditions are selected from the above 27 conditions to analyze the evacuation situation. The study concluded that: when the scale of fire is 20 MW, personnel can be safely evacuated within 613.5 s in case of traffic jam, and there is no death; when the scale of the fire is 30 MW and the ambient wind speed in the main tunnel is 1.0 m/s and 2.0 m/s, the personnel cannot be evacuated safely in case of traffic jam. When the ambient wind speed of the main tunnel is 3.0 m/s, the personnel can be evacuated safely, but the personnel safety in the slowest evacuation speed is difficult to guarantee. Therefore, it is suggested that the ambient wind speed of the tunnel under 30 MW fire should be greater than 3 m/s.

摘要: 为了研究单洞双向公路隧道在发生火灾时隧道内部人员的逃生问题, 首先结合 PHOENICS 计算软件建立了某特长单洞双向隧道的计算模型, 其次参考实际情况选取了 5 MW、20 MW 及 30 MW 下的共计 27 种火灾计算工况, 通过计算得出了火灾的烟雾场、温度场、CO、能见度以及控制风速的情况。进一步结合以上研究成果, 并借助于 Pathfinder 人员疏散软件, 以 Crane 修正模型及 FED 死亡模型为基础, 同时以高温 CO 叠加伤害为原则, 进一步从上述 27 种工况中选取 10 种典型计算工况对人员的疏散逃生情况进行了分析研究。研究得出: 对于火灾规模为 20 MW 时, 在交通堵塞的情况下人员能够在 613.5 s 内安全疏散, 且无人员

死亡;当火灾规模为 30 MW 时,在交通堵塞的情况下,主隧道纵向通风风速为 1.0 m/s 和 2.0 m/s 时,人员不能安全疏散,主隧道纵向通风风速为 3 m/s 时,人员能安全疏散,但疏散速度最慢的人员安全性难以保证,故建议 30 MW 火灾下主隧道的纵向通风风速应大于 3 m/s。

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文献类型: Article

作者关键词: road materials; conductive gussasphalt mixture; corrosion of steel bridge deck; prediction model; extreme learning machine

作者关键词: 道路材料; 浇注式导电沥青混凝土; 钢桥面板腐蚀; 预测模型; 极限学习机

摘要: Conductive gussasphalt mixture can melt snow and ice timely and efficiently, but it is easy to accelerate the corrosion of steel deck when it is powered on. It will affect the service performance and traffic safety of bridges. In order to solve the above problems, five kinds of conductive gussasphalt mixtures were designed and prepared. When conductive gussasphalt mixtures were powered on, the current density flowing through the steel plate was tested. The effects of types, working conditions and environmental factors of conductive gussasphalt mixtures

on steel plate corrosion were studied. And the prediction model of steel plate corrosion based on the extreme learning machine neural network was established. It lays a solid foundation for the further popularization and application of snow melting technology of conductive gussasphalt mixture in the field of steel bridge deck pavement. The results show that the influence degree order of different factors on steel plate corrosion was ranked as follows: number of time on power>temperature>humidity>electrified time. The influence of number of time on power and temperature on steel plate corrosion were more significant at the level of 0.05. Compared with the traditional neural network prediction model,the extreme learning machine prediction model had better accuracy and efficiency. And its mean absolute error,mean absolute percent error and root mean squared error were 50.48%,45.89% and 49.30% lower than the former,respectively.

摘要: 浇注式导电沥青混凝土能够实现桥面及时、高效融雪化冰,但其通电工作时易加速钢桥面板腐蚀,对桥梁服役性能和交通运行安全造成影响。为解决上述问题,本工作设计制备了五种浇注式导电沥青混凝土,测试了浇注式导电沥青混凝土通电工作时流经钢板的电流密度,研究了浇注式导电沥青混凝土类型、工作条件 and 环境因素对钢板腐蚀的影响规律,并建立了基于极限学习机神经网络的钢板腐蚀程度预测模型,为浇注式导电沥青混凝土融雪化冰技术在钢桥面铺装领域的进一步推广应用奠定了坚实的基础。结果表明:不同因素对钢板腐蚀的影响程度排序为:通电次数>温度>湿度>通电时间,且通电次数和温度在 0.05 水平上对钢板腐蚀的影响较为显著;与传统神经网络预测模型相比,极限学习机预测模型具有更好的准确性和高效性,其平均绝对误差、平均绝对百分比误差和均方根误差分别比前者低了 50.48%、45.89% 和 49.30%。

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作者: Sha Aimin

作者: 沙爱民

标题: Discussion on Countermeasures and Intelligent Operation Mode of Division Construction for the Expressway Passenger and Freight Transport System

标题: 高速公路客货系统分置建设对策建议与智慧运行模式探讨

来源出版物: 中国公路学报 卷: 33 期: 5 页: 1-7 出版年: 2020

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作者关键词: expressway; division of passenger and freight transport system; countermeasures; intelligent operation mode

作者关键词: 高速公路; 客货系统分置; 对策建议; 智慧运行模式

摘要: This paper is aimed at assessing the main problems and causes from the perspectives of service performance, traffic safety, operational efficiency and travel experience for the passenger and cargo mixed expressway in China. It demonstrated the necessity and feasibility of division construction for the expressway passenger and freight transport system and defined the extension of its basic connotation and technology. In addition, it put forward the three systems of Chinese future expressway shipping with high-speed passenger, high-speed freight, and passenger freight mixed systems, and conformed to become a new generation expressway system for the future. Combining 5G, artificial intelligence, and Internet of Things technology, the traditional passenger and cargo mixed expressway infrastructure could be upgraded to a new type of passenger and cargo division transport system, thus constructing a revolutionary and disruptive high-speed passenger and freight transport system. This would not only contribute to the optimization of construction cost and investment, but also help to achieve the smart expressway system, improve the operational efficiency, traffic safety level, and the travel experience.

摘要: 针对中国客货混行的高速公路,从服役性能、交通安全、运行效率、出行质量等角度分析其存在的主要问题及其成因,论证了高速公路客货系统分置建设的必要性和可行性,界定了其基本内涵和技术外延,提出了客运高速、货运高速和客运货运混行的中国未来高速公路三大系统及其智慧运行模式,顺应成为面向未来的新一代高速公路系统。结合 5G、人工智能和物联网等技术,将传统客货混行的公路交通基础设施升级为客货分置的新型基础设施,由此构建具有革命性和颠覆性的客运高速、货运高速系统,有助于优化建设成本和投资,更有助于实现高速公路系统智慧化,提升运行效率和交通安全水平,改善出行质量。

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作者: 罗刚; 张玉龙; 潘少康; 贾航航; 刘畅

标题: Response Parameter Analysis of Submerged Floating Tunnels Under Underwater Shock

标题: 水下爆炸冲击作用下悬浮隧道响应参数分析

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作者关键词: Bernoulli-Euler 梁; tunnel engineering; underwater explosion; Bernoulli-Euler beam; analytical expression; Galerkin method; dynamic response

作者关键词: 隧道工程; 水下爆炸; 解析表达式; Galerkin 法; 动力响应

摘要: To investigate the dynamic responses of submerged floating tunnels (SFTs) subjected to near-field non-contact explosions, the SFT was simplified as a constant-section-and-stiffness Bernoulli-Euler elastic-support beam to establish the SFT dynamic model under underwater shock load. The differential equation for the vibration was resolved with the Galerkin method. The displacement, velocity and acceleration were analyzed for the SFT, the influences of the explosive quantity, the blasting distance and the vertical stiffness of anchor cables were discussed, and the results were also used to analyze the damage of tunnels and human bodies. The results show that, the impact of the blasting distance on the kinematic parameters of the SFT is significant. Moreover, the maximum displacement of the tunnel decreases in inverse proportion to the blasting distance. Compared with those of the blasting distance of 10 m, the displacements of the tunnel body of 20 m and 30 m decrease by 50.7% and 66.6%, respectively. The impact of the explosive quantity on the kinematic parameters of the SFT is significant. Also, the maximum displacement of the tunnel decreases approximately in a low-order power function with the explosive quantity. Compared with those of the explosive of 20 kg, the displacements of the tunnel body of 40 kg and 60 kg increase by 29.8% and 51.3%, respectively. The impact of the vertical stiffness of anchor cables on the kinematic parameters of the SFT is significant. Besides, the maximum displacement of the tunnel decreases approximately in a step-like form with the vertical stiffness of anchor cables. Compared with those of the vertical anchor stiffness of 5×10^5 N/m, the maximum displacement of the tunnel body of 5×10^6 N/m and 5×10^7 N/m decrease by 53.0% and 86.2%, respectively. However, there is an efficiently acting interval for the anchor cable stiffness. The stiffness has significant influence on the displacement of the tunnel body within the interval, but has little influence outside the interval (large or small).

摘要: 为了研究水中悬浮隧道在近场非接触爆炸荷载作用下的动力响应规律,将悬浮隧道简化为等截面等刚度的 Bernoulli-Euler 弹性支撑梁,建立悬浮隧道在爆炸冲击作用下的动力学模型,使用 Galerkin 法求解振动微分方程,结合一个悬浮隧道待建工程对其进行参数分析,讨论炸药量、爆心距、锚索竖向刚度对位移、速度、加速度的影响规律,并利用其结果对隧道和人体进行损伤分析.结果表明:爆心距对悬浮隧道运动学参数的影响显著,就位移而言随爆心

距的增加隧道最大位移近似呈反比例下降趋势,与 10 m 爆心距相比,20 m 和 30 m 工况下位移分别下降了 50.7%,66.6%;炸药量对悬浮隧道运动学参数的影响显著,就位移而言随炸药量的增加隧道最大位移近似呈低阶幂函数上升趋势,与 20 kg 炸药量相比,40 kg 和 60 kg 的峰值位移分别增加了 29.8%,51.3%;锚索竖向刚度对悬浮隧道运动学参数的影响显著,就位移而言随锚索刚度的增加隧道的最大位移近似呈阶梯状下降趋势,与 5*10~5 N/m 的锚索刚度相比,5*10~6 N/m 和 5*10~7N/m 工况下的隧道最大位移分别下降了 53.0%,86.2%,但锚索刚度存在一个高效作用区间,当刚度在区间内,能显著地改变隧道管体的位移,当处在区间外(或大或小)时,对位移的影响不明显.

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作者: Kong Fanlei; Huang Pingming; Mei Kuihua; Wang Tao

作者: 孔凡磊; 黄平明; 梅葵花; 王涛

标题: Experimental Study of Load Bearing Performance of Modified Clothoid Shape Composite Dowels

标题: 改进螺旋线型组合销剪力连接件承载力试验研究

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作者关键词: corrugated steel composite deck; shear connector; load bearing performance; push-out test; damage mode; anti-shear stiffness; load bearing formula

作者关键词: 波形钢组合桥面板; 剪力连接件; 受力性能; 推出试验; 破坏形态; 抗剪刚度; 承载力公式

摘要: To study the mechanical behavior of a new type of shear connector,namely the modified clothoid shape(MCL)composite dowels,three groups of specimens with MCL composite dowels

and three groups of specimens with PBL shear connectors were prepared for push-out test, considering the adhesive friction forces and effect of elliptic holes. The failure mode, ultimate load bearing capacity, anti-shearing stiffness, ductility and structural strain of the two types of shear connectors were compared and analyzed. Based on the results of the test, the calculation formula for the MCL composite dowels was figured out. The results show that the failure modes of the two types of shear connectors all reveal shear failures of concrete that all belong to the ductile failure. The ultimate load bearing capacity of the MCL composite dowel exceeds that of the PBL shear connector, and elliptic holes can remarkably improve the load bearing capacity of the MCL composite dowel, but compromises the stiffness. The anti-shear stiffness and ductility of MCL composite dowel are superior to those of the PBL shear connector. The fluctuation of strain in the lower part of the steel dowel is significant, where is considered the stress-concentrated area of MCL composite dowel connection. The calculation formula for the load bearing capacity of MCL composite dowel proposed in this paper takes account of the load bearing capacity of composite dowel, adhesive friction force and effect of elliptic holes, which has good engineering feasibility.

摘要: 为研究新型剪力连接件改进螺旋线型(MCL)组合销剪力连接件的受力性能,考虑粘结摩擦力、椭圆开孔等因素,设计3组MCL组合销剪力连接件试件与3组开孔板(PBL)剪力连接件试件共同进行推出试验,对比分析2类剪力连接件的破坏形态、极限承载力、抗剪刚度、延性及结构应变,并根据试验结果得到MCL组合销剪力连接件承载力计算公式。结果表明:2类剪力连接件试件破坏形态均为混凝土剪切破坏,且为延性破坏;MCL组合销剪力连接件的极限承载力高于PBL剪力连接件,在MCL组合销剪力连接件上开椭圆孔会明显提高其极限承载力,但会降低其刚度;MCL组合销剪力连接件的抗剪刚度和延性均优于PBL剪力连接件;钢销下部应变变化幅度较大,为MCL组合销剪力连接件应力集中区域。文中提出的MCL组合销剪力连接件承载力公式计算方法考虑了组合销、粘结摩擦力和椭圆孔承载力,工程适用性较好。

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作者: Fang Naren; Wang Xuancang; Ye Hongyu; Su Ziyuan

作者: 房娜仁; 王选仓; 叶宏宇; 苏子元

标题: Study on design and fatigue life of asphalt mixture poured on steel bridge deck

标题: 钢桥面浇筑式沥青混合料设计与疲劳寿命研究

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作者关键词: road engineering; mixture design; stress ratio; asphalt-gravel ratio; fatigue life prediction

作者关键词: 道路工程; 混合料设计; 应力比; 油石比; 疲劳寿命预估

摘要: In order to improve the service life of steel deck pavement, reduce the occurrence of fatigue cracks, and ensure the service performance of bridge deck and the safety of steel bridge structure, two effective fatigue test materials were determined by low-temperature bending creep test and high-temperature Lueer fluidity test. The fatigue life curves of gussasphalt under different stress ratios and asphalt-gravel ratios were studied by the bending fatigue test of trabecular loaded at midpoint. The fatigue life prediction formula based on stress model was obtained. In order to improve the practicability of the fatigue life prediction formula, the influences of load intervals, unfavorable environment days, crack propagation and load transverse distribution were considered, and a comprehensive correction coefficient K was introduced to modify the indoor prediction formula. Thus, the gussasphalt fatigue life prediction equation was obtained. This research could provide a reference for the structure and material composition designs of asphalt pavement.

摘要: 为提高钢桥面铺装层使用寿命,减少疲劳裂缝的产生,保证桥面使用性能及钢桥结构的安全性,利用低温弯曲蠕变试验和高温 Lueer 流动性试验确定了 2 种有效的疲劳试验材料。通过中点加载小梁弯曲疲劳试验,研究了不同应力比和油石比下的浇筑式沥青混凝土疲劳寿命曲线,并得到了基于应力模型的疲劳寿命预估公式。为提高疲劳寿命预估公式的实用性,考虑荷载间歇时间、不利环境天数、裂缝扩展以及荷载横向分布的影响,引入综合修正系数 K 对室内预估方程进行了修正,得到了浇筑式沥青混凝土疲劳寿命预估方程,为沥青路面的结构设计和材料组成设计提供了参考。

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标题: Influencing of compounding flame retardants with ATH/MMT on performance of asphalt mixture

标题: ATH/MMT 阻燃剂对沥青混合料性能的影响

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作者关键词: 道路工程; 复掺阻燃剂; 试验研究; 沥青混合料; 金属氢氧化铝; 蒙脱土

摘要: In order to solve the existing security issues of long tunnel's asphalt pavement currently, and improve the flame retardant performance of highway tunnel asphalt pavement, metal aluminum hydroxide(ATH) and montmorillonite(MMT) was chosen as compounding flame retardants and then SBS modified asphalt mixture were prepared. Rutting test, low temperature blinding, Marshall submerge experiment, freeze-thaw indirect tension test were used to analysis the impact of ATH/MMT mixed flame retardant on asphalt mixture's paving performance and flame retardant performance. The results show that ATH/MMT compounding flame retardant can improve the asphalt materials' limiting oxygen index(LOI) by 21.2% to above 25%,and can increase asphalt material's flammability rating from flammable to flame retardant, and can reach the standard of self-extinguishing materials. ATH/MMT compounding flame retardant can reduce the burning duration of asphalt mixture. The burning duration can be reduce by nearly double, when the dosage of MMT and ATH is 3% and 10%, mass fraction, same below. ATH/MMT compounding flame retardant can also reduce the loss rate of combustion quality of asphalt mixture, and improve the burning residual Marshall stability of the asphalt mixture. It also can ensure that the burned Marshall test piece is basically complete in structure and has good mechanical properties. At the same time, ATH/MMT compounding flame retardant reduce the volatile organic compounds (VOC) volatilization during the burning process of asphalt mixture, reduce the peak concentration during VOC volatilization and accelerate the diffusion rate of VOC products. These all explain that ATH/MMT flame retardant can significantly improve the flame retardant and smoke suppression performance of asphalt mixture, and can improve asphalt mixture's high temperature stability and water stability, but reduce the low temperature crack resistance of the asphalt mixture to some extent. Although it can still meet high performance requirements, but the amount of flame retardant should not be too large. 8 tabs, 11 figs, 30 refs.

摘要: 为降低公路隧道沥青路面存在的火灾隐患,提升公路隧道沥青路面阻燃性能,采用金属氢氧化铝(ATH)和蒙脱土(MMT)复掺制备 SBS 改性阻燃沥青混合料,通过氧指数试验、直接

燃烧试验、车辙试验、低温弯曲试验、冻融劈裂试验等方法,分析 ATH/MMT 复掺阻燃剂对沥青混合料的阻燃抑烟性能和路用性能影响。研究表明:ATH/MMT 复掺阻燃剂可以将沥青材料的极限氧指数从 21.2%提升至 25%以上,使沥青材料燃烧级别达到难燃级别,基本可达到自熄材料的标准;掺加 ATH/MMT 复掺阻燃剂可以减少沥青混合料的燃烧持续时间,MMT 和 ATH 的掺量(质量分数,下同)分别为 3%、10%的复掺阻燃剂,其混合料的燃烧时间可以缩短近 1 倍;能降低沥青混合料的燃烧质量损失率,保证燃烧后的马歇尔试件结构的完整,并可提升沥青混合料的燃烧残留马歇尔稳定度,使沥青混合料燃烧后仍具有较好的力学性能;同时还可降低沥青混合料燃烧过程中挥发性有机化合物(VOC)的挥发量和峰值浓度,加快 VOC 产物的扩散速度;ATH/MMT 阻燃剂可以显著改善沥青混合料的阻燃抑烟性能,且其可有效改善沥青混合料的高温稳定性和水稳定性,但是会在一定程度上降低混合料的低温抗裂性,虽仍能满足较高的路面性能要求,但其阻燃剂掺量不宜过大。

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作者: 潘兵宏; 王开明; 赵胜林; 陈林圻; 胡炜; 温长鹏

标题: Mathematical model and characteristics analysis of K-curve that can be used as highway transition curve

标题: 可用作公路缓和曲线的 K 型曲线数学模型及其特点分析

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作者关键词: road engineering; line design; curve design; K-curve; highway alignment; new road design technology

作者关键词: 道路工程; 路线设计; 曲线设计; K 型曲线; 公路线形; 公路设计新技术

摘要: In order to overcome the limitation of curve method and some technical problems in highway geometric design, based on the traditional mathematical model of the gyro line, a K-shaped curve with stronger adaptability and more in line with the vehicle's driving trajectory and driver's behavior characteristics which could replace the traditional gyro line as the highway mitigation curve was proposed. First, the parameters of the traditional gyro line, the characteristics of curvature change and the relationships between the heading angle and the chord angle were analyzed. Based on the relationships between the heading angle and the chord angle, the K-curve parameter equation was established. The influence of various parameters on the K-curve were analysis in detail. Then the mathematical expression of the curvature radius of any point by the parametric equation formula of the curve was derived. Finally, the relationships between the curvature radius of the K-curve and the arc length under different parameters values were discussed by numerical solution. The results show that when the m value and the a value are fixed, the appropriate k value can be selected to adjust the change rate of the curvature radius of the K-curve with the arc length, which improves the flexibility of highway alignment design in difficult terrain area. In the highway alignment design, the K-shaped curve is used to instead of the traditional gyro line as the mitigation curve, which not only can improve the poor alignment combination and increase the safety of the vehicle. Its convenience and adaptability can greatly improve the design efficiency and design quality. 2 tabs, 9 figs, 26 refs.

摘要: 为了克服曲线法设计的局限性,解决长期困扰公路线形设计中的一些技术难题,以传统回旋线数学模型为基础,提出一种适应能力更强、更符合车辆行驶轨迹与驾驶人行为特征的 K 型曲线以代替传统回旋线作为公路用缓和曲线。首先,对传统回旋线的参数特点、曲率变化特点及航向角与弦切角的变化关系进行分析,并以航向角与弦切角的变化关系为基础建立了 K 型曲线参数方程,对方程中各参数对其影响进行分析;其次,通过 K 型曲线的参数方程推导出任意点曲率半径的数学表达式;最后,通过数值解法讨论在不同参数取值情况下,K 型曲线曲率半径与弧长之间的关系。研究结果表明:当弦长 m 值与弦切角 a 值固定时,选取适当的航向角与弦切角的比值 k 值,可调节 K 型曲线曲率半径随弧长的变化速率,提高了在地形困难地区公路线形设计的灵活性;在公路线形设计中采用 K 型曲线代替传统回旋线作为缓和曲线,不仅能够改善不良线形、增加车辆行驶的安全性,同时其便捷、适应性强等特点还可显著提高公路线形的设计效率与设计质量。

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作者: 冯威; 朱伟庆; 胡强

标题: Relation between frequencies and impact coefficients of continuous beam bridges

标题: 连续梁桥冲击系数与频率的对应关系

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作者关键词: 桥梁工程; 冲击系数; 理论分析; 连续梁桥; 振型; 频率

摘要: In order to clarify which order frequency was more reasonable when calculating the impact coefficients of different load effects (displacement, positive and negative bending moment and shear force) of the girder of a continuous beam bridge, the prestressed concrete (PC) continuous beam bridges with spans-unite length of $r \times 30$ m (span number $r=3, 4, 5, 6$) were taken as the research object. By using the theoretical analysis and finite element numerical simulation simultaneously, the relation between displacement impact coefficient, positive and negative moment impact coefficient and shear impact coefficient and the first three order frequencies were studied. Firstly, the relationship between displacement impact coefficient, positive and negative moment impact coefficient, shear impact coefficient and models of each order were obtained by using dynamics and curvature modal theory. Then the beam grid method was used to establish the MIDAS Civil finite element modes of $r \times 30$ m PC continuous beam bridges. And the Fourier series were used to fit the first three order vertical bending modes obtained from the finite element analysis. Finally, the fitting mode function was substituted into the relationship between the impact coefficients of different effects and the modes of each order, so that the contributing percentages of the first three orders of vibration modes to the impact coefficients of different effects were obtained. The theoretical analysis conclusions were verified by comparing with the existing research results. The research results show that the displacement impact coefficient, positive bending moment impact coefficient, and shear impact coefficient can be calculated more reasonably according to the first order vertical bending frequency. Among the first three order vertical bending modes, the first order mode contributes 84.4% to 99.5% of the largest dynamic displacement in the mid-span section, 77.2% to 98.7% of the maximum dynamic positive bending

moment in the mid-span section, and 84.1% to 99.1% of the maximum dynamic shear force of the bearing section. The negative moment impact coefficient is calculated more reasonably according to the second order vertical bending frequency. Among the first three order vertical bending modes, the second order mode contributes 70.0% to 98.2% of the maximum negative dynamic bending moment of the support section. 9 tabs, 2 figs, 31 refs.

摘要: 为明确在计算连续梁桥主梁不同荷载效应(位移、正负弯矩和剪力)的冲击系数时,采用哪一阶频率计算更加合理,以分联长度为 $r \times 30$ m(跨数 $r=3,4,5,6$)的预应力混凝土连续梁桥为研究对象,运用理论分析与有限元数值模拟相结合的手段,研究了位移冲击系数、正负弯矩冲击系数和剪力冲击系数与前3阶频率的对应关系。首先运用动力学和曲率模态理论得到了位移冲击系数、正负弯矩冲击系数和剪力冲击系数与各阶振型的表达式;接着运用梁格法分别建立 $r \times 30$ m 预应力混凝土连续梁桥的 MIDAS Civil 有限元数值模型,然后利用傅里叶级数分别对有限元分析中得到的前3阶竖弯振型进行拟合,最后将拟合得到的振型函数代入不同效应的冲击系数与各阶振型的表达式,从而分别得到前3阶竖弯模态对不同效应冲击系数的贡献百分比,并与已有研究成果进行对比,对该理论分析正确性进行了验证。研究结果表明:位移冲击系数、正弯矩冲击系数和剪力冲击系数根据第1阶竖弯频率来计算更加合理,在前3阶竖弯模态中,第1阶模态贡献了跨中最大动位移的84.4%~99.5%、跨中截面最大正动弯矩的77.2%~98.7%、支座截面最大动剪力的84.1%~99.1%;负弯矩冲击系数则根据第2阶竖弯频率来计算更加合理,在前3阶竖弯模态中,第2阶模态贡献了支座截面最大负动弯矩的70.0%~98.2%。

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作者: 武芳文; 罗建飞; 郑伟; 戴君; 蔡诚; 温雅军

标题: Optimization of load efficiency coefficient of self-anchored suspension bridge based on method of robust regression

标题: 基于稳健回归法的自锚式悬索桥荷载效率系数优化

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作者关键词: 桥梁工程; 荷载效率系数; 稳健回归; 自锚式悬索桥; 荷载试验

摘要: In order to explore the unreasonable value of load efficiency coefficient of self-anchored suspension bridges, the Baishi Bridge in Zhuhai City was studied, and the load efficiency coefficient of self-anchored suspension bridges were optimized by the method of robust regression. The relationship between the structural response and the load efficiency coefficient of the main girder and the main tower of the self-anchored suspension bridge was studied in detail. And the reasonable value of load efficiency coefficient was determined. Firstly, based on the field test of Baishi Bridge, the response values of the main beam and main tower under graded loading were obtained. Secondly, the linear robust regression model between load efficiency coefficient and structural response was established by using MATLAB, and the reliability of the mathematical model was analyzed. Then, the robust regression model was used to predict and analyze the structural response (deflection, stress and deflection of cable tower) under the load efficiency coefficient required by the code. The load efficiency coefficient with the smallest error value was taken as the final optimization value. Finally, the above research results were verified based on the field test data of the other two self-anchored suspension bridges with the same structural form. The results show that the predicted value of structural response obtained by the proposed robust regression analysis method is in good agreement with the test value, and the load efficiency coefficient of the main components of self-anchored suspension bridge can be optimized effectively. When the load efficiency coefficient of the main beam of the self-anchored suspension bridge is less than 0.68, and the offset load efficiency coefficient of the main tower is less than 0.82, the structural response of the self-anchored suspension bridge varies linearly. When the load efficiency coefficient of the main beam is 0.68, the relative error between the predicted value and the measured value of the structural response can be controlled within 3%. When the partial load efficiency coefficient of the tower is 0.82, the relative error between the predicted value and the measured value can also be controlled within the allowable range, that is, the offset load efficiency coefficient of the main beam and tower of the self-anchored suspension bridge should be optimized to 0.68 and 0.82 respectively. This method can provide a support for a quick evaluation of self-anchored suspension bridge and provide a certain reference basis for the subsequent improvement of relevant specifications. 7 tabs, 12 figs, 25 refs.

摘要: 为解决自锚式悬索桥荷载效率系数取值不合理问题,以珠海白石桥为研究对象,通过稳健回归法对自锚式悬索桥的荷载效率系数进行优化研究。研究了主梁、主塔的结构响应与荷载效率系数之间的关系,并确定合理的荷载效率系数取值。首先,基于白石桥的现场试验得到该桥主梁和主塔在分级加载下的响应值。其次,采用 MATLAB 软件建立荷载效率系数与结构响应的线性稳健回归模型,并对该数学模型进行可靠性分析。然后,利用该稳健回归模型对规范要求荷载效率系数下的结构响应(主梁挠度、应力以及索塔偏位)进行预测和误差分析,并以误差值最小时的荷载效率系数值作为最终优化值。最后,基于另外 2 座结构形式相同的自锚式悬索桥的现场试验数据对以上研究结果进行验证。研究结果表明:提出的稳健回归分析法得到的结构响应预测值与试验测试值具有较好的一致性,可对自锚式悬索桥主要构件的荷载

效率系数进行有效优化;当自锚式悬索桥主梁的荷载效率系数小于 0.68、主塔偏位荷载效率系数小于 0.82 时,其结构响应均为线性变化;当主梁荷载效率系数取 0.68 时,其结构响应的预测值与实测值的相对误差可控制在 3%以内;索塔偏位荷载效率系数取 0.82 时,其预测值与实测值的相对误差也可控制在容许范围内,即自锚式悬索桥的主梁和索塔偏位荷载效率系数应分别优化至 0.68 和 0.82。该方法可为自锚式悬索桥的快速评定提供有力理论支撑,并为后续相关规范的完善提供一定的参考依据。

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标题: Safety evaluation of urban expressway traffic flow operation status

标题: 城市快速路车流运行状态安全性评价

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作者关键词: traffic engineering; traffic safety; urban expressway; DEA; effective frontier

作者关键词: 交通工程; 交通安全; 城市快速路; 数据包络分析; 有效前沿面

摘要: To evaluate the traffic safety of driving on urban expressway, a method based on data envelopment analysis (DEA) was proposed to evaluate the safety of traffic flow. In addition, the practicability of the evaluation method was verified. Some indexes which can reflect the stability of traffic flow were analyzed deeply. The traffic stability indexes were divided into the

fundamental indexes and the characteristic indexes. The fundamental indexes represented by traffic flow, velocity and density, were selected as the input indexes. The coefficients of speed standard deviation, the rate of lane changing and the average of the headway, were selected as the output indexes. Then the non-expected indexes were converted to the expected indexes by using linear transformation. The undesired output indexes were converted to the desire output indexes according to linear transformation. Based on EDA method, the model of the traffic safety evaluation on urban expressway was established. The difference of input and output indexes in every evaluation segment were calculated, so the relative safety of multiple evaluation samples could be obtained through the model. Take 10 segments of the Xi'an Ring Expressway including 4 weaving segments as example. The radar speed gun and video methods were used to collect traffic data. The LINGO11.0 software was used to solve this model. The results show that there are 6 segments, which are effective units and the road safety degree is relatively effective, while 4 segments are ineffective units with potential safety hazards. The relative safety degree of road sections A, B, C and J of the ineffective units are 97%, 88%, 98% and 96% respectively. Based on the analysis of the evaluation results, it is proposed that when the input indexes such as traffic flow, velocity or traffic density change such as increasing, the hidden danger of road traffic safety is likely to be magnified and traffic accidents are likely to occur. 3 tabs, 3 figs, 33 refs.

摘要: 为了对城市快速路的车流运行状况进行评价,提出基于数据包络分析(DEA)的车流运行状态安全性评价方法,并对该方法的工程实用性进行研究。深入分析反映交通流稳定性的交通指标,将道路交通状态指标划分为基础性指标和特征性指标 2 种类型。以交通量、速度和密度等基础性指标为输入指标,以速度标准差系数、车辆变道率和平均车头时距等特征指标为非期望输出指标,运用线性转化将非期望指标转化为期望指标;基于数据包络分析理论构建城市快速路车流运行状态评价模型,通过计算不同路段输入和输出指标之间的差异性,可以得到多个评价样本路段之间的相对安全性;最后,以西安市绕城高速为例,分别选取 4 个交织路段和 6 个正常路段作为评估对象,使用雷达测速枪和视频法进行交通调查,并借助 LINGO11.0 软件对模型进行求解,验证了模型的实用性。研究结果表明:10 个评价样本路段中,6 个路段为有效决策单元,道路安全度达到了相对有效,4 个路段为非有效决策单元,存在潜在的安全隐患,其中非有效决策单元绕城高速 A、B、C、J 路段的道路相对安全度分别为 97%、88%、98% 和 96%;在交通量、平均行驶速度或车流密度等输入指标发生突变时,道路交通安全隐患存在被放大的可能性,容易发生交通事故。

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标题: Comparison of rheological properties between SBS,rubber and high-viscosity modified asphalt binders

标题: SBS、橡胶和高黏改性沥青流变性能对比

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文献类型: Article

作者关键词: road engineering; modified asphalt; rheological theory; high-temperature performance; low-temperature performance

作者关键词: 道路工程; 改性沥青; 流变学理论; 高温性能; 低温性能

摘要: To fully understand the high-and low-temperature rheological properties of different modified asphalt binders in the same evaluation system,a dynamic shear rheometer was used to conduct a strain sweep test to determine the linear viscoelastic range of styrene-butadiene-styrene(SBS)modified asphalt binder,rubber modified asphalt binder,and high-viscosity modified asphalt binder.This rheometer was also utilized to perform the frequency sweep test and multiple stress creep recovery tests to analyze their high-temperature properties.Meanwhile,a bending beam rheometer was used to carry out bending creep stiffness tests to analyze their lowtemperature properties.The results show that according to the strain sweep test,the SBS,rubber,and high-viscosity modified asphalt binders are within the range of linear viscoelasticity at less than 10%strains.Based on the frequency sweep test result,their complex shear modulus main curves fitted by the Sigmoidal model are smooth and continuous,they are all simple rheological materials.There are great differences in the complex shear moduli of the SBS,rubber,and high viscosity modified asphalt binders at low frequencies.These differences are relatively small at high frequencies.The multiple stress creep recovery test result shows that compared with the SBS and high-viscosity modified asphalt binders,the rubber modified asphalt binder has larger flow deformation characteristics.Furthermore,the high-viscosity modified asphalt binder has better resistance to permanent deformation than rubber and SBS modified asphalt binders.According to the low-temperature bending creep stiffness test result,both creep stiffness and creep rate are exponentially related to temperature.Through the creep stiffness and creep rate,it is determined that the low-temperature cracking resistance of the high-viscosity modified asphalt binder is better than that of SBS and rubber modified asphalt binders.Furthermore,the result of low-temperature sensitivity assessed by the creep stiffness index demonstrates that the temperature sensitivity of the high-viscosity modified asphalt binder is smaller than that of SBS and rubber modified asphalt binders.Therefore,the high-and lowtemperature rheological behaviors of the high-viscosity modified asphalt binder are superior to those of the SBS and rubber modified asphalt binders.

摘要: 为充分认识在同一评价体系中不同改性沥青高低温流变性能,使用动态剪切流变仪对 SBS、橡胶和高黏改性沥青分别进行应变扫描试验,确定其线性黏弹性范围,进行频率扫描试验和多重应力蠕变恢复试验分析其高温性能。同时使用弯曲梁流变仪对 3 种改性沥青进行弯曲蠕变劲度试验分析其低温性能。研究表明:根据应变扫描试验结果,当应变小于 10% 时,SBS、橡胶和高黏改性沥青处在线性黏弹性范围内。根据频率扫描试验结果,使用 Sigmoidal 模型拟合 SBS、橡胶和高黏改性沥青的复数剪切模量主曲线光滑连续,且均是简单的流变材料;SBS、橡胶和高黏改性沥青在低频状态下复数剪切模量相差较大,在高频状态下复数剪切模量相差较小。根据多重应力蠕变恢复试验结果,相比 SBS 和高黏改性沥青,橡胶改性沥青具有较高的流动变形特性;高黏改性沥青的抗永久变形能力优于橡胶和 SBS 改性沥青。低温弯曲蠕变劲度试验中,蠕变劲度和蠕变速率均与温度呈指数关系。通过蠕变劲度和蠕变速率可知,高黏改性沥青的低温抗裂性优于 SBS 和橡胶改性沥青。此外,用蠕变劲度指数衡量改性沥青的低温感温性,可知高黏改性沥青温度敏感性低于 SBS 和橡胶改性沥青温度敏感性。因此,在流变性能方面,高黏改性沥青的高低温性能均优于 SBS 和橡胶改性沥青。

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标题: Influence of Shield Tunnel Excavation on Adjacent Pile Foundation Based on Modified Cam-clay Model

标题: 基于修正剑桥本构模型的盾构隧道开挖对邻近桩基影响分析

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作者关键词: tunnel engineering; excavation disturbance; numerical simulation; pile foundation; Camclay model

作者关键词: 隧道工程; 开挖扰动; 数值模拟; 桩基础; 剑桥模型

摘要: In order to ensure the safety of urban metro shield tunneling near pile foundation and reduce the disturbance of shield tunneling on pile foundation in loess area of China,a 3D FE analysis model for metro shield tunneling is established based on ABAQUS numerical simulation FE analysis software and the modified Cambridge constitutive relation of soil mass. The deformation of adjacent pile foundation and the rule of grounds surface settlement during shield tunneling are calculated and analyzed. The result shows that (1) the influence of tunnel shield construction on adjacent pile foundation is mainly manifested in the displacement of the adjacent pile foundations buried depth in the horizontal direction (X direction) perpendicular to the longitudinal axis of the tunnel; (2) during the shield excavation process,the displacement in the horizontal direction of the pile increases gradually with the decrease of the distance between the excavation face and the pile d; (3) when d is approximately in the range of $[-0.5D, +0.5D]$,the displacement is the largest; (4) when d increases continuously,the displacement in the horizontal direction also increases continuously, and finally tends to be stable. Through the comprehensive analysis of surface deformation curve obtained by numerical simulation and field monitoring,it can be found that the ground deformation above the tunnel axis is the largest,and the deformation gradually decreases to both sides of the tunnel axis,but the surface settlement near the pile foundation is relatively small,and the pile cap is also affected by uneven settlement and generates an offset. In the actual excavation of the tunnel project,it is necessary to strengthen the monitoring of the uneven settlement of the cap to take timely control measures.

摘要: 为了保证在我国黄土地区城市地铁盾构开挖在靠近桩基础时的安全性,降低盾构开挖对桩基础的扰动影响,基于 ABAQUS 数值模拟有限元分析软件,采用土体的修正剑桥本构关系,建立地铁盾构法开挖施工的三维有限元分析模型。对隧道盾构开挖过程中邻近桩基础的变形和地表沉降规律进行了计算分析。研究表明:隧道盾构对邻近桩基础的影响主要表现在桩基础的隧道埋深位置处,垂直隧道纵轴的水平方向(X 方向)位移量上;在盾构开挖过程中,随着开挖面与桩之间距离 d 缩小,桩的水平方向位移逐渐增大;在 d 大致为 $[-0.5D, +0.5D]$ 范围内时,变形最大;当 d 继续增大时,水平方向位移也继续增大,最终趋于稳定值。通过综合分析数值模拟计算和施工现场监测得到的地表位移变形曲线,可以发现在隧道轴线正上方位置地面的沉降最大,向隧道轴线两侧沉降逐渐减小,但在桩基附近的地表沉降相对较小,而桩顶承台也受到不均与沉降的影响产生偏移。在该隧道工程实际开挖中,需要加强承台不均匀沉降监测,以便及时采取控制措施。

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作者关键词: 城市交通; 道路交通状态; 集对分析; 评价时间间隔; 瞬时速度

摘要: To improve the accuracy of urban road traffic status evaluation result and determine the appropriate traffic status evaluation interval,taking the number of vehicles passing the section continuously as the basis for dividing time interval of evaluation,the traffic status evaluation model is established based on the set bisection theory. First,to improve the operating efficiency of the evaluation model,based on the summary and analysis of the current researches,it is proposed to divide the evaluation interval by the number of vehicles passing the cross-section of the section,and to take the vehicle instantaneous speed as the single indicator for traffic status discrimination. Second,according to the theory of SPA,set pair $H(A,B)$ is formed by set A (measured data) and set B (standard composition of discrimination indicator), and a fiveelement coefficient based road traffic status evaluation model is established from the perspectives of identity, difference and reverse. Finally,to verify the effectiveness of the model,taking the measured data of a road section in Xian City for example,the traffic status grade of this section is discriminated by fuzzy evaluation method and SPA method respectively,which proved the superiority of this method. It is found that (1) The evaluation results of the 2 methods are basically the same,but the traffic status evaluation method based on SPA theory is more sensitive to the change of speed,the traffic status transition curve is smoother,which can better reflect the process

and gradual change of the transition to a certain extent; (2) the smaller the time interval of evaluation, the more sensitive the traffic status to the speed change; (3) but when the evaluation time interval is less than 1 min, the traffic status evaluation result is no longer affected by the time interval.

摘要: 为了提高城市道路交通状态评价结果的准确性,确定合适的交通状态评价间隔,以连续通过断面的车辆数作为划分评价时间间隔的依据,基于集对分理论建立了交通状态评价模型。首先为了提高评价模型的运行效率,在总结分析当前研究现状的基础上,提出了以通过路段断面的车辆数来划分评价时间间隔,以车辆的瞬时速度作为交通状态识别的单一指标。其次根据集对分析的原理,以集合 A (实测数据)与集合 B (判别指标的标准构成)构建了集对 H (A,B), 从同、异、反 3 个角度出发,建立了基于五元系数的道路交通状态评价的模型。最后为了验证模型的有效性,以西安市某路段的实测数据为例,分别利用模糊评价法和集对分析法对此路段的交通状态等级进行了判别,证明了该方法的优越性。研究发现:两种方法的评价结果基本相同,但是基于集对分析理论的交通状态评价方法对速度的变化反应更为灵敏,得到的交通状态转变曲线更为平滑,在一定程度上可以更好地反映交通状态转变的过程性和渐变性;评价时间间隔划分得越小,交通状态对速度的变化反应越灵敏;但当评价时间间隔小于 1 min 时,交通状态评价结果不再受时间间隔的影响。

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标题: 高速公路连续长下坡路段大型货车专用缓速车道研究

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作者关键词: road engineering; low-speed lane; downhill characteristics; continuous long downhill; brake temperature rising

作者关键词: 道路工程; 缓速车道; 下坡特性; 连续长下坡; 制动毂温升

摘要: Exclusive low-speed lane for large trucks was designed to improve the driving safety of large trucks in continuous downhill section of highways. The driving characteristics of large trucks going downhill under the condition of engine auxiliary braking were analyzed. Based on the brake drum temperature and speed characteristics, it was proposed that there is a necessity to construct an exclusive low-speed lane in continuous long downhill section of highways for large trucks. Taking the six-axis articulated vehicle as the guiding type, the low-speed lane structure system was studied for the driving safety of articulated vehicles when going downhill. the setting method of the low-speed lane was clarified. The lane structures including transition section, buffer zone, steady speed zone and its linear shape were proposed. Then the reasonable speed limit and recommended gear of the low-speed lane was analyzed. Finally, taking a long downhill slope in G5 Jing-kun highway as an example, the temperature rise value of the truck brake drum under various traffic modes was simulated, and the passing safety of the low-speed lane was verified. The results show that, compared with the temperature of brake drum in downhill of free-flow speed lanes and in downhill of limit speed lanes, the temperature of brake drum on downhill bottom of the low-speed lane is reduced by 114 and 79°C, respectively, and the cooling amplitude can reach 32.9% and 25.3%, respectively. The maximum temperature in the low-speed lane section is lower than the critical safety temperature. It indicates that setting a low-speed lane in the continuous long downhill section can greatly reduce the rising temperature of the brake drum as well as the probability of brake failure.

摘要: 为降低大型载重货车的下坡风险,提升我国高速公路连续长下坡的行车安全性,研究了连续长下坡路段货车专用缓速车道。分析了大型货车在发动机辅助制动下坡时的行驶特性,基于货车制动毂温度和速度特性,提出长下坡路段应在必要时增设货车专用缓速车道。以六轴铰接列车为设计主导车型,从铰接列车下坡安全性入手研究了缓速车道的架构体系,明确了缓速车道的设置方法,提出了包括渐变段、缓冲区和稳速区等在内的车道架构及其线形指标,分析了缓速车道的合理限速值以及推荐挡位。最后以G5京昆高速某长大下坡为例,通过多种通行方式下的货车制动毂温升数值模拟,对比验证了缓速车道的安全通行性。结果表明:相较于自由流速度下坡和分车道限速下坡,设置缓速车道后坡底制动毂温度分别降低了114和79°C,降温幅度分别达到32.9%和25.3%,且缓速车道路段内最高温度低于安全临界温度,表明在连续长下坡内增设缓速车道可显著缓解制动毂温升态势,降低货车制动失效概率。

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标题: Study on Aerodynamic Performance of a Continuous Steel Box Girder Bridge with Variable Sections

标题: 变截面连续钢箱梁桥静气动性能研究

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作者关键词: bridge engineering; static three-component force coefficient; numerical simulation; variable cross-section; continuous steel box girder bridge

作者关键词: 桥梁工程; 静三分力系数; 数值模拟; 变截面; 连续钢箱梁桥

摘要: The segment model wind tunnel test out on the mid-span section,1/4 span section and support section of a long-span continuous steel box girder bridge with variable sections is carried,and the 2D and 3D numerical simulations are performed on the girder. The influence of the girder span direction,change of web height,and line shape of the girder bottom of the subject bridge on the static three-component force of the model is examined by wind tunnel experiment and numerical simulation. The result shows that(1)the variation of web height and the line shape of the girder bottom can significantly affect the static aerodynamic dynamics coefficient of the continuous steel box girder bridge,the resistance coefficient,lift coefficient and torque coefficient of the subject bridge significantly increase as the web height increase;(2)when the line shape of the girder bottom is straight with a small slope,the static three-component force of the model would not obviously change with the straight line slope of the girder bottom,and the segment model with equal section can be used to replace the segment model with slope at the bottom of the

beam in wind tunnel experiment and numerical simulation;(3)but when the angle between the straight line of the girder bottom and the horizontal line is greater than 3° or the line shape of the girder bottom is a quadratic parabola,the calculated static three-component coefficient has a big relative variation compared with the result obtained from the equal-section model. Therefore,it is not suitable to use the segment model of equal section for wind tunnel experiment for the variable section girder bottom in this case,and it is recommended to use 3D flow field numerical simulation that is consistent with the line shape of the actual bridge bottom as far as possible to improve the accuracy.

摘要: 对某大跨变截面连续钢箱梁桥跨中断面、1/4 跨断面、支点断面进行了节段模型风洞测力试验,并对主梁进行了二维和三维数值模拟,通过风洞试验结合数值的方式来研究连续钢箱梁桥变截面主梁展向、腹板高度变化及梁底线形不同对于模型静三分力的影响。结果表明,腹板高度变化及梁底线形不同对连续钢箱梁桥静气动力系数有显著影响,随腹板高度增大,变截面连续钢箱梁桥阻力系数、升力系数、扭矩系数均有显著增加;在梁底线形为直线且斜率较小时,模型的静三分力不会随梁底直线斜率的变化而产生明显的变化,在风洞试验及数值模拟中可以用等截面的节段模型来代替梁底有斜率的节段模型。而当梁底直线与水平线夹角大于 3° 或梁底线形为二次抛物线时,计算得到的静三分力系数与等截面模型的结果相对变化量较大,故对于变截面梁在这种情况下不宜使用等截面的节段模型进行风洞试验,且应尽量采用三维流场数值模拟与实桥梁底线形相一致以提高计算精度。

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标题: In-situ Model Test of a Cantilever and Full-buried Single-row Double-pile Stabilizing System on a Loess Slope

标题: 黄土边坡悬臂式与全埋式单排两桩抗滑桩原位模型试验

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作者关键词: road engineering; loess side slope; in-situ model test; single-row anti-slide pile; bending moment of pile shaft; failure in sequence

作者关键词: 道路工程; 黄土边坡; 原位模型试验; 单排抗滑桩; 桩身弯矩; 破坏顺序

摘要: In this study, with a single-row double-pile stabilizing system used as a test object, remolded soil required for an indoor reduced-scale model test of stabilizing piles was transformed into undisturbed soil. An in-situ reduced scale model test, which was designed based on a field direct shear test of rock and soil, was conducted on cantilever and full-buried stabilizing piles on high and steep loess slopes of expressways to analyze the deformation of cantilever and full-buried model piles when they reached their ultimate state due to landslide thrust and interaction of soils around piles. This study investigated the force distribution process of two types of piles in undisturbed loess and determined the failure modes of these piles. Test results indicate that each pile experiences three stages, namely, zero displacement, effective deformation, and failure, during the loading process, and their dividing points are defined as starting and critical loads. Both the cantilever and full-buried piles represent specific types of fracture damage, where the first failure point of the two cantilevered model piles is at a penetration depth of approximately 68 cm. Piles A and B have the same starting load of 32.5 kN, and pile A is the first to fail, with the critical load being 75.5 kN. The first failure point of the two full-buried model piles is at a penetration depth of approximately 51 cm. The starting load of pile A is 32.5 kN, but that of pile B is 22 kN. Pile A is the first to fail, with theoretical loads of both piles being 93 kN. In the full-buried condition, the two piles experience a unique phenomenon of mutual coordination during the loading transfer, which is different from the cantilever condition. The test results provide data to support damage early warning and design of stabilizing piles.

摘要: 以单排两桩抗滑桩为研究对象,将室内抗滑桩缩尺模型试验方法中的重塑土条件改进为原状土条件,参照岩土体现场直剪试验方法设计了抗滑桩现场模型试验,在高速公路高陡黄土边坡上进行悬臂式、全埋式抗滑桩原位缩尺模型试验,确定2种埋设方式的模型桩与原状黄土体相互作用至极限状态过程中的受力变形规律,探究2种埋设形式的抗滑桩在原状黄土中的受力分配过程,获得2种埋设形式的模型桩各自的破坏模式。试验结果表明:各模型桩在受力过程中均经历了零位移阶段、有效变形阶段和失效阶段,并将3个阶段的分界点分别定义为临界启动荷载和临界阻滑荷载。2种埋置形式的模型桩均属于多点依次断裂破坏,两悬臂式模型桩首次破坏点位于模型桩入土深度约68 cm处,A桩为两桩中的首先破坏桩,两桩的临界启动荷载为32.5 kN,临界阻滑荷载为75.5 kN;两全埋式模型桩首次破坏点位于模型桩入土深度约51 cm处,A桩为两桩中的首先破坏桩,A桩的临界启动荷载为32.5 kN,B桩为22 kN,两桩的临界阻滑荷载为93 kN。在全埋式条件下,两桩在受力过程中均存在明显的相互协调过程,而这一过程在悬臂式条件下并未出现。试验结果为抗滑桩破坏预警及设计计算提供了数据支持。

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标题: Improved Mixed Ventilation Mode Combined Double-hole Complementarity with Blowing and Exhausting Shaft in Highway Tunnel

标题: 公路隧道互补结合竖井送排的改进型混合通风方式研究

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作者关键词: tunnel engineering; improved mixed ventilation; theoretical analysis; ventilation cross passage; benefit comparison

作者关键词: 隧道工程; 改进型混合通风; 理论分析; 换气横通道; 效益比较

摘要: In order to address the problem of expensive operating costs of conventional segmental longitudinal ventilation systems in long highway tunnels, an improved mixed ventilation mode combined double-hole complementarity with the blowing and exhausting shaft was proposed. On the basis of theoretical analysis, a reasonable combination scheme for ventilation cross passage and shaft was provided. Furthermore, a calculation method for an improved mixed ventilation mode was derived in detail, which is applicable to tunnels beyond the limit of the conventional double-hole complementary ventilation mode. By comparing the utilization efficiency of traffic wind and tunnel structure between the traditional segmental ventilation method and the improved mixed ventilation mode, the economic benefits of the improved mixed ventilation scheme were analyzed with the help of an example. Results showed that as compared to conventional segmental longitudinal ventilation, the improved mixed ventilation can effectively improve the utilization rate of traffic wind, reduce the adverse effect of excessive traffic wind on tunnel ventilation, and reduce wastage of resources. Under the most unfavorable traffic blocking conditions, the entire air

volume is sent and discharged by the improved mixed ventilation method through the shaft; a decrease from $1\,723.06\text{ m}^3 \cdot \text{s}^{-1}$ to $804.62\text{ m}^3 \cdot \text{s}^{-1}$, i. e., 53.3% decrease, was recorded that effectively reduces the power of the axial flow fan, as well as the design requirements of the shaft. Under the most unfavorable conditions of tunnel ventilation, the power of the jet fan increases by 84%, while that of the axial fan reduces by 52.4%. Although the purchasing cost of the jet fan increases, the power of the total fan reduces by 13.1%, which greatly reduces the operating costs. From the aspect of civil engineering, the improved mixed ventilation mode involves the use of two cross air ducts and canceling of a part of the connection channel for transmission and exhaust, both of which offset each other. However, as the scale of vertical shafts is reduced, the civil engineering costs are also reduced. The use of two smoke exhaust channels in the improved mixed ventilation system therefore addresses the problem of fire smoke exhaust in the dual hole complementary ventilation system.

摘要: 针对特长公路隧道常规分段纵向式通风系统运营费用昂贵的问题,提出采用双洞互补与竖井送排相结合的改进型混合通风方式。在理论分析的前提下给出换气横通道与竖井的合理结合方案,详细推导适用于超出常规双洞互补通风方式限制长度的隧道的改进型混合通风方式计算方法;通过比较传统分段通风方式和改进型混合通风方式的交通风与隧道结构利用效率,对改进型混合通风方案的经济效益进行工程实例分析。结果表明:改进型混合通风方式与常规分段纵向式通风方式相比,前者有效地提高了交通风的利用率,降低了由于交通风太过富余而对隧道通风产生的不利影响,同时减少了资源的浪费;在最不利的行车阻滞工况下,改进型混合通风方式需要通过竖井进行送排的风量之和由 $1\,723.06\text{ m}^3 \cdot \text{s}^{-1}$ 降至 $804.62\text{ m}^3 \cdot \text{s}^{-1}$,降幅达 53.3%,有效地减少了轴流风机的功率,降低了对竖井的设计要求;在隧道通风最不利工况下,射流风机的配机功率提高了 84%,轴流风机配机功率降低了 52.4%,虽然射流风机购置费用增加,但总配机功率仍然减少 13.1%,极大地节省了运营费用;在土建方面,改进型混合通风方式增加了 2 个横风道,取消了部分送排联络通道,相互抵消,但竖井的规模减小,土建费用有所下降;改进型混合通风方式增加了 2 条排烟通道,解决了双洞互补通风方式中火灾排烟困难的问题。

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标题: Research on surface morphology index of railway ballast based on grey correlation degree

标题: 基于灰色关联度的铁路道砟表面形态指标研究

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作者关键词: Angularity $\left(P \right)$; ballast; Los Angeles abrasion; digital image processing; grey correlation analysis; Angularity $\left(P \right)$; axial coefficient

作者关键词: 道砟; 洛杉矶磨耗; 数字图像处理; 灰色关联分析; 轴向系数

摘要: As the material directly bearing the railway track load, ballast needs to have better surface morphology and wear resistance. The first-class crushed stone ballast for the new railway was taken as the research object, Los Angeles abrasion test was used to change the surface morphology of the ballast, and image processing software was used to determine eight surface morphology indexes: area, equivalent ellipse long axis length, equivalent ellipse short axis length, Ferret maximum diameter, Ferret minimum diameter, axial coefficient, roundness and Angularity $\left(P \right)$. The change trend of each evaluation index and the loss percentage of different particle size under different abrasion times were analyzed, and the optimal evaluation index and specific requirements were further put forward in combination with the grey correlation analysis theory. The results show that the values of each evaluation index gradually decrease with the increase of abrasion times, and finally tend to be stable. 16-25mm and 56-63mm size ballast are most easily worn in Los Angeles abrasion test. Combined with the results of grey correlation degree calculation, angularity $\left(P \right)$, axial coefficient and roundness are determined as the optimal evaluation indexes of ballast surface morphology.

摘要: 道砟作为直接承受铁路轨道荷载的材料, 需要有较好的表面形态和抗磨耗能力. 以新建铁路用一级碎石道砟为研究对象, 通过洛杉矶磨耗试验改变道砟的表面形态, 利用图像处理软件确定出面积、等效椭圆长轴长度、等效椭圆短轴长度、费雷特最大直径、费雷特最小直径、轴向系数、圆度和 Angularity $\left(P \right)$ 8 个表面形态指标; 对不同磨耗次数下各评价指标的变化趋势和不同粒径的损失百分比进行分析, 进一步结合灰色关联分析理论提出最优评价指标和具体要求. 结果表明: 各评价指标值都随着磨耗次数的增加逐渐减小, 最终趋于稳定状态; 16~25mm 与 56~63mm 粒径的道砟在洛杉矶磨耗试验中最易被磨耗. 结合灰色关联度计算结果, 最后确定出 Angularity $\left(P \right)$ 、轴向系数和圆度为道砟表面形态的最优评价指标.

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标题: Field rapid estimation method for the scale of rockburst in deep tunnels

标题: 深埋隧道岩爆规模现场快速估算方法

来源出版物: 中国地质灾害与防治学报 卷: 31 期: 1 页: 57-64 出版年: 2020

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来源出版物: The Chinese Journal of Geological Hazard and Control 卷: 31 期: 1 页: 57-64 出版年: 2020

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文献类型: Article

作者关键词: deep buried tunnel; rockburst; volume of rockburst pit; disaster scale; Jinping-II Hydropower Station

作者关键词: 深埋隧道; 岩爆; 爆坑体积; 灾害规模; 锦屏二级水电站

摘要: Considering the area of wall surface damaged by rockburst and the volume of rock mass ejected as two important indexes to measure the scale of rockburst disaster, a method for rapid modeling of rockburst pit and estimating of rockburst scale based on field data is proposed. The important components of this method are type generalization of rockburst pit, selection of measured sections of rockburst pit, determination and coordinate record of the control points, fitting of the contour line of rockburst pit, derivation of estimation formulas about the wall area damaged by rockburst and volume of rockburst pit. For the rockburst pits of fossa type and V-type which are common in engineering, the estimation formulas of the rockburst scale are proposed, which can be suitable for the linear and arched walls of the tunnel respectively. Besides, a disposal method applied to approximately estimate the scale of the a typical fossa-type and V-type rockburst pits is discussed. The method was applied to estimate the rockburst scale of deep-buried diversion tunnel project of Jinping-II Hydropower Station in southwest China. The results of typical cases given by using this estimation method are close to the actual rockburst scale in the field and the estimation error is about 15%. This research can provide fundamental indexes to classify the intensity and

evaluatethe severity of rockburst.

摘要: 以岩爆破坏的洞壁面积及爆落的岩体体积作为衡量岩爆灾害规模的重要指标,提出一种基于现场测量信息的爆坑几何形态快速建模及岩爆规模估算方法,该方法的重要组成部分包括:爆坑形态类型的概化、爆坑测量断面的选取、控制测点的确定及坐标记录、爆坑纵横断面轮廓线线型的拟合、洞壁破坏面积与爆坑体积估算公式的推导。针对工程中常见的窝型与 V 型爆坑,分别建立了适用于隧道直线形与拱形洞壁的岩爆规模估算公式,探讨了非典型窝型与 V 型爆坑,岩爆规模估算的近似处理方法。将所提出的方法应用于我国西南锦屏二级水电站深埋引水隧洞工程的岩爆规模估算,典型案例验证结果表明,利用该估算方法所给出的结果与现场实际的岩爆规模接近一致,估算误差约为 15%以内。研究成果能够为岩爆烈度等级划分及严重程度的评定提供重要的基础性指标。

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作者: 潘兵宏; 单慧敏; 任卉; 胡炜

标题: Operational efficiency of new unconventional U-turn intersection

标题: 新型非常规 U 型转弯交叉口的运行效率研究

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文献类型: Article

作者关键词: traffic engineering; new unconventional U-turn intersection (NUUT); Vissim simulation; delay; number of stops; the queue length

作者关键词: 交通工程; 新型非常规 U 型转弯交叉口; Vissim 仿真; 延误; 停车次数; 排队长度

摘要: Left-turning vehicles have a significant impact on the traffic operation efficiency at intersections. However, the traffic conflicts at main intersections can be well solved by setting U-turn intersections. For the traditional U-bend intersections which have special requirements for the width of the central separation belt, a new type of unconventional U-turn intersections (NUUT) is proposed to improve the utilization of road space and to solve the conflict between large and small vehicles in the case of turning. The vehicle operating efficiency of the NUUT is analyzed by VISSIM simulation. NUUT is compared with direct left turn (DLT) lane, no lane U-turn (UT), and one lane U-turn (OLUT). The evaluation results show that the setting of NUUT reduces the average delay-rate of the network by 5.64%~85.73%, the number of stops is decreased by 6.17%~94.22%, and the queue length is cut 6.44%~95.38%, compared with the DLT in the same applicable traffic volume. And it decreases the average delay rate of the network by 1.45%~98.00% and 0.30%~97.97%, compared with UT and OLUT under the same applicable traffic volume and the same large vehicle proportion change. In conclusion, the NUUT can effectively improve the operational efficiency of road network when the proportion of large road vehicles increases. The maximum traffic volume applicable for the comparison with U-shaped intersection is in linear distribution. With the increase of the traffic volume in the main road, the secondary road gradually decreases. The design of NUUT can effectively improve the operational efficiency of road network under different traffic volumes and different large vehicle ratios.

摘要: 左转车辆对交叉口运行效率影响很大,通过设置 U 型转弯能够很好的解决主交叉口的交通冲突.针对常规的 U 型转弯交叉口对中央分隔带宽度的特殊要求,设计一种新型非常规 U 型转弯交叉口(new unconventional U-turn intersections, NUUT),通过将常规的 U 型掉头改造为分车道分车型的 U 型转弯交叉口,来解决道路空间利用以及大小车转弯之间的冲突问题.通过 Vissim 仿真,对比 NUUT、直接左转(direct left turn, DLT)、无专用车道 U 型转弯(U-turn, UT)以及有 1 条专用车道 U 型转弯(one lane U-turn, OLUT)4 种交叉口设计中的车辆运行效率.结果表明,在相同的适用交通量条件下,NUUT 路网的平均延误率比 DLT 交叉口降低 5.64%~85.73%,停车次数降低 6.17%~94.22%,排队长度减少了 6.44%~95.38%.在相同的适用交通量和大型车比例变化条件下,相比 UT 和 OLUT,NUUT 的设置使路网平均延误分别降低了 1.45%~98.00%和 0.30%~97.97%.当道路上的大型车比例增加时,NUUT 能够有效改善路网的运行效率.与 U 型交叉口对比,NUUT 所适用的最大交通量均呈线性分布,随着主干路交通量的增加,次干路交通量逐渐降低.NUUT 设计能够有效提高不同交通量、不同大型车比例情况下的路网运行效率.NUUT 在实际交叉口应用中的效果明显,有效降低了交叉口延误.

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标题: Experimental analysis of durability of acrylate spray film waterproof materials under acid alkali wetting and freeze-thaw cycles

标题: 丙烯酸盐喷膜防水材料在酸碱浸润和冻融循环条件下的耐久性试验分析

来源出版物: 实验力学 卷: 35 期: 2 页: 199-206 出版年: 2020

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作者关键词: acrylate; spray membrane waterproof material; acidic and alkaline medium; freeze-thaw cycle; tensile property; hygroscopicity

作者关键词: 丙烯酸盐; 喷膜防水材料; 酸性和碱性介质; 冻融循环; 拉伸性能; 吸水性

摘要: The durable properties of acrylate spray membrane waterproof materials under the conditions of acid and alkali solution infiltration and freeze-thaw are practical problems which are difficult to avoid in engineering applications. In this work, acidic medium (0.2% H₂SO₄ solution) and alkaline medium (0.1% NaOH+saturated Ca(OH)₂ solution) are used. After saturation immersion and permafrost circulation, the variation law of water absorption, fracture tensile strength and tensile elongation of the material is studied. The experimental results show that the tensile elongation and the tensile strength of spray film waterproof materials decrease significantly, and the influence of acid medium on the tensile properties of materials is greater than that of alkaline medium. The materials have strong cold resistance and poor ability to withstand at high temperature. It is shown that the water resistant materials of acrylate spray film have good durability in situations of cold freezing and alkaline medium.

摘要: 丙烯酸盐喷膜防水材料在酸碱溶液浸润和冻融条件下的耐久性能是该类材料在工程应用中较难回避的实际问题,论文采用酸性介质(0.2%的 H₂SO₄ 溶液)和碱性介质(0.1%NaOH+饱和 Ca(OH)₂ 溶液)对该材料进行饱和浸泡并进行冻融循环后,研究了该材料的吸水性、断裂拉伸强度和拉断伸长率的变化规律。试验结果表明:喷膜防水材料在侵蚀-冻融循环作用下,其拉断伸长率和断裂拉伸强度显著降低,且酸性介质对材料拉伸性能的影响较大;材料耐低温冰冻能力较强,耐高温能力较差。反映出丙烯酸盐喷膜防水材料在低温冰冻和碱性介质中耐久性较好,不建议在高温和酸性介质条件下使用。

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标题: Advances on molecular simulation technique in asphalt mixture

标题: 沥青混合料分子模拟技术综述

来源出版物: 交通运输工程学报 卷: 20 期: 2 页: 1-14 出版年: 2020

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文献类型: Review

作者关键词: road material; asphalt mixture; molecular simulation technique; molecular dynamics; review

作者关键词: 道路材料; 沥青混合料; 分子模拟技术; 分子动力学; 综述

摘要: The basic principle, implementation method and simulation procedure of molecular simulation technique were analyzed. Two main methods of asphalt molecular model construction were researched. Asphaltene structure models in different periods and aggregate models in different occasions were summarized. The problems about asphalt diffusion process, modifier effect on asphalt performance, asphalt-rejuvenator integration, asphalt-aggregate interface simulation factors and adhesion properties were explored. The future research direction of molecular simulation technique in asphalt mixture was discussed. Research result shows that molecular simulation technique can explore the performance change and internal mechanism of road materials from micro-scale, laying the foundation for accurate design and quantitative analysis. Multiple components asphalt model is an important method for asphalt molecular model construction. The construction method characterizes the physical and chemical properties of asphalt. The main construction method for aggregate models is to select and build unit cell

according to aggregate chemical composition, to represent the characteristics of aggregate in the macroscopic view. Molecular simulation technique shows the asphalt diffusion process and studies the internal components diffusion rate. Molecular simulation technique analyzes the process of asphalt self-healing behavior and proposes different indicators to characterize the healing rate of each stage. Molecular simulation technique can explain the influences of asphalt internal components and additives on asphalt performance from micro-scale. In terms of asphalt rejuvenator fusion, molecular simulation technique can characterize diffusion depth, incorporation timing and rejuvenation theory. In terms of asphalt-aggregate interface, molecular simulation technique can characterize the influences of the factors such as chemical compositions, loading mode, model parameters and interface contact. The factors such as water, temperature and aged asphalt will have an important influence on the interface behavior. Moisture model can link microscopic simulation with macroscopic experiment. 4 tabs, 10 figs, 79 refs.

摘要: 分析了沥青混合料分子模拟技术的基本原理、主要实现手段和模拟流程,研究了沥青分子模型构建的2类主要方法,总结了不同时期的沥青质结构模型与不同应用场合中的集料模型,探讨了沥青扩散现象、外加剂对沥青性能的影响机理、沥青与再生剂的融合、沥青-集料的界面作用模拟影响因素以及水、沥青老化等因素对沥青-集料黏附性的影响等问题,展望了沥青路面材料分子模拟技术的未来研究方向。研究结果表明:分子模拟技术可以从微观角度探究道路工程材料的性能变化与内在机理,为材料的精确设计和定量分析奠定基础;分子组装法是目前沥青分子模型构建的重要思路,能够有效表征沥青材料的物化和力学特性;集料模型的构建思路主要是根据集料的化学成分来选择构建相关晶胞,进而代表集料的宏观特性;分子模拟技术动态展现了沥青的扩散过程,体现了内部各组分的扩散速率;利用分子模拟技术可以分析沥青自愈行为的过程,并提出不同指标来表征了各个阶段的愈合速率;借助分子模拟技术,可以从微观角度解释和分析沥青内部组分和外加剂对沥青性能影响;在沥青-再生剂融合研究中,分子模拟技术可表征再生剂扩散深度、掺入时机与再生机理等问题;在沥青-集料界面作用研究中,分子模拟技术可表征材料的化学组成、加载模式、模型参数与界面接触等因素的影响;水、温度与沥青的老化等因素将会对沥青-集料界面作用产生重要影响,通过构建含水模型可将微观模拟与宏观试验联系起来。

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标题: Safety evaluation model of excavating rock slope based on entropy-grey correlation method

标题: 基于熵权-灰关联法的岩质开挖边坡安全评价模型

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作者关键词: rock slope; entropy weight-gray correlation evaluation model; safety evaluation;
numerical simulation; excavation method

作者关键词: 岩质边坡; 熵权-灰关联评价模型; 安全评价; 数值模拟; 开挖方法

摘要: According to slope stability evaluation system, five evaluation indexes, such as slope rock mass quality score, excavation method adjustment coefficient, height correction coefficient, structural surface adjustment coefficient, and structural surface adjustment value, were selected to reflect the overall stability of slope, and serve as the safety evaluation model sequence variables. The entropy weight-gray correlation safety evaluation model was established. Taking the target slopes as the system characteristic sequence and the 12 rock slopes as the correlation factor sequence, the safety of the typical rock slopes along the reconstruction and expansion project of Beijing-Shanghai Expressway was evaluated, and the engineering advices were provided. FLAC~(3D) simulation software was used to analyze the stability variation laws of the slopes under different stages of mechanical excavation and static blasting at different blastholes, and the accuracy of the safety evaluation model was verified. Analysis result shows that the evaluation indexes of the slope stability can well reflect the slope stability characteristics. The entropy weight-grey correlation safety evaluation model full plays the advantages of grey correlation method in the analysis of small sample data, and the index weights calculated by entropy weight method improve the defect of the traditional grey correlation analysis that the indexes are weighted by experts or average method, making the evaluation result more objective. The third-grade and first-grade slope excavations reduce the safety factor of the slope K593+260~K593+555 to 1.01 and 1.00, respectively, with decreases of 34.8% and 9.1% respectively compared with the upper grade slope. It shows that the excavation of rock slope with gently inclined bedding slope will cause rock layer slide along structural plane and makes the slope become unstable. Transients dynamic load and load accumulation effect control the stability of the slope under static blasting condition. The occurrence of transients dynamic load reduces the slope safety factor by 7.7%, and the dissipation of the load accumulation effect rises the safety factor by 3.6%. It

shows that the blasting has obvious loosening effect on the slope, and the dissipation of load accumulation improves the slope stability. 15 tabs, 6 figs, 30 refs.

摘要: 根据边坡稳定性评价体系,选取边坡岩体质量评分、边坡开挖方法调整系数、高度修正系数、结构面调整系数、结构面调整值 5 个评价指标反映边坡的整体稳定性,并作为安全评价模型的序列变量;建立了熵权-灰关联安全评价模型,将目标边坡作为系统特征序列,12 处岩质边坡作为相关因素序列,评价了京沪高速改扩建工程沿线典型岩质边坡的安全性,并提出工程建议;采用 FLAC~(3D)仿真软件,分析了不同阶段机械开挖和不同炮孔处静力爆破条件下边坡的稳定性变化规律,以验证安全评价模型的准确性。分析结果表明:边坡稳定性评价指标可较好地反映边坡的稳定性特征;熵权-灰关联安全评价模型充分发挥了灰关联法在小样本数据分析的优点,且由熵权法计算的指标权重改善了传统灰关联分析中由专家打分或平均赋权的缺陷,使评价结果更加客观;三级边坡和一级边坡的开挖使边坡 K593+260~K593+555 的安全系数分别降至 1.01 和 1.00,和上一级边坡相比降幅分别为 34.8%、9.1%,说明缓倾顺层岩质边坡的开挖会使岩层沿结构面滑动,使边坡失稳;瞬时动荷载和荷载积累效应控制静力爆破条件下边坡的稳定性,瞬时动荷载的出现使边坡安全系数下降了 7.7%,荷载积累效应的消散使安全系数平均回升 3.6%,说明爆破对边坡的松动作用明显,荷载积累的消散使边坡的稳定性提升。

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标题: Influence of Temperature Change on Deformation of Coarse-grained Sulfate Saline Soil Subgrade

标题: 温度变化对粗粒硫酸盐渍土路基变形影响分析

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作者关键词: road engineering; coarse-grained sulfate saline soil; temperature change cycle test; deformation

作者关键词: 道路工程; 粗粒硫酸盐渍土; 温度变化循环试验; 变形

摘要: Coarse-grained sulfate soil roadbeds are prone to excessive deformation problems, such as salt expansion and subsidence owing to changes in ambient temperature, and the impact on normal use of the roadbed cannot be ignored. In view of these problems, a test section was selected at the construction site of the Tehran-Qom-Isfahan high-speed railway project in Iran, and long-term monitoring of the roadbed temperature and moisture content was carried out. The variation of temperature and moisture content of the roadbed with time was analyzed. Based on this, a self-designed temperature change test device and field roadbed filling were used to conduct indoor temperature change cycle model tests to study the deformation characteristics of coarse-grained sulfate saline soil. The results show that during the monitoring period, the sensitive depth of the subgrade temperature in the field test is 0.22 m, and the moisture content of the subgrade within the depth of 1.0 m varies greatly. During the nine-cycle test, the temperature and moisture content of the sample depth in the range of 20 cm become more significant over time. However, with a change of the test temperature, there is a certain hysteresis in the change of sample temperature. The soil sample with 1.5% salt content shows salt expansion deformation and frost heave deformation in the first and second temperature change cycle tests, with a maximum deformation of 0.128 mm. The soil sample with 3% salt content exhibits such deformation in the first six cycles of the test, with a maximum deformation of 0.232 mm. Due to the influence of multiple factors such as temperature, ice-salt transformation, salt content, soil particle composition, and test cycle, specimens with different salt content eventually experience subsidence deformation after nine test cycles. The subsidence deformation of the sample with 1.5% salt content is 0.585 mm, which is 5.42 times the final subsidence deformation of the soil with 3% salt content. The research results can provide certain technical references for related projects.

摘要: 粗粒硫酸盐渍土路基在环境温度变化下易出现盐胀、沉陷等变形问题,其对路基正常使用造成的影响不容忽视。针对此问题,依托伊朗德黑兰-库姆-伊斯法罕高速铁路项目,在施工现场选取试验段,开展路基温度、水分的长期监测,分析路基温度和含水率随时间的变化规律。在此基础上,利用自主设计的温度变化试验装置,采用现场路基填料,开展室内温度变化循环试验,对粗粒硫酸盐渍土的变形特性进行研究。结果表明:监测期间,试验段路基温度的敏感深度为 0.22 m,深度为 1.0 m 以内的路基含水率变化较大;在 9 个周期的试验过程中,试样深度在 20 cm 范围内的温度和含水率随时间的变化更为显著,且随着试验温度的变化,试样温度的变化存在一定的滞后性;含盐量为 1.5% 的土样在第 1,2 次温度变化循环试验中表现为盐-冻胀变形,其最大盐-冻胀变形量为 0.128 mm,而含盐量为 3% 的土样在前 6 次循环试验中均表现为盐-冻胀变形,其最大盐-冻胀变形量为 0.232 mm;由于受到温度、冰盐相变、含盐量、土颗粒组

成、试验周期等多重因素的影响,9 个试验周期后,不同含盐量的试样最终均呈现沉陷变形,其中,含盐量为 1.5%试样的最终沉陷变形量为 0.585 mm,是含盐量为 3%试样最终沉陷变形的 5.42 倍。该研究结果可为相关工程提供一定的技术参考和借鉴。

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标题: Regional Variation and Zoning of Temperature Gradient Pattern of Concrete Box Girder

标题: 混凝土箱梁温度梯度模式的地域差异性及分区研究

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作者关键词: bridge engineering; concrete box girder; temperature gradient pattern; representative value of temperature difference; regional variation; temperature action zoning

作者关键词: 桥梁工程; 混凝土箱梁; 温度梯度模式; 温差代表值; 地域差异性; 温度作用分区

摘要: To investigate regional variation and zoning of temperature differences and temperature gradient in concrete box girders, long-term temperature field measurements of a concrete box girder bridge were conducted. The vertical temperature gradient curve of the box girder was given by the measured data. Then, a generalized extreme value distribution was applied to obtain

representative values of the temperature differences. Finite element models were established to calculate the temperature differences of concrete box girders in 34 major cities in China. Geologic factors and meteorological factors were used as parameters to obtain the empirical formula of the representative values of temperature difference. Based on this, the representative temperature difference values for 361 Chinese cities were calculated and zoned preliminarily. The results show that the vertical temperature gradient curve of the box girder based on the measured data conforms to the form recommended by the New Zealand Code, with "5th parabola at top" and "linear distribution at bottom." The temperature difference at top (T_1) and at bottom (T_2) of the concrete box girder can be subjected to the Weibull distribution with parameters of $W(6.86, 4.49, -0.42)$ and $W(-0.32, 1.46, -0.40)$, respectively. The representative values of T_1 and T_2 for the concrete box girder in Dongguan, Guangdong Province are $17.3\text{ }^{\circ}\text{C}$ and $3.1\text{ }^{\circ}\text{C}$ for a 50-year return period, respectively. In this paper, the empirical formula of the representative values $T_{1, \text{ref}}$ and $T_{2, \text{ref}}$ is established with the latitude l , the altitude H , and the daily air temperature difference T_V , and can be verified by the results of existing research. The formula can fully reflect the regional variation of the temperature difference in concrete box girders in China. Based on the regional variation of the representative values of temperature difference, China can be divided initially into four zones by their temperature difference values. The values of $T_{1, \text{ref}}$ in the four zones are $18\text{ }^{\circ}\text{C}$, $20\text{ }^{\circ}\text{C}$, $23\text{ }^{\circ}\text{C}$, and $29\text{ }^{\circ}\text{C}$, respectively. In addition, the values of $T_{2, \text{ref}}$ in 4 zones are $4\text{ }^{\circ}\text{C}$, $5\text{ }^{\circ}\text{C}$, $6\text{ }^{\circ}\text{C}$ and $7\text{ }^{\circ}\text{C}$, respectively. The empirical formula and the zoning map proposed in this paper are only applicable to concrete box girder with 100 mm asphalt pavement. The method and conclusion of the research can provide reference for the improvement of China's design code regarding the temperature action of concrete box girder bridges.

摘要: 为了对混凝土箱梁温度梯度中温差取值的地域差异性和分区进行研究,对一混凝土箱梁桥开展长期温度场测试与有限元数值模拟,通过实测数据给出混凝土箱梁竖向温度梯度曲线形式,采用广义极值分布得到温度梯度中的温差代表值。建立有限元模型对中国 34 个主要城市混凝土箱梁温差进行计算,以地理、气象参数回归计算温差代表值的经验公式,在此基础上,对中国 361 座城市的混凝土箱梁温差代表值进行初步分区。研究表明:基于实测数据的混凝土箱梁竖向温度梯度曲线接近于新西兰规范推荐的"顶部 5 次抛物线"和"底部线性段"的形式;混凝土箱梁的顶部温差 T_1 和底部温差 T_2 分别服从参数为 $W(6.86, 4.49, -0.42)$ 和 $W(-0.32, 1.46, -0.40)$ 的 Weibull 分布,广东东莞地区混凝土箱梁顶、底部 50 年重现期的温差代表值分别为 $17.3\text{ }^{\circ}\text{C}$ 和 $3.1\text{ }^{\circ}\text{C}$;建立了以纬度 l 、海拔 H 和日温差 T_V 为参数的混凝土箱梁顶部温差代表值 $T_{1, \text{ref}}$ 和底部温差代表值 $T_{2, \text{ref}}$ 的经验公式,可以很好地反映中国混凝土箱梁温差取值的地域差异性,与已有研究成果亦可相互验证;基于经验公式,初步将中国划分为 4 个区域进行温差取值,4 个区域 $T_{1, \text{ref}}$ 的取值分别为 $18\text{ }^{\circ}\text{C}$, $20\text{ }^{\circ}\text{C}$, $23\text{ }^{\circ}\text{C}$, $29\text{ }^{\circ}\text{C}$, $T_{2, \text{ref}}$ 的取值分别为 $4\text{ }^{\circ}\text{C}$, $5\text{ }^{\circ}\text{C}$, $6\text{ }^{\circ}\text{C}$, $7\text{ }^{\circ}\text{C}$;提出的经验公式和温差代表值分区仅适用于 100 mm 沥青铺装的混凝土箱梁,研究方法和结论可为中国规范关于混凝土箱梁桥温度作用的完善提供参考。

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标题: Full-scale Experiment on Stiffness Degradation and Identification of Prestressed Concrete Box Girders

标题: 装配式 PC 箱梁刚度退化及识别的足尺试验

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作者关键词: bridge engineering; prestressed concrete; full-scale experiment; stiffness identification; crack feature parameters; deflection; frequency

作者关键词: 桥梁工程; 预应力混凝土; 足尺试验; 刚度识别; 裂缝特征参数; 挠度; 频率

摘要: To study stiffness degradation under damaged conditions for prestressed concrete (PC) girders, a full-scale model test was conducted on three 30 m PC box girders. First, static and dynamic stiffness identification models of damaged beams were developed. The equivalent static stiffness was calculated based on beam deflections in the mid-section, and the equivalent dynamic stiffness was calculated based on its natural frequencies. Second, full-scale girders were loaded incrementally, and static and dynamic tests were conducted alternatively. The development of cracks, deflections, and frequencies of the experimental girders under different loads were then studied, and the effects of damage conditions on these parameters were analyzed. Third, the reduction coefficients of dynamic stiffness were derived using the finite element model updating method, and the relationship between static and dynamic stiffness with the damage conditions was analyzed. The difference between the static and dynamic stiffness was then explored. Finally, the regression formula of the reduction coefficients of the static and dynamic stiffness with crack feature parameters was established and compared with previous studies. The results show that the initial damage condition of the girder has an effect on the statistical distribution of the crack features. It also illustrates that the degradation of equivalent static and dynamic stiffness of the girder is not consistent, where the final reduction coefficients of static and dynamic stiffness are 0.30 and 0.80, respectively. The reduction coefficient of static stiffness between the full-scale and scale-down model tests is different. The study presents a simple method for the reduction

coefficients of static and dynamic stiffness to assess damaged PC box girders in practical engineering.

摘要: 为了明确装配式预应力混凝土(PC)梁刚度在损伤状态下的退化规律,针对 3 片 30 m 预应力混凝土箱梁开展了足尺模型试验研究。首先,建立了损伤梁的结构静动刚度识别模型,基于跨中挠度提出了结构等代静刚度计算式,基于自振频率提出了结构等代动刚度的计算式;其次,对足尺箱梁进行了多工况的静力逐级加载和动力交替试验,分析了箱梁裂缝、挠度、频率等特征参数随荷载的演化规律,研究了损伤状态对箱梁特征参数的影响;再次,通过有限元模型修正给出了箱梁动刚度衰减系数,研究了结构静动刚度随损伤状态的衰减规律,分析了静动刚度差异的原因;最后,建立了结构静动刚度衰减系数和裂缝特征参数之间的经验回归式,并与现有研究成果进行了对比。结果表明:初始损伤状况对箱梁受荷后的裂缝统计分布特征参数有一定影响;箱梁开裂后在相同荷载下的结构等代静、动刚度衰减程度并不相同,其中最终的静刚度衰减系数为 0.30,最终的动刚度衰减系数为 0.80;足尺梁与室内缩尺模型梁的静刚度衰减系数并不相同。所提出的静、动刚度衰减公式较为简洁,可用于实际损伤箱梁的结构性能评估。

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标题: Experiment on Local Resistant of Grid in Tunnel Ventilation Model Test

标题: 隧道通风阻力格栅局部阻力试验

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作者关键词: tunnel engineering; tunnel ventilation; model test; resistance grid; equivalent design theory

作者关键词: 隧道工程; 隧道通风; 模型试验; 阻力格栅; 等效设计理论

摘要: Due to the limitation of the test site and test conditions, it is usually to build a 1:1 scale model or a reduced model at the same scale. Therefore, on the premise that the prototype is similar to the model resistance, according to the equivalent design theory, the installation of resistance grid in the tunnel ventilation model can effectively shorten the length of the tunnel model. In order to solve the problem of selecting and setting the resistance grid in the ventilation model, the physical model is established for experimental test, and the experimental results are analyzed and compared. Among them, the influence of different resistance grid series spacing, series number and grid type on the local resistance of ventilation test is studied. The results show that adding resistance rack in the model, the automatic zone still exists, its critical speed of the wind is almost equal to the wind speed of the model; when the grid spacing is greater than three times of the model section, the interaction between the grid can be neglected, so the gap of the resistance rack should be longer than triple equivalent diameter of the section of the model; every rack of the part of the resistance loss factor is getting lower with the rising of the rack number, the lowering speed is getting smaller with the rising of the rack number. When selecting resistance grid, when the local resistance coefficient of grid is required to be large, porous plate can be selected as resistance grid, and square porous plate is preferred; when the local resistance coefficient of grid is required to be small, wire mesh can be selected. The research results provided guidance for the selection and setting of resistance grid in model test, and introduced the specific application of resistance grid in tunnel ventilation model test.

摘要: 由于试验场地和试验条件的限制,通常难以建立1:1比例模型或同比例尺缩小模型,因此在保证原形与模型阻力相似的前提下,根据等效设计理论,在隧道通风模型中安装阻力格栅可以有效缩短隧道模型的长度。为了解决阻力格栅在通风模型中的选取和设置问题,建立物理模型进行试验测试,并将试验结果进行了分析对比,研究了不同的阻力格栅串联间距、串联数量以及格栅类型的变化对通风试验局部阻力的影响。模型试验结果表明:加入阻力格栅后通风模型仍存在自模区,且阻力格栅的串联间距、组数、规格对模型进入自模区的临界风速几乎没有影响;当格栅间距大于3倍断面当量直径时,格栅之间的相互影响可以忽略不计,故阻力格栅串联间距应不小于3倍模型当量直径;每组格栅局部阻力损失系数随格栅组数的增多而降低,降低的速率随着格栅组数的增多而减小;在选择阻力格栅时,格栅局部阻力系数要求较大时,可选择多孔板作为阻力格栅,并优先考虑方孔多孔板;当格栅局部阻力系数要求较小时,可选择铁丝网作为阻力格栅。研究成果可以为模型试验阻力格栅的选取和设置提供指导建议,同时介绍了阻力格栅在隧道通风模型试验中的具体应用。

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标题: Simplified calculation method for flexural strength of CFST composite truss girder

标题: 钢管混凝土组合桁梁受弯承载力简化计算方法研究

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作者关键词: CFST; composite truss girder; flexural strength; simplified calculation method; efficiency coefficient

作者关键词: 钢管混凝土; 组合桁梁; 受弯承载力; 简化计算方法; 效率系数

摘要: The concrete filled steel tubular (CFST) composite truss girder is composed of the CFST truss and concrete slab. The composite effect of the CFST composite truss girder could be fully achieved under positive bending. In order to analyze the flexural behavior of this type of structure, the warren-type CFST composite truss girder without vertical braces was taken as an example and the efficiency coefficient of every component of the simply supported composite truss girder were derived based on the pin-jointed analysis under loading conditions of single concentrated load and symmetrical loads. By comparing the coefficients of efficiency of different components, the failure modes and the corresponding flexural strength equations of the CFST composite truss girder were obtained. The reduction factor of resistance of the brace was presented to take the effect of joint resistance on the flexural strength of the composite truss girder in to

consideration. The calculated flexural strength with the presented formulas was compared with the test results of the specimen from existing literatures and the results coincided well with each other. The results show that the presented formulas in this paper establishes the relationship between the resistance of the joint and the flexural strength of the truss girders, which can give accurate and rapid predictions of the failure mode and flexural strength of the CFST composite truss girder and also can simplify the designing process. The cross-sectional dimension of components can be optimized according to the coefficients of efficiency to ensure that the flexural strength are close to each other under different failure modes. The shear failure caused by the joints and braces at the early loading stage should also be avoided.

摘要: 钢管混凝土组合桁梁由钢管混凝土桁架和混凝土板组成,其在承受正弯矩时可充分发挥混凝土板与桁架的组合作用。为对这种结构的受弯受力性能进行研究,提出了基于铰接桁架的分析方法,以不带竖腹杆的 warren 型钢管混凝土组合桁梁为例,推导了在节点单点荷载以及两点对称荷载作用下简支组合桁梁各个构件的效率系数。通过不同构件之间的效率系数进行对比,得到了组合桁梁的破坏模式判定以及受弯承载力简化计算方法。同时通过引入腹杆抗力折减系数,将节点承载力对组合桁梁受弯承载力的影响也考虑在内。将公式计算结果与既有文献中的钢管混凝土组合桁梁、桁架试件试验结果进行了对比,破坏模式和受弯承载力均吻合良好,所选全部 33 榀试件的计算值与实测值的相对误差为 1.27%,标准差为 0.128。结果表明,该简化计算方法建立了节点与组合桁梁承载力之间的相互联系,能够快速、准确地对破坏模式及受弯承载力进行估算,可极大地简化设计流程。设计中应根据组合桁梁各构件的效率系数对其截面尺寸进行优化,确保不同破坏模式下的受弯承载力较为接近,同时避免由于节点或腹杆过早失效导致组合桁梁发生剪切破坏。

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标题: Crack Analysis Method of Prestressed Concrete Beams Strengthened with CFRP Based on

Cohesive Theory

标题: 基于内聚力理论的 CFRP 加固预应力混凝土梁裂缝分析方法

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文献类型: Article

作者关键词: CFRP; bridge engineering; CFRP; cohesive theory; prestressed concrete; crack

作者关键词: 桥梁工程; 粘结理论; 预应力混凝土; 裂缝

摘要: In order to calculate the crack characteristics of prestressed concrete beams strengthened with CFRP sheets accurately, the theoretical analysis model of cohesion was established by adopting the cohesion theory and incremental analysis, and introducing the interface bonding slip constitutive relation. The crack characteristics of the strengthened beams were theoretically deduced, which was based on the overall strength of the interface bonding material. And the theoretical calculation formulas of the crack width and spacing of the strengthened beams were put forward. Compared with the actual reinforcement test, it is found that: the error of the calculation value of crack spacing and crack width based on the cohesion theory is 5.77% and 12.83% respectively; the calculation results are in good agreement with the actual results, which can be applied to the crack calculation of the actual strengthened structure.

摘要: 为了准确计算碳纤维布加固预应力混凝土梁的裂缝特性,采用内聚力理论,通过增量分析,引入界面粘结滑移本构关系,建立了内聚力理论分析模型,并利用界面粘合材料的整体强度对被加固梁的裂缝特性进行了理论推导,提出了被加固梁裂缝宽度和间距的理论计算公式。与实际的加固试验进行对比,结果表明:基于内聚力模型所得裂缝间距计算值的误差为 5.77%,裂缝宽度计算结果的误差为 12.83%;计算结果与实际结果较为吻合,可应用于实际被加固结构的裂缝计算。

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作者: Han Xin; Ye Fei; Ying Kaichen; Gao Xiang

作者: 韩鑫; 叶飞; 应凯臣; 高翔

标题: Displacement effect on penetration diffusion of backfill grouting of shield tunnel considering self-weight

标题: 考虑自重的盾构壁后注浆浆液驱替渗透扩散

来源出版物: 华中科技大学学报. 自然科学版 卷: 48 期: 4 页: 37-42 出版年: 2020

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文献号: 1671-4512(2020)48:4<37:KLZZDD>2.0.TX;2-B

文献类型: Article

作者关键词: shield tunnel; backfill grouting; displacement effect; self-weight of grout; penetration diffusion

作者关键词: 盾构隧道; 壁后注浆; 驱替效应; 浆液自重; 渗透扩散

摘要: Based on the self-weight effect and the displacement effect of grout, the penetration diffusion characteristics of the back-filled grouting of shield tunnel in sand gravel stratum at different locations were analyzed. First, the penetration diffusion motion equation for Bingham grout under gravity is analyzed. According to the continuity equation in the spherical diffusion process of the grout, the model of grout displacement diffusion was established, and then the analytical solution of the grout diffusion process was given for the diffusion process injected from top and bottom grouting holes. Calculation results show that when the displacement effect of the grout is considered, the effect of gravity on the diffusion distance of the grout is more significant. Based on the grout permeation diffusion model of displacement effect, the calculation shows that when low grout pressure is used in high permeability formation, as the grouting time increases, the gravity of the grout has a significant influence on the grout permeation and diffusion process.

摘要: 针对砂砾石地层中盾构壁后注浆施工过程, 考虑浆液扩散过程的自重作用及浆液驱替效应, 分析不同位置注浆孔浆液的渗透扩散特征. 首先分析了重力作用下宾汉姆浆液渗透扩散运动方程, 根据浆液球形扩散的连续性方程, 建立浆液驱替渗透扩散模型, 并给出顶部和底部注浆孔浆液扩散的解析解. 计算结果表明: 当考虑浆液驱替效应时, 重力作用对浆液扩散距离的影响更加显著. 基于浆液驱替效应的渗透扩散模型表明: 在高渗透性地层中, 当采用低压注浆时, 随着注浆时间的增加, 浆液所受重力对浆液渗透扩散过程的影响显著.

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作者: 叶宏宇; 王选仓; 房娜仁; 苏子元; 孙晓文

标题: Study on grading and treatment of asphalt pavement of the airport in a hot and humid area

标题: 湿热地区机场沥青道面加铺层间工况分级及处治措施研究

来源出版物: 武汉大学学报. 工学版 卷: 53 期: 2 页: 123-131 出版年: 2020

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文献类型: Article

作者关键词: airport asphalt pavement; overlay; interlayer; working condition grading; treatment scheme

作者关键词: 机场沥青道面; 加铺层; 层间; 工况分级; 处治方案

摘要: A finite element model of asphalt pavement overlay is established through considering the pavement materials and structural usage in Juba Airport in Southern Sudan. The resilient modulus and the thickness of the overlay, the interaction between plane and pavement and the variations in the shear stress of the overlay affected by external environmental factors are obtained. In addition, the single-factor working conditions between the layers are graded, and the AHP-entropy value method is used to calculate the combined weights of the influencing factors. Combined with the climatic zoning of hot and humid region, the comprehensive working condition classifications are carried out. Through laboratory test, the properties of shear, crack resistance, seepage resistance and high temperature wheel rut of structures are obtained for three different materials which are asphalt, SBS modified asphalt and SBS modified asphalt emulsion, with four interlayer treatment measures which are asphalt pre-wrapped, two-oil and one-material spreading type stress absorbing layer, geotextile and geogrid. Finally, the corresponding interlayer treatment scheme for each working condition is put forward.

摘要: 结合南苏丹朱巴机场道面材料及结构使用情况, 建立机场沥青道面加铺层有限元模型, 得到加铺层回弹模量、加铺层厚度、飞机行驶状态、作用荷载及外界环境因素作用下层间剪应力的变化规律, 并进行加铺层间单因素工况分级; 运用 AHP-熵值法计算各影响因素组合权重, 结合湿热地区进一步的气候分区对机场沥青道面加铺层间进行综合工况分级。通过室内试验得到普通热沥青、SBS 改性沥青、SBS 改性乳化沥青 3 种层间材料及沥青预裹覆、两油一料撒布式应力吸收层、土工布和土工格栅 4 种层间处治措施下结构抗剪、抗裂、抗渗水及高温轮辙性能; 通过对比不同材料、层间处治类型的综合性能, 最终提出各工况对应层间处治方案。

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作者: Fan Taotao; Wang Xiushan

作者: 凡涛涛; 王修山

标题: Grey Correlation Analysis on Low Temperature Performance and Evaluation Indexes of Calcium Sulfate Whisker Modified Asphalt

标题: 硫酸钙晶须改性沥青低温性能及评价指标灰色关联分析

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文献类型: Article

作者关键词: highway engineering; calcium sulfate whisker (CSW) modified asphalt; grey correlation method; low temperature performance; evaluation indexes; influencing factors

作者关键词: 道路工程; 硫酸钙晶须改性沥青; 灰色关联方法; 低温性能; 评价指标; 影响因素

摘要: To optimize the low temperature performance evaluation indexes of calcium sulfate whisker (CSW) modified asphalt, the correlation of 10 °C ductility, equivalent brittle point T_{1.2}, 15 °C cone penetration and cone penetration index (CI) of CSW modified asphalt with - 12 °C bending creep stiffness test index (S) and stress relaxation rate (m) were analyzed by using grey correlation theory. The results indicate that it is feasible to use grey correlation theory to optimize the evaluation indexes of the low temperature performance of CSW modified asphalt. Among them, the correlation between the equivalent brittle point T_{1.2} and the stiffness modulus and m-value is the largest, followed by 10 °C ductility and cone penetration index (CI). The research results of influencing factors on the low temperature performance of CSW modified asphalt show

that the low temperature performance of asphalt is reduced to some extent after the incorporation of CSW, and CSW types have significantly larger influence on the low temperature performance of asphalt than CSW contents do.

摘要: 为优化硫酸钙晶须(CSW)改性沥青的低温性能评价指标,采用灰色关联方法计算分析了 10 °C 延度、当量脆点 T_{1.2}、15 °C 锥入度、锥入度指数 CI 等指标与 -12 °C 弯曲蠕变劲度试验指标 S 和 m 的关联度。结果表明:采用灰色关联方法优化比选 CSW 改性沥青低温性能评价指标是可行的,其中当量脆点 T_{1.2} 与劲度模量 S 和应力松弛速率 m 的关联度最大,10 °C 延度和锥入度指数 CI 次之。CSW 改性沥青低温性能影响因素研究结果表明:CSW 掺入沥青后一定程度上降低了沥青的低温性能,且 CSW 类型对沥青低温性能影响程度比其掺量显著。

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标题: Theoretical derivation of shear lag warping displacement function of box girder

标题: 箱梁剪力滞翘曲位移函数理论推导

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文献类型: Article

作者关键词: bridge engineering; warping displacement function; energy variation method; solid finite element; shear lag effect

作者关键词: 桥梁工程; 翘曲位移函数; 能量变分法; 实体有限元; 剪力滞效应

摘要: In order to study the reasonable warping displacement function of shear lag of box girder, plate flange is regarded in this paper as an elastic body connected by a spring with certain stiffness in longitudinal parallel and a flange plate spring model is established according to the longitudinal force and deformation characteristics of flange plate of box girder. And based on energy variational principle, flange plate equilibrium differential equation is established, deducing that the longitudinal displacement function is a linear combination of hyperbolic function and triangular function. The warping displacement function is determined as three single forms: hyperbolic

sinusoidal function, hyperbolic cosine function and sinusoidal function. By substituting three function forms into the shear lag variational equation, the bending normal stress equations of the three longitudinal displacement functions are obtained. In order to verify the rationality of the three functions derived from the theory, the normal stress of flange plate calculated by the three functions is compared with the measured value, the calculated value in the form of cubic parabola, and the calculated value of solid finite element. The effect of different function forms on the stress distribution of flange plate is analyzed from the perspective of the function property. The results show that the calculated value of sinusoidal function is in good agreement with the measured value and the calculated value of solid finite element method. In addition, the second derivative of the function is positively correlated with the stress distribution of the flange plate.

摘要: 为研究箱梁合理的剪力滞翘曲位移函数,根据箱梁翼缘板纵向受力和变形特性,将翼缘板视为纵向平行的具有一定刚度的弹簧所连接的弹性体,建立翼缘板弹簧模型,基于能量变分原理建立了翼缘板平衡微分方程,推导出纵向位移函数为双曲函数与三角函数的线性组合。通过分析确定翘曲位移函数分别为双曲正弦函数、双曲余弦函数、正弦函数 3 种单一形式,并将 3 种函数形式代入剪力滞变分方程中,得到 3 种纵向位移函数的弯曲正应力方程。为验证理论推导的 3 种函数的合理性,将 3 种函数形式计算得到的翼缘板正应力与实测值、三次抛物线形式计算值、实体有限元计算值进行比较,并从函数形态分析了不同函数形式对翼缘板应力分布的影响。结果表明:文中方法推导出的函数形式中正弦函数计算值与实测值吻合度较高,与实体有限元计算值也基本吻合。另外,函数的二阶导数与翼缘板应力分布存在正相关性。

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作者: 胥勋辉; 张国彪; 包含; 晏长根

标题: Anisotropic shear behavior of rock joint based on 3D printing technology

标题: 基于 3D 打印技术的岩体结构面各向异性剪切力学行为

来源出版物: 煤田地质与勘探 卷: 48 期: 1 页: 154-159,167 出版年: 2020

文献号: 1001-1986(2020)48:1<154:JY3DYJ>2.0.TX;2-V

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文献号: 1001-1986(2020)48:1<154:JY3DYJ>2.0.TX;2-V

文献类型: Article

作者关键词: joint; 3D laser scanning; 3D printing; shear strength; shear strength parameter; anisotropy

作者关键词: 结构面; 三维激光扫描; 3D 打印; 剪切强度; 抗剪强度参数; 各向异性

摘要: Topography is an important factor affecting the shear behavior of joint. Furthermore, there are certain connections between the anisotropy of topography and the anisotropy of shear behavior. In this study, 3D laser scanning technology and 3D printing technology were used to make molds for simulating the topography of natural joint. Then, the cement mortar samples with dimension of 100 mm*100 mm*150 mm were cast, and shear tests with different shear directions under different normal stresses were conducted. The results indicate that obvious anisotropy has been shown in the joint shear behavior, which is reflected in the peak shear strength and the corresponding shear displacement and shear strength parameters, respectively. In addition, the anisotropy of the peak shear strength do not present simple monotone to the normal stress under low normal stress. The shear strength parameters c and ϕ with different directions both show significant anisotropy, and the values of them have similar variation tendency. What's more, the results also indicate that the shear direction has a stronger influence on the cohesion by analyzing the discrepancy of cohesion and internal friction angle compared to 0° .

摘要: 结构面形貌特征是影响结构面剪切行为的重要因素,而且结构面形貌特征各向异性与其剪切力学行为的各向异性之间存在一定的联系。利用三维激光扫描和 3D 打印技术模拟了天然结构面,并以水泥砂浆为材料浇筑了尺寸为 100 mm*100 mm*150 mm 的含结构面试样,开展了不同法向应力下沿不同方向的剪切试验。结果表明,结构面的剪切行为具有明显的各向异性,这种特性可以体现在峰值剪切强度及相应的剪切位移和抗剪强度参数上;在低法向应力条件下,峰值剪切强度各向异性的强弱程度与法向应力之间并非呈现简单的单调变化关系;抗剪强度参数 c (黏聚力)、 ϕ (内摩擦角)值沿不同剪切方向的变化趋势总体上较相似;通过分析不同剪切方向上 c 、 ϕ 值相对于 0° 方向的差异程度,可以发现剪切方向对 c 值的影响更为强烈。

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标题: STUDY OF DAMAGE EQUIVALENT FACTORS OF URBAN RAIL TRANSIT STEEL BRIDGE

标题: 城市轨道交通钢桥疲劳损伤等效系数研究

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作者关键词: urban rail transit steel bridge; damage equivalent factors; fatigue verification; fatigue load models; maximum permitted vehicle speed

作者关键词: 城市轨道交通钢桥; 损伤等效系数; 疲劳验算; 疲劳荷载模型; 列车最大容许速度

摘要: To study the damage equivalent factors of urban rail transit steel bridge, the factors of Chinese urban rail transit steel bridge are analyzed based on the S-N curve and damage equivalent factor method in Eurocode. Six traffic types of urban rail transit applied to Chinese urban rail transit steel bridge are proposed, and three load diagrams, ZC, ZK and LM71, are selected as fatigue load models. According to the actual traffic volume of Chinese urban rail transit, a simplified calculation method using bi-linear S-N curve is proposed, which is compared with the methods using single slope S-N curve. Thus, damage equivalent factors of urban rail transit steel bridge are analyzed. To consider the characteristics of Chinese urban rail transit, an equivalent factor γ_v considering the maximum permitted vehicle speed is proposed. The results demonstrate that by taking diagram ZC as fatigue load model and considering influence of the maximum permitted vehicle speed, the damage equivalent factors based on the simplified bi-linear S-N calculation method can be reasonably applied to fatigue verification of Chinese urban rail transit steel bridge.

摘要: 为研究城市轨道交通钢桥疲劳损伤等效系数,根据 Eurocode 中 S-N 曲线和损伤等效系数法,对中国城市轨道交通钢桥疲劳损伤等效系数进行求解分析。提出 6 种适用于中国城市轨道交通钢桥的列车编组,选取 ZC、ZK 和 LM71 这 3 种荷载图式作为疲劳荷载模型。根据中国城市轨道交通的实际交通量,提出 1 种采用双斜率 S-N 曲线的简化算法,与采用单斜率 S-N 曲线求解方法进行对比分析。求解分析各项疲劳损伤等效系数,并针对中国城市轨道交通钢桥列车编组的特点提出考虑列车最大容许速度影响的损伤等效系数 γ_v 。结果表明:以 ZC 图式作为疲劳荷载模型,考虑列车最大容许速度的影响,依据双斜率 S-N 曲线简化算法求得的损伤等效系数较能合理地对中国轨道交通钢桥进行疲劳验算。

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标题: Correction of Hydrothermal Salt Force Coupled Equations for Coarse-grained Sulphate Saline Soil Roadbed and Its Experimental Verification

标题: 粗粒盐渍土路基水热盐力耦合方程修正及试验验证

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作者关键词: road engineering; migration of water and salt; coupled equation; freeze-thaw cycle experiment; coarse-grained sulphate saline soil; barrier layer

作者关键词: 道路工程; 水盐迁移; 冻融循环试验; 耦合方程; 粗粒硫酸盐渍土; 隔断层

摘要: In order to study the water and salt migration mechanism in coarse-grained sulphate saline soil roadbed and the water and salt migration affected by setting barrier layer in the roadbed, and to establish the relationship of water and salt migration with roadbed salt expansion and melting deformation, based on the theory of unsaturated soil seepage and heat conduction, considering the influence of water salt phase change on the stress field, the established moisture field, temperature field and salt field are modified to meet the engineering characteristics of coarse-grained sulphate saline soil, and the coupled differential equations suitable for the 4 fields of the roadbed are established. The 4-field coupling numerical model of the saline soil roadbed is established by using COMSOL Multi-physics software, and the effectiveness of the established mathematical model is verified by result of indoor large-scale freeze-thaw cycle test on coarse-grain sulphate saline soil. The result shows that (1) during the freezing-thawing cycle experiment of groundwater recharge, the influence depth of the low-temperature sensitive area of gravel sand sulphate saline soil roadbed is approximately 45 cm, the geotextile settings should comprehensively take into account the regional low temperature sensitive depth and the strong rise height of capillary water; (2) influenced by capillarity and temperature, the water and salt in the gravel sand sulphate saline soil roadbed migrate to the cold end, which will lead to salt accumulation under geotextiles, in

which sulfate ion is highly enriched; (3) the barrier layer can effectively cut off the longitudinal migration path of water and salt,weaken the migration of water and salt to the low-temperature-sensitive zone,reduce the roadbed's salt expansion and thaw collapse,and the degree of deformation reduction of roadbed can reach more than 30%.

摘要: 为了研究粗颗粒硫酸盐渍土路基中的水盐迁移机理及路基内隔断层设置对水盐迁移的影响效果,并建立水盐迁移与路基盐胀、融陷变形的联系,基于非饱和土渗流和热传导理论,考虑水盐相变对水分场、温度场、盐分场和应力场的影响,分别针对已建立的水分场、温度场、盐分场进行满足粗颗粒硫酸盐渍土路基工程特性的修正,进而建立了适用于粗粒硫酸盐渍土路基水-热-盐-力场的耦合微分方程组。利用 COMSOL Multi-physics 软件建立了盐渍土路基水-热-盐-力场耦合数值模型,并通过室内大型粗颗粒盐渍土冻融循环试验结果对建立的数学模型的有效性进行验证。结果表明:在有地下水补给的冻融循环试验过程中,砾砂类硫酸盐渍土路基的低温影响敏感区域深度范围约为 45 cm,土工布设置应综合考虑区域低温影响敏感深度和毛细水强烈上升高度;在毛细作用和温度影响下,砾砂盐渍土路基中的水、盐均向冷端迁移,其会导致土工布下方出现盐分聚集现象,其中硫酸根离子富集程度较强;隔断层可有效阻碍水盐纵向迁移路径,减弱水、盐向低温影响敏感区段迁移,从而达到减小路基盐胀、融陷的效果,同时减小路基变形的程度可以达到 30%以上。

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作者: 赵越; 黄平明; 龙关旭; 刘焕举; 孙亚民

标题: Study on Multi-objective Control of Viscous Damper for Suspension Bridge Based on Measured Traffic Flow

标题: 基于实测车流的悬索桥黏滞阻尼器多目标控制研究

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文献类型: Article

作者关键词: bridge engineering; multi-objective control; dynamic analysis; finite element; viscous damper; measured traffic flow

作者关键词: 桥梁工程; 多目标控制; 动力分析; 有限元; 黏滞阻尼器; 实测车流

摘要: To investigate the influence of different parameters of viscous damper on the response of long-span suspension bridge under traffic load, a FE model of a long-span steel truss suspension bridge is established. First, the actual traffic flow data collected by traffic load monitoring system is screened by time division and lane division to obtain the traffic flow data in the period of hourly vehicle weight extreme is obtained, the high-fidelity traffic flow based on real data is simulated by Greenshields model. Second, the vehicle load is simplified as concentrated force load for load distribution by isoparametric element method, and the influence of different viscous damper parameters on the response of structural key indicators under traffic flow is analysed, including the variation trends of the maximum longitudinal displacement of girder end, the accumulated displacement of girder end, girder mid-span bending moment, displacement at pylon top, acceleration at pylon top, bending moment at pylon base, main cable force and suspender force. At last, the weight of each indicator is determined by variation coefficient method, the ideal solution and the negative ideal solution of the indicator responses are determined by Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS), and the different damper parameter schemes are evaluated based on the relative proximity of the structural indicator response of each scheme. The analytical result shows that (1) The maximum longitudinal displacement of girder end, the accumulated displacement of girder end and acceleration at pylon top can be effectively reduced by viscous dampers. (2) Displacement at pylon top, bending moment at pylon base, main cable force and suspender force are not significantly affected. The variation rules of each indicator under different velocity exponent and damping coefficient are not consistent. (3) The influence of velocity exponent on the structural response under traffic flow is more obvious, the smaller the velocity exponent is, the better the control effect of viscous damper is, which has better control effect in girder slow movement. The control effect can be improved by increasing damping coefficient, but the maximum design velocity of viscous damper is larger in small damping coefficient.

摘要: 为了研究不同黏滞阻尼器参数对车流荷载作用下大跨径悬索桥响应的影响,建立了一座大跨径钢桁架悬索桥的有限元模型。首先对交通荷载监测系统采集的实际交通流数据进行了分时段分车道筛选,得到小时车重极值时段的车流数据,利用格林希尔兹模型模拟形成了基于实测数据的高真实度车流。接着采用等参元方法将车辆荷载简化为集中力荷载分配加载,分析了车流作用下不同黏滞阻尼器参数对结构关键指标响应的影响,包括主梁梁端纵向最大位移、主梁梁端累计位移、主梁跨中弯矩、主塔塔顶位移、主塔塔顶加速度、主塔塔根弯矩、主缆力以及吊杆力变化趋势。最后采用变异系数法计算了指标权重,利用 TOPSIS 法确定了指标响应的理想解与负理想解,基于各参数方案结构指标响应的相对接近度对阻尼器参数方案进行了评价。分析结果表明:黏滞阻尼器可以有效降低车流作用下的梁端最大位移、梁端累计位移及塔顶加速度;对塔顶位移、塔根弯矩、主缆力及吊杆力的影响并不明显,不同指标

对应速度指数和阻尼系数的变化规律不完全一致;速度指数对车流作用下结构响应的影响更为明显,速度指数越小,阻尼器的控制效果提升越明显,在慢速运动时能发挥更好的控制作用,阻尼系数增大亦可提升控制效果,但阻尼系数较小时对应的最大设计速度更大。

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标题: Research progress and engineering application of long lasting high performance weathering steel bridges

标题: 长寿命高性能耐候钢桥研究进展与工程应用

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作者关键词: bridge engineering; long lasting; high performance weathering steel; weathering bolt; corrosion-resistant patina; corrosion-resistant configuration; fatigue; design criterion; intelligent operation and maintenance

作者关键词: 桥梁工程; 长寿命; 高性能耐候钢; 耐候螺栓; 耐候锈层; 耐候构造; 疲劳; 设计准则; 智能运维

摘要: The new research progress and engineering application of weathering steel bridges at home and abroad were systematically generalized and analyzed. The key scientific and technological achievements in the fields of formation mechanism of stable corrosion-resistant patina, material selection standard, corrosion and fatigue damage mechanism, research and development of

corrosion-resistant configuration and weathering bolt, and detection and evaluation technology of patina were summarized. The application scope and corrosion allowance design indexes of weathering steel bridges were combed and improved, and the key points of stabilization treatment and construction technology for the patina of weathering steel bridges were proposed. The damage detection and evaluation technology and corrosion damage maintenance and management technology of patina in weathering steel bridges were evaluated and analyzed. Combined with the experience and lessons of weathering steel bridge engineering accidents in the United States and Japan, as well as the construction technological innovation achievements of the first batch of long lasting high performance weathering steel bridges in China, the technological innovation direction in this field was discussed. Research result shows that the composition of corrosion-resistant patina contains the outer layer of γ -FeOOH and α -FeOOH, and the inner layer of amorphous FeOOH compound and Fe_3O_4 . The formation and durability of stable corrosion-resistant patina are mainly affected by the factors such as chloride ion, accumulated water and dust. The material selection zoning map of high performance weathering steel bridges in China is suggested to establish, and the configuration design criterion of stable corrosion-resistant patina should be improved. The modern weathering steel bridge has the technical characteristics of high performance and long lasting. The in-plane stress fatigue, out-of-plane deformation fatigue test, numerical fracture mechanics simulation of configuration details with patina and the research on the long-term damage resistance of weathering high-strength bolts should be promoted to lay the foundation for establishing a perfect design criterion of anti-corrosion and anti-fatigue. The application of artificial intelligence technology will promote the significant progress of intelligent management and maintenance technology of long lasting high performance weathering steel bridges. The investment for research and development should be increased, a specification system should be established for the design, construction and maintenance of long lasting high performance weathering steel bridges with independent intellectual property rights in China, the high-quality engineering and technical talents should be cultivated, thus to promote the development of Chinese strong transportation network.

摘要: 系统归纳与剖析了国内外耐候钢桥的研究新进展及工程应用情况,总结了稳定耐候锈层的形成机制、选材标准、腐蚀与疲劳损伤机理、耐候构造、耐候螺栓研发以及锈层检测与评价技术等方面的关键科技成果,梳理并完善了耐候钢桥的适用范围和腐蚀余量设计指标,提出了耐候钢桥锈层稳定化处理及施工技术要点;评析了耐候钢桥锈层损伤检测与评价技术、腐蚀损伤养管技术,结合美、日耐候钢桥工程事故经验教训和中国首批长寿命高性能耐候钢桥建设技术创新成果,探讨了该领域的技术创新方向。研究结果表明:耐候锈层由外层的 γ -FeOOH、 α -FeOOH 以及内层的非晶态 FeOOH 化合物与 Fe_3O_4 构成,稳定耐候锈层能否形成与保持,主要受氯离子、积水和积尘等因素的影响;建议编制中国高性能耐候钢桥选材区划图谱,完善稳定耐候锈层构造设计准则;现代耐候钢桥具有高性能和长寿命的技术特征,带锈层构造细节的面内应力疲劳、面外变形疲劳试验和数值断裂力学模拟,以及耐候高强螺栓长期耐损性能研究的推进,将为建立完善的耐腐蚀、抗疲劳设计准则奠定基础;人工智能技术的应用将推动长寿命高性能耐候钢桥智能运维技术的重大进步;应加大研发投入,建立具有中国自主知识产权的长寿命高性能耐候钢桥设计、建造和运维标准规范体系,培养高素质工程技术人员,推进交通强国建设。

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作者: 刘永健; 刘江

标题: Review on temperature action and effect of steel-concrete composite girder bridge

标题: 钢-混凝土组合梁桥温度作用与效应综述

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作者关键词: bridge engineering; review; steel-concrete composite girder; temperature action; temperature effect; analytical method

作者关键词: 桥梁工程; 综述; 钢-混凝土组合梁; 温度作用; 温度效应; 解析方法

摘要: To understand the temperature action and effect of composite girder bridge in depth, the research status of domestic and overseas,including the temperature action and effect of hydration heat in construction stage,the temperature action patterns and finding values methods in the operation stage,and the calculation methods of temperature effect,was summarized and analyzed.The subsequent research emphases and directions were discussed.Research result shows that the hydration heat temperature effect is an important reason for the early cracking of decks in cast-in-situ composite girder bridges.The accurate selection of applicable hydration heat model and the consideration of the effect of temperature history on the elastic modulus and tensile strength of hardening concrete and the connection stiffness of studs are the keys to accurately calculate the hydration heat temperature effect of composite girder.Three temperature action patterns,including uniform temperature,positive and negative temperature gradients,are generally taken into consideration on the composite girder bridge in the operation environment. The specifications of temperature action patterns and values of composite girder bridges are not coincident due to the differences in climate environments and research histories in different countries.Additionally,the temperature gradients are not obtained based on the statistical analysis and the existing historical meteorological data resources are not fully utilized.The temperature effect calculations of composite girder bridges are mostly based on the finite element numerical simulation.The analytical calculation methods for solving the temperature effect of composite

girders are also improved, from taking no account of the interfacial slip and simple steel-concrete uniform temperature difference to considering the interfacial slip and arbitrary temperature distribution of steel and concrete. However, the theoretical model for solving the temperature effect of composite girder with arbitrary boundaries should be strengthened. The future research directions of composite girder bridge temperature problem should focus on the composite girder temperature action pattern based on effect classification, the in-depth understanding the temperature self-generated and secondary effects from the mechanism, and strengthening the long-term temperature measurement to determine the representative values of temperature actions by statistical analysis, as well as fully using the historical meteorological data of the meteorological departments in various regions of China to study the regional differences of the temperature action values.

摘要: 为深化对钢-混凝土组合梁桥温度作用与效应的认识,从施工阶段水化热温度作用与效应计算,运营阶段温度作用模式与取值,以及温度效应计算方法等方面,综述了国内外研究现状,探讨了后续的研究重点和方向。研究结果表明:现浇组合梁桥施工阶段水化热温度作用是桥面板早期开裂的重要原因,准确计算组合梁水化热温度效应的关键在于选取更为准确适用的水化热模型和考虑温度变化对混凝土硬化过程中弹性模量、抗拉强度以及剪力钉连接刚度发展的影响;运营环境下组合梁桥主要考虑均匀温度、正负温度梯度等3种温度作用模式,由于不同国家气候环境的差异及研究历程的不同,各国规范关于组合梁桥温度作用模式和取值的规定尚不统一,温度梯度作用的取值并非基于统计分析方法得到,在取值时亦未充分利用已有历史气象数据资源;组合梁桥温度效应的计算多基于有限元数值模拟展开,求解组合梁温度效应的解析计算方法也逐渐准确化,钢-混界面关系已从不考虑界面滑移发展到考虑界面滑移,温度分布模式从简单的钢-混均匀温差发展到钢与混凝土任意温度分布,但还应加强建立任意边界组合梁温度效应求解的理论模型;组合梁桥温度问题研究的未来发展方向应集中在开展基于效应分类的组合梁温度作用模式研究,从机理上加强对组合梁温度自生效应和次生效应的认识,加强组合梁桥长期温度实测,基于统计分析确定组合梁温度作用代表值;同时充分利用中国各地区气象部门历史气象数据,开展组合梁温度作用地域差异性取值研究。

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标题: Monitoring and evaluation of fatigue damage for orthotropic steel deck using acoustic emission technology

标题: 基于声发射技术的钢桥面板疲劳损伤监测与评估

来源出版物: 交通运输工程学报 卷: 20 期: 1 页: 60-73 出版年: 2020

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作者关键词: bridge engineering; steel bridge; orthotropic steel deck; AE monitoring; fatigue damage; cold reinforcement

作者关键词: 桥梁工程; 钢桥; 正交异性钢桥面板; 声发射监测; 疲劳损伤; 冷维护

摘要: Based on the integration of multiple monitoring technologies, the fatigue damage was analyzed and assessed for the orthotropic steel deck(OSD), including the fatigue test of a fullscale OSD segment in lab and the fatigue damage monitoring of a cable-stayed highway steel bridge with the OSD during service stage. For the fatigue test study of the OSD in lab, two kinds of acoustic emission(AE) sensors, including physical acoustics corporation(PAC) commercial AE sensors and smart piezoelectric paint sensors made of lead-zirconate-titanate (PZT), and supplementary strain gages were comprehensively used to detect and monitor the fatigue crack activities before and after the cold reinforcement of bonding steel plate. For the in-service highway steel bridges with detected fatigue cracks in the OSD, the cold reinforcement of bonding angel steel was proposed for the fatigue sensitive details in the OSD. Both AE monitoring and strain monitoring were conducted to study the fatigue crack activity and verify the effectiveness of the cold reinforcement. Learn from the fatigue test and monitoring results in lab, both PAC commercial AE sensors and smart PZT sensors are efficient ways to capture the fatigue propagation signals that have the characteristic of a peak amplitude and then fading gradually. The application of both PAC commercial AE sensors and smart PZT sensors achieve smart monitoring for the fatigue crack activity. The PAC commercial AE sensor group can locate the fatigue crack propagation length and direction in the rib accurately. After adopting bonding steel plate, the stress level keeps at 64.8MPa stably, and no fatigue crack propagation is observed until the cyclic loading accumulates to 5.12 million times, testifying fine workability of the OSD model after the cold reinforcement. The PAC commercial AE sensor and smart PZT sensor have good agreement in detecting fatigue crack propagation during fatigue loading process, and can capture more fatigue crack activity information in-time than the strain gage. Learn from the monitoring and evaluation results for the in-service steel bridge with the OSD, the peak energy of AE monitoring result before the cold reinforcement is 5 times as that after the cold reinforcement, and the accumulated AE signals decreasing from intensive to scatter indicate the stability of fatigue cracks. After the cold reinforcement, the peak stresses nearby the fatigue crack tips decrease by 40% to 50 % when the loading vehicles pass, and the maximum stress near the fatigue detail declines from 78MPa before the cold reinforcement to 48MPa after the cold reinforcement during 24 h monitoring. The peak energy and accumulated number of AE signals and the stress level testify the effectiveness of cold reinforcement for the fatigue cracks in the OSD.

摘要: 采用多种监测技术融合手段,对正交异性钢桥面板开展了疲劳损伤监测与评估,包括足尺正交异性钢桥面板节段模型疲劳试验与某公路斜拉桥正交异性钢桥面板运营阶段的疲劳损伤监测;在正交异性钢桥面板疲劳试验中,综合采用了美国物理声学(PAC)声发射(AE)传感器、智能锆钛酸铅压电漆(PZT)传感器和应变片进行了粘贴钢板冷加固前后的疲劳裂纹监测;对处于运营阶段的斜拉桥钢桥面板疲劳开裂区域,采用了粘贴角钢的冷加固方法进行加固,并对加固前后的桥梁结构开展了 AE 监测和应变监测以研究疲劳裂纹状态与检验冷加固方法

的效果。疲劳试验与监测结果表明:PAC 的 AE 传感器和智能 PZT 传感器能有效捕捉具有突发峰值与快速衰减特征的疲劳扩展信号,二者的协同应用实现了疲劳裂纹智能感知,PAC 的 AE 传感器组能实时捕捉纵肋上的疲劳裂纹扩展长度和方向;粘贴钢板冷加固后,应力水平稳定在 64.8MPa,直到继续循环加载至 512 万次仍无疲劳裂纹扩展,验证了正交异性钢桥面板粘贴钢板疲劳冷加固措施的良好加固效果;在疲劳试验过程中,PAC 的 AE 传感器和智能 PZT 传感器监测疲劳裂纹扩展结果一致性良好,与应变片相比可实时捕捉更丰富的疲劳裂纹动态信息。对运营阶段正交异性钢桥面板疲劳监测与评估结果表明:加固前 AE 监测结果峰值能量是加固后峰值能量的 5 倍,AE 累积信号由加固前的密集分布改变为加固后的稀疏分布,表明加固后的钢桥面板疲劳裂纹处于稳定状态;随着加载车辆行驶通过,冷加固后的疲劳裂纹尖端应力峰值降低 40%至 50%;对比加固前后的 24 h 疲劳应力连续监测结果,疲劳细节附近应变片的应变水平从加固前的 78MPa 下降至加固后的 48MPa;AE 信号峰值能量、AE 累积信号和应力水平的监测结果均证明了冷加固技术对正交异性钢桥面板疲劳开裂加固的有效性。

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作者: 张琛; 许辉; 尚为公; 韩森

标题: Study of road performance of micro-nano brick and concrete waste modified asphalt and its mixture

标题: 微纳米砖混凝土垃圾改性沥青及其混合料路用性能研究

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作者关键词: road engineering; modified asphalt; micro-nano material; brick and concrete waste;

road performance

作者关键词: 道路工程; 改性沥青; 微纳米材料; 砖混凝土垃圾; 路用性能

摘要: In order to improve the pavement quality requirements and reduce the waste of waste asphalt materials year by year, the fine parts of bricks and concrete in construction waste are crushed, grinded and processed into micro-nano scale, and as a modifier added to the matrix asphalt. Utilizing the special functions of nanomaterials, asphalt performance is improved and the amount of asphalt is reduced. The penetration, ductility, softening point, viscosity and dynamic shear rheological (DSR) test are used to test and verify the high and low temperature properties of modified asphalt. The rutting test, low temperature bending creep test, freeze-thaw splitting test and water-immersed Marshall test are used to verify the high and low temperature performance and water stability of the modified asphalt mixture. The experimental results show that the micro-nano bricks and concrete waste materials in the modified asphalt mixture can effectively improve its high temperature performance and have the best effect at 10% blending ratio. In the mixture, the micro-nano bricks and concrete waste materials can significantly improve its high temperature stability and water stability, and the dynamic stability is improved by 60.2%, and the residual stability and splitting strength ratio are increased by 13.8% and 24%, respectively. It can be seen that micro-nano bricks and concrete waste can effectively improve the road performance of asphalt and its mixture.

摘要: 针对逐年提高的路面质量要求和大量的废旧沥青材料浪费的现象,提出将建筑垃圾中的砖、混凝土类细料部分进行碾压、研磨并加工成微纳米级别,并将其作为改性剂加入到基质沥青中,达到改善沥青并减少沥青用量的作用.采用针入度、延度、软化点、黏度和动态剪切流变等试验测试并验证改性沥青的高、低温性能;采用车辙试验、低温弯曲蠕变试验、冻融劈裂试验以及浸水马歇尔试验分别验证改性沥青混合料的高、低温性能和水稳定性.试验结果表明:改性沥青中,微纳米砖混凝土垃圾材料能够改善其高温性能,且在 10% 掺配比时效果最佳;混合料中,微纳米砖混凝土垃圾材料能显著提高其高温稳定性和水稳定性,其中动稳定度提高 60.2%,残留稳定度与劈裂强度比分别提高 13.8% 和 24%.由此可见,微纳米砖混凝土垃圾能够有效提高沥青及其混合料的路用性能.

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作者: 蒋应军; 王瑞祥; 刘鹏; 陈浙江

标题: Effect of fiber on pavement performance of emulsified asphalt cold recycled mixture

标题: 纤维对乳化沥青冷再生混合料路用性能影响

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作者关键词: vertical vibration test method; fiber; pavement performance; cold recycled mixture

作者关键词: 垂直振动试验方法; 纤维; 路用性能; 冷再生混合料

摘要: The influence of fiber content and fiber type on pavement performance of emulsified asphalt cold recycled mixture was studied by vertical vibration test method. This method has better correlation with compaction effect in construction site. The results show that with the increase of fiber content, the dynamic stability, bending strain, freeze-thaw splitting strength and other road performance indicators of cold recycled mixtures increase first and then decrease. In addition, compared with the cold recycled mixtures without fibers, the effects of four kinds of fibers on the water stability of the mixtures are not obvious on the whole. The cold recycled mixture with lignin fiber has the best high temperature stability. The dynamic stability can be improved by 79%, and the optimum content is 0.4%. The cold recycled mixture with polyester fiber has the best crack resistance at low temperature. The bending strain can be increased by 19%, and the optimum content is 0.6%.

摘要: 采用与施工现场压实效果相关性更好的垂直振动试验方法,研究了纤维掺量以及纤维类型对乳化沥青冷再生混合料路用性能的影响.结果表明:随着纤维掺量的增加,冷再生混合料动稳定度、弯拉应变、冻融劈裂强度等各项路用性能指标均先增大后减小.此外,与不掺加纤维冷再生混合料相比,试验选用的4种纤维对混合料水稳定性影响效果总体上均不明显;掺加木质素纤维的冷再生混合料高温稳定性能最好,动稳定度可提高79%,其最佳掺量为0.4%;掺加聚酯纤维的冷再生混合料低温抗裂性能最好,弯拉应变可提高19%,其最佳掺量为0.6%.

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标题: Study on Mix Design of Emulsified Asphalt Cold Recycled Mixture Based on Early Compression Strength

标题: 基于早期抗压强度的乳化沥青冷再生混合料配合比设计方法

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作者关键词: road engineering; early compression strength; experimental study; mix design; cold recycled mixture

作者关键词: 道路工程; 早期抗压强度; 试验研究; 配合比设计; 冷再生混合料

摘要: In order to study the evaluation indicator of early strength and the optimum emulsion content (OEC) of the cold recycled mixture with different gradations, the different proportions of new aggregate are blended into the RAP material. The cold recycled mixtures with 4 gradations are designed, and the optimum water contents of the above mixtures are obtained by compaction test, respectively. Considering the shortcomings of the method for determining the OEC in current domestic specification, the specimens with 2% moisture content is proposed as the experimental state of the specimens. According to the residual moisture content and the test value of compressive strength, the unconfined compressive strength of the static pressured specimens after curing 27 h in air-circulating oven at 25 °C is determined as the evaluation indicator of early strength of the cold recycled mixture with emulsified asphalt. Based on the early compressive strength, splitting strength with dry/wet condition as the indicators, the OECs of the cold recycled mixture without cement corresponding to different strength indicators are determined. Based on the early strength of the cold recycled mixture, the early compressive strength is proposed as the evaluation indicator for determining the OEC of the cold recycled mixture. Finally, taking the early compressive strength as the evaluation indicator, the OECs of the mixtures with different gradations are determined. The result shows that (1) for the same strength indicator, the order the OECs of 4 types of the cold recycled mixture is as follows: XL40 > XL30 > XL20 > XL10, which indicates that the OEC is gradually increased with the increase of new aggregate content; (2) for the same cold recycled mixture, the order of the OEC corresponding to the maximum values of 3 strength indicators is as follows: OEC_d > OEC_w > OEC_e, and the OEC_e is 0.24% - 0.5% less than those of OEC_d and OEC_w; (3) considering the later strength, the early strength of the cold recycled mixture with OEC_e is higher than the those of the cold recycled mixtures with OEC_d and OEC_w; (4) although the strengths of the cold recycled mixtures meet the requirements of the specification, the mechanical strength is not too high, which is available to be improved by adding cement to a certain extent.

摘要: 为了研究不同级配冷再生混合料的早期强度评价指标及最佳乳化沥青用量(OEC),在RAP料中掺入不同比例的新集料,设计出4种不同级配的冷再生混合料,通过击实试验确定了不同级配混合料的最佳掺水量。针对我国现行规范中最佳乳化沥青用量确定方法的不足,以试件含水率为2%作为试件的试验状态。根据剩余含水率及强度检测结果,确定了采用静压试件在25℃鼓风烘箱中养生27h后的无侧限抗压强度作为评价乳化沥青冷再生混合料早期强度的指标。以早期抗压强度和干、湿劈裂强度为指标,确定了不添加水泥时冷再生混合料在不同强度指标下对应的OEC。基于冷再生料早期强度,提出了以早期抗压强度为指标确定最佳乳化沥青用量。最后,以早期抗压强度为指标,确定了不同级配混合料的最佳乳化沥青用量。结果表明:同一强度指标下,4种冷再生混合料的最佳沥青用量大小顺序为XL40>XL30>XL20>XL10,表明随着新集料掺量的增加,冷再生混合料的最佳乳化沥青用量也逐渐增加;同一冷再生混合料下,3种强度指标最大值对应的最佳乳化沥青用量大小顺序为OEC_d>OEC_w>OEC_e,与OEC_d和OEC_w相比,OEC_e少了0.24%~0.5%的乳化沥青用量;与采用OEC_d和OEC_w的冷再生混合料相比,在兼顾后期强度的同时,采用OEC_e的冷再生混合料具有较高的早期强度。冷再生混合料强度虽满足规范要求,但并未表现出较高的力学强度,在此可通过添加适量的水泥来进行改善。

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作者: 唐鹏; 宫赛; 梁鹏; 程高; 苏巨峰

标题: Experimental study on bearing capacity of glass bridge deck under different boundary conditions

标题: 不同边界条件下玻璃桥面板承载力试验研究

来源出版物: 深圳大学学报. 理工版 卷: 37 期: 1 页: 84-90 出版年: 2020

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文献类型: Article

作者关键词: bridge engineering; glass bridge deck; sandwich glass; boundary conditions; wheel load; bearing capacity

作者关键词: 桥梁工程; 玻璃桥面板; 夹层玻璃; 边界条件; 轮压荷载; 承载性能

摘要: In order to study the bearing capacity of the vehicle glass bridge deck structure, the displacement sensor is used to measure the deformation of the glass panel, and the strain gauge is used to measure the change rule of the strain on the outer surface of the glass panel, and the failure mode, the load-displacement curve, safety performance and stiffness requirements of the glass plate under different boundary conditions and the most unfavorable load position are analyzed. The results show that the ultimate bearing capacity of a single glass plate supported on both sides is about 53.7% of that of a simple glass plate supported on four sides, and that of laminated glass plate supported on both sides is about 66.7% of that of a simple glass plate supported on four sides. The deformation of the glass plate is the largest when the load acts on the center of the plate, and the stress of the glass plate is the largest when the load acts on the corner of the plate. From the perspective of meeting the structural strength requirements, the load acting on the corner of the plate is the most unfavorable working condition, and from the perspective of meeting the structural stiffness requirements, the load acting on the center of the plate is the most unfavorable working condition. Under the two most unfavorable conditions of plate angle and plate center position, applied 0.8, 1.0, 1.2, 1.5, 1.8 and 2.0 times of wheel load, the maximum strain and deformation of laminated glass plate can meet the requirements of the code. The test results can provide a reference for the practical engineering of vehicle glass bridge plate.

摘要: 为研究车行玻璃桥面板结构的承载力性能,以位移传感器测量玻璃板的变形量,以应变计测试玻璃板外表面应变变化,分析车轮荷载在不同边界条件和最不利荷载位置时玻璃板的破坏形态、荷载-位移曲线、安全性能及刚度要求.结果表明:单层玻璃在两边简支玻璃板的极限承载力约为四边简支玻璃板极限承载力的 53.7%;夹层玻璃在两边简支玻璃板的极限承载力约为四边简支玻璃板极限承载力的 66.7%;荷载作用在板中央时玻璃板的变形最大,作用在板角时玻璃板的应力最大;从满足结构强度要求的角度出发,荷载作用于板角部是最不利工况;从满足结构刚度要求的角度出发,荷载作用于板中央是最不利工况;在板角和板中央位置两种最不利工况下施分别加 0.8、1.0、1.2、1.5、1.8 和 2.0 倍的车轮荷载,所得夹层玻璃板的最大应变值、最大变形值均满足规范规定值及试验结果可为车行玻璃桥面板用于实际工程提供参考.

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标题: Analysis of Seismic Fragility and Recoverability of Long-Span Cable-Stayed Bridge

标题: 大跨度斜拉桥地震易损性及可恢复性分析

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作者关键词: cable-stayed bridge; dynamic analysis; seismic response; seismic fragility analysis; seismic recoverability

作者关键词: 斜拉桥; 动力分析; 地震响应; 地震易损性分析; 抗震可恢复性

摘要: To study the seismic capacity of the main tower of cable-stayed bridge under earthquake and evaluate its seismic recoverability,the structural dynamic calculation model was established by the finite element analysis program SPA2000 based on a single-column long-span concrete cable-stayed bridge,the seismic response of the transverse cable-stayed bridge was analyzed by

incremental dynamic analysis (IDA). The moment-curvature curves of the tower key sections were studied and the curvature damages were calibrated by analysis software XTRACT, then the data from IDA analysis were processed, and the seismic vulnerability curve of each key sections of the main tower was obtained, and the vulnerable part of the main tower and its evolution law were determined. Based on the concept of recoverability, the seismic restorability analysis of the structure was carried out. The results show that under the action of transverse seismic, the bottom section of the tower is the vulnerable section. When the action of seismic intensities are 0.150g and 0.271g, its own seismic capacity decrease from 80.6% to 46.7%, with the increase of seismic intensity, the bridges seismic reserve capacity decrease.

摘要: 为了研究地震作用下斜拉桥主塔的抗震能力,评估其抗震可恢复性,以一座独柱式大跨径混凝土斜拉桥为例,采用 SAP2000 有限元分析程序建立结构动力计算模型,通过增量动力分析法(IDA)分析结构的横向地震响应;选用 X-TRACT 软件对主塔划分的各关键截面进行了弯矩-曲率分析和损伤标定,对 IDA 分析的数据进行处理,拟合得到了主塔各关键截面的地震易损性曲线,确定主塔容易损伤部位及演变规律;基于可恢复性的理念开展结构的抗震可恢复性分析.研究表明:在横向地震作用下,主塔底部截面是所选截面中最容易损坏的部位;在地震动强度 0.150g 和 0.271g 作用后,自身的抗震能力由 80.6%降到 46.7%,随着地震动强度的增大,抗震储备能力不断降低.

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标题: Study on the Long-term Performance of Warm Mix Asphalt by Accelerated Loading Test

标题: 基于加速加载试验的温拌沥青混合料长期性能研究

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作者关键词: road engineering; warm mix asphalt; accelerated loading test; long-term performance

作者关键词: 道路工程; 温拌沥青混合料; 加速加载试验; 长期性能

摘要: The purpose of this paper is to study the long-term performance of warm mix asphalt mixture which added with Alpha-min, Sasobit and DAT respectively. The routine performance tests and MMLS3 accelerated loading test were used to evaluate the pavement performance of three kinds of warm mix asphalt mixture(WMA), and the long-term rutting resistance of WMA was estimated by rutting depth prediction method based on rutting test. The results show that the performances of the three WMA could basically reach the technical level of HMA. However the water stability of WMA is poor after adding Alpha-min and Sasobit, so some improvement measures should be taken when it is used in rainy areas, especially in rainy and cold areas. It's found that there are two stages of rutting deformation curve of asphalt mixture: the rapid increase of compaction stage and the steady increase of creep stage, by MMLS3 accelerated loading test. And the rutting depth has a good logarithmic relationship with the number of loading times, while the regression coefficient could better represent the rutting resistance of asphalt mixture. When MMLS3 accelerated loading test is used to evaluate the rutting resistance of asphalt mixture, the standard loading times can be selected as 200 000-300 000 times. In general, the rutting resistance and fatigue resistance of WMA can basically reach or even exceed the technical level of HMA.

摘要: 目的研究分别添加 Aspha-min、Sasobit 和 DAT 温拌剂的 3 种温拌沥青混合料(WMA)长期使用性能。方法对 3 种温拌沥青混合料的使用性能进行了常规性能试验和 MMLS3 加速加载试验, 并采用基于车辙试验的沥青路面车辙深度预估方法对 WMA 的长期抗车辙性能进行评估。结果 3 种 WMA 使用性能基本可以达到热拌沥青混合料(HMA)的技术水平, 但添加 Aspha-min 和 Sasobit 后混合料的水稳定性较差, 在多雨地区尤其是多雨寒冷地区使用时应采取一定改善措施; MMLS3 加速加载试验表明沥青混合料的车辙变形存在两个阶段: 迅速增大的压密阶段和稳定增加的蠕变阶段, 且车辙深度与加载次数呈良好的对数关系, 而回归系数 a 则可以较好地表征沥青混合料的抗车辙性能; 采用 MMLS3 加速加载试验评价沥青混合料高温抗车辙性能时标准试验加载次数可以选择 20~30 万次。结论在添加温拌剂后沥青混合料的抗车辙性能以及抗疲劳性能基本都能达到甚至超过热拌沥青混合料的技术水平。

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标题: Optimization of Semi-rigid Pavement Structures of LSPM Lower Layer Based on Fatigue Life Increasing

标题: 基于疲劳寿命递增的 LSPM 下面层半刚性路面结构优选

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作者关键词: highway engineering; large stone porous asphalt mixes (LSPM); life increasing; pavement structure combination; material type; fatigue life

作者关键词: 道路工程; 大粒径透水沥青混合料; 寿命递增; 路面结构组合; 材料类型; 疲劳寿命

摘要: Fatigue life is a key factor affecting the durability of pavement structure. The pavement structure with increasing life needs to meet the requirements of good bearing capacity of pavement structure and only functionalize its surface layer, so as to achieve the design goal of long-life durability asphalt pavement structure. Through theoretical calculation and statistical analysis, the relationship between fatigue life and structural layer parameters of asphalt pavement structure layer were discussed, and the influence of different factors on the fatigue life of large stone porous asphalt mixes (LSPM) pavement structure was analyzed. The prediction model of pavement structure fatigue life was proposed. Based on the differences of climate and traffic conditions in Shaanxi province, the combination types and material parameters of LSPM asphalt pavement with increasing life in different regions of Shaanxi province were put forward.

摘要: 疲劳寿命是影响路面结构耐久性的关键因素, 寿命递增的路面结构需在满足路面结构良好的承载力要求下, 仅对其表面层进行功能化, 从而实现耐久性长寿命沥青路面结构的设计目标。通过理论计算及统计分析, 探讨沥青路面结构层的疲劳寿命与结构层参数之间的关系, 分析不同因素对大粒径透水沥青混合料路面结构疲劳寿命的影响, 提出路面结构疲劳寿命的预估模型; 并基于陕西地区的气候交通条件差异, 提出陕西不同地区寿命递增的 LSPM 沥青路面结构组合类型和材料参数。

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标题: A study on combined effect of earthquake and scour of bridge in high earthquake-intensity and soft soil site

标题: 高烈度软土地场地桥梁地震与冲刷联合作用效应研究

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作者关键词: earthquake; scour; partial coefficient; failure probability; combined effect

作者关键词: 地震; 冲刷; 失效概率; 分项系数; 联合作用

摘要: Scour leads bridge foundation to be exposed, which weakens the constraint function of soil to the pile foundation and increases the damage risk of the foundation under earthquake. Therefore, it is significant to establish the failure probability model of a bridge under the combined effect of scour and earthquake, and to analyze the combined component coefficient of the scour action of the continuous rigid frame bridges in an earthquake zone. In this paper, based on a continuous rigid frame bridge built in the area with seismic basic intensity of VIII degree, the distribution function of the scour depth was determined by the Monte-Carlo method, and the dynamic finite element models of the entire bridge under different scouring depth were established by CSIBridge software. Forty-eight seismic waves were used for incremental dynamic analysis (IDA), and the distribution function of seismic action effects with different scouring depth was calculated. The failure probability and reliability index of bridge foundation at different scouring depths were obtained by the direct integration method. The results show that the nonlinear relationship between the scouring depth and the earthquake failure probability can be established by the failure probability analysis under the framework of combined effect of erosion and earthquake. This method can reasonably determine the partial combination coefficient of loading

combination including erosion and seismic action.

摘要: 冲刷会导致桥梁基础裸露,土体对桩基的约束作用减弱,使得桥梁基础在地震作用下的危险性增大,因此建立冲刷与地震联合作用下桥梁的失效概率模型,分析震区连续刚构桥冲刷作用组合分项系数具有重要的意义。以地震基本烈度Ⅷ度区某连续刚构桥为依托工程,基于 Monte-Carlo 法确定冲刷深度的分布函数,并采用 CSIBridge 有限元软件建立不同冲刷深度下全桥空间有限元动力模型,进行 48 条地震波下的增量动力分析(IDA),计算不同冲刷深度的地震作用效应分布函数,并采用直接积分法求得桥梁基础的失效概率及可靠度指标。研究结果表明:通过冲刷与地震的联合作用框架下失效概率分析,可建立冲刷深度与失效概率的非线性关系;该方法可合理确定冲刷与地震作用组合下荷载组合分项系数,可为桥梁在冲刷与地震联合作用下的风险评估和设计提供参考。

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标题: Composition and Performance Enhancement of Geopolymer Grouting Materials with Industrial Residue: a Review

标题: 工业废渣地聚合物注浆材料组分及性能增强的研究进展

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作者关键词: grouting material; geopolymer; material composition; performance enhancement; statistical analysis

作者关键词: 注浆材料; 地聚合物; 材料组分; 性能增强; 统计分析

摘要: Grouting technology is to inject the liquid material with cementation ability into the cracks

and voids of the formation. After the grouting material is solidified, the structure is strengthened and the crack is filled. At present, cement grouting materials are mainly used in engineering because of their mature technology, low price, high stone strength and wide application. However, there are also defects such as high water bleeding rate, poor stability, and long setting time. The most important thing is that the production of cement materials consumes a lot of energy and has a great impact on the environment, which is not conducive to the sustainable development of the society. In recent years, geopolymer materials using industrial waste as raw materials have been widely used by researchers as a green and environmentally friendly inorganic material, and have been gradually applied to the field of grouting. Geopolymer materials are used to dissolve active components (such as Si and Al) in industrial wastes such as fly ash, slag and steel slag by chemical alkali excitation technology, and further recombination to form new inorganic cementitious materials. Geopolymer grouting materials have two distinct advantages: (1) geopolymers have a wide range of raw materials and low cost, which can effectively reduce the cost of grouting engineering; (2) geopolymer materials have the advantages of low energy consumption and green environmental protection, which can effectively recycle and reuse industrial waste residue, and have far-reaching environmental and social benefits. At present, research on geopolymer grouting materials needs to solve two major problems: (1) selection of components of grouting material-the properties of the grouting material are closely related to the material properties such as the degree of activity of the silicon-aluminum source and the degree of alkali excitation. (2) Performance enhancement of grouting material-the performance of geopolymer grouting material is adjusted for different grouting conditions to expand the application range of geopolymer grouting material. From the perspective of reaction mechanism and performance characteristics, this paper comprehensively combs the selection and performance enhancement methods of the current polymer grouting material components, and uses statistical methods to analyze the blending ratio range of geopolymer grouting materials and recommend the range. Grey relational entropy is used to analyze the gray correlation between each material component and compressive strength and fluidity performance, and then give the correlation degree ranking. Then, the geopolymer injection is summarized from three aspects: raw material property activation, slurry mix optimization and admixture selection. The way of improving the performance of pulp materials, in the end, the problems existing in the research of polymer grouting materials are proposed, and the development trend of geopolymer grouting materials is prospected.

摘要: 注浆技术是将具有胶结能力的浆液注入地层的裂缝和空隙中,以达到加固和填充目的。目前注浆主要采用水泥基材料,其具有技术成熟、价格便宜、结石强度高、应用广泛等优点,但也存在析水率高、稳定性差、凝结时间长等缺陷。最为关键的是水泥材料生产耗能大且会排放大量 CO₂,这加剧了全球的温室效应,不符合可持续发展的理念。近年来,以工业废渣为原料的地聚合物材料因其绿色、环保的特点,引起了学者的广泛关注,并逐渐被应用于注浆领域。地聚合物(Geopolymer)是利用化学碱激发技术(Alkaline activation technology,AAT),将粉煤灰、矿渣、钢渣等工业废渣中的活性成分(Si、Al 等元素)浸出,进一步重组化合形成的新无机胶凝材料。使用地聚合物作为注浆材料具有两大优势:(1)地聚合物的原材料来源广、造价低,可有效降低注浆工程的成本;(2)相比水泥材料,地聚合物材料具有耗能低、绿色环保等优势,可实现工业废渣有效回收再利用,减少 CO₂ 大量排放,具有深远的环保和社会效益。目前,地聚合物注浆材料研究需解决两大难题:(1)浆材材料组分的优选-浆材的性能与材料组分硅铝源活性程度、碱激发程度等材料特性息息相关;(2)注浆材料的性能增强-针对不同注浆条件对地聚合物浆材的性能进行调整,以扩大地聚合物浆材的适用范围。本文从反应机理和性能

特点出发,全面梳理了目前地聚合物注浆材料组分的选择和性能增强方式,利用统计学方法分析了地聚合物注浆材料配合比范围并推荐了范围,采用灰关联熵对各材料组分与抗压强度、流动度性能进行灰关联分析并给出了关联度排序,然后从原材料性质活化、浆材配合比优化和外加剂选择三方面概述了地聚合物注浆材料性能增强的方式。最后,提出目前地聚合物注浆材料研究中存在的问题,同时对地聚合物注浆材料的发展趋势进行了展望。

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作者: 沙爱民; 蒋玮; 王文通; 娄宝文; 曹阳森; 贾猛

标题: Design and prospect of new pavement materials for smart road

标题: 面向智慧道路建造的新型路面材料设计与展望

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作者关键词: road materials; self-energy harvesting; self-luminescent; self-temperature regulation; self-healing

作者关键词: 路面材料; 自俘能; 自发光; 自调温; 自愈合

摘要: Considering the development of conventional engineering materials, the research on new modern materials and the increasing demand for road infrastructure construction, significant changes regarding both the road fundamental properties and functional positioning have been

taking place at an increasing pace. The roads have evolved from early structures meeting basic traffic needs to important assets with well-defined economic and environmental characteristics. Since the beginning of the 21st century, the need for smart and safe travel has steadily created new requirements for road infrastructure. The rapid development of material science and interdisciplinary research has provided viable and technical support for the design and construction of various types of new pavements, thus promoting the continuous expansion within the research field of pavement materials. Therefore, this research introduces and analyzes the technical principles, design, development, and challenges related to new pavement materials characterized by self-capture energy, selfluminescence, self-regulation, and self-healing functions, providing a reference for the future research direction. The main objective of piezoelectric self-powering pavement is to design the structure and optimize the performance of self-powering devices, and apply this technique in road engineering. A series of studies on mechanical modeling, laboratory verification and engineering application of self-powering devices show that the energy harvesting effect of embedded piezoelectric self-powering devices made of block or multilayer piezoelectric materials is considerable, and the piezoelectric self-powering pavement has a broad prospect. Thermoelectric pavement is a new type of pavement, which uses the Seebeck effect of thermoelectric materials to collect excess energy of asphalt pavement and realize green conversion of pavement energy. Meanwhile, it can effectively reduce the temperature of pavement and prolong the service life of road. The composition includes three main parts: Thermoelectric conversion device, hot end and cold end. A new type of thermoelectric asphalt pavement structure is studied in this paper. Results indicate that the power generation 0.564 V of single specimen has good application potential via monitoring the generation voltage of thermoelectric pavement in different seasons. The research of self-luminous pavement mainly focuses on the design and optimization of pavement luminescent materials. The self-luminous paste materials are prepared by adding long afterglow rare earth luminescent powder and glass beads reflective powder into cement materials. The luminescence properties are characterized by afterglow decay time and fluorescence chromatography. The optimum range of particle size of selfluminous pavement materials and reflective powder is determined, which can provide reference for the further research. As for the self-regulation pavement material, the thermogravimetric and differential scanning calorimetry tests are conducted to study the thermal stability and phase transition characteristics of PEG. The results show that PEG has excellent thermal stability; the average molecular weight ranging from 4000 to 10000 of PEG have relatively high phase change heat storage capacity and similar phase change temperature. Based on asphalt properties, the optimum average molecular weight for asphalt pavements can be further decided.

摘要: 随着传统工程材料与现代新型材料研究的深入,以及人们对道路基础设施需求的不断提升,道路的内在属性和功能定位发生了显著的变化,从早期满足通行基本需求的结构物,演化到具有经济属性和环境属性的固定资产.进入 21 世纪以来,智慧出行和安全出行的需求,对道路基础设施提出了新的需求.道路作为交通工具的重要载体,需要进一步提升其自身的智慧化水平.材料科学和交叉学科的飞速发展,为设计和建造各类新型路面提供了可能与技术支撑,也推动了路面材料研究领域的不断拓宽.为此,本文介绍了具有自俘能、自发光、自调温和自愈合功能新型路面材料的技术原理、设计、发展与挑战,为新型路面材料的设计和研究提供参考和借鉴.新型路面材料设计的意义不仅仅在于拓展路面的功能,而且在于引发路面材料和结构技术设计理念的更新,进一步丰富和拓展现代道路工程以及相关学科知识体系,推动现代路面工程技术进步和相关产业的发展.

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标题: Experimental Research on the Influence of Filler and Partition Layer on Subgrade Multi-Field

标题: 填料及隔断层对路基多场域影响的试验研究

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作者关键词: 道路工程; 盐渍土; 素土; 温度场; 导热能力; 力学性能

摘要: Because of the collapsibility, expansibility and corrosiveness of saline soil itself, as well as

the complex geological conditions and harsh climate in the western region, road construction in saline soil area has been regarded as a worldwide problem. In order to provide theoretical and design basis for reasonable selection of roadbed partition form in road construction in saline soil area, the variation law of subgrade temperature field, salinity field and surface deformation of roadbed with different fillers and diverse isolation conditions was studied by laying test road in the field of typical sulfuric acid saline soil section. From the test results, it can be seen that the thermal conductivity, water permeability and mechanical properties of the fillers are the main reasons for the changes of temperature, salinity, moisture and pavement surface deformation. The change of temperature inside the roadbed is positively correlated with the change of temperature outside, but there are also differences between different fillers and different working conditions with or without barrier faults. When the outside temperature is higher than 20 °C, the temperature inside the subgrade is negatively correlated with the depth of the subgrade; when the outside temperature is less than 20 °C, the internal temperature of subgrade is positively correlated with the depth of subgrade. At the subgrade depth of 100 cm, the difference of transverse temperature is mainly due to the different intensity of solar radiation on the left and right slopes of the subgrade. At the subgrade depth of 300 cm, the horizontal temperature presents umbrella-shaped distribution, and its curvature is positively correlated with the depth of roadbed. At the depth of 200 cm or more, the salinity change of each section of roadbed is almost the same, while salt accumulation occurs in the place of 100 ~ 120 cm in the subgrade with partition layer. When the depth is below 200 cm, the change of salt content in each section is different due to the different water seepage capacity. The deformation of road surface is affected by two aspects: salt heave and frost heave caused by moisture and temperature, and subsidence and solution settlement caused by the weight of soil foundation itself. For the fillers with strong thermal conductivity, the correlation between the temperature inside the subgrade and the depth of subgrade is not obvious, the thermal expansion and cold contraction caused by temperature are not obvious, and the salt expansion amount is correspondingly small. If the mechanical properties are strong, the settlement caused by its own weight is also small.

摘要: 因盐渍土本身具有湿陷性、膨胀性和腐蚀性,加之西部地区地质情况复杂,气候恶劣,盐渍土地区筑路一直被视为世界性难题。为了给盐渍土地区道路修筑合理选择路基隔断形式提供理论和设计依据,通过在典型硫酸盐渍土路段现场铺设试验路,研究不同填料、不同隔断层条件下的路基温度场、盐分场及路面表面变形的变化规律。从试验结果可看出:填料的导热性能、渗水性能及力学性能是导致温度变化、盐分变化、水分变化及路面表面变形变化的主要原因。路基内部温度变化与外界气温变化呈正相关,但不同填料、有无隔断层各工况之间也存在着差异。当外界气温大于 20 °C 时,路基内部温度与路基深度呈负相关;当外界气温小于 20 °C,路基内部温度与路基深度呈正相关。在路基深度 100 cm 处,横向温度差异主要在于路基左、右边坡受到太阳辐射的强度不同。在路基深度 300 cm 处,水平温度呈现伞形分布,其曲率与路基深度呈正相关;在深度 200 cm 以上,路基各断面盐分变化几乎一致,但有隔断层的路基盐分在 100 ~ 120 cm 处出现聚积;深度 200 cm 以下,各断面盐分变化因渗水能力的不同而存在差异。路表面变形量受两方面影响,即水分、温度引起的盐胀和冻胀以及土基自身重量引起的沉陷和溶陷。导热性能强的填料,路基内部温度与路基深度的相关性不明显,温度引起的热胀冷缩不明显,盐胀量相应小。力学性能强的,自身重量引起的沉陷量也小。

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标题: Effect of Self-melting Snow Agent on Performance of Asphalt Mixture

标题: 自融雪剂对沥青混合料性能影响研究

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作者关键词: highway engineering; asphalt mixture; self-melting snow; road performance

作者关键词: 道路工程; 沥青混合料; 自融雪; 路用性能

摘要: In order to analyze the effect of the addition of self-melting snow agent in the self-melting snow pavement on the road performance of asphalt mixture, the Mafilon(MFL)asphalt mixture with 0%,30%,60% and 100% dosage and the self-melting agent(ZRX)asphalt mixture were respectively subjected to rutting test, beam bending test, water stability test and self-made precipitation scouring test to compare the high temperature stability, low temperature crack resistance and water stability. The research results show that the snow-melting agent has adverse effect on the high and low temperature performance of asphalt mixture, but both of them meet the requirements of the specification. It is necessary to scour 48 hours before evaluating water stability of asphalt mixture with self-melting snow agent. The snow-melting agent affects the water stability of asphalt mixture greatly. The addition of 100% MFL asphalt mixture is even lower than the specification requirements, and the use of slaked lime or anti-stripping agent can significantly

improve the water stability of the selfmelting snow asphalt mixture, and the best addition is 1.5% or 0.5% respectively. The high temperature, low temperature and water stability of ZRX asphalt mixture are similar to those of MFL asphalt mixture with 60%.

摘要: 为分析自融雪路面中的自融雪剂的添加对沥青混合料路用性能的影响,笔者分别对掺量为 0%、30%、60%和 100%的 Mafilon(MFL)沥青混合料以及自研发的融雪剂(ZRX)沥青混合料进行车辙实验、小梁弯曲试验、水稳定性试验以及自制的降水冲刷试验,对比其高温稳定性、低温抗裂性和水稳定性。研究结果表明:融雪剂对于沥青混合料的高、低温性能均有不利影响,但都满足规范要求;在评价自融雪沥青混合料水稳定性时,有必要先动水冲刷 48 小时;融雪剂对于沥青混合料的水稳定性的影响较大,掺量为 100%的 MFL 沥青混合料甚至低于规范要求,使用消石灰或抗剥落剂均能明显改善自融雪沥青混合料的水稳定性,且最佳添加量分别为 1.5%或 0.5%;ZRX 沥青混合料的高、低温和水稳定性能与掺量为 60%的 MFL 沥青混合料相似。

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标题: Analysis and evaluation method of water seepage and accumulation of bridge deck pavement waterproof interlayer

标题: 桥面铺装防水粘层渗水、积水分析与评价方法

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作者关键词: bridge deck pavement; waterproof adhesive interlayer; digital image processing; lateral seepage of interlayer; water accumulation of interlayer

作者关键词: 桥面铺装; 防水粘结层; 数字图像处理; 粘层横向渗水; 粘层积水

摘要: Aiming at the problem that the existing evaluation methods of water seepage and accumulation of bridge deck pavement waterproof interlayer are not perfect, digital image processing technique was used to quantify the pore distribution of interlayer, and the evaluation method of water seepage and accumulation was proposed based on indexes of porosity, pore number, and equivalent pore diameter. Then, a three-dimensional reconstruction model of pores in bridge waterproof interlayers was established and the structure of the pores was visually presented. At last, combining with the transverse permeation tests of 5 typical interlayers, the reliability of the digital image analysis technique in evaluating water seepage and accumulation of interlayers was verified. Test results show that synchronous surface dressing had rich pore distribution and large pore size, which is easy to permeate water and can supply sufficient space for water accumulation. The pores of AC-5 and slurry seals were dense and small, making the seepage resistance of AC-5 better than that of synchronous surface dressing. The porosity of the SBS modified emulsified asphalt as interlayer was small, and there was little connectivity between pores due to the dispersion of pores. Therefore, the waterproof performance of SBS modified emulsified asphalt used as bridge waterproof interlayer was the best.

摘要: 针对现行桥面铺装防水粘层渗水、积水检测技术不完善的问题,首先通过数字图像处理技术,量化粘层的空隙分布状态,提出基于空隙率、空隙数量、空隙等效直径的粘层渗水、积水评价方法。然后,建立粘层空隙三维重构模型,直观展现粘层空隙立体形态分布特征。最后,结合粘层横向渗水试验,测量5种典型桥面防水粘层的渗水量,验证了数字图像分析技术应用于评价粘层渗水、积水的可靠性。研究结果表明:同步碎石空隙分布丰富,空隙尺寸大,易于渗水,且为层间积水提供了充足的储水空间;AC-5和稀浆封层空隙分布密且尺寸小,防水能力优于同步碎石;SBS改性乳化沥青粘层的空隙率较小,且空隙分布离散,空隙间几乎不连通,抗渗水能力最好。

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标题: Research progress on vegetable oil rejuvenator of asphalt

标题: 沥青植物油再生剂研究进展

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作者关键词: asphalt; vegetable oil; rejuvenator

作者关键词: 沥青; 植物油; 再生剂

摘要: The recent studies on fresh vegetable oil rejuvenator,waste vegetable oil rejuvenator and composite rejuvenator of asphalt have been reviewed. At the same time, the regeneration mechanism of the old asphalt mixture was introduced,and the further research on the rejuvenator was prospected. The development of the sustainable waste vegetable oil compound regenerant with low-cost and excellent performance is the main research direction in the future.

摘要: 综述了近年来新鲜植物油沥青再生剂、废弃植物油沥青再生剂以及复合再生剂的研究进展,同时介绍了旧沥青混合料的再生机理,并对再生剂的进一步研究进行了展望。开发可持续、价格低廉且性能优良的废弃植物油复合再生剂是今后一段时间的主要研究方向。

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标题: Differentiation Analysis of Viscoelastic Properties of High-Viscosity Modified Asphalt at High Temperature

标题: 高黏改性沥青高温黏弹特性指标区分度分析

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作者关键词: asphalt binder; high-viscosity modifier; high temperature performance; viscoelastic property; distinction degree

作者关键词: 沥青混合料; 高黏改性剂; 高温性能; 黏弹特性; 区分度

摘要: In order to optimize the evaluation index of high-viscosity modified asphalt at high temperature, the high temperature properties of three kinds of high-viscosity modified asphalt (12% of high viscosity modifier) and base asphalt were evaluated by hysteresis loop, dynamic shear rheological (DSR) test and softening point test. The rutting test was used to verify the results. Then, based on the rutting test results, the consistency and discrimination analysis of different high temperature performance evaluation indexes of three kinds of high-viscosity modified asphalt were made. The test results and result analyses indicate that three kinds of high-viscosity modifiers can improve the viscoelastic properties and high temperature properties of the base asphalt, but the modification effect is different. The evaluation indexes of different high temperature test methods can almost consistently evaluate the high temperature performance of the high-viscosity modified asphalts, but the distinguishing ability is different, the hysteresis loop test index and zero shear viscosity (ZSV) of the Carreau model can distinguish and evaluate the high temperature performance of high-viscosity modified asphalts well, while the distinction degree and consistency of rutting factor and softening point are poor.

摘要: 为得到能准确区分高黏改性沥青高温性能的评价指标, 分别对 3 种高黏改性沥青 (高黏改性剂掺量均为 12%) 及基质沥青进行滞后环、动态剪切流变 (DSR) 和软化点等试验, 并采用沥青混合料车辙试验进行了验证, 基于沥青混合料试验结果对 3 种高黏改性沥青的高温性能评价指标作了一致性和区分度分析. 结果表明: 3 种高黏改性剂的掺入均可提高基质沥青的黏

弹特性和高温性能,但改性效果不同;不同高温评价指标基本能对 3 种高黏改性沥青的高温性能做出一致性评价,但区分能力不同,其中滞后环试验技术指标和 Carreau 模型拟合的零剪切黏度(ZSV)值区分度和评价效果最好,而车辙因子和软化点较差.

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作者: 张丙武; 张鹏; 戴振华; 吴银河; 罗卫

标 题 : Analysis of the Mechanical Behavior of Segments of the Shield-driven Metro Tunnel beneath River Bottom

标题: 河底地铁盾构隧道管片受力特征分析

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文献类型: Article

作者关键词: Shield tunnel beneath river bottom; Beam-spring model; High water pressure;

Numerical analysis

作者关键词: 河底盾构隧道; 梁-弹簧模型; 高水压; 数值分析

摘要: Compared with other sections of a shield tunnel, the engineering geology and hydrogeological conditions of the shield tunnel section passing through river are more complex, especially in southern China where the seasonal precipitation is large, the surface and underground water levels change obviously. Taking certain section of the shield tunnel on Foshan metro line 2 as the research object, it carries out a numerical analysis on segments using Abaqus finite element software based on a beam-spring model, and verifies with the measured axial forces of segments. The results show the earth pressure on segment is slightly smaller than that calculated by the full-covered earth pressure method; water pressure around the shield tunnel has great influence on internal force of segment, the fissure water and confined water in rock stratum should be taken into account in the design of segment even if the rock layer above shield tunnel is poor in water permeability, and the earth pressure acting on segment is calculated with the full-covered earth pressure for the sake of security.

摘要: 穿河盾构隧道相比其它区段盾构隧道的工程地质和水文地质条件更为复杂, 特别在我国南方地区, 季节性降水量大, 地表及地下水位变化明显。针对穿河盾构隧道富水软粘土地层, 文章以佛山地铁2号线某区间穿河盾构隧道管片为研究对象, 利用Abaqus有限元软件, 采用梁-弹簧模型对受力管片进行数值计算分析, 并与现场试验所测得的管片轴力进行验证。结果表明, 现场测试管片受到的土压力略小于采用全覆土压方法的计算值; 盾构隧道周围的水压对管片内力的影响较大, 穿河盾构隧道即使上部土层透水性差, 在管片设计时也要考虑岩层中裂隙水和承压水存在的可能, 且为安全考虑, 作用在管片上的土压可按全覆土压来计算。

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标题: Durability of compound waterborne epoxy emulsified asphalt microsurfacing

标题: 复配型水性环氧乳化沥青微表处耐久性

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作者关键词: road engineering; durability; waterborne epoxy emulsified asphalt; accelerated wear; composite modification; micro-surfacing

作者关键词: 道路工程; 耐久性; 水性环氧乳化沥青; 加速磨耗; 复合改性; 微表处

摘要: In order to solve the problem of frequent early diseases on the microsurfacing of asphalt pavements, waterborne epoxy resin(WER) and styrene butadiene rubber(SBR) latex were used in the composite modification of emulsified asphalt to prepare a composite-modified waterborne epoxy emulsified asphalt microsurfacing. The asphalt was verified through three main indexes and adhesion properties. The water stability, abrasion resistance, and slip resistance of the mixture were taken as the evaluation criteria. The durability of the microsurfacing mixture under different waterborne epoxy resin contents was evaluated by the long-term immersion wet track abrasion test, multiple freezing-thawing cycle wet track abrasion test(WTAT) and four-wheel accelerated abrasion test, respectively, and compared with SBR modified emulsified asphalt microsurfacing. The results show that composite modification significantly improve the high- and low-temperature performance and adhesion performance of the emulsified asphalt. The microsurfacing mixture also has better durability than ordinary SBR modified emulsified asphalt microsurfacing. The WTAT values do not increase significantly under the conditions of long immersion time and multiple freezing-thawing cycles, and it has good water stability. The wear resistance can be maintained at a higher level during 15 000 times of accelerated wear, and the rate of decline of anti-slip performance is lower than that of SBR microsurfacing. When the waterborne epoxy resin content is increased to 8%, the durability of the composite modified microsurfacing continuously improves, the attenuation rate of various properties gradually slow down during the test. When the waterborne epoxy resin content exceed 8%, the improvement of durability at microsurface is no longer obvious, hence, the waterborne epoxy resin content should not exceed 8%.

摘要: 为解决沥青路面微表处早期病害多发问题, 使用水性环氧树脂(waterborne epoxy resin, WER)配合丁苯橡胶(styrene butadiene rubber, SBR)对乳化沥青进行复合改性, 制备复合改性水性环氧乳化沥青微表处, 通过三大指标及黏附性能验证沥青改性效果。以混合料的水稳定性、耐磨耗性及抗滑性作为评价标准, 分别采用长期浸水湿轮磨耗试验、多次冻融循环湿轮磨耗试验和四轮加速磨耗试验, 对不同水性环氧树脂掺量下的微表处混合料的耐久性进行评价, 同时与不参加水性环氧树脂的 SBR 改性乳化沥青微表处进行对比。研究结果表明: 在复合改性作用下, 乳化沥青的高低温性能及黏附性能均得到较大提升, 微表处混合料相较普通的 SBR 改性乳化沥青微表处表现出更为优异的耐久性能, 其湿轮磨耗值(wet track abrasion

test,WTAT)在长时间浸水与多次冻融循环的条件下不会出现大幅度增长,具有较好的水稳定性;在 15 000 次加速磨耗过程中的耐磨耗性能可以维持在较高的水平,且抗滑性能衰减速率较 SBR 微表处有所下降;水性环氧树脂掺量(质量分数,下同)逐渐增加至 8%的过程中,微表处的耐久性可以持续提升,即各项性能在试验过程中的衰减速率逐渐放缓,在超过 8%的掺量之后,对微表处的耐久性提升不再明显,所以建议较为经济的水性环氧树脂掺量不宜超过 8%。

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标题: Road Performance of SBS-PU Composite Modified Asphalt and Its Mixture

标题: SBS-PU 复合改性沥青及其混合料路用性能研究

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作者关键词: highway engineering; high viscosity and high elasticity asphalt; composite modification; asphalt mixture; road performance

作者关键词: 道路工程; 高黏高弹沥青; 复合改性; 沥青混合料; 路用性能

摘要: SBS-PU composite modified asphalt with high viscosity and high elasticity properties was

prepared based on composite modification technology. Its technical performance was evaluated by conventional performance test, multi-stress creep recovery (MSCR) test and bending beam rheological (BBR) test of the asphalt. On this basis, SMA-13 asphalt mixture was prepared with SBS-PU composite modified asphalt as binder, and its high-temperature rutting resistance, low-temperature cracking resistance, water stability and fatigue resistance were tested by rutting test, low-temperature bending test, freeze-thaw splitting test, Hamburg rutting test and indirect tensile fatigue test. At the same time, the technical properties of SMA-13 asphalt mixture were compared with those of TPS, SINOTPS, SBS and polyurethane (PU) modified asphalt mixture which were common in the market. The results show that SBS-PU composite modified asphalt prepared by composite modification technology meets the requirements of high viscosity and high elasticity asphalt, and has well high and low temperature performance and storage stability. The viscosity and elastic recovery of SBS-PU composite modified asphalt at 60 °C reaches 34 217 Pa·s and 97% respectively, which is twice and three times as much as that of PU modified asphalt. Its viscosity at 60 °C is higher than that of TPS modified asphalt, lower than that of SINOTPS modified asphalt, and its storage stability is higher than that of SBS, TPS and SINOTPS modified asphalt. Compared with PU modified asphalt, it has excellent properties of high viscosity and high elasticity. The high and low temperature performance and fatigue resistance of SBS-PU composite modified asphalt mixture are higher than those of TPS modified asphalt mixture, and lower than those of SINOTPS modified asphalt mixture. Generally, SBS-PU composite modified asphalt mixture has better high and low temperature performance and fatigue resistance. The water damage resistance of SBS-PU composite modified asphalt mixture under the action of hydrothermal coupling is slightly lower than that of TPS modified asphalt mixture, but it still meets relevant technical standards.

摘要: 基于复合改性技术制备了具有高黏高弹特性的 SBS-PU 复合改性沥青,通过沥青的常规性能试验、SHRP 评价体系多应力蠕变恢复(MSCR)试验、弯曲梁流变(BBR)试验评价了其技术性能。在此基础上,以 SBS-PU 复合改性沥青为胶结料制备 SMA-13 沥青混合料,通过车辙试验、低温弯曲试验、冻融劈裂试验、汉堡车辙试验(HWTD)及间接拉伸疲劳试验测试其高温抗车辙性能、低温抗裂性能、水稳性能及抗疲劳性能,同时与市场上常见的 TPS、SINOTPS、SBS 及聚氨酯(PU)改性沥青混合料的技术性能进行对比。结果表明:采用复合改性技术制备的 SBS-PU 复合改性沥青满足高黏高弹沥青指标要求,具有较好的高低温性能及储存稳定性;60 °C黏度与弹性恢复分别达到了 34 217 Pa·s 和 97%,分别为 PU 改性沥青的 2 倍和 3 倍;SBS-PU 复合改性沥青的 60 °C黏度值高于 TPS 改性沥青,低于 SINOTPS 改性沥青,储存稳定性高于 SBS、TPS、SINOTPS 改性沥青,相对 PU 改性沥青具有优异的高黏高弹特性;SBS-PU 复合改性沥青混合料的高温、低温及抗疲劳性能高于 TPS 改性沥青混合料,低于 SINOTPS 改性沥青混合料,总体上具有较好的高低温性能和抗疲劳性能,在水热耦合作用下的抗水损害能力略低于 TPS 改性沥青混合料,但仍满足相关技术标准。

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作者: 李家春; 宋宗昌; 侯少梁; 王利婷; 范小力

标题: Application of Beidou high-precision positioning technology in slope deformation monitoring

标题: 北斗高精度定位技术在边坡变形监测中的应用

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作者关键词: 北斗云监测系统; 自动化; 边坡变形监测; 监测精度

摘要: The Beidou satellite navigation system is briefly introduced, and the Beidou cloud monitoring system suitable for slope deformation monitoring is established based on the Beidou satellite navigation and positioning system. The system mainly includes four parts: data acquisition, data transmission, data analysis and result display, which realizes the whole process automation from data collection to monitoring result display. The advantages of Beidou technology in monitoring the slope deformation compared with the traditional slope deformation monitoring are analyzed. The accuracy test of the monitoring system is designed, and the relationship between the system accuracy and the positioning time is analyzed. The test results show that the accuracy of the horizontal direction of the monitoring system is about 2 mm when the positioning time is 24 h, which can fully meet the accuracy requirements of highway high slope deformation monitoring. The Beidou cloud monitoring system was applied to a high slope deformation monitoring project of Duan Expressway in Guizhou, and the automatic monitoring of the slope deformation was realized. The monitoring results show that Beidou technology can be applied to the slope deformation monitoring, which is of great significance to improve the slope deformation monitoring capability.

摘要: 简要介绍了北斗卫星导航系统,并基于北斗卫星导航定位系统建立了适合于边坡变形监测的北斗云监测系统,实现了从数据采集到监测结果显示的全过程自动化。分析了相对于

传统边坡变形监测应用北斗技术对边坡变形监测的优势。设计了监测系统的精度试验,分析了系统精度与定位时长的关系,试验结果表明,定位时长为 24 h 时,监测系统的水平方向的精度为 2 mm 左右,完全满足公路高边坡变形监测的精度要求。将北斗云监测系统应用于贵州都安高速某高边坡变形监测工程中,实现了对该边坡变形的自动化监测。监测结果表明北斗技术完全可以应用于边坡变形监测,对提高边坡变形监测能力具有重要意义。

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标题: Experimental Study of Performance of Desulfurized Rubber Asphalt and Rubber Asphalt

标题: 脱硫橡胶沥青和普通橡胶沥青性能试验研究

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文献类型: Article

作者关键词: highway engineering; desulfurized rubber asphalt (DRA); rubber asphalt (RA); viscosity-temperature curve; low-temperature adhesion; aging performance

作者关键词: 道路工程; 脱硫橡胶沥青; 普通橡胶沥青; 黏温曲线; 低温黏结性; 老化性能

摘要: Dongming 70# asphalt was selected as matrix asphalt (MA), and the desulfurized rubber asphalt (DRA) and rubber asphalt (RA) were prepared by mixing 22% ordinary rubber powder or deep desulfurized rubber powder respectively. And three asphalt mortars corresponding to MA, DRA and RA were prepared. Properties of DRA, RA were tested and compared, such as the infrared spectrum, viscosity-temperature curve, harmful gas emission, adhesion, storage stability, aging performance, high temperature performance etc.. The test results show that: compared with RA, there is no new chemical bonds in DRA, which shows that DRA and RA contain similar chemical functional groups. The mixing and compaction temperature of DRA are 166.20~175.40 °C, 151.30~157.98 °C respectively, and those of RA are 195.62~205.26 °C, 179.53~187.19 °C respectively, which indicates that RA has better high temperature performance. The harmful gas emission of DRA is about 1/2 of that of RA, indicating that DRA is relatively environmentally friendly. DRA is superior to RA in low-temperature cohesion, mechanical stirring storage stability and high-temperature rutting resistance after short-term aging. However, the aging resistance, high-temperature rutting resistance of DRA are lower than those of RA. It is recommended that DRA can be used in areas where high-temperature performance requirements are relatively low, while RA should be restricted due to its poor environmental protection.

摘要: 选用东明 70 #沥青作为基质沥青(MA),分别掺入沥青质量 22%的普通胶粉或深度脱硫胶粉,制备了脱硫橡胶沥青(DRA)和普通橡胶沥青(RA),并拌制了这 3 种沥青的沥青胶浆;对比分析了橡胶沥青 RA 和 DRA 的红外光谱、黏温曲线、有害气体排放量,以及黏附性、存储稳定性、耐老化性及高温性能等。结果表明:DRA 相较于 RA 无新化学键产生,说明 DRA 与 RA 所含化学官能团相似;沥青的拌和温度及压实温度,DRA 分别为 166.20~175.40 °C、151.30~157.98 °C,RA 分别为 195.62~205.26 °C、179.53~187.19 °C,说明 RA 的高温性能更好;DRA 的有害气体排放量约为 RA 的 1/2,说明 DRA 相对较环保;DRA 的低温黏结性、机械搅拌存储稳定性及短期老化后的高温抗车辙性能均优于 RA,但抗老化性能及高温抗车辙性能不及 RA。建议:DRA 可用于对高温性能要求相对较低的地区,而 RA 由于其环保性较差则应限制使用。

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作者: 张争奇; 田中男; 黄硕磊; 赵富强

标题: Composition and Process Parameters of SBS-PU Modified High-Viscosity and High-Elasticity Asphalt

标题: SBS-PU 高黏高弹沥青材料组成及工艺参数研究

来源出版物: 建筑材料学报 卷: 23 期: 1 页: 100-107 出版年: 2020

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文献类型: Article

作者关键词: road engineering; high viscosity and elasticity asphalt; composite modification; process parameter; mechanism analysis; performance analysis

作者关键词: 道路工程; 高黏高弹沥青; 复合改性; 工艺参数; 机理分析; 性能分析

摘要: The preparation of SBS-PU high viscosity and elasticity asphalt material was carried out through the optimization of raw materials such as matrix asphalt, polyurethane (PU) and styrene-butadiene-styrene copolymer (SBS). The modification mechanism, high temperature properties and storage stability of SBSPU binder were analyzed by Fourier transform infrared spectroscopy (FTIR), multiple stress creep recovery (MSCR) and dynamic shear rheological (DSR) test. The key process parameters were determined according to the grey correlation and asphalt performance. The results show that SBS and PU composite modification can effectively improve the viscoelasticity of the binder to possess high-viscosity and high-elasticity. SBS-PU composite modification combines both physical and chemical modification; PU chemical modification helps SBS-PU binder to obtain excellent high temperature rheological properties and storage stability. The recommended process parameters are as follows: shear temperature 170 °C, shear rate 4 000 r/min, shear time 50 min, curing time 60 min.

摘要: 通过对基质沥青、聚氨酯(PU)、苯乙烯-丁二烯-苯乙烯嵌段共聚物(SBS)等原材料的优选和分析,采用共混复合改性技术研发了一种新型的 SBS-PU 高黏高弹沥青.通过红外光谱(FTIR)、多应力蠕变恢复(MSCR)和动态剪切流变(DSR)试验,分析了 SBS-PU 高黏高弹沥青的改性机理、高温流变性能和储存稳定性.同时结合灰色关联熵分析及沥青性能变化规律,确定了改性工艺关键参数.结果表明:SBS 与 PU 复合改性可有效提高沥青的黏弹性能,使其达到高黏高弹特性;SBSPU 复合改性过程兼具物理和化学改性;PU 化学改性有助于 SBS-PU 高黏高弹沥青获得优异的高温流变性能和储存稳定性.推荐工艺参数为:剪切温度 170°C,剪切速率 4 000 r/min,剪切时间 50 min,发育时间 60 min.

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作者: 刘梦梅; 韩森; 杨赫; 吴晓明

标题: The applicability of different waterproof adhesive interlayer for bridge deck pavement

标题: 桥面铺装不同防水黏层的工程适用性

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文献类型: Article

作者关键词: bridge engineering; waterproof adhesive interlayer; digital image processing; lateral anti-permeability performance; bonding performance; engineering applicability

作者关键词: 桥梁工程; 防水黏层; 数字图像处理; 水平抗渗性能; 黏结性能; 工程适用性

摘要: Waterproof adhesive interlayer of the bridge deck pavement is prone to horizontal interlayer water seepage and ponding, which results in the degradation of interlayer bonding performance. In this paper, the CT scanning techniques, interlayer permeability tests, shear tests and pullout tests are used to comprehensively analyze the engineering applicability of five kinds of waterproof adhesive interlayer (modified emulsified asphalt, 4.75 synchronous surface dressing, 9.5 synchronous surface dressing, 5 mm asphalt concrete (AC-5) and slurry seal) commonly used in engineering. Based on the digital image processing technology, we quantize the interlayer pore distribution and analyze the relationship between the pore distribution characteristics of each waterproof adhesive layer and its impermeability or bond performance. The results show that the distribution of pores in the waterproof adhesive interlayer is closely related to the seepage, water accumulation and bonding properties. The more the pores are, the easier it is for water to seepage through interlayer, the lower the bonding performance of the bonding layer. Among the five typical waterproof adhesive interlayers, AC-5 has the best mechanical properties, while the modified emulsified asphalt has the best waterproof effect.

摘要: 桥面铺装防水黏层易发生水平层间渗水和积水等现象,进而造成层间黏结性能降低.通过电子计算机断层扫描、黏层水平渗水试验、层间剪切及拉拔试验,对工程中常用的 5 种桥面黏层(改性乳化沥青、4.75 同步碎石、9.5 同步碎石、5 mm 沥青混凝土(5 mm asphalt concrete, AC-5)和稀浆封层)的工程适用性进行研究.基于数字图像处理技术,量化层间空隙分布状态,并分析各防水黏层孔隙分布特性与抗渗水、黏结性能的关系.研究表明,黏层的空隙分布状况与其渗水、积水及黏结特性紧密相关,层间空隙越丰富,越易渗水,黏层的黏结性能越低.在 5 种典型黏层中,AC-5 的力学性能最优,改性乳化沥青的防水效果最佳.

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标题: Time-dependent system reliability assessment of existing multi-beam RC simply supported bridges

标题: 在役多梁式 RC 简支梁桥的体系时变可靠度评估方法

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作者关键词: bridge engineering; existing beam bridge; multi-beam simply supported bridge; reinforcement concrete; time-dependent system reliability assessment

作者关键词: 桥梁工程; 在役梁桥; 多梁式简支桥; 钢筋混凝土; 体系时变可靠度评估

摘要: To scientifically evaluate the structural performance of multi-beam simply supported

bridges in service, the redundancy of system bearing, in view of the randomness and time-varying of system failure, and the randomness of system time-varying, time-varying reliability evaluation model was established. Through accident investigation and conceptual analysis, the characteristics and attributes of failure mode and failure mechanism were systematically studied. A set of quantitative analysis methods and indicators were proposed for multi-beam bending failure mode. According to the bearing characteristics of the simply supported bridge, the failure mode analysis model considering multiple failure mechanisms were established. According to the bearing capacity characteristics of the multi-beam system, the failure probability expression of the system was derived with or without the horizontal connection. Based on the full probability formula, the time-varying reliability evaluation model under multiple failure mechanism was proposed, the contribution rate indicators of different failure modes were proposed. The results show that the most unfavorable component evaluation and the traditional system evaluation model may not make a comprehensive investigation of the structural force transmission mechanism and the interaction of each component and its changes, which may make a conservative or dangerous misjudgment to the structural safety. The model can accurately reflects the law of reliability degradation of structural bearing performance from the system level, considering both the randomness and time-varying of system failure, and the randomness of structural connectivity changes caused by the degradation of horizontal connectivity. 1 tab, 6 figs, 26 refs.

摘要: 为科学评价在役多梁式简支梁、板桥的结构性能,针对其体系承载的冗余性、体系失效的随机性与时变性、及体系时变的随机性,对多梁式钢筋混凝土(RC)简支桥开展体系时变可靠度评估模型研究。通过事故调查与概念分析,系统研究其失效模式和失效机制的特点和属性;针对多梁弯曲失效模式,提出一套定量分析方法和指标,建立在役多梁式钢筋混凝土简支桥的失效模式。根据简支桥的承载特点,建立考虑多重失效机制的失效模式分析模型;根据多梁式体系的承载传力特点,推导横向联系不同状态时,体系的失效概率表达;基于全概率公式,建立多重失效机制条件下,在役多梁式 RC 简支桥的体系时变可靠度评估模型;提出不同失效模式的贡献率指标,并提出多梁弯曲失效模式的定量分析指标与方法,分析其主要影响因素。以标准通用板梁桥为例,通过算例分析对提出的方法进行验证。研究结果表明:最不利构件评估和传统的体系评估模型未能全面考察结构的传力机制和各构件相互的作用及其变化,可能对结构安全性做出保守或危险的误判;提出的模型可从体系层次准确地反映结构承载性能可靠性退化规律,既可考虑体系失效的随机性和时变性,又可表现出横向连接的退化对结构体系改变的随机性,更加合理地反映了寿命周期内梁桥体系的安全可靠性。

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标题: Study on performance of epoxy resin/polyurethane composite modified asphalt and its mixture

标题: 环氧树脂/聚氨酯复合改性沥青及其混合料性能研究

来源出版物: 功能材料 卷: 51 期: 12 出版年: 2020

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文献类型: Article

作者关键词: epoxy resin/polyurethane; composite modified asphalt; modification mechanism; road performance; infrared spectroscopy; atomic force microscope

作者关键词: 环氧树脂/聚氨酯; 复合改性沥青; 改性机理; 路用性能; 红外光谱; 原子力显微镜

摘要: In view of the defects of poor flexibility of epoxy asphalt and easy cracks of asphalt pavement at low temperature, in this study, epoxy resin (EP), polyurethane (PU) and No. 90 base asphalt were selected to prepare EP/PU composite modified asphalt, and AC-13 asphalt mixture was prepared by using this binder. The reaction mechanism and microstructure of EP/PU composite modified asphalt were analyzed by Fourier infrared spectrometer (FTIR) and atomic force microscope (AFM). The high-temperature stability, low-temperature crack resistance and water stability of EP/PU composite modified asphalt mixture were studied by rutting test, trabecular bending test, immersion Marshall test and freeze-thaw splitting test, and compared with the performance of epoxy asphalt mixture and PU modified asphalt mixture. The results show that the epoxy group, acid anhydride carbonyl group C=O, -NCO and -OH could undergo chemical reactions during the composite modification process to form ether bond C-O-C and ester group C=O. Compared with the base asphalt, the "bee-shaped" structure in the composite modified asphalt was not obvious, the continuous phase and the dispersed phase were blurred, and the surface roughness and the contact area with the aggregate increased. EP/PU composite modified asphalt mixture had good road performance. The high-temperature stability and water stability of EP/PU composite modified asphalt mixture were slightly lower than that of epoxy asphalt mixture, but the low-temperature crack resistance was improved.

摘要: 针对环氧沥青柔韧性差、低温下沥青路面易产生裂缝的缺陷, 本研究选用环氧树脂 (EP)、聚氨酯 (PU) 和 90 号基质沥青制备 EP/PU 复合改性沥青, 并以此为结合料制备了 AC-13 沥青混合料。利用傅里叶红外光谱仪 (FTIR) 和原子力显微镜 (AFM) 对 EP/PU 复合改性沥青反应机理和微观结构等进行了分析; 通过车辙试验、小梁弯曲试验、浸水马歇尔试验和冻融劈

裂试验分别研究了 EP/PU 复合改性沥青混合料高温稳定性、低温抗裂性以及水稳定性,并与环氧沥青混合料和 PU 改性沥青混合料进行性能对比。结果表明,复合改性过程中环氧基、酸酐羰基 C=O、-NCO 以及-OH 可以进行化学反应,生成醚键 C-O-C 和酯基 C=O;与基质沥青相比,复合改性沥青中蜂形结构不明显,连续相与分散相边界模糊,表面粗糙度增加,与集料接触面积增加。EP/PU 复合改性沥青混合料拥有良好的综合路用性能。EP/PU 复合改性沥青混合料高温稳定性和水稳定性相较于环氧沥青混合料有所降低,但低温抗裂性得到改善。

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作者: 谢永利; 刘新荣; 晏长根; 杨忠平; 李家春; 周志军; 岳夏冰

标题: Research progress of special soil and rock engineering slopes

标题: 特殊岩土体工程边坡研究进展

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文献类型: Review

作者关键词: special soil and rock; engineering slope; stability analysis; engineering design; monitoring and prewarning

作者关键词: 特殊岩土体; 工程边坡; 稳定性分析; 工程设计; 监测预警

摘要: Theoretical research and stabilization of engineering slopes are of important meaning for ensuring safety construction and normal operation of infrastructures. The engineering slopes composed by rock mass and special soils with special characters including loess, expansive soil and frozen soil are different from common soil slopes, which show some differences in the theoretical research referring to stability analysis, engineering design and analysis software. For this purpose, based on review of related research literature at home and abroad, common theoretical research progress in terms of stability analysis, engineering design and analysis software of loess, expansive soil, frozen soil and rock engineering slopes was first summarized, and new theoretical research progress of loess, expansive soil, frozen soil and rock engineering slopes was expounded. Furthermore, development tendency of monitoring and prewarning of engineering slopes was summarized, typical treatment cases of special soil and rock engineering slopes were provided, and further research direction of special soil and rock engineering slopes was pointed.

摘要: 工程边坡的理论研究及稳定对确保基础设施的安全建设和正常运营有重要意义。由性质特殊的黄土、膨胀土与冻土等特殊土和岩体组成的工程边坡有别于一般土质边坡,在稳定性分析、工程设计和分析软件等理论研究方面表现出一定差异。为此,在查阅国内外相关资料的基础上,文章总结工程边坡在稳定性分析方法、工程设计和分析软件等理论方面的共性研究成果,又分别阐述黄土、膨胀土、冻土和岩质工程边坡在理论方面的新研究进展。此外,文章还概括工程边坡监测预警技术的发展趋势,提供特殊岩土体工程边坡的典型治理案例,并指出特殊岩土体工程边坡研究的进一步方向。

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作者: 王文真; 申爱琴; 郭寅川; 张东; 李得胜

标题: Shape Feature Parameters and Distribution Rule of Coarse Aggregate Based on Image Analysis

标题: 基于图像分析的粗集料形状特征参数及分布规律

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作者关键词: MATLAB; road engineering; shape feature; MATLAB; coarse aggregate; distribution rule; gradation range

作者关键词: 道路工程; 形状特征; 粗集料; 分布规律; 级配范围

摘要: The shape characteristics of coarse aggregate have an important influence on the road performance of asphalt mixture. In order to solve the problem of measuring and describing the basic contour shape characteristics of aggregate, after conducting a series of tests on the aggregate, such as cleaning, dyeing, drying and taking photos by tiling, the basalt coarse aggregate image which has particle size of 4.75, 9.5, 13.2, 16, 19 mm is enhanced and segmented respectively using MATLAB software. The size indicators (long axis and short axis, perimeter and area) of different particle sized aggregates are calculated based on digital image processing technology. The shape parameter indicators (rectangularity, shape index and angularity) of different particles are introduced and calculated by the aggregate size indicator. Based on the statistical method, the distributions of shape characteristics parameters are analyzed, the correlation between each parameter and gradation is analyzed by linear regression model, and the aggregate processing and the gradation of the mixture are evaluated by the shape parameters. The result shows that (1) the rectangularity shows a good consistency in numerical value, the variation ranges of the average value and the maximum value are small, and the rectangularity distribution of the aggregate with particle diameter of 9.5 mm is more uniform; (2) the average and minimum values of the shape indicator are not significantly changed, while the difference in values is large; (3) the angularity difference of aggregates with different particle sizes is larger, and the aggregate particles with angularity greater than 1.20 are less; (4) there is a good correlation between rectangularity/angularity and aggregate gradation, while the shape index is not related to the gradation; (5) rectangularity and angularity can represent the thickness of mixture gradation; (6) shape index can be used to evaluate whether the aggregate processing meets the requirements, which can provide a basis for determining the gradation range of the mixture.

摘要: 沥青混合料的路用性能受粗集料的形状特征影响显著。为解决集料基本轮廓形状特征的测量和表征问题,通过对集料进行清洗、染色、烘干、平铺拍照等一系列试验,使用 MATLAB 软件编程计算,对试验采集的玄武岩粒径分别为 4.75, 9.5, 13.2, 16, 19 mm 的粗集料图像进行了增强、分割等处理。基于数字图像处理技术计算得到不同粒径集料的大小指标(长短轴、周长和面积)。引入形状参数指标(矩形度、形状指数和棱角性),通过集料大小指标计算了不同颗粒的形状特征参数。基于统计学方法研究了各形状特征参数的分布规律,利用线性回归

模型分析了各形状特征参数与级配的相关性,并通过形状参数对集料加工和混合料级配进行了评价。结果表明:矩形度在数值上体现出较好的一致性,平均值与最大值变化幅度小,粒径为 9.5 mm 的集料矩形度分布更均匀;形状指数的平均值和最小值变化不明显,在数值上其差异性较大;不同粒径集料的棱角性差异性较大,棱角性大于 1.20 的集料颗粒较少;矩形度和棱角性与集料级配之间有着较好的相关性,而形状指数与级配不相关;矩形度和棱角性能够表征混合料级配的粗细;形状指数可以评价集料加工是否符合要求,为混合料级配范围的确定提供依据。

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标题: Study on the reliability index of flexural reliability of prestressed T beam bridge by RBF-SVM

标题: 基于 RBF-SVM 的拼宽预应力 T 梁桥抗弯可靠度分析

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文献类型: Article

作者关键词: widened T-beam bridge; support vector; flexural capacity; secondary internal force

of steel cable; reliability index

作者关键词: 拼宽 T 梁桥; 支持向量; 抗弯承载力; 钢束二次力; 可靠指标

摘要: At present, the load effect and reliability of bending resistance of concrete beam bridge are calculated by explicit functions. When the spatial beam lattice method is used to calculate the load effect including secondary internal forces, the sample data has high discreteness, so that the method of JC or Monte Carlo(MC) cannot be used directly. Based on the radial basis function-SVM(RBF-SVM), this paper studied the regression analysis of the load effect with high data discretization of widened T beams, which include secondary internal forces. The corresponding implicit function was constructed, and the requirements of reliability were satisfied. The results of the analysis show that the errors of implicit function by RBF-SVM meet the requirements of engineering precision. The flexural reliability indexes of widened T-beam bridge under the actions of constant loads and moving loads are all greater than 4.7, which meets the standard requirements of China. The flexural reliability indexes of the new and old beams with secondary internal forces of steel cables generally meet the reliability requirements of the International Joint Commission on Structural Safety(JCSS).

摘要: 目前针对混凝土梁桥结构抗弯可靠度的荷载效应多采用显式功能函数来计算,当采用空间梁格法求解包含次内力的荷载效应时,样本数据离散性较高,验算点法(JC)或 Monte Carlo 法(MC)无法直接采用。因此基于 RBF-SVM(radial basis function-SVM),对数据离散型较高的拼宽 T 梁(含次内力)进行荷载效应的回归分析,构建出了相应的隐函数,且可靠度满足要求。分析结果表明:采用 RBF-SVM 拟合荷载效应的隐式函数误差符合工程精度要求;仅考虑恒荷载和移动荷载作用的拼宽 T 梁桥的抗弯可靠指标均大于 4.7,满足我国规范要求;考虑钢束二次力作用后的新旧梁片抗弯可靠指标,总体满足国际结构安全度联合委员会(JCSS)建议的可靠度要求。

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标题: Microscopic Aging Mechanism of SBS Modified Asphalt in RTFOT

标题: SBS 改性沥青的 RTFOT 微观老化机理

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作者关键词: road engineering; aging mechanism; experimental study; SBS modified asphalt; Fourier transform infrared spectroscopy; fluorescence microscopy

作者关键词: 道路工程; 老化机理; 试验研究; SBS 改性沥青; 傅里叶变换红外光谱; 荧光显微镜

摘要: In order to study the microscopic aging mechanism of SBS modified asphalt,selecting Shell No. 70 matrix asphalt and 3501 linear SBS as raw materials,the SBS modified asphalts with 3%,4% and 5% SBS contents are prepared through indoor high-speed shearing equipment. The performance indicators,chemical composition and micro distribution variations of modified asphalt with different contents in different aging time are analyzed by conventional indicator test, Fourier transform infrared spectroscopy and fluorescence microscope. The double bond retention and gel content are used to analyze the variations of SBS modifier with the extension of thermal oxidative aging time. The result shows that (1) with the extension of aging time,the penetration and ductility of SBS modified asphalt decreases gradually, the penetration index and the equivalent softening point increases; (2) when the content of SBS is less than 5%,the penetration decreases significantly and the softening point increases gradually,while when the amount of SBS modifier is 5%,there are 2 stages of change,which are the decreasing range of penetration is first increases and then decreases, and the softening point drops at first and then rises up; (3) as the aging time prolongs,the BI decreases gradually,and both the CI and the SI increase,indicating that the main occurrence of the asphalt aging process is the oxygen absorption reaction,which produces carbonyl and sulfoxide groups; (4) when aging for 85 minutes,the modifier particles further absorb the light components in asphalt and swelled and partially dissolved,the distribution of the modifier particles is close to two-phase continuous structure at that time, which further confirmed that the 2 stages of change is the characteristic of the 5% SBS content modified asphalt; (5) along with the extension of thermal oxidative aging time,the SBS double bond retention decreases and the gel content increases, indicating that the SBS modifier has both degradation and crosslinking reaction during the aging process,and the rates of degradation and crosslinking increase with the extension of aging time.

摘要: 为了研究 SBS 改性沥青的微观老化机理,选择壳牌 70#基质沥青和 3501 线型 SBS 为原材料,通过室内高速剪切设备制备了 SBS 掺量分别为 3%,4%,5%的 SBS 改性沥青。采用常规指标试验、傅里叶变换红外光谱、荧光显微镜分析了不同 SBS 掺量的改性沥青在不同老化时间下的性能指标、化学组成和微观分布的变化规律。采用双键保持率和凝胶含量分析了 SBS 改性剂随着热氧老化时间延长的变化规律。结果表明:随着老化时间延长,SBS 改性沥青的针入度和延度逐渐下降,针入度指数上升,当量软化点增高;当 SBS 掺量小于 5%时,针入度显著下降,软化点逐渐上升,而当 SBS 掺量为 5%时,出现针入度降幅先大后小,软化点先降后升的两阶段变化;随着老化时间延长,BI 指数逐渐下降,CI 指数和 SI 指数均上升,这说明沥青老化过程中主要发生的是吸氧反应,生成羰基和亚砷基;老化 85 min 时,改性剂颗粒进一步吸收沥青中的轻质组分溶胀并部分溶解,此时分布状态接近两相连续结构,进一步证实了两阶段变化是 5%掺量改性沥青的特征;随着热氧老化时间延长,SBS 双键保持率下降,凝胶含量上升,表明

SBS 改性剂在老化过程中既发生了降解,又发生了交联反应,且降解和交联的速率随着老化时间延长而增大。

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材料科学与工程学院

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标题: Study on Adhesion Properties of Broken Pebble and Asphalt Based on Surface Energy Theory

标题: 基于表面能理论的破碎卵石与沥青粘附性能研究

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作者关键词: surface energy theory; broken pebble; adhesion properties; water stability; comprehensive energy ratio

作者关键词: 表面能理论; 破碎卵石; 粘附性能; 水稳定性; 综合能量比

摘要: Aiming at the problem that the composition of broken pebbles is complex and its composition varies with particle size, based on the surface energy theory, the adhesion properties of asphalt and broken pebbles with different particle sizes were studied. The surface energy of asphalt and broken pebble was tested by sessile drop method and capillary rise method, and the adhesion work and peeling work of asphalt and broken pebble system were calculated. The comprehensive energy ratio (CER) was used to evaluate the adhesion properties of broken pebbles and asphalt in

the four asphalt mixtures. The results show that the addition of anti-stripping agent will reduce the surface energy of the asphalt, increase the polar component, and reduce the dispersion component. Due to the different chemical composition, mineral composition and surface charge of broken pebble with different particle sizes, the surface energy of broken pebble with different particle sizes is different and the order from large to small is 5-10 mm, 10-15 mm, 3-5 mm, 0-3 mm. The adhesion work of 0-3 mm and 3-5 mm broken pebbles to SK90 asphalt, SBS modified asphalt, SK90 asphalt and SBS modified asphalt with anti stripping agent are better than that of 5-10 mm and 10-15 mm broken pebbles, and the peeling work of 0-3 mm and 5-10 mm broken pebbles to these four kinds of asphalt are less than that of 3-5 mm and 10-15 mm broken pebbles, which shows that the compatibility of different particle size broken pebbles and asphalt is different in adhesion performance. The results of water stability test of the mixture show that it is reasonable to evaluate the adhesion performance of broken pebble and asphalt with CER, and the size of CER can be used as the basis for selecting the material combination of asphalt aggregate system (especially the aggregate with complex composition), which provides theoretical and technical support for the application of broken pebbles in actual engineering.

摘要: 针对破碎卵石成分复杂且随着粒径变化其成分存在差异这一问题, 基于表面能理论研究了不同粒径破碎卵石与沥青的粘附性能。采用滴法和毛细管上升法分别测试沥青和破碎卵石的表面能, 并计算沥青与破碎卵石体系的粘附功以及剥落功; 采用综合能量比 (CER) 来评价四种沥青混合料中破碎卵石与沥青的粘附性能。结果表明: 抗剥落剂的加入会使沥青的表面能降低、极性分量升高、色散分量降低; 由于不同粒径的破碎卵石的化学成分、矿物成分、表面电荷不同, 导致不同粒径的破碎卵石的表面能不同, 从大到小排序为 5~10 mm、10~15 mm、3~5 mm、0~3 mm; 0~3 mm 和 3~5 mm 的破碎卵石与 SK90 沥青、SBS 改性沥青以及添加抗剥落剂的 SK90 沥青和 SBS 改性沥青的粘附功都优于 5~10 mm 和 10~15 mm 的破碎卵石, 0~3 mm 和 5~10 mm 的破碎卵石与这四种沥青的剥落功都小于 3~5 mm 和 10~15 mm 的破碎卵石, 这表明不同粒径的破碎卵石与沥青粘附性的配伍性不同; 混合料的水稳定性能试验表明, CER 这一指标评价破碎卵石与沥青的粘附性能是合理的, 并且 CER 可以作为沥青-破碎卵石系统材料组合的选择依据, 这为破碎卵石在实际工程中的应用提供了理论和技术支持。

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标题: Research progress on application of bagasse fibers

标题: 蔗渣纤维应用研究进展

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作者关键词: 复合材料; 蔗渣纤维; 表面改性与强化; 应用

摘要: This paper has elaborated the recent research progress on the chemical composition and microstructure of bagasse fibers and analyzed the application of bagasse fibers in papermaking and building board. To further enhance the strengthening effect of bagasse fibers in composite materials, the feasibility and necessity of its surface modification have been explored, which will open up new ways for bagasse fibers utilization of environmental protection and resource.

摘要: 综述分析了蔗渣纤维的材料组成、微观结构的研究进展, 分析其在造纸、建筑板材等方面的应用研究现状。为进一步提升蔗渣纤维在复合材料中的增强效果, 探索其表面改性的可行性、必要性; 为蔗渣纤维的环保、资源化利用开辟了新途径。

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标题: VCoNi 中熵合金力学性能的温度依赖性研究

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作者关键词: medium entropy alloy; rolling; mechanical properties; serrated flow

作者关键词: 中熵合金; 轧制; 力学性能; 锯齿流变

摘要: In this paper, the effect of service conditions at different temperatures (77K~773K) on the mechanical properties of entropy alloy in VCoNi was studied. Grain size of VCoNi alloy was adjusted by large deformation rolling and short time annealing. The change rule of material mechanical properties was studied by quasistatic tensile test and the internal mechanism was explained by microscopic observation. At 77K, a large number of twins and twisted dislocations in the material made the alloy have excellent comprehensive properties. With the increase of experimental temperature from 293K to 573K, the elongation and mechanical properties of the materials remained stable. When the experimental temperature reached 373K, the serrated flow appeared on the stress-strain curve.

摘要: 研究了不同温度 (77~773K) 的服役条件对 VCoNi 中熵合金力学性能的影响, 采用大变形轧制和短时间退火调控 VCoNi 合金晶粒尺寸, 通过准静态拉伸实验研究了材料力学性能的变化规律并通过微观组织观察对内在机制进行阐述说明。在 77K 时, 材料内部的大量孪晶和缠绕的位错, 使得合金具有优异的综合性能。随着实验温度由 293K 升高至 573K, 材料延伸率和力学性能保持稳定。当实验温度达到 373K, 应力-应变曲线上出现锯齿流变。

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标题: DIBCH 改性沥青及其混合料低温性能研究

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作者关键词: road engineering; plasticizer; DIBCH; low-temperature performance; grey correlation analysis

作者关键词: 道路工程; 增塑剂; 环己烷二甲酸二异丁酯; 低温性能; 灰色关联分析

摘要: To improve the service level of asphalt pavement at low temperature and prolong its service life, the matrix asphalt was modified by environment-friendly plasticizer diisobutyl cyclohexane dicarboxylate (DIBCH), the modified asphalt with different DIBCH content (0, 1.5%, 2%, 2.5%, 3%) was prepared by high-speed shear method, and the AC-13C DIBCH modified asphalt mixture was designed by Marshall method. The improvement effect of DIBCH on SK90 asphalt was analyzed by ductility test, penetration test and bending beam rheological

test. The low temperature crack resistances of SK90 and modified asphalt mixture were evaluated by low temperature trabecular bending test. The results shown that the ductility and equivalent brittleness of SK90 asphalt increased obviously with the increase of DIBCH content, and the creep stiffness and creep rate of DIBCH modified asphalt were obviously better than those of SK90 asphalt. Through mechanical and energy analysis, DIBCH was helpful to improve the low temperature crack resistance of SK90 asphalt mixture. Based on the analysis of the performance indexes of DIBCH modified asphalt and its mixture, it was concluded that the best content was 3.0%. The grey correlation analysis shown that the creep rate can better evaluate the low temperature performance of DIBCH modified asphalt, and the flexural tensile strength RB can better evaluate the low temperature performance of DIBCH modified asphalt mixture.

摘要: 为了改善沥青路面在低温下的服务水平, 延长其使用寿命, 采用环保型增塑剂环己烷二甲酸二异丁酯(DIBCH)对基质沥青进行改性, 以高速剪切法制备不同 DIBCH 掺量(0、1.5%、2%、2.5%、3%)的改性沥青, 以马歇尔法设计 AC-13C 型 DIBCH 改性沥青混合料, 通过延度、针入度和弯曲梁流变等试验分析 DIBCH 对 SK90 沥青的改善效果, 采用低温小梁弯曲试验评价 SK90 及改性沥青混合料的低温抗裂性能。结果表明: 随 DIBCH 掺量的增加, SK90 沥青的延度、当量脆点明显增大; DIBCH 改性沥青蠕变劲度及蠕变速率较 SK90 沥青相比得到明显改善; 通过力学和能量角度分析, DIBCH 有助于改善 SK90 沥青混合料的低温抗裂性。综合 DIBCH 改性沥青及其混合料各低温性能指标分析得出其最佳掺量为 3.0%。通过灰色关联分析可知, 蠕变速率能够较好地评价 DIBCH 改性沥青的低温性能, 采用抗弯拉强度(RB)能够较好地评价 DIBCH 改性沥青混合料的低温性能。

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标题: Dual Effect of Aluminum Doping and Lithium Tungstate Coating on the Surface Improves the Cycling Stability of Lithium-rich Manganese-based Cathode Materials

标题: 铝掺杂及钨酸锂表面包覆双效提升富锂锰基正极材料的循环稳定性

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作者关键词: Li₂WO₄; lithium ion battery; sol-gel; lithium-rich manganese-based cathode material; Li₂WO₄; Al-doping

作者关键词: 锂离子电池; 溶胶-凝胶法; 富锂锰基正极材料; Al 掺杂

摘要: The layered lithium-rich manganese-based cathode material has been widely concerned because of its advantages such as a specific discharge capacity greater than 250 mAh·g⁻¹ and a high discharge platform, and is expected to become the next-generation lithium ion battery cathode material. However, lithium-rich manganese-based cathode materials have poor cycle stability, low coulombic efficiency for the first charge and discharge, and low rate performance. The most important thing is that the problem of faster voltage decays on the discharge platform has not been effectively solved. The current is mainly to improve the performance by element doping modification and surface coating, so it is very important to find suitable doping elements and coating materials. The common coating material is mainly to prevent direct contact between the electrolyte and the positive electrode material to improve the cycle stability, and it is difficult to slow down the attenuation of the discharge voltage platform. Al-doping lithium-rich manganese-based Li_{1.2}Mn_(0.54-x)Al_xNi_(0.13)Co_(0.13)O₂ (x=0, 0.03) cathode material was prepared by sol-gel method and Li₂WO₄ surface coating by one-step liquid phase method. The required materials were confirmed by X-ray diffractometer (XRD), energy dispersive spectroscopy (EDS) and scanning electron microscope (SEM) tests, and then the effects of Al-doping and Li₂WO₄ coated double-effect modification on the electrochemical performance of lithium-rich manganese-based cathode materials were studied by electrochemical test system. The results show that Al doping significantly improves the cycling stability of lithium-rich manganese-based cathode materials, and the coating Li₂WO₄ significantly improves its rate performance and discharge platform voltage attenuation. In 5% Li₂WO₄ coated Li_{1.2}Mn_(0.51)Al_(0.03)Ni_(0.13)Co_(0.13)O₂ cathode material in charge and discharge voltage 2.0~4.8 V, and under the current density 1000 mA·g⁻¹, the specific capacity is still as high as about 110 mAh·g⁻¹. At the same time, the specific capacity retention rate was 78% after 300 cycles at the current density of 100 mA·g⁻¹, and the voltage decay of the discharge platform significantly slowed down during the cycle.

摘要: 采用溶胶-凝胶法合成 Al 掺杂富锂锰基 Li_{1.2}Mn_(0.54-x)Al_xNi_(0.13)Co_(0.13)O₂ (x=0, 0.03) 锂离子电池正极材料, 之后采用一步液相法制备 Li₂WO₄ 包覆层, 系统地研究了 Al 掺杂和 Li₂WO₄ 包覆双效改性对富锂锰基正极材料电化学性能的影响. 结果表明, Al 掺杂后明显提升富锂锰基正极材料的循环稳定性, 包覆层 Li₂WO₄ 明显改善其倍率性能和放电平台电压衰减问题. Li₂WO₄ 包覆量为 5% Li_{1.2}Mn_(0.51)Al_(0.03)Ni_(0.13)Co_(0.13)O₂ 正极材料在 2.0~4.8 V 充放电电压区间及

1000 mA·g⁻¹电流密度下比容量仍高达 110 mAh·g⁻¹左右,同时在 100 mA·g⁻¹的电流密度下循环 300 次容量保持率为 78%,而且循环过程中放电平台电压衰减也明显减缓.该工作为解决锂离子电池富锂锰基正极材料循环稳定性和平台电压衰减提供了新的思路.

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标题: Influence of Contact Parameters of Coarse Aggregate on Damage Evolution of Asphalt Mixture

标题: 粗集料接触参数对沥青混合料损伤演化的影响

来源出版物: 中国公路学报 卷: 33 期: 10 页: 201-209 出版年: 2020

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作者关键词: road engineering; asphalt mixture; digital image correlation method; meso-damage; contact parameters of coarse aggregate

作者关键词: 道路工程; 沥青混合料; 数字图像相关方法; 细观损伤; 粗集料接触参数

摘要: Research based on a digital image correlation method and four-point-bending fatigue tests was conducted to determine the relationship between meso-damage and macro-performance of asphalt mixtures. The different contact states of coarse aggregate were investigated to determine the scale effect of meso-damage of the asphalt mixtures. First, the three-dimensional packing and filling theory and the particle interference theory was used as a basis for proposing a computing method of the coordination number of particle contact force (n_{pfc}) and characterizing the stable state of the framework structure. By controlling the unit screening rate of the key screen mesh (2.36-4.75 mm) and using the SAC design method, four different SAC16 gradations, which reflect the combinations of the different particle size aggregates, were designed. Moreover, n_{pfc} was calculated for asphalt mixtures with different aggregate gradations. Then, combining the digital image correlation method and the four-point-bending fatigue tests, the evolution of the horizontal strain field of asphalt mixture beam specimens was analyzed using the DIC method; a quantitative analysis method for fatigue damage factors of asphalt mixtures was proposed. Finally, the evolution of the meso-damage and the fatigue damage factor of asphalt mixtures were analyzed using the different contact parameters of coarse aggregate. Moreover, the analysis extended to the K_m value, which indicates the macro-fatigue resistance. The results show that with increasing fatigue loading, the horizontal strain distribution of the four different n_{pfc} asphalt mixtures changes from non-uniform to uniform, the strain variable increases from small to large, and the fatigue damage factors increases significantly. The fatigue damage factor decreases significantly with increasing n_{pfc} . When n_{pfc} is from 7.73 to 9.55, the fatigue meso-damage scale superposition effect of this graded asphalt mixture is small. Simultaneously, the K_m value, which characterizes the macroscopic fatigue resistance performance, tends to first increase and then decrease slightly as n_{pfc} increases. When n_{pfc} is from 7.73 to 9.55, the corresponding macro-fatigue resistance is better. Therefore, selecting a reasonable n_{pfc} optimizes the meso-structural state of the main skeleton inside the asphalt mixture, reduces the effect of the meso-damage scale effect, and improves the macro-fatigue resistance of the asphalt mixture.

摘要: 为了揭示沥青混合料内部细观损伤对宏观性能的影响,基于 DIC 方法与四点弯曲疲劳试验,对不同粗集料接触状态的混合料细观损伤尺度效应进行研究。首先以颗粒堆积理论与粒子干涉理论为基础,提出可表征细观主骨架结构状态的颗粒接触主力链配位参数(n_{pfc})计算方法。采用 SAC 设计方法,通过控制关键筛孔 2.36~4.75 mm 的分计筛余质量百分比,设计 4 组可反映不同粒径尺寸集料组合形式的 SAC16 级配(B60S00~B60S15),计算不同级配沥青混合料对应的 n_{pfc} 。其次,结合 DIC 方法与四点弯曲疲劳试验,分析疲劳荷载作用下沥青混合料小梁试件水平应变场演化特征,并提出混合料疲劳损伤因子定量分析方法。最后对不同粗集料接触参数的沥青混合料的细观损伤演化特征、疲劳损伤因子 D_{FD} 及表征宏观抗疲劳性能的 K_m 进行分析。研究结果表明:随着疲劳荷载作用次数的增加,4 种不同 n_{pfc} 混合料的水平应变变量逐渐增大,各 D_{FD} 也均显著增加;随着 n_{pfc} 的增大, D_{FD} 明显减小,当 $n_{\text{pfc}}=7.73\sim 9.55$ 时, D_{FD} 较小,混合料的疲劳细观尺度损伤叠加效应较小;同时,随着 n_{pfc} 增加, K_m 呈先增大后略微减小的趋势;当 $n_{\text{pfc}}=7.73\sim 9.55$ 时,对应的宏观抗疲劳性能较好;因此,选取合理的 n_{pfc} 可优化沥青混合料内部主骨架细观结构状态,减少细观尺度损伤叠加效应影响,提高沥青混合料的宏观抗疲劳性能。

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标题: Advances in Mechanisms for Flash Sintering of Ceramic Materials

标题: 陶瓷材料闪烧机理研究进展

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作者关键词: flash sintering; mechanism; Joule heating; defect generation; electrochemical reaction

作者关键词: 闪烧; 机理; Joule 热; 缺陷生成; 电化学反应

摘要: Flash sintering is a new type of electric field/current assisted sintering technology developed in recent years, which can densify ceramic materials in very short time at low temperatures. Although flash sintering has been demonstrated in many ceramic materials, there is

no consensus on the sintering mechanism. In this paper, several main sintering mechanisms have been reviewed, including Joule heating, defect generation, electrochemical reaction, etc. In addition, the advantages and disadvantages of various mechanisms are discussed based on the reported works. Finally, the research direction of the flash sintering mechanism is proposed.

摘要: 闪烧是近年来发展出的一种新型的电场/电流辅助烧结技术,能在低温下极短时间内实现陶瓷材料的烧结致密化。研究者采用闪烧技术制备了多个体系的陶瓷材料,但是关于其闪烧机理并没有达成共识。本工作总结了目前已经提出的几种主要闪烧机理,包括 Joule 热、缺陷生成、电化学反应等,并结合已有的研究结果,探讨了各种机理的优势及存在的问题,最后提出了闪烧机理的研究方向。

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标题: Effects of Carboxyl Group on Performance of Amphoteric Asphalt Emulsifier and Emulsified Asphalt

标题: 羧基对两性沥青乳化剂及乳化沥青性能影响研究

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 11 页: 81-85 出版年: 2020

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文献类型: Article

作者关键词: highway engineering; emulsified asphalt; asphalt emulsifier; carboxyl group; surfactant; chloroacetic acid

作者关键词: 道路工程; 乳化沥青; 沥青乳化剂; 羧基; 表面活性剂; 氯乙

摘要: To study the effect of carboxyl group on the performance of amphoteric asphalt emulsifier and emulsified asphalt prepared from amphoteric asphalt emulsifier, three different asphalt emulsifiers were synthesized by using oleic acid, different molar ratio of diethylene triamine and chloroacetic acid, and their performances were characterized by infrared spectroscopy, surface activity and hydrophilic-lipophilic balance (HLB) value. The performances of emulsified asphalt prepared by different emulsifiers were tested. The research results show that: with the increase of carboxyl group in molecular structure of emulsifier, the surface tension of emulsifier at the critical micelle concentration (CMC) is increased from 37.42 mN/m to 40.24 mN/m and 43.98 mN/m; HLB value is increased from 8.1 to 11.1 and 13.9, which means that the water solubility becomes better; the demulsification rate of emulsified asphalt is from middle fission to fast cracking and then to slow cracking; the penetration at 25 °C of emulsified asphalt evaporation residue gradually decreases from 8.0 mm to 7.9 mm and 7.6 mm; the softening point successively increases from 47.0 °C to 47.5 °C and 48.5 °C, and the hardness of asphalt increases.

摘要: 为研究羧基对两性沥青乳化剂及其制备的乳化沥青的性能影响,笔者利用油酸、不同摩尔比的二乙烯三胺和氯乙酸合成了三种沥青乳化剂,采用红外光谱、表面活性和亲水亲油平衡值表征其性能,对不同乳化剂制备的乳化沥青性能进行了测试。研究结果表明:随着分子结构中羧基的增加,乳化剂在临界胶束浓度下的表面张力由 37.42 增加到 40.24 和 43.98 mN/m; 亲水亲油平衡值由 8.1 增大到 11.1 和 13.9,水溶性变好;乳化沥青的破乳速度从中裂变为快裂再到慢裂;乳化沥青蒸发残留物的 25 °C 针入度由 8.0 减小为 7.9 和 7.6 mm,软化点由 47.0 升高为 47.5 和 48.5 °C,沥青的硬度增大。

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标题: 锰黄铜滚压强化及综合性能研究

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作者关键词: manganese brass; rolling strengthening; microstructure; hardness; tribology

作者关键词: 锰黄铜; 滚压强化; 显微组织; 硬度; 摩擦磨损

摘要: The surface treatment of as - cast manganese brass alloy was carried out by mechanical rolling, and the surface morphology, microstructure, hardness and friction and wear properties of the samples before and after rolling were studied and analyzed. The results show that the surface roughness of as-cast manganese brass is improved nearly three times after rolling. The grains are seriously deformed. The surface microhardness is 275HV0.1, which is 65% higher than the original as-cast sample, and the depth of the affected layer is 180 μm . Under the condition of oil lubrication, the friction coefficient of the rolling specimen is obviously reduced and stable at low load (50 N and 75 N), and the wear rate is more than 2 times lower than that of the original specimen. The surface comprehensive properties of the rolled samples are improved obviously.

摘要: 用机械滚压对铸态锰黄铜合金进行表面处理, 研究并分析滚压前后试样的表面形貌、显微组织、硬度及摩擦磨损性能。结果表明: 铸态锰黄铜经滚压强化后, 晶粒严重变形; 粗糙度降低 70%; 表层显微硬度最高为 275HV0.1, 比铸态原试样提高 65%, 硬化层深度为 180 μm ; 在油润滑条件下, 滚压试样在低载荷 (50 N 和 75 N) 时, 摩擦因数明显降低且稳定, 磨损率比原试样降低 2 倍以上。经滚压强化后, 试样表面综合性能明显提升。

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标题: 丝网印刷法制备 Y 改性 CuMn₂O₄ 尖晶石涂层研究

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作者关键词: screen printing; spinel coating; Y modification; high temperature oxidation resistance; high temperature conductivity

作者关键词: 丝网印刷; 尖晶石涂层; Y 改性; 高温抗氧化性; 高温导电性

摘要: The work aims to improve the high temperature oxidation resistance and electrical conductivity of CuMn₂O₄ spinel coatings. Y modified CuMn₂O₄ spinel powder was prepared by sol-gel method. Y modified CuMn₂O₄ spinel coating was prepared on the surface of SUS430 alloy by screen printing. The phase structure and microstructure of Y modified CuMn₂O₄ spinel powder and coating were characterized by XRD and SEM. The high temperature oxidation behavior of CuMn₂O₄ spinel coating before and after Y modification in air at 800 °C for 168 h was studied by weight gain experiment. The area specific resistance of coating was measured by the four-point method. It was found that the lattice constant of CuMn₂O₄ spinel powder increased with the increasing of the content of rare earth Y. When the content of Y element was fixed at 0.02 mol/L, the increasing trend of lattice constant tended to be smooth and the modified CuMn₂O₄ spinel powder with stable structure, high crystallinity, fine grain size and less agglomeration could be obtained. The oxidation kinetics curves of CuMn₂O₄ spinel coating before and after Y modification followed the parabolic oxidation law, and the oxidation rate constants were $9.39 \times 10^{-5} \text{ mg}^2/(\text{cm}^4 \cdot \text{h})$ and $6.31 \times 10^{-5} \text{ mg}^2/(\text{cm}^4 \cdot \text{h})$, respectively. The area specific resistance of the Y modified CuMn₂O₄ spinel coating oxidized at 800 °C for 168 h was about $26.2 \text{ m}\Omega \cdot \text{cm}^2$, which was lower than that of unmodified coating (about $27.3 \text{ m}\Omega \cdot \text{cm}^2$). The Y modified CuMn₂O₄ spinel coating can effectively improve the high temperature oxidation resistance and electrical conductivity of metal interconnects.

摘要: 目的提高 SOFC 金属连接件 CuMn₂O₄ 尖晶石涂层高温抗氧化性能和导电性能。方法采用溶胶-凝胶法制备 Y 改性 CuMn₂O₄ 尖晶石粉末,采用丝网印刷技术在 SUS430 合金表面制备 Y 改性 CuMn₂O₄ 尖晶石涂层。利用 XRD、SEM 表征 Y 改性 CuMn₂O₄ 尖晶

石粉体及涂层的物相结构及微观形貌。利用氧化增重实验研究 Y 改性前后 CuMn₂O₄ 尖晶石涂层试样在 800 °C 空气中氧化 168 h 的高温氧化行为,通过四点法测量涂层在高温氧化过程中的面比电阻值。结果 CuMn₂O₄ 尖晶石粉末的晶格常数随着稀土 Y 含量的增大而增大,当 Y 元素的含量为 0.02 mol/L 时,晶格常数增幅趋于平缓,此时所得粉体物相结构稳定,结晶程度较好,晶粒尺寸细小且颗粒间团聚现象较少。Y 改性前后 CuMn₂O₄ 尖晶石涂层试样的氧化动力学曲线均遵循抛物线氧化定律,其氧化速率常数分别为 9.39×10^{-5} 、 6.31×10^{-5} mg²/(cm²·h)。Y 改性 CuMn₂O₄ 尖晶石涂层试样在 800 °C 氧化 168 h 时的面比电阻值约为 26.2 mΩ·cm²,低于未改性涂层试样的面比电阻值(约 27.3 mΩ·cm²)。结论 Y 改性 CuMn₂O₄ 尖晶石涂层能有效改善金属连接体的高温抗氧化性能和导电性能。

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标题: Study on microstructure and properties of VAE modified cement mortar

标题: VAE 改性水泥砂浆微观结构及性能研究

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作者关键词: cement mortar; vinyl acetate-ethylene polymer; carbonization; micro structure

作者关键词: 水泥砂浆; 醋酸乙烯-乙烯共聚物; 碳化; 微观结构

摘要: A polymer modified cement mortar for concrete pavement maintenance was prepared with vinyl acetate-ethylene polymer(VAE),cement,quartz sand and other materials.The effects of VAE content on the fluidity,strength,shrinkage,carbonization resistance and interface adhesion of cement mortar were studied.The microstructure of the modified cement mortar was observed by SEM.The results show that the flexural strength and interfacial bonding strength increase firstly and then decrease with the increase of VAE content, indicating that VAE can improve the flexibility and interfacial bonding strength of cement mortar.With the VAE content increases, the flow loss rate, shrinkage rate and the carbonation depth gradually decrease, indicating that VAE can improve the water retention capacity,dry shrinkage rate,and resistance to carbonization erosion of cement mortar.The SEM test results show that the polymer glue film fills the harmful pores inside the mortar and wraps on the surface of the hydration product,which improves the compactness of the mortar.Considering the physical,mechanical and economic properties of modified cement mortar, it is recommended that the reasonable dosage of VAE as a modified polymer is 8% of the amount of cementitious material.

摘要: 以醋酸乙烯-乙烯共聚物(VAE)、水泥、石英砂等材料,制备出一种混凝土路面修复用聚合物改性水泥砂浆,研究了 VAE 掺量对水泥砂浆流动度、强度、干缩、抗碳化特性及界面粘结性的影响,并采用扫描电镜(SEM)观测其微观结构。结果表明,抗折强度、界面粘结强度随 VAE 掺量的增加先增加后降低,表明 VAE 可以提高水泥砂浆的柔韧性、界面粘结强度;随着 VAE 掺量的增加,1 h 流动度损失率、干缩率、碳化深度逐渐降低,表明 VAE 可以改善水泥砂浆的保水能力、干缩率、抗碳化侵蚀能力;SEM 测试结果显示,聚合物胶膜填充于砂浆内部的有害孔隙,裹附于水化产物表面,提高了砂浆的密实程度。综合考虑水泥砂浆物理力学及经济性能,推荐 VAE 作为改性聚合物的合理掺量为胶凝材料用量的 8%。

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标题: Mechanisms and effects of graphene oxide in cement-based materials

标题: 氧化石墨烯在水泥基材料中的作用研究综述

来源出版物: 应用化工 卷: 49 期: 9 页: 2377-2380 出版年: 2020

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作者关键词: graphene oxide; cement-based materials; mechanism of action; review

作者关键词: 氧化石墨烯; 水泥基材料; 作用机理; 综述

摘要: Based on the application of GO in cement-based materials at home and abroad, the action mechanism of GO in cement-based materials was analyzed, and the performance improvement of GO cement-based materials in domestic and foreign literatures was summarized. The current research trends of GO in cement-based materials are reviewed, which can provide references for future research on GO in cement-based materials.

摘要: 结合国内外氧化石墨烯在水泥基材料中的应用研究, 分析了氧化石墨烯在水泥基材料中的作用机理, 并通过总结国内外文献中氧化石墨烯水泥基材料的性能改善。综述了现阶段氧化石墨烯在水泥基材料中的研究动态, 为后续氧化石墨烯在水泥基材料中的研究提供借鉴。

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标题: Microstructure and properties of laser alloyed Mo_1B_9Cr_x coating on 45 steel

标题: 45 钢激光合金化 Mo_1B_9Cr_x 涂层的组织及性能

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作者关键词: laser alloying; Mo_1B_9Cr_x alloyed coating; Cr content; microstructure; wear resistance

作者关键词: 激光合金化; Mo₁B₉Cr_x 合金化涂层; Cr 含量; 组织; 耐磨性

摘要: Mo₁B₉Cr_x alloyed coating was prepared on the 45 steel substrate by laser alloying technology. The effect of Cr content on the microstructure and properties of the coating was studied. The results show that the best laser alloying process parameters for Mo₁B₉Cr_(1.1) coating are laser power of 3.3 kW, scanning speed of 900 mm/min, overlap rate of 30%. By adopting this process, the coating shows a good metallurgical bonding with the substrate without voids and cracks, the alloying zone is composed of Fe-Mo, Fe₂B, Fe-Cr, Cr₂B, Cr_xFe_y solid solutions and compounds, and the coating hardness, friction coefficient, and wear rate gradually decrease when the Cr content increases from 1.1% to 23.3%. When the Cr content is 1.1%, the maximum coating hardness is 1005 HV0.1. When the Cr content is 23.3%, the wear resistance is the best, the friction coefficient is 0.475, the wear rate is $0.574 \times 10^{-14} \text{ m}^3/(\text{N} \cdot \text{m})$, and the form of coating wear is mainly a combination of abrasive wear and adhesive wear.

摘要: 通过激光合金化技术在 45 钢基体上制备 Mo₁B₉Cr_x 合金化涂层,研究了 Cr 含量对涂层组织性能的影响。结果表明,Mo₁B₉Cr_(1.1)涂层最佳激光合金化工艺为激光功率 3.3 kW,扫描速度 900 mm/min,搭接率 30%;在此工艺条件下,涂层与基体呈良好的冶金结合,无孔洞和裂纹,合金化区组织为 Fe-Mo、Fe₂B、Fe-Cr、Cr₂B、Cr_xFe_y 固溶体和化合物;随 Cr 含量从 1.1% 增加到 23.3%,涂层硬度、摩擦因数、磨损率逐渐减小;当 Cr 含量为 1.1% 时,涂层硬度最大,为 1005 HV0.1;当 Cr 含量为 23.3% 时,其耐磨性能最好,摩擦因数为 0.475,磨损率为 $0.574 \times 10^{-14} \text{ m}^3/(\text{N} \cdot \text{m})$,涂层磨损形式主要是磨粒磨损和粘着磨损结合的形式。

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作者关键词: TC4; MoS₂; TC4 alloy; micro-arc oxidation; MoS₂; in situ synthesis; friction and wear

作者关键词: 微弧氧化; 原位合成; 摩擦磨损

摘要: The design and preparation of antifriction coating on titanium alloy surface is one of the important technologies to improve the wear resistance of titanium alloy components and ensure the safety in service. In order to solve the problems of uneven dispersion of antifriction agents and poor adhesion of coating caused by easy agglomeration in titanium alloy antifriction coating, this paper adopts one-step micro-arc oxidation technology to in situ synthesize MoS₂/TiO₂ composite ceramic coating with anti-wear effect on the surface of titanium alloy. The effects of sulfur source concentration on microstructure and wear resistance of the coating was discussed. The results show that MoS₂/TiO₂ composite ceramic film has been successfully prepared by micro-arc oxidation with Na₂S and Na₂MoO₄ as sulfur source and molybdenum source, respectively. By controlling Na₂S concentration, nano-MoS₂ particles with small size and uniform distribution can be generated in situ, and the content and morphology of MoS₂ can be regulated. With the increase of Na₂S concentration, the coating becomes compact and the roughness decreases. When the addition amount reaches 60 g/L, the coating turns into loose due to sulfur precipitation and the roughness increases. Due to the uniform distribution of MoS₂ particles on the surface and inside of the coating, the abrasion resistance of the obtained coating is improved by 395.4% and 129.4% compared with the conventional micro-arc oxidation coating and the coating prepared by directly adding MoS₂ particles into the electrolyte, respectively. At the same time, adhesion (reaching 723.8 N) increases by 87.1% compared with that of the traditional micro-arc oxidation, indicating that this technology not only guarantees good self-lubrication effect, but also improves adhesion of the coating and matrix. The results can provide new ideas and research methods for the design and preparation of titanium alloy

wear-resistant coatings.

摘要: 钛合金表面减摩涂层的设计和制备是提升钛合金构件耐磨性能、保障服役安全的重要技术之一。针对于目前钛合金减摩涂层中减摩剂分散不均匀,易于团聚导致膜基结合力差等问题,本研究采用一步微弧氧化技术在 TC4 合金表面原位生长纳米 MoS₂ 颗粒,制备具有减摩作用的 MoS₂/TiO₂ 复合陶瓷膜层;讨论了原位反应中硫源添加量对膜层微观结构及耐磨性能的影响。结果表明:以 Na₂S 和 Na₂MoO₄ 分别为硫源和钼源在 TC4 合金表面通过微弧氧化制备出了 MoS₂/TiO₂ 复合陶瓷膜层;通过控制 Na₂S 浓度可以原位生成具有小尺寸、均匀化分布的纳米 MoS₂ 颗粒,并实现对 MoS₂ 含量和形态的调控。随着 Na₂S 浓度的增加,膜层结构逐渐致密化且表面粗糙度较低,当添加量到达 60 g/L 时,由于硫沉淀作用导致膜层开始疏松,粗糙度增加。由于膜层表面和内部均存在均匀化分布且具有自润滑作用的 MoS₂ 颗粒,所得膜层耐磨性较传统微弧氧化膜层或直接添加 MoS₂ 颗粒所得膜层分别提高了 395.4%、129.4%;同时,膜基结合力较传统微弧氧化提高了 87.1%,达到了 723.8 N,说明了该技术在保证良好的自润滑效果同时改善了膜基结合力。该研究结果可以为钛合金耐磨涂层设计和制备提供新思路和研究方法。

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作者: 赵雪雪; 门引妮; 邢亚哲

标题: Research Progress in Ceria-based Electrolytes of Solid Oxide Fuel Cell

标题: 固体氧化物燃料电池钪基电解质的研究进展

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作者关键词: solid oxide fuel cell; operating temperature; doped cerium oxide; thin film; preparation method

作者关键词: 固体氧化物燃料电池; 工作温度; 掺杂氧化钪; 薄膜; 制备方法

摘要: The development of electrolyte materials with high conductivity at low and medium temperatures is an important direction for the future development of low-cost solid oxide fuel cells(SOFC).Doped cerium oxide(DCO)has good electrical conductivity at 500~700 °C,and its ionic conductivity is much higher than that of yttria-stabilized zirconia(YSZ)electrolyte materials at the same temperature,so it becomes the focus in application and research of medium temperature SOFC electrolyte material.However,Ce~(4+)in DCO is easy to be partially reduced to Ce~(3+)in reducing atmosphere,increasing electronic conductivity and manufacturing costs,and reducing open circuit voltage.Therefore,many studies have been conducted on rare earth elements and alkaline earth metals doped cerium oxide electrolytes and composite electrolytes to overcome these problems,and it has been found that the two-phase composite electrolyte is conducive to improving the ionic conductivity and stability of DCO.Based on the overview of zirconium-based solid electrolytes,Bi₂O₃-based electrolytes,LaGaO₃-based oxides,CeO₂-based oxides and other SOFC electrolytes,the single doped,double doped,and multi-doped cerium oxide electrolytes were summarized.The research progress of doped cerium oxide-carbonate composite electrolyte and two kinds of electrolyte composite electrolyte materials was also reviewed.In addition,the application of film-forming methods such as casting,screen printing,slurry coating,electrophoresis deposition,spray pyrolysis,sputtering,atmospheric plasma spraying,and laser pulse deposition was introduced in the preparation of cerium-based electrolyte film formation.In the end,the research direction of cerium base electrolyte was prospected.

摘要: 开发在中、低温下具有高电导率的电解质材料是未来发展低成本固体氧化物燃料电池(SOFC)的重要方向。掺杂氧化钪(DCO)在 500~700 °C时,具有良好的导电性能,其离子电导率远远高于同温度下氧化钇稳定的氧化锆(YSZ)电解质材料,因此其成为中温 SOFC 电解质材料应用与研究的重点。但 DCO 在还原气氛下 Ce~(4+)部分还原为 Ce~(3+),会引起电子电导增加、制造成本提高、开路电压降低等问题。针对这些问题,大量研究通过稀土或碱金属掺杂、电解质复合进行了探索,发现掺杂和多相电解质复合有助于提高 DCO 的离子电导率和稳

定性。在概述锆基固体电解质、Bi₂O₃ 基电解质、LaGaO₃ 基氧化物、CeO₂ 基氧化物等 SOFC 电解质的基础上,重点综述了单掺杂、双掺杂和多掺杂的氧化铈电解质,同时综述了掺杂氧化铈-碳酸盐复合电解质和两种电解质复合的电解质材料的研究进展。另外,介绍了流延、丝网印刷、浆料涂覆、电泳沉积、喷雾热解、溅射、大气等离子喷涂、激光脉冲沉积等制膜方法,在铈基电解质膜制备方面的应用。最后,对铈基电解质的发展前景和方向进行了展望。

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标题: Multiscale simulation of superplastic tensile deformation behavior of WSTi3515S titanium alloy

标题: WSTi3515S 钛合金超塑性拉伸变形行为的多尺度模拟

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作者关键词: WSTi3515S burn-resistant titanium alloy; deformation behavior; multiscale; stress and strain distribution

作者关键词: WSTi3515S 阻燃钛合金; 变形行为; 多尺度; 应力应变分布

摘要: Metal materials have multi-scale effects in the process of plastic deformation, and multi-scale modeling is an effective method to study multi-scale effects. On the basis of dynamic recrystallization thermoviscoplastic theory, the tensile deformation behavior of WSTi3515S burn-resistant titanium alloy was simulated. The macroscopic mechanical response and microscopic stress distribution of the material during the deformation process were analyzed and studied by establishing a corresponding multiscale model. The results show that the stress-strain curve obtained by macroscopic tensile simulation is basically consistent with the experimental results. As a representative volume unit of the macroscopic sample, the overall response of the polycrystalline aggregate model is in good agreement with the behavior of the microregion of macroscopic sample, which indicates that the established multi-scale model can simulate the tensile deformation behavior of the alloy well. During the deformation process, the stress-strain distribution develops from the central region to the periphery, and the stress-strain distribution is more uniform at high temperature and low strain rate. As the strain increases, the local relaxation of deformation is caused by the mutual restraint of stresses, and the stress concentration is effectively alleviated, so that the deformation continues, and good plasticity is obtained.

摘要: 金属材料在塑性变形过程中存在多尺度效应, 而多尺度建模仿真研究多尺度效应的一种有效方法。基于动态再结晶热黏塑性本构理论, 对 WSTi3515S 阻燃钛合金的拉伸变形行为进行仿真模拟, 建立相应的多尺度模型, 研究变形过程中材料的宏观力学响应和微观应力分布。结果表明: 宏观拉伸模拟获得的应力-应变曲线与试验结果吻合; 多晶集合模型体积单元, 其整体响应与宏观试样微区的行为吻合较好; 在变形过程中, 应力-应变分布均从中心区向四周扩展, 且在高温低应变速率下, 应力-应变分布更均匀; 随着应变增大, 变形局部化由于应力的相互牵制而松弛, 应力集中被有效缓解, 使变形持续进行, 从而获得较好的塑性。

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标题: Study on the effect of pulverizing time on the properties of coal gasification slag composite cementitious material

标题: 粉磨时间对煤气化渣复合胶凝材料的性能影响研究

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作者关键词: coal gasification slag; composite cementitious materials; grinding time; physical properties; mechanical properties; dry shrinkage properties

作者关键词: 煤气化渣; 复合胶凝材料; 粉磨时间; 物理性能; 力学特性; 干缩特性

摘要: Grinding of coal gasification slag,with 20% to prepare the coal gasification slag composite gelled material.The effect of grinding time on the fineness,standard consistency,water consumption,setting time,mechanical properties of composite cementitious material mortar and dry shrinkage characteristics of coal gasification slag composite cementitious material were investigated.The results show that the composite gelled material fineness,water consumption standard consistency,setting time,mortar composite gelled material mechanical properties and shrinkage properties with the extension of coal gasification slag grinding time have obvious changes,when the grinding time of 70 min,its various performance achieves the optimal.Coal gasification slag composite cementitious materials can meet the strength standards of PC32.5 cement,with lower dry shrinkage characteristics than PC32.5 cement mortar.

摘要: 将煤气化渣粉磨后以 20%的掺量配制煤气化渣复合胶凝材料,研究粉磨时间对煤气化渣复合胶凝材料细度、标准稠度用水量、凝结时间、复合胶凝材料砂浆力学特性以及干缩特性的影响。结果表明,复合胶凝材料的细度、标准稠度用水量、凝结时间、复合胶凝材料砂浆力学特性及干缩特性随煤气化渣粉磨时间的延长有明显变化,当粉磨时间达到 70min 时,其各项性能均达到最优。煤气化渣复合胶凝材料可达到 PC32.5 水泥的强度标准,干缩特性低于 PC32.5 水泥砂浆。

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标题: Synthesis and characterization of superlasticezer for magnesium oxychloride cement

标题: 适用于氯氧镁水泥混凝土减水剂的制备与表征

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作者关键词: 氯氧镁水泥; 聚羧酸减水剂; 流动度; 抗压强度

摘要: A retarded polycarboxylic acid water reducer suitable for magnesium oxychloride cement was synthesized by radical polymerization using allyl polyoxyethylene ether(APEG2400)as the main chain and sodium methacrylate sulfonate as the block.The influence of water reducing agent dosage on magnesium oxychloride cement,fluidity and concrete compressive strength were investigated.The result showed that when the synthesis conditions were $n(\text{AA}) : n(\text{APEG2400}) : n(\text{HPEG2400}) : n(\text{SMAS})=24 : 3 : 1 : 4$,the reaction is carried out at 85 °C,and when the amount of the water reducing agent is 0.6%,the fluidity of the magnesium oxychloride cement slurry reaches the best,the 7 d and 28 d compressive strength of oxymagnesium cement is 38%

and 33% higher than that of concrete without water reducing agent.

摘要: 通过自由基聚合法,采用烯丙基聚氧乙烯醚(APEG2400)为主链,甲基丙烯磺酸钠为嵌段合成了一种适用于氯氧镁水泥的缓凝型聚羧酸减水剂。探讨了减水剂掺量对氯氧镁水泥浆体流动度与混凝土抗压强度的影响。结果表明,当合成条件为 $n(\text{丙烯酸}):n(\text{烯丙基聚氧乙烯醚}):n(\text{甲基烯丙基聚氧乙烯醚}):n(\text{甲基丙烯磺酸钠})=24:3:1:4$,反应在 $85\text{ }^{\circ}\text{C}$ 下进行,减水剂掺量为 0.6% 时,氯氧镁水泥浆体的流动度达到最佳,同时氯氧镁水泥的 7 d 与 28 d 抗压强度比未掺减水剂的混凝土分别提高了 38% 和 33%。

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标题: Preparation and Oxidation Behavior of CeO₂ Doped Si-B Composite Coatings

标题: CeO₂ 掺杂 Si-B 复合涂层的制备及氧化行为

来源出版物: 材料导报 卷: 34 期: 9B 页: 18035-18038 出版年: 2020

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文献类型: Article

作者关键词: molybdenum; two-step pack cementation; Si-B composite coating; CeO₂ doping

作者关键词: 钼; 两步包埋渗; Si-B 复合涂层; CeO₂ 掺杂

摘要: The Si-B composite coatings with different doping amount of CeO₂ were prepared on the surface of molybdenum substrate by two-step pack cementation methods. The effect of CeO₂ doping on phase structure and cross-section morphology of Si-B composite coatings before and

after oxidation at 1 150 °C were analyzed by XRD,EDS and SEM.The oxidation kinetics of Si-B composite coatings before and after CeO₂ doping oxidized at 1 150 °C for 160 h were studied by mass-loss method.The results showed that appropriate doping amount of CeO₂ had certain permeation effect on Si element in pack cementation process.The Si-B composite coatings with thick,uniform and dense structure were obtained when the doping amount of CeO₂ was fixed at 1wt%.However,the thickness of Si-B composite coatings decreased with the further increase of CeO₂ doping amount.The oxidation rate constant(1.48×10^{-4} mg² /(cm⁴·h))of the doped Si-B composite coating oxidized at 1 150 °C for 70 h was significantly lower than that without CeO₂ doping,which indicated that the Si-B composite coating doped with CeO₂ has better high temperature oxidation resistance.

摘要: 采用两步包埋渗的方法在钼基体表面制备了不同 CeO₂ 掺杂量的 Si-B 复合涂层,通过 XRD、EDS 和 SEM 分析了 CeO₂ 掺杂对 Si-B 复合涂层在 1 150 °C 氧化前后表面物相和截面形貌的影响,并采用失重法研究了 CeO₂ 掺杂前后 Si-B 复合涂层在 1 150 °C 下氧化 160 h 的氧化动力学行为。结果表明:适量 CeO₂ 的掺杂对 Si 具有一定的催渗效果,当 CeO₂ 掺杂量为 1%(质量分数)时,所制备的 Si-B 复合涂层的厚度最大且均匀致密,但随着 CeO₂ 掺杂量的增加,涂层厚度有所减小。CeO₂ 掺杂 Si-B 复合涂层在 1 150 °C 下氧化前 70 h 的氧化速率常数(1.48×10^{-4} mg² /(cm⁴·h))较未掺杂时明显降低,这表明 CeO₂ 掺杂 Si-B 复合涂层的高温抗氧化性能较好。

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标题: Research progress on causes and control of cracks in laser clad composite coatings

标题: 激光熔覆复合涂层裂纹产生原因及控制研究进展

来源出版物: 金属热处理 卷: 45 期: 8 页: 233-239 出版年: 2020

文献号: 0254-6051(2020)45:8<233:JGRFFH>2.0.TX;2-Y

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文献类型: Review

作者关键词: laser cladding; composite coating; cracks; thermal stress

作者关键词: 激光熔覆; 复合涂层; 裂纹; 热应力

摘要: Causes of cracks in laser clad composite coatings and the affecting factors were reviewed. The methods for controlling cracks were summarized from the aspects of preheating of the substrate, overall tempering and remelting of the coating after cladding, gradient structure, process parameter optimization, the composition control of cladding materials and addition and assistive technologies.

摘要: 综述了激光熔覆复合涂层裂纹产生的原因及影响因素, 并从基材预热、熔覆后涂层整体回火和重熔、梯度结构、工艺参数优化、熔覆材料及添加剂成分控制和辅助技术等方面归纳了控制裂纹的方法和途径。

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标题: Effects of SiC addition on the microstructure, ablative and thermophysical properties of C/ C-ZrC-SiC composites

标题: SiC 对 C/ C-ZrC-SiC 复合材料的微观形貌、烧蚀及热物理性能的影响

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文献类型: Article

作者关键词: C/ C composites; ultra-high temperature ceramic; precursor infiltration and pyrolysis process; ablation performance; thermophysical properties

作者关键词: C/ C 复合材料; 超高温陶瓷; 聚合物浸渍裂解法; 烧蚀性能; 热物理性能

摘要: In order to investigate the effects of SiC and its precursor-polycarbosilane on C/ C-ZrC-SiC composites prepared by precursor infiltration and pyrolysis process(PIP), C/ C-ZrC and C/ C-ZrC-SiC composites were prepared by PIP process by using polycarbosilane and organic zirconium as precursor of SiC and ZrC, respectively. The microstructure of the composites were investigated by scanning electron microscopy(SEM) and X-ray diffraction. The effects of SiC on the ablative and thermophysical properties of the composites were studied. Ablation properties and thermal physical properties of the composites were determined by means of oxy-acetylene flame tests and thermal analyzer, respectively. The results show that polycarbosilane improve the density and compactness of ceramic matrix of the composites, and its product SiC could enhance the interface bonding between pyrolytic carbon and ceramic matrix greatly. Compared with C/ C-ZrC composites, C/ C-ZrC-SiC composites exhibit a better ablation resistance after ablation for 120 s, which is mainly attributed to the formation of molten ZrO₂ protective layer and SiO₂ layer on the surface of ablation center and ablation brim region, respectively. In addition, SiC could improve the thermal conductivity of the composites and reduce their coefficient of thermal expansion.

摘要: 为了研究 SiC 及其前驱体聚碳硅烷对聚合物浸渍裂解法(PIP)制备的 C/ C-ZrC-SiC 复合材料的影响, 本文以聚碳硅烷和有机锆分别为 SiC 和 ZrC 的前驱体, 利用 PIP 法制备了 C/ C-ZrC 和 C/ C-ZrC-SiC 两组复合材料, 采用扫描电子显微镜(SEM)和 X 射线衍射仪(XRD)对材料的微观结构进行分析, 在氧乙炔环境下考核了复合材料的抗烧蚀性能, 并选用热分析仪对两组材料的热物理性能进行对比分析。结果表明, 聚碳硅烷因其较高的 SiC 产率可以提高 C/ C-ZrC-SiC 复合材料中陶瓷基体的致密程度, 其产物 SiC 改善了陶瓷基体与碳基体的界面结合状态。氧乙炔烧蚀 120 s 后, 与 C/ C-ZrC 相比, SiC 的加入使 C/ C-ZrC-SiC 表现出更优异的抗烧蚀性能, 主要归功于烧蚀中心表面熔融 ZrO₂ 保护层和烧蚀边缘致密 SiO₂ 层的形成。此外, SiC 有利于提高材料的导热性能, 同时降低其热膨胀系数。

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标题: Research Progress of Laser Cladding Coating on Titanium Alloy Surface

标题: 钛合金表面激光熔覆涂层的研究进展

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文献类型: Review

作者关键词: titanium alloy; laser cladding; surface modification; oxidation resistance; corrosion resistance; wear resistance; bioceramic coating

作者关键词: 钛合金; 激光熔覆; 表面改性; 抗氧化; 耐腐蚀; 耐磨损; 生物陶瓷涂层

摘要: Laser cladding is one of the important technical methods for surface modification of titanium alloys, and has become a current research hotspot. The research status of cladding materials, phase composition and strengthening mechanism of laser cladding high-temperature and oxidation-resistant, corrosion-resistant, wear-resistant and bio-ceramic coatings on titanium alloys at home and abroad was summarized. The high-temperature and oxidation resistant coating was mainly attributed to the oxygen barrier effect of TiO_2 , Al_2O_3 and other phases, which improved the oxidation resistance of titanium alloys at high temperature; the corrosion-resistant coating was mainly due to the solid solution strengthening of TiN and Ti_2Ni phases and the

fine-grained strengthening of martensitic α' , which improved the corrosion resistance; the wear-resistant coating mainly improved the wear resistance due to the dispersion strengthening of TiC, TiB, TiB₂ and other phases; and bio-ceramic coating enhanced the biocompatibility of titanium alloys due to the presence of HA, CaO and other phases. Then, the main defects such as un-melted particles, spheroidization effect, cracks, pores and inclusions caused by the differences in thermal properties between the cladding material and the substrate, improper sample pretreatment, and improper process control were described, and the laser power, scanning speed and other process parameters were regulated to preheat the base material and introduce protective gas and add appropriate component additives to control and improve related defects. Finally, the development direction of laser cladding coating and technology on the surface of titanium alloy was prospected.

摘要: 激光熔覆是钛合金表面改性的重要手段之一,已成为当前研究热点。综述了国内外关于钛合金表面激光熔覆抗高温抗氧化、耐腐蚀、耐磨损和生物陶瓷等涂层的熔覆材料、熔覆层相组成和强化机理等的研究现状。其中,抗高温抗氧化涂层主要由于 TiO₂、Al₂O₃ 等相的隔氧作用,提高了钛合金在高温下的抗氧化性;耐腐蚀涂层主要由于 TiN 和 Ti₂Ni 等相的固溶强化及细小针状马氏体 α' 等的细晶强化,提高了其耐腐蚀性;耐磨损涂层主要由于 TiC、TiB、TiB₂ 等相的弥散强化作用,提高了涂层的耐磨性;生物陶瓷涂层由于 HA、CaO 等相的存在,增强了钛合金的生物相容性。其次,阐述了由于熔覆材料与基材的热物性差异、试样预处理不当和工艺调控不当等因素引起的未熔颗粒、球化效应、裂纹、气孔和夹杂等主要缺陷,以及调控激光功率、扫描速度等工艺参数,预热基体材料,通入保护气体和加入适当成分添加剂等控制和改善相关缺陷的措施。最后,展望了钛合金表面激光熔覆涂层和技术的发展方向。

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作者: 宋莉芳; 张婷; 霍慧文; 吕昕; 陈华鑫

标题: Preparation and application of nano-SiO₂sol modified waterborne fluorocarbon coating in concrete anti-corrosion

标题: 纳米 SiO₂ 溶胶改性水性氟碳涂料的制备及用于混凝土防腐研究

来源出版物: 化工新型材料 卷: 48 期: 8 页: 294-298 出版年: 2020

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作者关键词: nano-SiO₂ sol; concrete anti-corrosion; fluorinated acrylate emulsion; waterborne fluorocarbon coating

作者关键词: 纳米 SiO₂ 溶胶; 混凝土涂层防腐; 含氟丙烯酸乳液; 水性氟碳涂料

摘 要 : Nano-SiO₂sol was modified by gamma-(2,3-epoxypropoxy)propyltrimethoxysilane(KH-560),and then it was combined with fluorinated acrylate emulsion,alcohol ester-12as filming additive,proper amount of pigment filler and other additives to make into a composite coating.The particle size and the structure of the SiO₂sol modified by KH-560were measured by zetasizer nano instrument and fourier transform infrared spectroscopy.The thermal stability,morphology and hydrophobicity of the coating were measured by thermogravimetric analysis,scanning electron microscopy and dynamic contact angle.It was applied to a concrete mortar test piece for various performance tests.The results shown that when the nano-SiO₂sol(the dosage was 20%)was used to modify the fluorine-containing acrylic emulsion,the adhesion of the coating was 1.92MPa,the pencil hardness was 5H,the impact strength was up to 50cm,the corrosion resistance of acid and alkali salts was 16%,11%,10%,the aging resistance was 0.5,the contact angle was 103.57°,and the water absorption was 0.75,which was suitable for long-term protection of concrete in corrosive environment.

摘要: 选用硅烷偶联剂(KH-560)改性纳米 SiO₂ 溶胶,然后将其与含氟聚丙烯酸酯乳液、成膜助剂醇酯-12、适量颜填料及其他助剂混合制备复合乳液。运用 Zetasizer Nano 仪器、傅里叶变换红外光谱表征改性后纳米 SiO₂ 溶胶的粒径大小及结构,并运用热重分析、扫描电镜、动态接触角等手段对复合涂层的热稳定性、形貌和疏水性进行表征。将其涂覆于混凝土砂浆试件,进行各项性能测试。结果表明:采用纳米 SiO₂ 溶胶(掺量为 20%时)改性含氟丙烯酸乳液时,复合涂层的附着力为 1.92MPa,铅笔硬度为 5H,耐冲击强度最高可高于 50cm,耐酸碱盐腐蚀率分别为 16%、11%、10%,耐老化性色差为 0.5,接触角为 103.57°,吸水率为 0.75,适用于腐蚀环境下混凝土的长效防护。

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作者: 田耀刚; 张梦缘; 马荣辉; 阎宝宝; 齐琳; 徐鸥明; 王振军

标题: Effects of different fillers on adhesion performance of asphalt mortar /aggregate

标题: 填料对沥青胶浆/集料黏附性能的影响

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文献类型: Article

作者关键词: adhesion performance; asphalt mortar; filler; surface energy; adhesion work

作者关键词: 黏附性; 沥青胶浆; 填料; 表面能; 黏附功

摘要: In order to study the influence of filler on the adhesion performance of asphalt mixture. Asphalt mortar was regarded as the research object, the mineral filler of fillers was replaced by cement, fly ash and concrete recycled powder with the same volume at 0, 20%, 60%, 100%, which was analyzed through the modified coating, photoelectric colorimetric and surface energy method. Based on these test results, asphalt mixtures were prepared and the performance was verified by freeze-thaw split test. The results show that the cement could enhance the adhesion grade of asphalt mortar, reduce the peeling rate and improve the adhesion work which trend would be slower gradually. The fly ash can also improve the adhesion of asphalt mortar and the effect is slightly better than cement. Concrete recycled powder would significantly reduce the adhesion work, which was a disadvantage to the adhesion performance of asphalt mortar. It was also found

that the test results of asphalt mixture had strong consistency with the test of adhesion performance of asphalt mortar, the cement and fly ash of fillers could improve the tensile strength residual(TSR)of asphalt mixture respectively,while the value was reduced when its used concrete recycled powder.

摘要: 为研究填料对沥青混合料黏附特性的影响,以沥青胶浆为研究对象,采用改进水煮法、光电比色法和表面能法研究了水泥、粉煤灰以及水泥混凝土再生粉等体积取代矿粉(0,20%,60%,100%)对沥青胶浆/集料黏附性能的影响,并通过沥青混合料冻融劈裂试验进一步验证了其性能影响。结果表明,水泥取代矿粉能提高沥青胶浆黏附等级,降低剥落率,提高黏附功且其增幅随着取代率的增加而降低;粉煤灰同样能改善沥青胶浆黏附性,其改善效果略优于水泥;水泥混凝土再生粉取代矿粉会明显降低黏附功,对沥青胶浆黏附性不利;沥青混合料冻融劈裂实验与沥青胶浆黏附性实验具有较强一致性,引入水泥与粉煤灰可提高混合料冻融劈裂强度比,而再生粉会降低该值。

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标题: Research progress on performance damage of asphalt mixture exposed to salt freeze-thaw cycles

标题: 盐冻循环作用下沥青混合料性能损伤研究进展

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文献类型: Review

作者关键词: road engineering; asphalt mixture; durability deterioration; freeze-thaw cycle; salt erosion

作者关键词: 道路工程; 沥青混合料; 耐久性劣化; 冻融循环; 盐蚀作用

摘要: This paper summarizes the domestic and foreign research results on the durability deterioration of asphalt mixture exposed to freeze-thaw cycles and salt freeze-thaw cycles, and analyzes the effects of salt solution concentration, aggregate gradation, and number of freeze-thaw cycles on the salt-freeze cycle. The results show that salt erosion accelerates the impact of the freeze-thaw cycle on the asphalt mixture. With the increase of salt solution concentration and freezing-thawing cycle, the performance of asphalt mixture deteriorates faster. The larger the gap of the asphalt mixture, the more significant the effect of the salt freezing cycle on the asphalt mixture. The larger voidage of asphalt mixture, the more significant the effect of salt-freezing cycle on asphalt mixture. The existing problems in the research field of the salt mixture freezing cycle degradation of the asphalt mixture are put forward, which provides a certain basis for the study of the asphalt mixture salt freezing cycle.

摘要: 总结国内外冻融循环和盐冻循环条件对沥青混合料耐久性性能的研究成果, 分析了盐溶液浓度、级配、冻融循环次数等对盐冻循环的影响。结果表明, 盐侵蚀加速了冻融循环对沥青混合料的影响, 随着盐溶液浓度和冻融循环次数的增加, 沥青混合料性能劣化越快; 沥青混合料空隙率越大, 盐冻循环对沥青混合料影响越显著。提出目前沥青混合料盐冻循环劣化研究领域存在的问题, 为沥青混合料盐冻循环研究提供一定的基础。

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标题: Impact of Qinghai-Tibet Plateau's Climate on Strength and Permeability of Concrete

标题: 青藏高原气候环境对混凝土强度和抗渗性的影响

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作者关键词: road engineering; concrete; test research; plateau climate; pore structure; strength; impermeability; interfacial transition zone

作者关键词: 道路工程; 混凝土; 试验研究; 高原气候环境; 气孔结构; 强度; 抗渗性; 界面过渡区

摘要: To explore the impact of the Qinghai-Tibet plateau's climate on the performance of concrete, the processes relating to the preparation and curing of concrete were completed and simulated on the plateaus and plains. Furthermore, the difference in concrete performance was studied by combining the tests of strength, impermeability, pore structure, micro-hardness, scanning electron microscopy, and atomic force microscopy. The influence and mechanism of high altitude

climate conditions on concrete performance and internal structure were revealed with respect to macroscopic, mesoscopic, and microscopic aspects. The test results show that the compressive strength and impermeability of the concrete, prepared on the plateau, and cured under the standard condition are the best, followed by that prepared on the plain under similar conditions. The group prepared on the plateau and cured outdoor under natural environmental conditions have the worst performance. Low air pressure leads to the reduction of air content and workability of the concrete mixture. Hardened concrete cured under the standard condition on the plateau has the lowest air content and smallest average pore size. In contrast, the hardened concrete cured outdoors has the highest air content and largest average pore size. The interfacial transition zone (ITZ) of concrete, cured under standard conditions, on the plateau has the highest density, the least pore distribution, a uniform structure, and the greatest micro-hardness. In contrast, the ITZ of concrete cured outdoors has the worst density, the most micro-cracks, a rough structure, and the smallest micro-hardness. The poor pore structure of concrete combined with the deterioration of the microstructure in the ITZ has an extremely unfavorable effect on the mechanical and impermeability to the concrete prepared on the plateau and cured outdoor under natural environmental conditions. In general, the negative effect of the climate on the concrete performance in the Qinghai-Tibet plateau is mainly due to outdoor curing conditions rather than the preparation process.

摘要: 为了研究青藏高原气候环境对混凝土性能的影响,在高原和平原地区完成相同配比混凝土的制备与养护工作,并结合强度、抗渗性、气孔结构、显微硬度以及扫描电镜与原子力显微镜分析等测试对比研究混凝土性能的差异,从宏观、细观和微观多个角度揭示高原气候条件对混凝土性能与内部结构带来的影响与作用机理。结果表明:高原地区制备且标准养护组混凝土的抗压强度与抗渗性都最优,其次是平原地区制备且标准养护组,高原地区制备且室外自然养护组性能最差;低气压导致混凝土拌合物含气量降低和工作性下降;高原标准养护下硬化混凝土含气量最低,平均孔径最小,而高原室外自然养护下硬化混凝土含气量最大,平均孔径最大;高原地区制备的混凝土,在标准养护条件下界面过渡区密实程度最高,结构均匀,其显微硬度最大,而室外自然养护条件下界面过渡区密实程度最差,微裂纹密布,结构粗糙,其显微硬度最小;而高原地区制备且室外自然养护条件下,混凝土气孔结构参数和界面过渡区微结构整体最差,以上原因的综合作用给混凝土力学和抗渗性带来极为不利的影响。总体来讲,青藏高原气候环境对混凝土性能的负面影响主要源于室外养护条件,而非制备过程。

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标题: Evaluation of Interface Diffusion Behavior Between Rejuvenator and Aged Asphalt Based on Surface Wettability Theory

标题: 基于表面润湿理论的再生剂-老化沥青界面扩散行为评价

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作者关键词: road engineering; rejuvenated asphalt; Wilhelmy pendant method; interface between rejuvenator and aged asphalt; wetting process; contact angle

作者关键词: 道路工程; 再生沥青; Wilhelmy 吊片法; 再生剂-老化沥青界面; 界面扩散; 润湿过程

摘要: To study the interface diffusion behavior between rejuvenator and aged asphalt and its influencing factors, the surface tension of the rejuvenator at different temperatures and its contact angle with the aging asphalt was tested using Wilhelmy pendant method. The thermodynamic parameters-wetting work and kinetic parameters-wetting speed (wetting time) during the wetting process were calculated. Based on this, the effects of the regenerator's properties, environmental temperature, and aging degree of asphalt on the interface diffusion behavior were studied. The results show that the incorporation of epoxy soybean oil (ESO) reduces the contact angle of the rejuvenator, increases the wetting work, accelerates the wetting speed, shortens the wetting time, improves the wetting performance of the rejuvenator on aged asphalt, and promotes the interfacial diffusion between rejuvenator and aging asphalt. Moreover, the incorporation of dodecyl benzene sulfonic acid (DBSA) adversely affect the interfacial diffusion of the regenerator. Temperature has a significant effect on the interface diffusion behavior; as the temperature increases, the viscosity of the rejuvenator decreases, the contact angle decreases, and the wetting speed is accelerated. The rejuvenator can fully wrap the surface of aged asphalt in a short time. The higher the surface tension of the rejuvenator, the higher the wetting work on the surface of the aging asphalt, and the higher the interface diffusion power, the easier the diffusion process to proceed. The smaller the contact angle of rejuvenator on the surface of aged asphalt, the higher the wetting speed on the surface of the aging asphalt, and the easier it is for the rejuvenator droplets to form a film of rejuvenator that covers the aged asphalt surface. The lower the viscosity of the rejuvenator, the better the fluidity. It has a higher wetting speed on the surface of aged

asphalt, which is beneficial to the interface diffusion between rejuvenator and aged asphalt. The aging of asphalt is detrimental to the interface diffusion between rejuvenator and aged asphalt. With the increase in the aging degree of asphalt, the wettability of rejuvenator on the surface of asphalt decreases, which reduces the degree of interface diffusion. Therefore, to ensure the effect of the rejuvenator on the aged asphalt, it is necessary to select a rejuvenator with higher surface tension, lower viscosity, and smaller contact angle with the aged asphalt when developing the rejuvenator.

摘要: 为研究再生剂-老化沥青界面扩散行为及其影响因素, 采用 Wilhelmy 吊片法测试了不同温度下再生剂的表面张力及其与老化沥青间的接触角, 计算得到润湿过程中的热力学参数浸润功和动力学参数润湿速度(润湿时间), 研究了再生剂自身性质、环境温度及沥青老化程度对界面扩散行为的影响。结果表明: 环氧大豆油(ESO)的掺入降低了再生剂的接触角, 增大了浸润功, 加快了润湿速度, 缩短了润湿时间, 提升了再生剂的润湿性能, 促进了再生剂-老化沥青的界面扩散, 而十二烷基苯磺酸(DBSA)的掺入则对再生剂-老化沥青的界面扩散有不利影响; 温度对再生剂-老化沥青界面扩散行为影响显著, 随着温度升高, 再生剂的黏度降低, 接触角减小, 润湿速度加快, 再生剂在较短时间内即可充分包裹老化沥青表面; 再生剂表面张力越大, 其在老化沥青表面浸润功越大, 界面扩散动力越大, 扩散过程更易自发进行; 再生剂在老化沥青表面的接触角越小, 其在老化沥青表面的润湿速度越快, 再生剂液滴更容易形成包裹老化沥青表面的再生剂膜; 再生剂的黏度越低, 流动性越好, 其在老化沥青表面的润湿速度越快, 有利于再生剂-老化沥青界面的扩散; 沥青的老化对再生剂-老化沥青的界面扩散有不利影响, 随沥青老化程度的加深, 再生剂在其表面的润湿性能下降, 界面扩散程度降低。故为保证再生剂对老化沥青的再生效果, 在再生剂选择及研发时, 应优先选用表面张力更大、黏度更低且与老化沥青间接触角更小的再生剂。

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标题: Development and Application of Green Ecological Hollow Plastic Building Template

标题: 绿色生态中空塑料建筑模板开发与应用

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作者关键词: regenerated polypropylene; plastic building template; modification; recyclable

作者关键词: 聚丙烯再生料; 塑料建筑模板; 改性; 可回收

摘要: Aiming at the shortcomings of most types of building templates in the market, such as high cost, low production efficiency and environmental unfriendliness, a green ecological hollow plastic building template was developed. Nano-functional masterbatch was prepared with special surface-modified nano fillers and additives with specific structure, then it was compounded with other fillers to modify regenerated polypropylene (PP). The tensile strength and bending modulus of the resulting products were up to 19.6 MPa and 1 669 MPa, respectively. On this basis, modified PP recycled materials were used to develop hollow plastic building templates, and finally a green ecological product by the three-layer co-extrusion one-step method based on the optimized design of the extrusion die structure was developed, which fully met the requirements of construction industry, and the flexural modulus was up to 2 200 MPa. In actual engineering applications, the number of turnover time can be more than 100, and it can be crushed, re-modified and reused after exceeding the limit usage number; in addition, the surface density of the template is only 8 kg/m², so it is easy to move and disassemble; the price is low which is less than 1 yuan/m². In summary, the hollow plastic building template is an ideal new building material.

摘要: 针对市面大多数类型建筑模板存在成本过高、生产效率低、对环境不友好等缺点的现状, 开发了一种绿色生态中空塑料建筑模板。通过采用经特殊表面改性的纳米填料和具有特定结构的助剂制备的纳米功能母粒, 复配其它填料对聚丙烯(PP)再生料进行改性, 使其拉伸强度与弯曲模量分别达到 19.6 MPa 和 1 669 MPa。在此基础上以改性 PP 再生料开发中空塑料建筑模板, 并在优化设计挤出模结构的基础上, 通过三层共挤一步法成功开发出完全满足建筑行业要求的绿色生态中空塑料建筑模板, 其弯曲模量可高达 2 200 MPa 以上。所开发的塑料建筑模板在实际工程应用中可周转次数达 100 次以上, 在超出极限使用次数后又可粉碎重新改性再利用; 此外, 其模板面密度仅 8 kg/m², 易于搬运拆装; 价格低廉, 分摊价格不到 1 元/m², 是一种理想的新型建筑材料。

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作者: 张学敏; 周腾; 李厚补; 王品; 袁战伟; 肖春红

标题: Simulation of Pressure-bearing Performance of Polyester Fiber Reinforced Polyethylene Composite Pipes

标题: 涤纶纤维增强聚乙烯复合管承压性能模拟

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作者关键词: polyester fiber; flexible composite pipe; burst pressure; finite element simulation; winding angle

作者关键词: 涤纶纤维; 柔性复合管; 爆破压力; 有限元模拟; 缠绕角度

摘要: Aiming at the problems such as heavy workload, high cost, and unclear influencing factors of pressure-bearing performance test of fiber-reinforced plastic composite pipes, the influence of composite pipe production process on pressure-bearing performance was studied by using finite element simulation analysis method. Based on the structure and material characteristics of polyester fiber reinforced polyethylene composite pipes with the nominal diameter of 150 mm and the nominal pressure of 2.5 MPa, a finite element model of the composite pipe was established by the Halpin-Tsai model method. The effects of process parameters such as the number of fiber layups, the fiber winding angle, and the wall thickness of the inner liner on the pressure-bearing performance of the composite pipes were studied. The results show that the bursting pressure of the pipe calculated by the established model is 11.105 MPa, and the relative error with the real pipe

hydraulic blasting value of 10.75 MPa is only 3.302%. Increasing the number of fiber layers, the fiber winding angle, and the wall thickness of the inner liner can improve the pressure-bearing performance of the composite pipes. Considering the manufacturing cost and production efficiency comprehensively, the optimal production process parameters of the polyester fiber reinforced polyethylene composite pipe are obtained as follows, the number of fiber layers is 4 layers, the fiber winding angle is 56° , and the minimum wall thickness of the inner lining layer is 9 mm.

摘要: 针对纤维增强塑料复合管实物承压性能测试工作量大、成本高以及影响因素不明确等问题,采用有限元模拟分析法研究了复合管生产工艺对承压性能的影响。依据公称直径 150 mm、公称压力 2.5 MPa 涤纶纤维增强塑料复合管的结构及材料特征,采用 Halpin-Tsai 模型法建立了复合管的有限元模型,研究了纤维铺层数量、纤维缠绕角度以及内衬层壁厚等工艺参数对复合管承压性能的影响。结果表明,采用建立的复合管模型模拟计算的管材爆破压力为 11.105 MPa,与实物管材水压爆破值 10.75 MPa 的相对误差仅为 3.302%。增加纤维层的数量、纤维缠绕角度以及内衬层壁厚均可提高复合管的承压性能。综合考虑制造成本和生产效率,分析获得涤纶纤维增强聚乙烯复合管最佳生产工艺参数为纤维铺层数为 4 层、纤维缠绕角为 56° 、内衬层最小壁厚为 9 mm。

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标题: Preparation and Hydrogen Evolution Performance of Ni(S_xSe_(1-x))₂ Nanowire Array Catalytic Electrode

标题: Ni(S_xSe_(1-x))₂ 纳米线阵列催化电极的制备与析氢性能

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作者关键词: nickel diselenide; anion doping; electrocatalyst; hydrogen evolution reaction; catalytic activity

作者关键词: 二硒化镍; 阴离子掺杂; 电催化剂; 析氢反应; 催化活性

摘要: Pyrite transition metal sulfur compounds (MX₂, typical M=Fe, Co or Ni, X=S or Se) have broad development prospects in the field of electrocatalysts due to their unique electronic structure, low price, high catalytic activity and good stability. However, there is still a gap between its electrocatalytic performance and that of traditional Pt noble metal catalysts. Therefore, this paper attempts to further improve its catalytic performance by doping and regulating the composition of the catalyst. The precursors Ni₂(CO₃)(OH)₂ nanowire arrays were synthesized on carbon fiber surface by hydrothermal method. The self-supporting integrated catalytic electrode with anion co-doped Ni(S_xSe_(1-x))₂ nanowire arrays on carbon fiber paper were synthesized by chemical vapor deposition using S/Se mixed powders as reaction source, where the composition of the catalyst was controllable. The electrocatalytic performance test showed that Ni(S_(0.81)Se_(0.19))₂ nanowire exhibited the best catalytic performance among the Ni(S_xSe_(1-x))₂ catalysts with different components. The current densities of 10 mA·cm⁻² and 100 mA·cm⁻² could be achieved by only 93 mV and 135 mV overpotential, respectively, and the Tafel slope was as low as 42.07 mV·dec⁻¹. These results show that anion doping can further improve the catalytic activity of these catalysts, and provide ideas for the design and preparation of alkali metal compound electrocatalysts with high efficiency and low cost.

摘要: 黄铁矿型过渡金属硫属化合物(MX₂, 典型的 M=Fe、Co 或 Ni, X=S 或 Se)因具有独特的电子结构、低廉的价格、优异的催化活性和稳定性等特点,在电催化剂领域拥有广阔的发展前景。然而其电催化性能与传统 Pt 系贵金属催化剂相比尚有差距,因此本研究尝试通过掺杂调控催化剂成分的方式进一步改善其催化性能。以 S 和 Se 共掺杂 Ni 基硫属化合物为研究对象,选择碳纤维纸作为导电基底,采用水热法在碳纤维表面生长出 Ni₂(CO₃)(OH)₂ 纳米线阵列作为前驱体,并以 S/Se 混合粉作为反应源,利用化学气相沉积法实现 S/Se 与 Ni₂(CO₃)(OH)₂ 的反应,合成了成分可控的阴离子共掺 Ni(S_xSe_(1-x))₂ 纳米线阵列自支撑一体化催化电极。电催化性能测试表明:在不同成分的 Ni(S_xSe_(1-x))₂ 中, Ni(S_(0.81)Se_(0.19))₂ 纳米线表现出最佳的催化性能,仅需要 93 mV 和 135 mV 的过电位就可以分别驱动 10 mA·cm⁻² 和 100 mA·cm⁻² 的电流密度,对应的 Tafel 斜率也低至 42.07 mV·dec⁻¹。研究表明,阴离子掺杂能够进一步提高该类催化剂的催化活性,为高效率、低成本碱金属化合物电催化剂的设计和制备提供借鉴思路。

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作者关键词: coal gasification slag cement macadam; compressive strength; splitting strength; shrinkage characteristics; microstructure

作者关键词: 煤气化渣水泥; 抗压强度; 劈裂强度; 收缩特性; 微观形貌

摘要: The optimum dosage of coal gasification slag cement in cement-stabilized crushed stone base and the unconfined compressive strength, splitting strength and shrinkage performance of coal gasification slag cement stabilized crushed stone under different curing temperatures were studied. The test results show that the optimal moisture content and maximum dry density of cement-stabilized crushed stone with 20% coal gasification slag are 6% and 2.46 g /cm³ respectively. Under standard curing conditions, the unconfined compressive strength of the base layer meets the standard requirements of unconfined compressive strength of 7 d of 3 ~ 5 MPa. The splitting strength is almost the same as that of PC32.5 cement stabilized crushed stone base. Under the curing temperature of 20,5,0,- 5,- 5 ~ 20 °C,the splitting strength of coal gasification cement stabilized macadamia could reach 0.51,0. 32, 0.21,0. 15,0. 39 MPa. The shrinkage resistance of cement gravel mixed with coal gasification slag is significantly improved. Under standard curing conditions, the shrinkage strain of coal gasification slag cement for 7 d and 28 d is about 9% and 10% lower than that of PC32.5 cement.

摘要: 研究了煤气化渣水泥在水泥稳定碎石基层中的最佳用量以及煤气化渣水泥稳定碎石在不同养护温度下的无侧限抗压强度、劈裂强度和收缩性能。结果表明,掺 20%煤气化渣的煤气化渣水泥稳定碎石最佳含水量为 6%,最大干密度为 2.46 g /cm³;标准养护条件下煤气化渣水泥稳定碎石基层低于对照组 PC32.5 水泥稳定基层,但满足 7 d 无侧限抗压强度规范要求的 3 ~ 5 MPa;在不同养护温度 20,5,0,- 5,- 5 ~ 20 °C下,煤气化渣水泥碎石劈裂强度可达 0.51,0. 32,0. 21,0. 15,0. 39 MPa,与对照组 PC32.5 水泥劈裂强度几乎一致;掺加煤气化渣的水泥碎石抗收缩性能明显提高,标准养护条件下煤气化渣水泥 7, 28 d 收缩应变比 PC32.5 水泥分别低约 9%和 10%。

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标题: Preparation and performance evaluation of SBS /PPA composite modified emulsified asphalt

标题: SBS /PPA 复合改性乳化沥青的制备与性能评价

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作者关键词: 沥青路面; SBS 改性沥青; 乳化沥青; 多聚磷酸

摘要: SBS /PPA composite modified asphalt was prepared by melt blending method. It is emulsified by a colloid mill to obtain a modified emulsified asphalt. The effect of PPA on the road performance of SBS modified emulsified asphalt evaporation residue can be characterized by softening point, ductility at 5 °C, penetration and viscosity. The results show that PPA can improve the storage stability of SBS modified emulsified asphalt. When the PPA content increased from 1% of SBS to 3%, the 5 d storage stability decreased from 6.3% to 4.9% compared with SBS modified emulsified asphalt without PPA, and the reduction was over 22%. And the softening point and ductility of SBS modified emulsified asphalt evaporation residue increase with the increase of PPA content. PPA can promote the formation of spatial network structure in SBS in modified asphalt, which improves the performance of SBS on asphalt pavement performance. When the amount of SBS is 4.5% of the amount of asphalt and the amount of PPA is 3% of the amount of SBS, the road performance of the SBS /PPA modified emulsified asphalt evaporation residue is close to that of hot asphalt.

摘要: 通过熔融共混法制备 SBS /PPA 复合改性沥青, 采用胶体磨将其乳化得到 SBS /PPA 复合改性乳化沥青, 研究多聚磷酸(PPA)对 SBS 改性乳化沥青稳定性、蒸发残留物路用性能的影响。结果表明, PPA 能够改善 SBS 改性乳化沥青的储存稳定性, 当 PPA 掺量由占 SBS 用量的 1% 增加到 3% 时, 和未添加 PPA 的 SBS 改性乳化沥青相比, 其 5 d 储存稳定性由 6.3% 降低到 4.9%, 降低的幅度超过 22%, 且随着 PPA 掺量的增加, SBS 改性乳化沥青蒸发残留物的软化点、延度逐渐升高。PPA 能够促使 SBS 在改性沥青中形成空间网状结构, 从而提高了 SBS 对沥青路用性能的改善效果。当 SBS 掺量为沥青用量的 4.5%, PPA 的用量为 SBS 用量的 3%

时,SBS /PPA 改性乳化沥青蒸发残留物的路用性能接近热沥青。

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标题: RESEARCH PROGRESS ON MECHANICAL PROPERTIES OF RECYCLED CONCRETE

标题: 再生混凝土力学性能研究进展

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作者关键词: recycled concrete; reuse; mechanical properties; research progress

作者关键词: 再生混凝土; 再利用; 力学性能; 研究进展

摘要: The application of recycled concrete can not only reduce the environmental pollution caused by waste concrete landfill, but also solve the problem of insufficient natural stone resources and reuse of waste concrete. Mechanical properties are an important part of the research field of recycled concrete. In this paper, the research progress of mechanical properties of recycled

concrete at home and abroad was summarized. The influencing factors including compressive strength, tensile strength, flexural strength, elastic modulus, Poissons ratio and strain of recycled concrete and the latest research results were introduced. We also analyzed the shortcomings of the current researches, in order to provide novel ideas for the future research of recycled concrete.

摘要: 再生混凝土的应用,不仅能够减少废弃混凝土填埋导致的环境污染,而且能解决天然石料资源不足和废弃混凝土如何再利用的问题,其中,力学性能是再生混凝土研究领域的重要内容。对国内外再生混凝土力学性能的研究进展进行了总结,介绍了再生混凝土的抗压强度、抗拉强度、抗折强度、弹性模量、泊松比和应变的影响因素及其最新研究成果,并分析了目前研究的不足,以期对未来再生混凝土的研究提供新思路。

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标题: Rheological Property and Surface Structure of SBS Compound Modified Asphalt with Nano Sulfur

标题: 纳米硫 SBS 复合改性沥青的流变性质与微表构造

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作者关键词: 纳米材料; 纳米硫; SBS 改性沥青; 流变性质; 微观结构

摘要: Nano-materials have been applied gradually in road engineering because of their excellent technical characteristic, especially in the modification of road performances. In order to improve the technical performance of modified asphalt, it is an effective technical mean to prepare compound modified asphalt with different materials. In this paper, the compound modified asphalt was prepared using SBS modifier with different structure and nano sulfur, and then the influences of nano sulfur content on the basic technical indexes and rheological properties of modified asphalt were analyzed. Furthermore, the compound modified mechanism was explored by characterizing the surface morphology of SBS compound modified asphalt with nano sulfur using the atomic force microscopy (AFM). Results indicate that the interface stability between SBS modifier and asphalt can be improved by the cross-link effect of nano sulfur, which can contribute to the formation of the new asphalt-modifier colloidal system and also enhance their compatibility. Moreover, the distribution of polar components in asphalt can be changed for nano sulfur, so the high temperature stability and internal cohesiveness of asphalt are significantly improved. Research results will provide an important reference for the application of SBS compound modified asphalt with nano sulfur.

摘要: 纳米材料因其优异的技术特性逐渐应用于道路工程领域,尤其在道路沥青改性方面引起了研究者的普遍关注。为了进一步提升改性沥青的路用性能,采用多种材料对其进行复合改性是行之有效的技术手段。本文采用不同结构类型的 SBS 改性剂和纳米硫粉,制备纳米硫 SBS 复合改性沥青,分析纳米硫掺量对改性沥青的基本技术指标和流变性质的影响;并采用原子力显微镜观测纳米硫 SBS 改性沥青的表面形貌,探测其复合改性机理。研究结果表明:纳米硫可以通过交联作用改善 SBS 改性剂与沥青界面的稳定性,有助于沥青-改性剂新胶体体系的形成,提高两者之间的相容性;同时,纳米硫还可改善沥青中极性组分的分布,显著提升沥青的高温稳定性及粘聚性。研究结果为纳米硫 SBS 复合改性沥青的推广应用提供了重要参考。

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标题: One-step Solvothermal Synthesis of Gadolinium(III) -doped Zinc Oxide Nanoparticles with Enhanced Photocatalytic Activity

标题: 一步溶剂热法合成高催化性能的 Gd³⁺掺杂氧化锌纳米晶体

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作者关键词: 氧化锌(ZnO)纳米晶体; 光催化; 掺杂; 三价钆; 溶剂热法; 罗丹明 B

摘要: Doping has been proven effective in enhancing the catalytic activity of nanoscale zinc oxide (ZnO) to photocatalyzed reactions. In this paper, we report a facile and effective approach of synthesizing gadolinium(III) -doped ZnO nanocrystals with high photocatalytic activity. This onestep solvothermal method uses zinc acetate and Gd(NO)₃·6H₂O as raw materials, and the Gd³⁺ concentrations of the products can be controlled by changing the amount of Gd(NO)₃·6H₂O. X-ray diffraction (XRD), scanning electron microscopy (SEM) indicated smaller particle size and more prominent agglomeration of the products with higher Gd³⁺ content, which was also supported by the Brunauer-Emmett-Teller (BET) gas adsorption measurement result. The obtained UV-vis absorption spectra proved that the absorption edges of the Gd³⁺-doped ZnO nanocomposites red-shifted and the band gaps became narrower compared to pure ZnO. Finally, according to the photocatalytic experiment results, Gd³⁺-doped ZnO nanoparticles exhibit enhanced activity toward the photocatalyzed degradation of Rhodamine-B under simulated sunlight irradiation.

摘要: 近年来, ZnO 作为性能优异的光催化剂受到广大研究者的密切关注。它是一种宽带隙半导体, 禁带宽度为 3.37 eV, 具有良好的稳定性。但也不可避免地存在一些不足, 如光生电子空穴复合率太高、光能利用率太低等。为进一步提高 ZnO 的光催化降解活性, 研究者们对其进行了一系列改性。其中, 掺杂是一种行之有效的方法, 它可以通过调控 ZnO 禁带宽度、晶体结构和缺陷利用, 进而提高光催化性能。本工作采用具有特殊电子结构的稀土离子钆(Gd)作为掺杂剂, 研究了其对 ZnO 晶体结构、形貌及光催化性能的影响。通过一步溶剂热法合成了纯氧化锌(ZnO)和不同 Gd³⁺掺杂浓度的 ZnO 纳米颗粒。采用 X 射线衍射(XRD)、扫描电镜(SEM)、比表面积分析、傅里叶变换红外(FT-IR)光谱、紫外-可见(UV-vis)吸收光谱和光

致发光(PL)光谱等手段对所得样品进行了表征。光催化降解实验以 20 mg/L 罗丹明 B 为模拟污染物,在 300 W 氙灯光源下进行。同时也分析了 Gd~(3+)掺杂氧化锌纳米颗粒的光催化机理。实验结果显示,稀土 Gd 掺杂后 ZnO 晶体结构没有发生改变,仍为六方纤锌矿结构。在 Gd~(3+)浓度较低时,Gd~(3+)进入 ZnO 晶格,取代部分 Zn~(2+)或进入间隙位置;但是当 Gd~(3+)浓度达到 3 mol%时,检测到了少量 Gd₂O₃ 的衍射峰,可能的原因是两种离子的半径和化合价存在差异,ZnO 晶格难以容纳较多的 Gd~(3+)。同时,Gd 离子掺杂引起 ZnO 衍射峰位置向低角度偏移,晶胞参数发生变化,这也进一步证实 Gd~(3+)进入到了 ZnO 晶格中。观察样品的形貌发现,Gd 离子掺杂对 ZnO 纳米颗粒的生长有较强的抑制作用,使得晶粒尺寸相比纯 ZnO 有较明显的减小,这主要是由于稀土离子掺杂后会在 ZnO 表面形成 Re-O 键,抑制 ZnO 的生长,通过 XRD 结果计算也可得出同样的晶粒尺寸变化趋势。比表面积测试发现掺杂 Gd 离子后 ZnO 的比表面积显著提高,暗示着更多的反应活性位点和更强的吸附污染物能力。UV-vis 吸收谱中掺杂 Gd 离子后 ZnO 在紫外和可见光区域的吸收都明显增强,且吸收边出现红移,表明禁带宽度减小,在可见光区的吸收增强。另外,PL 光谱测试表明掺杂 Gd 离子后 ZnO 光生电子空穴的复合率显著降低,意味着将有更多的光生电子、空穴参与到光催化降解反应中,从而使光催化活性提升。Gd~(3+)掺入 ZnO 基质将导致系统内产生更多数量的电荷载流子和缺陷,这些 Gd~(3+)和缺陷会充当俘获中心抑制光生载流子的复合,增强光催化活性。但是,过量 Gd~(3+)掺杂将产生过多的缺陷,反而会成为光诱导电子-空穴复合的中心,不利于光催化反应。罗丹明 B 降解实验进一步印证了 Gd 离子掺杂引起的 ZnO 光催化性能的明显提升,其中 3 mol% Gd-ZnO 的催化效果最佳,对应的罗丹明 B 降解率为 70.9%(模拟太阳光照射 120 min)。降解实验同时表明,对于 ZnO 而言 Gd~(3+)的掺杂量并不是越大越好。适度提高 Gd~(3+)的引入量(<3 mol%)会使表面势垒变高及空间电荷区变窄,因此可以有效地分离电子-空穴对。然而,当 Gd~(3+)浓度增加到 4 mol%时,空间电荷区变得非常狭窄,光可以完全穿越空间电荷层,使得电子-空穴对的重组变得更容易;同时过量的 Gd~(3+)不能继续进入 ZnO 的晶格,而只能附着在晶体表面,影响光子对晶体的作用,最终的结果是 ZnO 光催化活性又出现降低。

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作者: 赖歆玥; 郑雪萍; 朱永胜; 元想胜; 贾润楠

标题: Effect of CoCl₂ on hydrogen production performance of NaBH₄/Al system

标题: CoCl₂ 对 NaBH₄/Al 体系储氢性能的影响

来源出版物: 应用化工 卷: 49 期: 5 页: 1203-1207 出版年: 2020

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文献类型: Article

作者关键词: NaBH₄; NaBH₄; catalyst; hydrogen evolution rate; hydrogen release

作者关键词: 催化剂; 放氢速率; 放氢量

摘要: The use of drainage method to study the hydrolysis of NaBH₄/Al by CoCl₂ was studied. The hydrogen production performance of the whole system was studied by changing the ratio of NaBH₄/Al and the doping ratio of CoCl₂. The morphology and composition of the hydrolyzed product were characterized by SEM and XRD. The results showed that the ratio of NaBH₄ to Al powder was 1 : 1 in all samples, and the hydrogen evolution rate of the sample containing 12% CoCl₂ was the highest, being 341.67 mL/(min·g), the hydrogen release was 2 050 mL/g, and the hydrogen release performance was the most. The ratio of NaBH₄ to Al powder is 1 : 2, and the sample with 14% CoCl₂ has the lowest hydrogen evolution rate of 27.45 mL/(min·g) and hydrogen release of 1 866.7 mL/g, and the hydrogen release performance is the worst.

摘要: 使用排水法研究了 CoCl₂ 催化 NaBH₄/Al 体系水解制氢, 通过改变 NaBH₄/Al 的配比和 CoCl₂ 的掺杂比来研究整个体系的水解制氢性能。通过 SEM 和 XRD 表征水解产物的形貌和成分。结果表明, 在所有样品中, NaBH₄ 与 Al 粉的比例为 1 : 1, 含 12% CoCl₂ 的样品的析氢速率最大, 为 341.67 mL/(min·g), 氢气释放量为 2 050 mL/g, 放氢性能最佳; 而 NaBH₄ 与 Al 粉的比例为 1 : 2, 含 14% CoCl₂ 的样品的析氢速率最小, 为 27.45 mL/(min·g), 氢气释放

量为 1 866.7 mL/g,放氢性能最差。

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作者: 宋晓珩; 桑可正; 曾德军

标题: Whisker Frame Strengthening and Toughening Porous Mullite Ceramics

标题: 晶须框架强韧化多孔莫来石陶瓷

来源出版物: 中国陶瓷 卷: 56 期: 6 页: 34-39 出版年: 2020

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作者关键词: Whisker framework; Porous mullite ceramics; Ceramic toughening

作者关键词: 莫来石晶须框架; 多孔莫来石陶瓷; 陶瓷强韧化

摘要: Mullite whisker frames were prepared by gas-solid reaction, mullite precursor powder was introduced into mullite whisker frame by vacuum infiltration, after sintering at 1650 °C, the strong and tough porous mullite ceramics with whisker frame were obtained. The influence of mullite whiskers on mechanical properties of porous mullite ceramics was studied. The results showed that whisker frame has obvious effect on the strength and toughness of porous mullite ceramics, whisker ceramics had the best strengthening effect with a porosity of 43.5% and whisker content of 90 wt%, and the intensity increased by 55%. Whisker ceramics had the best toughening

effect with whisker content of 70 wt% and porosity of 28% t,and the toughness value increased by 134%.

摘要: 气固反应制备莫来石晶须框架,通过真空浸渗将莫来石前驱体粉引入莫来石晶须框架中,经过 1650 °C 烧结得到晶须框架强韧的多孔莫来石陶瓷,研究了框架结构的莫来石晶须对多孔莫来石陶瓷力学性能的影响。研究表明:晶须框架对多孔莫来石陶瓷的强韧化效果明显,其中气孔率为 43.5%、晶须含量为 90 wt% 的晶须强韧陶瓷的增强效果最佳,强度提高了 55%;70 wt% 晶须含量、气孔率为 28% 的晶须强韧陶瓷增韧效果最佳,韧性值提高了 134%。

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作者: 陈宏; 李佩; 朱晓宇; 康亚斌

标题: Effect of Graphene Concentration on Growth and Corrosion Resistance of Magnesium Based Ceramic Coating

标题: 石墨烯浓度对镁基陶瓷膜生长及耐蚀性的影响

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作者关键词: magnesium alloy; micro-arc oxidation; ceramic coating; graphene; dispersion; corrosion resistance

作者关键词: 镁合金; 微弧氧化; 陶瓷膜; 石墨烯; 分散液; 耐蚀性

摘要: The work aims to study the effect of graphene concentration on the growth and corrosion resistance of micro-arc oxidation ceramic coating of AZ91D magnesium alloy. Graphene dispersion was obtained by ultrasonic dispersion and added to the zirconium salt electrolyte to prepare the micro-arc oxidation ceramic coating on the surface of the magnesium alloy by micro-arc oxidation technique. The microstructure of the ceramic coating was analyzed by SEM

and EDS, and the phase composition of the ceramic coating was analyzed by XRD. The polarization curves of the ceramic coating in 3.5%NaCl solution were measured by electrochemical workstation, and the corrosion resistance was analyzed. With increasing graphene concentration, the C content in the micropores of the ceramic coating firstly increased and then decreased, and the C content outside the micropores increased. The pore diameter of the ceramic coating and surface roughness decreased firstly and then increased. The porosity increased, but the thickness hardly changed. Moreover, the concentration of graphene had no effect on the phase composition of the ceramic coating, and the main phase composition was MgF_2 , ZrO_2 , MgO and $\text{Mg}_2\text{Zr}_5\text{O}_{12}$. Compared with the sample without graphene, the corrosion current density was reduced by 1~2 orders of magnitude and the polarization resistance was increased by 1~2 orders of magnitude. When the concentration of graphene was 0.15 g/L, the pore diameter of the ceramic coating was the smallest, the corrosion current density was the smallest of 9.46×10^{-7} A/cm², and the polarization resistance was the largest of $1.95 \times 10^6 \Omega \cdot \text{cm}^2$. Thus, the coating had the best corrosion resistance. A certain concentration of graphene can reduce the micropore diameter of micro-arc oxidation ceramic coating, increase the porosity of ceramic coating and improve the corrosion resistance of ceramic coating.

摘要: 目的研究石墨烯浓度对 AZ91D 镁合金微弧氧化陶瓷膜生长及耐蚀性的影响。方法通过超声分散获得石墨烯分散液,添加到铅盐体系电解液中,采用微弧氧化技术,在 AZ91D 镁合金表面制备微弧氧化陶瓷膜。采用 SEM、EDS 对陶瓷膜微观结构进行分析,采用 XRD 对陶瓷膜物相组成进行分析,采用电化学工作站测量陶瓷膜在 3.5%NaCl 溶液中的极化曲线,并对其耐蚀性进行分析。结果随着石墨烯浓度增加,陶瓷膜微孔中的 C 含量先增加后减小,微孔外的 C 含量增加,陶瓷膜表面孔径和粗糙度先减小后增加,孔隙率增加,厚度几乎没有变化。并且石墨烯浓度对陶瓷膜相成分没有影响,主要相组成为 MgF_2 、 ZrO_2 、 MgO 和 $\text{Mg}_2\text{Zr}_5\text{O}_{12}$ 。与未添加石墨烯的试样相比,添加石墨烯后,腐蚀电流密度降低了 1~2 个数量级,极化电阻增加了 1~2 个数量级。在石墨烯质量浓度为 0.15 g/L 时,陶瓷膜表面微孔孔径达到最小,腐蚀电流密度最小,为 9.46×10^{-7} A/cm²,极化电阻最大,为 $1.95 \times 10^6 \Omega \cdot \text{cm}^2$,耐蚀性最好。结论一定浓度石墨烯能够减小微弧氧化陶瓷膜微孔孔径,增加孔隙率,提高陶瓷膜的耐蚀性。

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作者: 耿九光; 兰倩; 刘光军; 周恒玉; 刘润喜

标题: Research progress on surface texture measurement and repair methods of asphalt pavement

标题: 沥青路面表面纹理测量及修复方法研究进展

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作者关键词: road surface; anti-sliding performance; texture structure; repair method

作者关键词: 路面; 抗滑性能; 纹理构造; 修复方法

摘要: Aiming at the problem of insufficient slip resistance of pavement,the influence of pavement texture structure on the anti-sliding performance of pavement and the relationship between asphalt pavement texture and anti-sliding performance were summarized. The existing asphalt pavement texture structure measurement method and repair method were reviewed. Studies have shown that the average structural depth(MTD) and average section depth(MPD), two asphalt pavement texture structural characteristics evaluation indicators can not characterize the texture distribution. The indirect method is used to measure the surface texture of the pavement. Although it is convenient to operate,it cannot visually characterize the pavement structure. The direct measurement method can directly obtain the two-dimensional or three-dimensional shape of the road surface,and the measurement result is intuitive and can be directly used for the evaluation of the road surface texture features. Under the continuous compaction and friction of the vehicle, the surface texture structure of the asphalt pavement can be repaired by adding anti-sliding surface layer and surface mechanical treatment to improve the anti-sliding performance of the road surface.

摘要: 针对路面抗滑性不足问题,分析了路面纹理构造特征对路面抗滑性能的影响以及沥青路面纹理与抗滑性能的关系,综述了现有的沥青路表纹理构造测量方法与修复方法。研究表明,平均构造深度(MTD)和平均断面深度(MPD)这两个沥青路面纹理构造特征评价指标不能表征纹理分布。采用间接法测量路表纹理虽然操作方便但是不能直观形象地表征路面构造特征。直接测量法可以直接捕获路表二维或三维形貌,测量结果形象直观,可以直接用于路表纹理特征的评价。在车辆的不断压实和摩擦作用下,可以采用加铺抗滑表层和表面机械处理等方法修复沥青路面表面纹理构造从而提高路面抗滑性能。

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标题: Effect of complex climatic environment on pore structure and mechanical properties of
concrete

标题: 高原复杂气候环境对混凝土气孔结构与力学性能的影响

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作者关键词: road engineering; concrete; low air pressure; dry; low temperature; pore structure;
compressive strength

作者关键词: 道路工程; 混凝土; 低气压; 干燥; 低温; 气孔结构; 抗压强度

摘要: In order to study the influence of the plateau environment on concrete pore structure and mechanical properties, the air-entrained concrete formed and cured in the plateau and plain regions was taken as the research object. Concrete formed and cured under different environments was used to analyze the porosity characteristic parameters of concrete, using a hardened concrete porosity analyzer after some cutting and surface treatments, and the 28 d compressive strength of concrete under different forming and curing environments was tested. The effects of different environments on concrete pore structure and mechanical properties were discussed. The influences of low-pressure, dry and low-temperature environment on air content, average pore size, pore size distribution, pore spacing factor and 28 d compressive strength were obtained through comparative analysis. The relationship between the concrete pore structure and the compressive strength was established, and the reason for the deterioration of concrete pore structure and

mechanical properties under the plateau environment was revealed. The results show that compared with the concrete cured at normal pressure, the air content of the hardened concrete cured under low-pressure standard reduced by 5% to 22%, the average pore size reduced by 2% to 5%, the spacing factor increased by 4% to 11%, and the strength increased by 5% to 10%. Compared with concrete cured under low air pressure, the air content of hardened concrete cured under plateau environment increased by 20% to 30%, the average pore diameter increased by 8% to 12%, and the spacing factor decreased by 15 to 20%, and the strength reduced by up to 36%. The dry and low-temperature environment in the plateau area will affect the progress of the cement hydration reaction. The internal concrete structure will be loose and the porosity structure is deteriorated. At the same time, the frost heaving stress generated inside the concrete under low-temperature environment lead to the damage to its structure and the decline of strength in the later period. Adding air-entraining agent will increase the porosity in the concrete and reduce the strength, but the introduction of air bubbles in the plateau environment can effectively buffer the frost heave stress, and reduce the damage of the internal structure of the concrete and the loss of strength. 7 tabs, 6 figs, 25 refs.

摘要: 为探究高原复杂气候环境对混凝土气孔结构与力学性能的影响,分别以高原地区和平原地区成型养护的引气混凝土为研究对象,对混凝土试块进行切割以及表面处理,利用硬化混凝土气孔分析仪,对不同成型养护环境下混凝土的气孔特征参数进行分析,并对不同成型养护环境下混凝土的 28 d 抗压强度进行测试,研究不同环境对混凝土气孔结构以及 28 d 抗压强度的影响;通过对比分析得出高原地区低压、干燥、低温的气候环境下,混凝土含气量、气孔平均孔径、孔径分布、气孔间距系数以及 28 d 抗压强度的变化规律,建立混凝土内部气孔结构与混凝土抗压强度之间的关联,揭示高原复杂环境下混凝土气孔结构劣化以及力学性能下降的原因。研究结果表明:与常压标准养护的混凝土相比,低压标准养护的硬化混凝土含气量降低了 5%~22%,平均孔径减小了 2%~5%,气孔间距系数增加了 4%~11%,强度增加了 5%~10%;与低气压标准养护的混凝土相比,高原养护环境下硬化混凝土含气量增加了 20%~30%,平均孔径增大了 8%~12%,气孔间距系数降低了 15%~20%,强度下降了 15%~36%。高原地区干燥、低温环境会影响水泥水化反应,导致混凝土结构疏松,气孔结构劣化,同时低温环境下混凝土内部产生冻胀应力,对其结构造成破坏,并导致后期强度下降。掺入引气剂会使混凝土内气孔变多,混凝土强度降低,但高原环境下引入气泡可有效缓冲冻胀应力,减少混凝土内部结构的破坏以及强度的损失。

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标题: Synthesized and long-cycle stability of LiVOPO₄ cathode materials for lithium-ion battery
标题: 锂离子电池正极材料 LiVOPO₄ 的制备及其长循环稳定性
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作者关键词: LiVOPO₄; LiVOPO₄; sol-gel; cathode materials; lithium ion battery; electrochemical performance
作者关键词: 溶胶-凝胶; 正极材料; 锂离子电池; 电化学性能
摘要: LiVOPO₄ cathode material was synthesized by sol-gel method in this study. The structures and electrochemical properties of the synthesized materials were studied. Present results indicated that pure beta-LiVOPO₄ phase crystallized in an orthorhombic Pnma space group after the precursor gel was calcined at a low temperature of 500°C. Micrometer-sized LiVOPO₄ material exhibited a superior long-term cyclability during charge-discharge processes. After cycling 300 times at a current density of 10 mA/g, the discharge capacity did not decay, retaining a reversible capacity of over 150 mAh/g after 300 cycles. Particularly, the material also retained excellent capacity (100%) upon 1000 cycles at a current density of 100 mA/g. The present results show that the LiVOPO₄ could be used as efficient cathode materials for high energy and long-life lithium ion battery.
摘要: 本文采用溶胶凝胶法合成了 beta-LiVOPO₄ 锂离子电池正极材料, 研究了其结构和电化学性能。结果表明, 在 500°C 较低温度下能够合成晶态纯相 beta-LiVOPO₄, 其结构为正交晶系, 属于 Pnma 空间群。这种材料具有非常稳定的电化学充放电长循环性能。在 10 mA/g 充放电电流密度下循环 300 次, 其放电比容量没有衰减, 维持在 150 mAh/g 以上。即使在 100 mA/g 的电流密度下循环 1 000 次, 其比容量保持率仍旧高达 100%。本文研究结果显示, LiVOPO₄ 适合作为高能量长循环寿命锂离子电池正极材料。
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标题: Investigation on low-temperature rheology and adhesion properties of salt-doped asphalt mortars

标题: 掺盐沥青胶浆低温流变及粘附特性

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作者关键词: road engineering; salt; asphalt mortar; low temperature rheological characteristic; contact angle; adhesion characteristic; salt aging effect

作者关键词: 道路工程; 盐分; 沥青胶浆; 低温流变特性; 接触角; 粘附特性; 盐老化效应

摘要: In order to explore the influence of salts on the low-temperature rheological properties and adhesion properties of asphalt mortars, preparation method of asphalt mortars with salt particles replacing mineral powder by volume ratio 1:1 and the bending beam rheological test(BBR) were used to study the effects of different salt-doped asphalt mortars on the low-temperature rheological properties at 30 d and 120 d test age. The corresponding Burgers model was built to analyze the effect of salinity on low temperature viscoelasticity of asphalt. Through the contact angle test, the surface energy parameters of asphalt were obtained, and the adhesion characteristics of different asphalt mortar were evaluated. Scanning electron microscopy (SEM) and infrared spectroscopy (FTIR) were used to explore the microscopic mechanism of salt-doped asphalt mortars. The results showed that compared with control asphalt, the rheological property of salt-doped asphalt mortars at low temperature decreases with the increase of age. At the age of 120d, the contact angles of asphalt increase obviously, the surface energy of salt-doped asphalt mortars decreases and its adhesion property degrades. The dissolution and crystallization process of salt particle and its salt aging effect are the main inducing factors of performance deterioration of salt-doped asphalt mortars.

摘要: 为探究盐分对沥青胶浆低温流变及粘附特性的影响规律,采用盐颗粒以体积比 1:1 替代矿粉的沥青胶浆制备方法,通过弯曲梁流变试验(BBR)研究不同掺盐沥青胶浆在 30 d 与 120 d 龄期下的低温流变特性,并构建相应的 Burgers 模型,分析盐分对沥青低温粘弹特性的影响;通过接触角试验,得出沥青表面能参数,评价不同沥青胶浆粘附特性;借助扫描电镜(SEM)和红外光谱(FTIR)手段,探究掺盐沥青胶浆微观作用机理。结果表明:相较于基质沥青,不同种类掺盐沥青胶浆随着龄期的增加,低温流变性能不断降低;经 120 d 龄期后,沥青接触角明显增大,掺盐沥青胶浆表面能降低,粘附性劣化;盐分颗粒溶析及其盐老化效应,是导致掺盐沥青胶浆性能劣化的主要诱因。

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作者关键词: plasma spraying; Fe -based amorphous coating; Ni -Al powder; 45 steel; shell -core structure; wear resistance

作者关键词: 等离子喷涂; 铁基非晶涂层; Ni -Al 粉末; 45 钢; 壳-核状结构; 耐磨性

摘要: In order to reduce the porosity of Fe-based amorphous coating and improve its friction resistance, Ni-Al particles were coated on the surface of Fe -based amorphous particles by mechanical ball milling. The composite coating powders with shell-core structure were obtained and used for preparing Fe-based amorphous coatings by plasma spraying method. Subsequently, the phase composition and microstructure of coated composite powders and Fe -based composite coatings were analyzed, and the porosity, amorphous ratio and dry friction properties of the composite coatings were tested. In addition, the changes of microstructure and friction mechanism of the coatings before and after Ni-Al particle coating were studied. Results showed that Ni-Al particles were successfully coated on Fe-based amorphous surface to form a compact shell-core composite powder, of which the particle size was less than 50 μm and the coating thickness was 1~ 3 μm . The porosity of the coating decreased by about 5%, and the amorphous content decreased from 72.5% to 64.8% due to the dilution of Ni -Al. Moreover, the structure of the composite coating presented lamellar structure was formed by Ni₃Al phase and Fe -based

amorphous phase. Compared with the traditional coating structure, the composite coating could strengthen the advantages of layered amorphous coating. In the comparison of Fe-based amorphous coatings, the friction coefficient of composite coating decreased from 0.412 3 to 0.256 1, and the wear amount was about half of the original coating. By modifying the melting morphology and ductility of Fe-based amorphous particles, Ni-Al particles could effectively improve the density of amorphous coatings. Furthermore, the amorphous content of the coatings was not significantly reduced, while the wear resistance was significantly enhanced.

摘要: 为了降低 Fe 基非晶涂层的孔隙率, 并提高其耐摩擦性能, 采用机械球磨法在铁基非晶颗粒表面包覆 Ni-Al 颗粒, 得到具有壳-核结构的涂层复合喷涂粉末, 并采用等离子喷涂法将其在 45 钢表面制备铁基非晶涂层; 分析了包覆型复合粉末和 Fe 基复合涂层的相组成和微观结构, 测试了复合涂层的孔隙率、非晶相比比例和干摩擦性能, 研究了 Ni-Al 粒子包覆前后涂层的微观结构与摩擦机理变化。结果表明: Ni-Al 粒子成功包覆在 Fe 基非晶表面形成了结构致密的壳-核结构复合粉末, 粉末粒径小于 50 μm , 包覆层厚度 1 ~ 3 μm 。涂层孔隙率下降 5% 左右, 由于 Ni-Al 稀释作用, 非晶含量由 72.5% 降低为 64.8%, 复合涂层的结构显示为 Ni₃Al 相和 Fe 基非晶形成的层片状。相对于传统涂层结构, 复合涂层更能够强化非晶涂层的层状堆积的优点。相比 Fe 基非晶涂层, 复合涂层的摩擦系数由 0.412 3 降低到 0.256 1, 磨损量为原涂层的 1/2 左右。Ni-Al 粒子通过改进 Fe 基非晶粒子的熔解形态和延展能力, 有效提高了非晶涂层的致密度, 涂层非晶含量降低不明显, 耐磨性显著增强。

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标题: Damage evaluation of asphalt mixture performance under chloride salt erosion

标题: 氯盐侵蚀条件下沥青混合料性能损伤评价

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作者关键词: road engineering; asphalt mixture; salt erosion; CT technology; damage evaluation

作者关键词: 道路工程; 沥青混合料; 盐侵蚀; CT 技术; 损伤评价

摘要: The salt erosion environment deteriorates the performance of the asphalt pavement. The macroscopic mechanical properties of asphalt mixture under the immersion and dry-wet cycle of NaCl solution were characterized by Marshall specimen splitting strength. Based on infrared spectroscopy (FTIR) analysis and CT scanning images, the performance of chlorine salt on asphalt performance was investigated. From the meso level, the variance of the gray scale change of CT image is used to quantitatively evaluate the degree of salt damage of asphalt mixture. The results show that the dry-wet cycle is a significant factor leading to the degradation of asphalt mixture performance. The chloride salt erosion damage of asphalt mixture is mainly physical effect. The variance of the gray value of CT image is highly negatively correlated with the mechanical strength of asphalt mixture. The research results can provide a new way to investigate the damage evolution and durability prediction of asphalt mixture exposed to salt erosion environment.

摘要: 盐蚀环境使沥青路面性能劣化严重。采用马歇尔试件劈裂强度表征 NaCl 溶液浸泡与干湿循环作用下沥青混合料宏观力学性能; 基于红外光谱(FTIR)、CT 扫描图像探究氯盐对沥青性能损伤机理。从细观层次提出采用 CT 图像灰度变化方差值来定量评价沥青混合料盐蚀损伤程度。结果表明, 干湿循环作用是导致沥青混合料性能劣化的显著因素; 沥青混合料氯盐侵蚀损伤以物理作用为主; CT 图像灰度变化方差值与沥青混合料力学强度呈极强负相关性, 为研究盐蚀环境下沥青混合料性能损伤演化及耐久性预估提供新思路。

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标题: Study on performance of environmental friendly compound snow-melting salted asphalt mortar

标题: 环保型复合融雪盐化物沥青胶浆性能研究

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作者关键词: asphalt pavement; asphalt mortar; salt compounds; viscosity-temperature characteristic; low temperature rheological characteristic

作者关键词: 沥青路面; 沥青胶浆; 盐化物; 粘温特性; 低温流变特性

摘要: The asphalt mortar were prepared under the condition of 1 : 1 powder-to-binder ratio, in which mineral filler was replaced with different salt compounds shares. The effects of substitution rate on the conventional properties of salted asphalt mortar were analyzed by penetration, ductility and elastic recovery tests. Based on the results of Brookfield viscosity test, the influence of substitution rate and temperature on the viscosity-temperature characteristics of salted asphalt mortar was investigated by regression analysis. The low temperature performance of the salted asphalt mortar was studied by low temperature bending beam rheological test, and the influence of substitution rate and temperature on the low temperature performance of the salted asphalt mortar was analyzed. The results show that the addition of salt compounds can reduce the penetration and ductility of the asphalt mortar, and at the same time, the elastic recovery of the asphalt mortar is significantly improved. With the increase of temperature, the effect of salt substitution rate on the viscosity of asphalt mortar is more obvious. The temperature sensitivity of salted asphalt mortar increases first and then decreases with the increase of salt substitution rate. With the decrease of temperature, the performance of asphalt mortar decreases gradually. The creep modulus of asphalt mortar increases slowly and the creep rate decreases slightly when the substitution rate of salts is

less than 75%.However,when the substitution rate is more than 75%, the low temperature performance of asphalt mortar decreases sharply,and the substitution rate of salt has little effect on the low temperature performance of asphalt mortar.

摘要: 采用等体积替换法,在 1 : 1 粉胶比条件下用盐化物替换沥青胶浆中的矿粉,制备不同替代率的盐化物沥青胶浆。采用针入度、延度及弹性恢复试验,分析替代率对盐化物沥青胶浆常规性能的影响;通过布氏粘度试验,回归分析替代率、温度对盐化物沥青胶浆粘温特性的影响;以低温弯曲梁流变试验,研究盐化物沥青胶浆的低温性能,分析替代率、温度对盐化物沥青胶浆低温性能的影响。结果表明,盐化物的掺入,会降低沥青胶浆的针入度、延度,同时会使沥青胶浆的弹性恢复出现明显提高。温度越高,盐化物替代率对沥青胶浆粘度影响越显著,盐化物沥青胶浆的温度敏感性随盐化物替代率的变化先增大后减小;随着温度下降,沥青胶浆性能逐渐劣化,当替代率小于 75%时,沥青胶浆蠕变劲度模量增长缓慢,蠕变速率下降不明显,但替代率高于 75%时,沥青胶浆低温性能迅速衰减。掺入适量盐化物对沥青胶浆低温性能影响不大。

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标题: Research on Technology of Activated Rubber Powder Modified Asphalt Based on TOPSIS

标题: 基于逼近理想点排序法的活化橡胶粉改性沥青工艺

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作者关键词: TOPSIS; Composite nonionic surfactant; Modified asphalt; TOPSIS; Crumb rubber powder

作者关键词: 复合非离子表面活性剂; 改性沥青; 废旧橡胶粉

摘要: Rubber powder was activated by composite nonionic surfactant, and then to be used to modify the asphalt. The morphology and main functional groups of rubber powder before and after activation were characterized by scanning electron microscope (SEM) and infrared spectrometer (IR). The conventional performance of activated rubber powder modified asphalt was evaluated comprehensively by using the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS). The activated rubber powder technology was selected according to the evaluation results. The high and low temperature performance, temperature sensitivity, DMA and TGA of matrix asphalt, rubber powder modified asphalt and activated rubber powder modified asphalt were compared and analyzed. The results show that: The best modification technology is 70°C and 3h, and the content of composite nonionic surfactant (best ratio is 1:2) is 2% of the rubber powder; The high and low temperature performance, temperature sensitivity of activated rubber powder modified asphalt is better than that of common rubber powder modified asphalt; DMA and TGA results show that the performance of activated rubber powder modified asphalt is better than that of common rubber powder modified asphalt.

摘要: 采用系列复合非离子表面活性剂在不同工艺条件下对橡胶粉进行活化, 并利用得到的活化橡胶粉改性沥青。通过扫描电镜和红外光谱对橡胶粉活化前后的微观形貌和主要官能团进行对比分析。对基质沥青、橡胶粉改性沥青和活化橡胶粉改性沥青的高、低温性能、温度敏感性以及动态热机械和热稳定性对比分析, 利用逼近理想点排序法 (TOPSIS) 对活化橡胶粉改性沥青的上述性能进行综合评价, 优选橡胶粉的最佳活化工艺。研究结果表明: 橡胶粉表面活化最佳工艺: 复合非离子表面活性剂配比为 1:2, 掺量为橡胶粉质量的 2%, 活化温度为 70°C, 处理时间 3h; 活化橡胶粉改性沥青的高温性能、低温性能、温度敏感性均优于普通橡胶粉改性沥青; 动态热机械和热稳定性分析表明活化橡胶粉改性沥青的性能均优于橡胶粉改性沥青。

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标题: TiN/Ti 多层涂层高速冲击损伤特征研究

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作者关键词: TiN/Ti multilayer coating; tensile stress; equivalent plastic strain

作者关键词: TiN/Ti 多层涂层; 拉应力; 等效塑性应变

摘要: In order to study the damage characteristics of high-speed erosion of TiN/Ti multilayer coatings by sand particles, the finite element method was used to simulate the erosion of TiN/Ti multilayer coatings by sand particles. The effects of the total coating thickness, modulation ratio, and impact angle on the damage characteristics of TiN/Ti coatings under single-particle high-speed impact were studied. The results show that during the sand impacts coating, a large tensile stress is distributed on the lower surface of each TiN layer directly below the impact center and the upper surface of each TiN layer near the impact contact radius. Large compressive stress is mainly distributed on the upper surface of each TiN layer directly below the impact center. The maximum tensile stress in the coating and the maximum equivalent plastic strain of the substrate increase first and then decrease as the total thickness of the coating increases. The coating exhibits good impact resistance at the maximum thickness. Increasing the modulation ratio of the multilayer coating will cause the maximum tensile stress in the coating and the maximum equivalent plastic strain of the substrate to increase continuously. When the impact angle of the sand particles increases from a small angle to a large angle, the maximum stress in the coating and the maximum equivalent plastic strain of the substrate continue to increase. When the impact angle is 90° , the gradient effect of TiN/Ti multilayer coating becomes less obvious.

摘要: 为研究砂粒高速冲蚀 TiN/Ti 多层涂层的损伤特征, 采用有限元方法模拟砂粒冲蚀 TiN/Ti 多层涂层过程, 研究单颗粒高速冲击下涂层总厚度、调制比、冲击角度对 TiN/Ti 涂层损伤特征的影响。结果表明: 砂粒冲击涂层过程中, 冲击中心正下方的各 TiN 层下表面和冲击接触半径附近的各 TiN 层上表面均分布较大的拉应力, 在冲击中心正下方各 TiN 层上表面主要分布较大的压应力; 涂层内的最大拉应力和基体最大等效塑性应变随着涂层总厚度的增大先增大后减小, 厚度最大时体现出良好的抗冲击性; 增大多层涂层的调制比会造成涂层内的最大拉应力以及基体的最大等效塑性应变不断增大; 砂粒冲击角度从小角度到大角度的过程中, 涂层内的最大应力和基体最大等效塑性应变不断增大, 冲击角度为 90° 时, TiN/Ti 多层涂层的梯度作用不明显。

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标题: Effects of Degradation of SBS Modified Asphalt Binders during Thermal Storage and Transportation

标题: SBS 改性沥青热储存及运输过程中的降解研究

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作者关键词: SBS modified asphalt; thermal degradation; storage performance; chemical structure

作者关键词: SBS 改性沥青; 热降解; 储存性能; 化学结构

摘要: Through indoor simulation of the thermal degradation process of styrene-butadiene-styrene block copolymer(SBS) modified asphalt binders under low air concentration(or relative condition without oxygen), the performance of SBS modified asphalt binders under different conditions was tested and analyzed. The results show that in the process of thermal degradation, the crack resistance of SBS modified asphalt binders at low temperature decreased with time or temperature increases; compared with the effects of thermal degradation under low air concentration on microstructure of SBS modified asphalt binders, SBS modified asphalt binders have higher carbonyl and lower butadiene contents during thermal degradation under high air concentration. It is necessary to fully consider the influences of time, temperature and air concentration on SBS modified asphalt binders performance in the production, storage and transportation of SBS modified asphalt binders.

摘要: 通过室内模拟低空气浓度(或相对绝氧)环境下苯乙烯丁二烯苯乙烯嵌段共聚物(SBS)

改性沥青的热降解过程,测试和分析了不同条件下 SBS 改性沥青的性能.结果表明:在热降解过程中,SBS 改性沥青低温抗裂能力随时间的延长或温度的升高而逐渐降低;与低空气浓度下热降解对 SBS 改性沥青微观结构的影响相比,SBS 改性沥青在高空气浓度下热降解过程中有更高的羰基和更低丁二烯含量.在生产、储存和运输 SBS 改性沥青时,需要充分考虑时间、温度以及空气浓度对其性能的影响.

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标题: Preparation and electrochemical performance of three-dimensional ordered macroporous SnO₂-SiO₂lithium ion battery anode materials

标题: 3DOM SnO₂-SiO₂ 锂离子电池负极材料的制备及电化学性能

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作者关键词: SiO₂; lithium ion battery; three-dimensionally ordered macroporous; SiO₂; composite materials; cycle performance

作者关键词: 锂离子电池; 三维有序大孔; 复合材料; 循环性能

摘要: Aiming at the shortcomings of poor long-cycle performance of SnO₂lithium ion battery

anode materials, amorphous SiO_2 is introduced into SnO_2 material to form $\text{SnO}_2\text{-SiO}_2$ nanocomposites. Three-dimensional ordered macroporous $\text{SnO}_2\text{-SiO}_2$ nanocomposites are prepared by using polystyrene(PS) colloid as a template. The results show that the crystal structure of 3DOM SnO_2 material is similar to that of 3DOM $\text{SnO}_2\text{-SiO}_2$ material, but the long cycle performance of 3DOM $\text{SnO}_2\text{-SiO}_2$ material is significantly improved after adding SiO_2 . Cycling 100 times at a current density of 500mAh/g, at which time the charge specific capacity of the 3DOM $\text{SnO}_2\text{-SiO}_2$ material with 0% Si is sharply attenuated to 147mAh/g, and the charge capacity of the 3DOM $\text{SnO}_2\text{-SiO}_2$ material with 5% Si is added, the capacity is 654mAh/g, and the charge capacity of the 3DOM $\text{SnO}_2\text{-SiO}_2$ material with 5% Si added after 500 cycles is increased to 728mAh/g. These results indicate that SiO_2 can improve the long cycle stability of 3DOM SnO_2 materials.

摘要: 针对 SnO_2 锂离子电池负极材料长循环性能差的缺点,把非晶 SiO_2 引入 SnO_2 材料中,形成 $\text{SnO}_2\text{-SiO}_2$ 纳米复合材料。采用聚苯乙烯(PS)胶晶作为模板,制备出三维有序大孔 $\text{SnO}_2\text{-SiO}_2$ 纳米复合材料。研究表明,3DOM SnO_2 材料晶体结构和 3DOM $\text{SnO}_2\text{-SiO}_2$ 材料相似,但是加入 SiO_2 以后,3DOM $\text{SnO}_2\text{-SiO}_2$ 材料的长循环性能得到显著提高。在 500mAh/g 的电流密度下循环 100 次,此时加 0%Si 的 3DOM $\text{SnO}_2\text{-SiO}_2$ 材料的充电比容量急剧衰减为 147mAh/g,加 5%Si 的 3DOM $\text{SnO}_2\text{-SiO}_2$ 材料的充电比容量达 654mAh/g,此外 500 次循环后加 5%Si 的 3DOM $\text{SnO}_2\text{-SiO}_2$ 材料充电比容量增至 728mAh/g。这些结果表明 SiO_2 能够改善 3DOM SnO_2 材料长循环稳定性。

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标题: Evaluation of adhesion properties between asphalt and calcined bauxite aggregate

标题: 煅烧铝矾土集料与沥青粘附性评价

来源出版物: 应用化工 卷: 49 期: 1 页: 85-89 出版年: 2020

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作者关键词: road engineering; adhesion; surface energy; dynamic shear rheology; calcined bauxite aggregate

作者关键词: 道路工程; 粘附性; 表面能; 动态剪切流变; 煅烧铝矾土集料

摘要: The adhesion properties and interfacial adhesion of SK-90 asphalt,SBS modified asphalt and rubber powder modified asphalt and 90# calcined aluminum alumina aggregate were evaluated.The adhesion energy was calculated by the contact angle experiment to determine the surface energy of asphalt and aggregate,and the aggregate powder and different asphalt were mix into a mortar for dynamic shear rheometer(DSR)test to evaluate the interaction between aggregate and asphalt.Finally, the functional group changes after the main components of alumina powder were added to the asphalt by infrared spectroscopy,and the mechanism of interaction between aggregate and asphalt was analyzed.The results show that the adhesion work of 90# calcined bauxite and rubber powder modified asphalt is the largest,and the interaction between mineral powder and rubber powder modified asphalt is the strongest.Therefore, the adhesion properties of calcined bauxite aggregate and rubber powder modified asphalt are the best.

摘要: 对比评价了 SK-90 沥青、SBS 改性沥青和橡胶粉改性沥青与 90#煅烧铝矾土集料的界面粘附性。通过接触角实验测定沥青与集料的表面能计算粘附功,并将集料粉末与不同沥青制成胶浆进行动态剪切流变仪(DSR)测试,评价集料与沥青的交互作用,最后通过红外光谱测试氧化铝粉末加入沥青后主要成分的官能团变化,分析集料与沥青相互作用的机理。结果表明, 90#煅烧铝矾土与橡胶粉改性沥青的粘附功最大,常温下其矿料粉末与橡胶粉改性沥青的交互作用能力最强。故煅烧铝矾土集料与橡胶粉改性沥青的粘附性最好。

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标题: Preparation and properties of waste crumb powder composite high viscosity modified asphalt

标题: 废胶粉复合高黏改性沥青制备与性能研究

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作者关键词: DSR; BBR; rubber modified asphalt; DSR; BBR; cosolvent; adhesive

作者关键词: 胶粉改性沥青; 助溶剂; 增黏剂

摘要: The high-viscosity modified asphalt with high performance was prepared by compounding the waste rubber powder co-solvent and adding the tackifier. The conventional performance index of cone penetration, softening point, ductility and Brinell viscosity was adopted, and the dynamic shear flow was DSR and BBR were used to study the high temperature rutting resistance and low temperature rheological properties. The results show that when the content of waste rubber

powder,cosolvent and bismuth adhesive are 20%,5 % and 3%,respectively,the modified asphalt meets the viscosity index of high-viscosity asphalt;the addition of modifier improves the modified asphalt of the rutting factor ($G^*/\sin\delta$)and m value reduce the phase angle (δ)and the stiffness modulus (S),which effectively improve the high temperature performance and anti-aging performance of the modified asphalt,and the low temperature performance is also improved;The PG grade of the modified asphalt is PG82-24.

摘要: 通过复配废胶粉助溶剂和添加增黏剂制备了性能优越的废胶粉高黏改性沥青,采用锥入度、软化点、延度、布氏黏度常规性能指标,借助动态剪切流变试验(DSR)和小梁弯曲蠕变试验(BBR)对其高温抗车辙能力及低温流变特性进行了研究。结果表明,当废胶粉、助溶剂、增黏剂掺量分别为20%,5%和3%时,所制改性沥青满足高粘沥青黏度指标;改性剂的加入提高了改性沥青车辙因子($G^*/\sin\delta$)和 m 值,降低了相位角(δ)和劲度模量(S),有效提升了改性沥青的高温性能和抗老化性能,低温性能也有所改善;所制备改性沥青的 PG 分级为 PG82-24。

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作者: 李彦明; 晁敏; 蒋润凯; 穆志豪; 周振君; 颜录科

标题: Influence of electrospinning structure modulation on PI morphology and property

标题: 聚酰亚胺电纺纤维膜的结构调控与性能研究

来源出版物: 化工新型材料 卷: 48 期: 2 页: 55-59,65 出版年: 2020

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文献类型: Article

作者关键词: lithium ion battery separator; polyimide; electrospinning

作者关键词: 锂离子电池隔膜; 聚酰亚胺; 静电纺丝

摘要: Conventional polyolefin lithium ion battery separators have serious safety hazards due to low melting point, poor thermal stability and the like. Polyimide (PI) can make up for the defects of traditional polyolefin lithium ion battery separators due to its excellent mechanical strength and thermal stability. The polyimide fiber membrane prepared by the electrospinning technology has high porosity, excellent electrolyte wettability and high thermal properties, and can be well applied in the field of lithium ion battery separators. After scanning electron microscopy, fourier infrared absorption spectroscopy and thermal weight loss test, the optimal solution for electrospinning was determined, namely: voltage was 15 kV, spinning speed was 0.6 mL/h, and post-treatment was chemical imidization. And thermal imidization for 3 h, the contact angle test showed that the membrane and the electrolyte had good wetting properties, and the calculated porosity can reach 107%. A series of tests shown that the membrane obtained by structural regulation can be a good substitute for the traditional polyolefin lithium ion battery separators.

摘要: 通过静电纺丝技术制备得到了聚酰亚胺(PI)纤维膜, 经过扫描电子显微镜、傅里叶红外吸收光谱和热失重测试确定静电纺丝的最优方案, 即: 纺丝电压为 15 kV, 纺丝速度为 0.6 mL/h, 后处理为化学亚胺化和热亚胺化各 3 h。经过接触角测试表明, PI 纤维膜与电解液有很好的润湿性能, 孔隙率可达 107%。一系列的测试表明, 通过结构调控得到的 PI 纤维膜可以很好地替代传统的聚烯烃锂离子电池隔膜。

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标题: Microstructure and properties of B-Al composite coatings on TC4 titanium alloy

标题: TC4 钛合金表面 B-Al 复合渗层的组织和性能

来源出版物: 金属热处理 卷: 45 期: 3 页: 11-14 出版年: 2020

文献号: 0254-6051(2020)45:3<11:TTHJBM>2.0.TX;2-S

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文献类型: Article

作者关键词: TC4 titanium alloy; B-Al composite coatings; friction coefficient; wear resistance

作者关键词: TC4 钛合金; B-Al 复合渗层; 摩擦因数; 耐磨性能

摘要: B-Al composite coatings were prepared on the surface of TC4 titanium alloy by boronizing at 1050 °C for 4-6 h and subsequent aluminizing at 950-1050 °C for 4 h through a two-step pack cementation process. The constituent phases, microstructure, composition, hardness, friction coefficient of the composite coatings were analyzed by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), wavelength dispersive spectrometer (WDS) and energy dispersive spectrometer (EDS), microhardness tester, and friction and wear tester. The results show that the thickness of the B-Al composite coatings is in the range of 37-115 μm, and the coatings mainly consist of TiB₂ and TiAl₃ phases. The outer layer is TiAl₃ layer with dispersed TiB₂; and TiAl₂, TiAl and Ti₃Al intermetallic compound layers with smaller thickness are formed inward in turn. The surface hardness of the B-Al composite coatings is in the range of 1041.7-1429.4 HV0.1, which is about 3.03-4.16 times of the TC4 alloy. By boronizing at 1050 °C for 6 h followed by aluminizing at 1050 °C for 4 h, the friction coefficient of the B-Al composite coating is about 0.3, lower than that of TC4 alloy by about 25%.

摘要: 采用固体粉末包埋渗两步法,在 TC4 钛合金表面先 1050 °C 渗硼 4~6 h 再 950~1050 °C 渗铝 4 h 制备出 B-Al 复合耐磨渗层。利用 X 射线衍射仪(XRD)、扫描电镜(SEM)、波谱仪(WDS)和能谱仪(EDS)、显微硬度仪和摩擦磨损试验机对复合渗层的物相组成、显微组织、微区成分、表面硬度和摩擦因数进行测试和分析。结果表明: B-Al 复合渗层厚为 37~115 μm,主要由 TiB₂ 相和 TiAl₃ 相组成,外层是弥散分布 TiB₂ 的 TiAl₃ 层,向内依次形成厚度较小的 TiAl₂、TiAl 及 Ti₃Al 等 Ti-Al 金属间化合物层。B-Al 复合渗层表面硬度为 1041.7~1429.4 HV0.1,约为 TC4 钛合金硬度的 3.03~4.16 倍;经 1050 °C*6 h 渗 B 后 1050 °C*4 h 渗 Al,其摩擦因数约为 0.3,较 TC4 钛合金基体下降约 25%。

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标题: Research Progress on Electromagnetic Wave Absorption Properties of Carbon Materials

标题: 碳基材料吸波性能研究进展

来源出版物: 中国材料进展 卷: 39 期: 2 页: 138-145 出版年: 2020

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作者关键词: electromagnetic wave absorption mechanism; carbon materials; electromagnetic wave; composites; electromagnetic wave absorption properties

作者关键词: 吸波机理; 碳材料; 电磁波; 复合材料; 吸波性能

摘要: With the rapid development of radar detection technology and increasing impact of electromagnetic radiation pollution, the research and development of new microwave absorption materials have become the hotspot in each country. A single absorbent has the disadvantages of narrow absorption bandwidth and weak absorption intensity, which cannot meet the requirements of wide bandwidth, thin thickness, light weight and strong absorption of the new microwave absorption materials. Carbon materials have the advantages of light weight and excellent microwave absorption properties. Carbon composites exhibit excellent microwave absorption properties by virtue of two-component, multi-component composites with other absorbent components, or the structure design of composites. In this paper, the application and development of carbon materials in microwave absorption field are reviewed from five aspects: carbon black, carbon fiber, carbon nanotube, graphene and other carbon materials. The recent research progress of the electromagnetic wave absorption properties of carbon materials was summarized and analyzed, and the shortcomings of the current research and the direction of further research were put forward.

摘要: 随着雷达探测技术的迅猛发展和电磁波辐射污染的日益加剧, 新型吸波材料的研究和开发成为各国研究的热点。单一吸收剂存在吸波频带窄和吸收强度低等缺点, 无法满足新型吸波材料频带宽、厚度薄、质量轻、吸收强的要求。碳材料具有密度低和吸波性能好等优点, 通过与其他吸收剂的双组分、多组分复合, 或对复合材料的微观结构进行设计, 碳系复合材料表现出优异的吸波性能。简要介绍了吸波材料的工作机理, 然后分别从炭黑、碳纤维、碳纳米管、石墨烯和其他碳系材料等 5 个方面综述了碳系材料在电磁波吸收中的应用和发展, 归纳了碳系材料吸波性能的最新研究进展, 最后提出了当前研究中存在的不足并明确了研究方向。

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作者: 刘小婷; 温久然; 王思雨; 刘开平; 高妮; 钟佳墙

标题: Study on strengthening technology of raw coal gangue aggregate

标题: 原状煤矸石骨料强化工艺研究

来源出版物: 无机盐工业 卷: 52 期: 4 页: 65-71,78 出版年: 2020

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作者关键词: coal gangue; crushing value; water resistance; liquid strengthener; cover treatment

作者关键词: 煤矸石; 压碎值; 耐水性; 液体强化剂; 包覆处理

摘要: The original coal gangue in Tongchuan, Shaanxi Province was taken as the research object. Through the processing of sorting, crushing and grading etc., the experiments on chemical strengthening and surface coating of coal gangue were emphasized. In this study, coal gangue with the particle size of 2.36~4.75 mm was selected. The strength and water resistance of coal gangue were improved with different strengthening agents and coated powder. It was found that when the solution was compounded with 0.7% soil solidified agent in a mass fraction of 6% silicate-based strengthening agent B, the strengthening effect on coal gangue was the most obvious. The surface of the coal gangue after liquid strengthening was covered with a mass ratio of cement to tailings powder of 1 : 1.2, The amount of coating was 25% of the mass of coal gangue. The dry crush value of the obtained product can be reduced by about 50%, the water resistance performance was

improved by about 85%,and the produced coal gangue aggregate product performance was well.The coal gangue aggregate product was replaced by a part of the stone as a cement mortar aggregate.Compared with the original gangue cement mortar,the reinforced coal gangue cement mortar has improved flexural strength and compressive strength.

摘要: 以陕西铜川原状煤矸石为研究对象,对其进行分拣、破碎、分级等工艺处理,重点进行煤矸石的化学强化和表面包覆相关实验。选用粒径为 2.36~4.75 mm 的煤矸石,采用不同的强化剂和包覆粉来提高其强度和耐水性。研究发现,当用硅酸盐类强化剂 B(质量分数为 6%)掺入 0.7%土壤固化剂进行复配后的溶液作强化剂,对煤矸石强化效果最明显;在液体强化后的煤矸石表面用水泥和某尾矿粉质量比为 1:1.2 进行包覆处理,包覆量为煤矸石质量的 25%,所制得的产品干压碎值约降低 50%,耐水性约提高 85%,所制得的煤矸石骨料产品性能良好。将所制得的煤矸石骨料产品替代部分石灰岩用作水泥砂浆集料,相比原状煤矸石砂浆,强化后的煤矸石水泥砂浆抗折、抗压强度都有提高。

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作者: 王兆丰; 赵鹏; 景明海; 张煜坤; 冯雷

标题: Pb leaching characteristics of solidified municipal solid waste incineration fly ash by cold sintering

标题: 冷烧结法固化垃圾焚烧飞灰铅浸出特性

来源出版物: 环境污染与防治 卷: 42 期: 1 页: 44-48,53 出版年: 2020

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作者关键词: municipal solid waste incineration fly ash; cold sintering; solidification; Pb; compressive strength

作者关键词: 垃圾焚烧飞灰; 冷烧结; 固化; 铅; 抗压强度

摘要: In this paper, the cold sintering method was firstly used for solidifying Pb in municipal solid waste incineration fly ash (hereinafter referred to as fly ash). The research studied the effects of water content, temperature, pressure and time on the solidification of Pb. The results showed that the compressive strength of the solidified body increased and Pb leaching concentration decreased with the increase of temperature, pressure and time. When the water content was 20%, the compressive strength reached the maximum. The minimum compressive strength of the solidified body was 93.30 MPa and the maximum compressive strength could reach 233.23 MPa. When the temperature was 120 °C, time was 100min, pressure was 50kN and the water content was 15%, the Pb leaching concentration of the solidified body was 0.52mg/L, which was reduced by 79.45% compared with fly ash.

摘要: 利用冷烧结法对垃圾焚烧飞灰(以下简称飞灰)进行了铅固化研究,分析了含水量、温度、压力和时间等参数对飞灰中铅固化效果的影响。结果表明:随着温度、压力和时间的增加,固化体的抗压强度大体升高且铅浸出浓度降低,当含水量为 20%时,抗压强度达到最大。固化体的最小抗压强度为 93.30MPa,最大抗压强度可达到 233.23MPa。当温度为 120°C、时间为 100min、压力为 50kN、含水量为 15%时,固化体的铅浸出质量浓度为 0.52mg/L,与飞灰相比降低了 79.45%。

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标题: Wear Properties of Microarc Oxidation Coating of 2A12 Aluminum Alloy in Two Systems

标题: 2A12 铝合金在两种体系中微弧氧化膜层的磨损性能研究

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作者关键词: aluminum alloy; micro-arc oxidation; zirconium salt; phosphate; wear resistance

作者关键词: 铝合金; 微弧氧化; 锆盐; 磷酸盐; 耐磨性

摘要: The work aims to compare the wear properties of micro-arc oxidation (MAO) coating of aluminum alloy in two solution systems. In this paper, MAO coatings on 2A12 aluminum alloy were prepared by MAO technology. The morphology, thickness, phase composition, hardness and wear properties of the MAO coatings were investigated by means of Scanning Electron Microscope (SEM), X-ray Diffraction Spectrometer (XRD), Vicker hardness tester and friction tester respectively. The results showed that the growth rate of coating in zircon salt system is higher than that in phosphate system. The hardnesses of zircon salt and phosphate were 1050HV and 1250HV, respectively. The coating of zircon salt system is mainly composed of α -Al₂O₃, γ -Al₂O₃, c-ZrO₂ and t-ZrO₂ phases. The coating of phosphate system coating is composed by α -Al₂O₃ and γ -Al₂O₃ phases. In the zircon salt system, the friction coefficient of the coating under the voltage of 450 V and 500 V are 0.425 and 0.375 respectively. In the phosphate system, the friction coefficient of the coating under the voltage of 450 V and 500 V are 0.328 and 0.325 respectively. The friction coefficient of zircon salt coating is higher than that of phosphate coating. During the wear process, the friction auxiliary material GCr15 is filled into the pits of the coating. Under high voltage, the coating in two solution system exhibits a smaller coefficient of friction. The initial stage of wear is abrasive wear and the stable stage is adhesive wear.

摘要: 目的比较两种不同溶液体系中铝合金微弧氧化膜层的摩擦磨损性能。方法以 2A12 铝合金为研究对象,通过微弧氧化技术,制备了在两种体系中的微弧氧化膜层。利用扫描电子显微镜(SEM)和 X 射线衍射仪(XRD)、显微硬度计、摩擦磨损机,研究了两种不同溶液体系中的微弧氧化膜层的形貌、厚度、硬度和磨损性能的差异。结果锆盐体系中膜层的生长速率较磷酸盐中的更大。锆盐和磷酸盐体系中膜层的硬度分别为 1050HV 和 1250HV。锆盐体系的膜层主要由 α -Al₂O₃、 γ -Al₂O₃、c-ZrO₂ 和少量的 t-ZrO₂ 组成,磷酸盐体系膜层的主要成分是 α -Al₂O₃ 和 γ -Al₂O₃。锆盐体系中,450 V 电压下膜层的摩擦系数为 0.425,500 V 电压下膜层的摩擦系数为 0.375;磷酸盐体系中,450 V 电压下膜层的摩擦系数为 0.328,500 V 电压下膜层的摩擦系数为 0.325。结论锆盐膜层的摩擦系数总体大于磷酸盐膜层。在磨损过程中,被磨掉的 GCr15 材料填充到膜层的凹坑中。两种溶液体系下,膜层在高电压下表现出更小的摩擦系数。磨损起始阶段为磨粒磨损,稳定阶段为粘着磨损。

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标题: Study on the Color Development of Anodic Oxidation Film of TC4 Titanium Alloy

标题: TC4 钛合金阳极氧化着色膜显色规律探讨

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作者关键词: titanium alloy; anodizing; colored film; color development mechanism

作者关键词: 钛合金; 阳极氧化; 着色膜; 显色机理

摘要: The work aims to anodize TC4 titanium alloy under different electrolytes and different voltages to obtain color film, discuss the coloration of color film with different process parameters, and analyze the coloration of color film by the color development rule. Ti6Al4V titanium alloy was oxidized and colored by NaOH electrolyte, H₃PO₃ electrolyte and Na₂SiO₃ salt solution. The microstructure, morphology, phase composition, film thickness and color change of the oxide film layer were analyzed by metallographic microscope, SEM, XRD, AFM and 3nh color difference meter. The color of the film (L*, a*, b*) measured by the 3nh color difference meter had a periodic variation with the voltage. Before the voltage parameter was about 120 V, the anodic oxidation film of the three electrolytes was composed of amorphous titanium oxide, with the same color development law. The oxide film layer was dense and uniform, but the growth rate was slightly different. Film color development was a combination of interference enhancing light color and interference complementary light color. Through the formula of interference optical path difference of titanium alloy oxide film, the theoretical calculation formula of film thickness was

derived. The AFM test results were basically consistent with the theoretically calculated film thickness. As the voltage continued to rise, the electrolysis reaction was severe, the micro-arc discharge phenomenon was observed on the macroscopic surface, and the electrolysis process transitioned to the micro-arc oxidation stage. In the low-voltage anodization stage, the TC4 titanium alloy colored film layer is composed of dense and uniform amorphous titanium oxide. The growth mode of the film layer is uniform layer-like growth with voltage. The principle of color development is mainly the principle of thin film interference. The voltage parameters can control the film thickness to obtain the desired color. The film growth rate in the Na₂SiO₃ salt solution is from 1 nm/V to 1.7 nm/V.

摘要: 目的在不同电解液、电压等工艺参数下对 TC4 钛合金进行阳极氧化,获得彩色膜,分析探讨着色膜颜色随不同工艺参数变化的显色规律,并通过该显色规律分析着色膜显色机理。方法分别选用 NaOH 电解液、H₃PO₃ 电解液、Na₂SiO₃ 盐溶液对 Ti6Al4V 钛合金进行氧化着色。通过金相显微镜、SEM、XRD、AFM 和 3nh 色差仪等测试方法,分析氧化膜层显微组织、形貌特征、物相成分、膜层厚度与颜色变化。结果 3nh 色差仪测得膜层颜色值(L*, a*, b*)随电压具有周期变化规律。在电压参数为 120 V 左右的起弧电压之前,三种电解液阳极氧化着色膜均是由非晶态的钛氧化物组成,显色规律一致,氧化膜层致密均匀,只是生长速率稍有不同。膜层显色是干涉加强光色与干涉减弱光色的互补光色的共同作用。通过钛合金氧化膜干涉光程差公式修正,推导出了薄膜厚度的理论计算公式,且 AFM 测试结果与理论计算得出的膜厚基本一致。随着电压继续升高,电解反应剧烈,宏观表面观察到微弧放电现象,电解过程过渡到微弧氧化阶段。结论在低电压阳极氧化阶段,TC4 钛合金着色膜层是由致密均匀的非晶态钛氧化物组成,膜层生长方式是随电压均匀层状生长,显色原理主要是薄膜干涉原理。通过控制电压参数,可控制膜层厚度,继而得到理想的颜色。在 Na₂SiO₃ 盐溶液中的膜层生长速率为 1~1.7 nm/V。

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标题: Hot Deformation Behavior and Mechanism of As-cast Ti-5553 Alloy with Coarse Grains

标题: 铸态粗晶 Ti-5553 钛合金的高温变形行为与机理

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作者关键词: Ti-5553 alloy; hot deformation; constitutive relationship; processing map; deformation mechanism

作者关键词: Ti-5553 合金; 高温变形行为; 本构关系; 加工图; 变形机制

摘要: The hot deformation behavior of as-cast Ti-5553 (Ti-5Al-5Mo-5V-3Cr) alloy with coarse grain was investigated in the temperature range of 700~1100 °C and strain rate range of 0.001~10 s⁻¹ by Gleeble-3800 thermal physical simulator. The results show that the flow stress is sensitive to both temperature and strain rate, and the flow curves display various softening modes under different conditions. The activation energy map and constitutive relationship are constructed for the alloy, and the average deformation activation energy is calculated as 447.2 kJ/mol. The hot processing map is established based on the dynamic materials model with the identification of underlying mechanisms at various processing regions. Two peak domains are identified in the hot processing map: 800~975 °C/0.001~0.01 s⁻¹ and 1000~1100 °C/0.01~0.1 s⁻¹, and the flow instability region locates at the region where the strain rate is higher than 1 s⁻¹. External cracking, adiabatic shear banding and/or flow localization are observed in the region of low-temperature deformation and flow instability, and these conditions should be avoided in actual processing. The mechanism at the peak efficiency domain is dynamic recovery (DRV) or the combination of DRV and dynamic recrystallization (DRX), and the region with the occurrence of extensive DRX is recommended as the optimal processing window for the alloy at high temperature about 1100 °C and medium-low strain rate about 0.01 s⁻¹.

摘要: 借助 Gleeble-3800 热模拟试验机研究了铸态粗晶 Ti-5553 合金在温度 700~1100 °C、应变速率 0.001~10 s⁻¹条件下的高温变形行为。结果表明,合金的流变应力对变形温度和应变速率都有强敏感性,流变软化过程也随变形参数的改变呈现出不同的模式。通过经典动力学模型,建立了合金高温变形的本构关系和激活能分布图,基于动态材料模型构建了合金的热加工图并实现了对不同加工区间变形机制的识别。合金在低温区(700 °C)和高应变速率区(>1 s⁻¹)均展现出失稳变形的特征,包括外部开裂、绝热剪切带、局部流变等机制,在实际加工中应对这些加工区域进行规避。合金在 800 °C及中低应变速率(<0.1 s⁻¹)变形下的主导机制为 α 相的动态析出,在中高温(900~1100 °C)及中低应变速率变形下的主导机制为动态

回复与动态再结晶的结合。此外,合金在高温较低应变速率(1100 °C/0.01 s⁻¹)条件的变形中表现出大范围动态再结晶的行为特点并伴随稳定的流变软化,因此此条件附近的参数区间被认定为该合金的最优加工窗口,应在实际加工中给予优先考虑。

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标题: Comparison of Discontinuous Yielding Phenomenon and Adiabatic Temperature Rising Effect of Ti-5553 Alloys Prepared by Powder Metallurgy and Ingot Metallurgy

标题: 粉末冶金态与铸态 Ti-5553 合金高温不连续屈服行为和绝热温升效应对比研究

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作者关键词: Ti-5553 合金; 粉末冶金; 热变形; 不连续屈服; 绝热温升

摘要: Discontinuous yielding phenomenon (DYP) and adiabatic temperature rising (ATR) effect were investigated for Ti-5553 (Ti-5Al-5Mo-5V-3Cr) alloys prepared by powder metallurgy (PM) and ingot metallurgy (IM) approaches during hot compression testing conducted at the temperature range of 700~1100 °C and the strain rate range of 0.001~10 s⁻¹. The results show that the magnitude of yield drop exhibits a positive correlation to strain rate but nearly a negative correlation to deformation temperature for both PM and IM alloys, and the occurrence of DYP in the alloys is elucidated by the dynamic theory. IM alloy shows a higher degree of yield drop than

PM alloy under the same condition because of low initial dislocation density in as-cast state and the subsequently promoted newly-generated mobile dislocation from grain boundary. A strong positive correlation between ATR effect and strain rate but intensive negative correlation between ATR effect and deformation temperature are discovered for the two alloys. PM alloy shows a lower degree of ATR effect under the same processing condition than IM alloy as a result of its lower deformation resistance and higher deformation compatibility.

摘要: 研究了粉末冶金态与铸态 Ti-5553 合金在温度为 700~1100 °C、应变速率为 0.001~10 s⁻¹条件下的高温不连续屈服行为和绝热温升效应,并对这 2 种同名义成分不同制备工艺的钛合金进行了对比研究。结果表明:2 种合金不连续屈服的幅度均与应变速率呈正相关关系,并与温度呈近似负相关关系,2 种合金中出现的不连续屈服现象符合动态理论。在相同变形条件下,铸态合金中不连续屈服的幅度更大,其原因是相对于粉末冶金态合金,铸态合金中的起始位错密度低,这更有利于晶界处可动位错的突然增殖与扩展。2 种合金在热变形中绝热温升的大小均随应变速率的升高而逐渐增大,并随着变形温度的升高而逐渐降低。在相同变形条件下,粉末冶金态合金的绝热温升效应相比与铸态合金较弱,这是因为粉末冶金态合金具有较低的变形抗力和较高的协调变形能力。

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作者关键词: 道路工程; 改性沥青; 短期老化; 煎炸废油; 废旧橡胶粉; 傅里叶红外光谱; 分子结构

摘要: In order to use the solid and liquid waste resources to improve performances of base asphalt, waste frying oil (WFO) and crumb rubber (CR) are used to modify the asphalt to obtain the sustainable pavement material. The molecular structures and the performances of the modified asphalts with different amounts of WFO and CR are analyzed by conventional asphalt methods, short-term aging test and Fourier transform infrared spectroscopy (FT-IR). The results indicate that the retained penetration ratio (RPR), the softening point increment (SPI) and retained ductility ratio (RDR) indexes of modified asphalts with different amounts of WFO-CR composite are better than those of the base asphalt after short-term aging test. WFO and CR can improve anti-aging performance. Moreover, FT-IR results show that the absorption peaks at 814 cm^{-1} and 720 cm^{-1} , which represent the alkenyl or benzene ring C=C in WFO-CR composite modified asphalt after short-term aging, increase obviously. Both the carbonyl absorption peak and the sulfoxide absorption peak are improved for modified asphalts with different amounts of WFO-CR composite. The quantitative analysis shows that the carbonyl and sulfoxide indices of the modified asphalt reach the lowest values with 5.0% WFO and 20.0% CR, which are 36.02% and 32.04% lower than those of the base asphalt, respectively.

摘要: 为充分利用固、液废弃资源,改善沥青高低温性能缺陷,将复配煎炸废油(waste frying oil, WFO)与废胎橡胶粉(crumb rubber, CR)用于制备改性沥青,以开发一种可持续路面材料。采用常规沥青试验、短期老化试验和傅里叶红外光谱试验,分析短期老化后不同质量分数 WFO-CR 复合改性沥青的性能指标及化学分子结构的变化规律。结果表明:短期老化后,不同质量分数 WFO-CR 复合改性沥青的残留针入度比、软化点增值和残留延度比均优于基质沥青,抗老化性能改善明显。傅里叶红外光谱试验结果表明, WFO-CR 复合改性沥青中代表烯基或苯环 C=C 键的 814 cm^{-1} 和 720 cm^{-1} 处的吸收峰峰值明显增大;不同质量分数 WFO-CR 复合沥青的羰基吸收峰和亚砷基吸收峰均有增强。由碳基指数和亚砷基指数定量分析可知,当 WFO 与 CR 的质量分数分别为 5.0% 和 20.0% 时,碳基指数和亚砷基指数最低,相比基质沥青分别降低了 36.02% 和 32.04%,对沥青抗老化性能的改善效果最好。

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地质工程与测绘学院

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标题: QUANTITATIVE ANALYSIS OF ACTIVITY CHARACTERISTICS OF LONGYAO GROUND FISSURE

标题: 隆尧地裂缝活动特征的定量分析

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作者关键词: Longyao ground fissure; Exploratory trench; Quantitative analysis; Slip rate

作者关键词: 隆尧地裂缝; 探槽; 定量分析; 活动速率

摘要: Longyao ground fissure is one of the large and hyperactive ground fissures in North China plain. The activity of the fissure has caused damages such as slip dislocation, vertical subsidence and horizontal tension to buildings and highways over the fissure. In order to provide essential data for disaster prevention and mitigation of engineering buildings along the fissure, we carried out field geological survey and OSL dating experiment to ascertain the accurate activity value of Longyao ground fissure. We summarized the horizontal distribution and sectional structure characteristics of Longyao ground fissure at the beginning. Then we determined the strike-slip displacement, vertical dislocation and horizontal tensile width of the ground fissure based on the exploratory trench profile. Finally, we estimated the slip rates of Longyao ground fissure during different periods. Our study results show that the vertical differential settlement rate is the largest on both sides of the fissure, the horizontal strike-slip dislocation rate is the second, and the

horizontal tension rate is the smallest. According to the OSL experiment, from 8 ka B. P. to present, the displacement rate of Longyao ground fissure has been increasing. Since the Holocene, the ground fissures have been continuously active and the intensity has been raised constantly. We also found that there were three periods of rapid rise in activity rate.

摘要: 隆尧地裂缝是华北平原中规模大、活动强的典型地裂缝之一,对跨地裂缝建筑造成水平拉张、走滑剪切与垂直位错等形式的破坏。为了给地裂缝沿线工程建筑的灾害防治提供依据,本文基于野外地质调查及探槽工程揭露,总结了地裂缝的平面展布及剖面结构特征,同时根据探槽剖面分析了地裂缝活动对不同深度土层造成的水平走滑、拉张和垂直活动量,并结合地层光释光测年结果,计算了不同时段地裂缝活动速率。结果表明,隆尧地裂缝平面上分为东段与西段两段展布,其中西段从周村至西店子村,近东西走向,长 17.7 km;东段从东店马村至毛儿寨,近北东走向,长 15.3 km;地裂缝活动具有拉张走滑与差异沉降特征,且西段活动强度大于东段;裂缝两侧垂直差异沉降速率最大,剪切走滑错动速率次之,水平拉张速率最小;在时间轴上,8 ka B. P.至今,地裂缝活动速率逐渐增大,且多次出现活动速率骤升期。

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标题: RELATIONSHIP BETWEEN DISTRIBUTION CHARACTERISTICS OF PREHISTORIC LANDSLIDES AND SEISMIC ACTIVITY ALONG QINLING PIEDMONT FAULT

标题: 秦岭北麓古滑坡分布特征与地震活动关系研究

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作者关键词: Prehistoric landslide; Qinling piedmont fault; DEM; Paleoearthquake

作者关键词: 古滑坡; 秦岭北缘断裂; 数值高程模型; 古地震

摘要: Earthquake-induced landslides are serious secondary geological hazards, and they are also an important force to change the topography of the earth surface. Research on the scale, number, and type of earthquake-induced landslides is an important method for seismic risk assessment and the main method for understanding seismic geological disasters and approaches. The scale, quantity and the type of earthquake-induced landslide is an important way to evaluate the seismic risk, and also the main approach to understand the seismic hazard. There is a prehistoric landslide group of about 50 km long in the middle part of the northern foothills of the Qinling Mountains. It is distributed in parallel with the Qingling Piedmont fault. The recent research generally believes that the prehistoric landslide group was probably induced by the significance earthquake of the Qingling Piedmont fault activity. But there is no detailed study on the magnitude and influence range of this earthquake. In this paper, we use the high-resolution digital elevation model (DEM) that is produced from the ZY-3 satellite stereo image, and multispectral remote sensing image to mapping the landslide area in detail. Combined with the some field investigation, we finally obtain a detailed map of the prehistoric landslide distribution in the Qinling Piedmont area. In the end, totaling 43 prehistoric landslides are interpreted and concentrated in a area of 70*10 km². Based on the relationship between the moment magnitude and the frequency-area distribution (FAD) of inventories of triggered landslides, we analyze the earthquake scale of the prehistoric landslide group in Qinling Piedmont area. The magnitude of the earthquake that triggered the prehistoric landslide group in the north Qinling Piedmont should be between 7.6 and 8.1. By combining the regional seismic tectonic environment and the comparison with modern earthquake-induced landslide events, we conclude that the Qinling Piedmont fault has the potential to produce earthquakes of more than 7.5 magnitude. This research provides quantitative data support for understanding the causes of the prehistoric landslide group in the Qingling Piedmont area, and also has practical significance for understanding the seismic risk of the Qinling Piedmont fault.

摘要: 地震滑坡是严重的次生地质灾害,也是改变地球表层地貌形态的重要力量,对地震诱发滑坡的规模、数量、类型等研究是地震危险性评价的重要手段,也是认识地震地质灾害的主要方法和途径。位于西安市以南的秦岭山脉北麓中段发育有一条长约 50 km 的古滑坡群,且

基本与山前秦岭北缘断裂带平行展布,普遍认为该古滑坡群可能是由于秦岭北缘断裂的强震活动所诱发,但对于诱发地震的震级大小和影响范围尚没有细致研究。本文通过利用资源 3 号卫星立体影像制作的高分辨率数值高程模型(DEM)和高分辨率多光谱遥感影像对秦岭北麓古滑坡区域进行了详细的解译工作,并结合对部分古滑坡体进行了野外调查,制作了详细秦岭北麓古滑坡分布图。结果表明:解译出了 43 处古滑坡,主要集中分布在 70 km*10 km 的范围内,总滑坡面积是 16.57 km²。通过利用地震震级与滑坡面积频度分布的关系分析了诱发秦岭北麓古滑坡群的地震规模,得到了诱发秦岭北麓古滑坡群的地震震级应在 7.6~8.1 之间。并结合区域地震构造环境以及与现代地震诱发滑坡事件的对比,认为秦岭北麓具有发生 7.5 级以上地震的潜在能力。该研究对认识现今秦岭北麓古滑坡的成因提供了定量化的数据支持,也对理解秦岭北缘断裂的地震危险性具有重要的现实意义。

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标 题 : EXPERIMENTAL RESEARCH ON BREACH BROADENING PROCESS OF LANDSLIDE DAM UNDER DIFFERENT CHANNEL BED SLOPES

标题: 不同沟床坡度堰塞坝溃口展宽历程试验研究

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作者关键词: 堰塞坝; 沟床坡度; 漫顶溢流; 溃口展宽

摘要: In order to understand the widening process of dam breach in different slope sections of trench bed, seven sets of flume tests were carried out with the gradient of $7^{\circ} \sim 13^{\circ}$ and the interval of 1° . Seven groups of experimental data were compared and analyzed to evaluate the influence of different ditch bed slopes on the process of dam breach widening. The following results and conclusions are obtained. (1) The process of breach widening of dam with overtopping failure is very similar at different slope sections. According to the characteristics of breach, the widening process can be divided into three stages: break through, mutation and formation of stable slope. (2) In the sudden change stage, the slope can lose stability many times along the x-axis direction. The top of the breach is in the shape of S on the downstream slope, in the shape of U on the dam crest and in the shape of arc on the upstream slope. (3) Different slope conditions can affect the outburst characteristics in the abrupt stage. With the increase of the slope of the gully bed, the scale of the single slope instability increases first and then decreases, and the number of the slope instability decreases first and then increases. (4) The stability of the breach slope mainly depends on the width of the side erosion and depth of the vertical erosion of the breach, which has a negative correlation with the difference between the width of the top and bottom side erosion of the breach, and a positive correlation with the depth of the vertical erosion of the breach. (5) The discharge of dam with different slopes has the same change trend with the extension of failure time. However, the peak discharge and the arrival time of the peak discharge are different at different slopes of the channel bed. With the increase of the slope of the channel bed, the peak discharge gradually decreases, and the arrival time of the peak discharge is first advanced and then postponed.

摘要: 为了解堰塞坝在不同沟床坡度地段的溃口展宽历程,进行了沟床坡度为 $7^{\circ} \sim 13^{\circ}$, 间隔为 1° 的 7 组水槽试验。对比分析 7 组试验观测数据,评价不同沟床坡度对堰塞坝溃口展宽历程的影响。得到如下结果及结论: (1)漫顶破坏的堰塞坝在不同沟床坡度地段的溃口展宽历程是十分相似的,根据其溃决特征,可将其展宽历程划分为溃口贯通、突变和稳定边坡形成等 3 个阶段。(2)在突变阶段溃口边坡沿 x 轴方向会发生多次失稳,溃口顶部形态在背水坡呈 S 型,在坝顶呈 U 型,在迎水坡呈弧型。(3)不同沟床坡度条件会影响突变阶段的溃决特征,随沟床坡度的增加突变阶段溃口边坡单次失稳规模表现出先增大后减小的特征,溃口边坡失稳次数呈现出先减少后增加的特征。(4)溃口边坡的稳定性主要取决于溃口的侧蚀宽度和下蚀深度,其与溃口顶、底部侧蚀宽度之差呈负相关关系,与溃口下蚀深度呈正相关关系。(5)不同沟床坡

度堰塞坝的溃决流量随溃决时间的延长具有相同的变化趋势,但不同沟床坡度堰塞坝的溃决峰值流量和峰值流量到达时间却不尽相同,随沟床坡度的增加峰值流量逐渐减小,峰值流量到达时间先提前后推迟。

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标题: Monitoring the Jianshanying landslide in a karst mountainous area of Guizhou by optical remote sensing

标题: 光学遥感用于贵州发耳镇尖山营滑坡监测研究

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作者关键词: landslide; optical remote sensing; correlation; 2D deformation; time-series monitoring

作者关键词: 滑坡; 光学遥感; 相关性匹配; 二维形变; 时序监测

摘要: Landslides in karst mountainous areas of southwest China induced by underground mining can cause huge economic losses and casualties. Such hazard is characterized by large deformation gradients and serious collapse of the surface. This work takes the Jianshanying mining-induced landslide as an example to realize the quantitative 2D timeseries deformation monitoring of the landslide by optical sub-pixel correlation methods based on multiple optical images. First, multiple historical archives of Google earth images and UAV images are used to detect the damage of the surface, showing that the 1# landslide area has undergone significant surface deformation in 2013, becoming increasingly serious over time. Then, the 2D deformation time series of the 1# landslide area from July 31, 2016 to March 22, 2020 is inverted based on the Sentinel-2 data. Results indicate that the horizontal deformation in this area tended to be larger in the slope direction as well as in the east-west and north-south directions over time. The deformation continued to increase over time, and the maximum cumulative deformation reached 44 m and -58 m, respectively. Therefore, the large-gradient deformation monitoring of the landslide disaster in Guizhou karst mountainous areas can be realized by using optical remote sensing technology, which is important to the monitoring and early warning of landslides in similar areas.

摘要: 文章选取贵州省发耳镇尖山营采矿型滑坡为研究对象,利用多期光学遥感数据,基于亚像元相关性匹配技术,实现该滑坡长时序量化二维形变监测。利用多期存档 Google earth 影像及无人机影像,探测出该地区 1#滑坡在 2013 年已开始发生明显的地表形变,且随着时间的推移,地表形变愈发严重;再基于 Sentinel-2 遥感数据求解出 1#滑坡自 2016 年 7 月 31 日至 2020 年 3 月 22 日期间的二维形变时间序列,结果表明:该滑坡最大水平形变方向与斜坡方向一致,且在东西向和南北向上均表现为持续增大的趋势,最大累积形变量分别达到了 44 m 和 -58 m。

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作者: 高浩源; 高杨; 贺凯; 李滨; 赵志男; 陈立川; 王永甫

标题: Impact and scraping effects of the high-elevation, long-runout "7.23" landslide in Shuicheng, Guizhou

标题: 贵州水城"7.23"高位远程滑坡冲击铲刮效应分析

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作者关键词: high-elevation and long-runout landslide; dynamic mechanism; impact and scraping effect; numerical simulation

作者关键词: 高位远程滑坡; 动力学机制; 冲击铲刮效应; 数值模拟

摘要: This paper analyzes the Shuicheng "7.23" landslide in Guizhou, 2019. Based on the field survey, Unmanned Aerial Vehicle (UAV) images and numerical simulation, the movement process, and impact and scraping effects of this landslide are characterized. Results suggest that, (1) the Shuicheng "7.23" landslide sliding volume is about $70 \times 10^4 \text{ m}^3$, with the horizontal slide distance 1,360 m, elevation difference 430 m between the front and the toe, and the equivalent friction angle 19° , implying a typical high-level, long-distance slope slide; (2) After the initiation of the slide, it hit the convex ridge, scraped the residual slope soil of the surface, disintegrated and formed a debris flow, resulting in a maximum scraping depth of 11 m; (3) The numerical simulation shows that the maximum velocity of the landslide is $30 \text{ m} \cdot \text{s}^{-1}$, the maximum kinetic energy is 8,900 kJ, the scrap volume is $46 \times 10^4 \text{ m}^3$, and the deposit volume is $116 \times 10^4 \text{ m}^3$, with an

obvious amplifying effect of hazard;(4)The impact and scraping process of the Shuicheng landslide can be divided into 3 stages, impact insertion, shear nappe and mixed accumulation of sliding debris.

摘要: 以 2019 年贵州水城"7.23"滑坡为例,采用现场调查、无人机航测和数值模拟技术,分析了滑坡的运动过程和冲击铲刮特征,结果表明:(1)水城"7.23"滑坡属典型的高位远程滑坡,滑体高位启动后冲击下方凸起山脊,铲刮地表残坡积土层,并解体形成碎屑流,最大铲刮深度可达 11 m;(2)模拟结果显示,滑坡运动最大速度为 $30 \text{ m}\cdot\text{s}^{-1}$,最大动能达 8 900 kJ,铲刮体积达 $46\cdot 10^{-4} \text{ m}^3$,最终体积为 $116\cdot 10^{-4} \text{ m}^3$,灾害放大效应明显;(3)水城滑坡的冲击铲刮过程可分为冲击嵌入剪切推覆裹挟混合三个阶段。

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标题: Improvement and optimization of permeability and strength properties of loess

标题: 黄土渗透和强度性能的改良优化

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作者关键词: improved loess; polypropylene fibers; bentonite; unconfined compressive strength; permeability coefficient

作者关键词: 改良黄土; 聚丙烯纤维; 膨润土; 无侧限抗压强度; 渗透系数

摘要: When constructing a sponge city in a collapsible loess region, the reinforcement of the loess roadbed needs to consider the permeability. In order to explore the roadbed fillers with higher strength and impermeability suitable for the construction of sponge city in loess area, this experimental study was performed to investigate the effect of polypropylene fibers in combination with cement and bentonite as a new stabilizer for improving the geotechnical properties of the loess. The Taguchi method was applied to the experiments and a standard L9 Orthogonal Array with four factors (Polypropylene fiber length, Polypropylene fiber content, cement content and bentonite content) and three levels were chosen. A series of unconfined compression and permeability tests were conducted on each specimen. And the signal-to-noise ratio analysis of orthogonal test and Taguchi method had obtained the optimal proportioning scheme for each mixing amount of improved loess. The results of these tests showed: that the most effective material for increasing the unconfined compressive strength of the samples was cement. Polypropylene fiber has the greatest influence on the permeability coefficient of the samples. Taking unconfined compressive strength and permeability coefficient as evaluation indexes, the optimum conditions for curing times of 3 days were Polypropylene fiber length (12 mm)、content (0.3%), cement content (8%) and bentonite content (3%). The optimum conditions test results were also superior in comparison with the lime-loess at 3, 7, and 14 days of curing time. The results of the study provide some reference for the subgrade treatment in sponge city road construction.

摘要: 为探寻适用于黄土地区海绵城市建设的具有较高强度和防渗性能的路基换填材料, 通过对掺入水泥、聚丙烯纤维、膨润土的黄土进行强度和渗透性试验, 并基于正交试验和田口方法的信噪比分析, 获得了改良黄土各掺量的最优配比方案。结果表明: 水泥掺量对改良黄土的无侧限抗压强度影响最显著, 聚丙烯纤维掺量和长度对其渗透系数影响最大; 改良黄土各掺量的最优配比为聚丙烯纤维长度取 12 mm、聚丙烯纤维掺量取 0.3%、膨润土和水泥掺量分别取 3% 和 8%; 在 3、7、14d 养护龄期下, 最优配比改良黄土的强度和渗透性能均优于不同配比的石灰改良黄土。改良的黄土各掺量最优配比可为黄土地区海绵城市道路建设中的路基处理提供参考。

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标题: Spatial relationship between temperature field, hydrothermal alteration and main faults in Shiquan County, Ankang

标题: 安康石泉县温度场、水热蚀变与主要断裂带空间关系

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作者关键词: spatial analysis; fault activity; geothermal; remote sensing; Shiquan County

作者关键词: 空间分析; 断裂活动性; 地热; 遥感; 石泉县

摘要: The fault structure, hydrothermal alteration information and the true surface temperature field are important indicators of geothermal resources. In order to study the spatial distribution of the three, based on the Landsat8 OLI data in Shiquan area, the radiative transfer equation method was used to invert the land surface temperature (LST); and the principal component analysis method was used to extract the hydroxyl hydrothermal alteration information. With the known

fault as the center, equally spaced buffer zones on both sides of the fault zone were set up to calculate the average surface temperature and hydrothermal alteration distribution in the buffer zone; the average distance from the center of the fault zone was used as the horizontal axis to plot the relationship among the three. The curve further described the relationship among the true temperature field, the hydrothermal alteration distribution and the main fault structures. The results showed that the NW-trending Lianghe-Chihe fault zone had the highest average temperature in the affected area, with an average temperature ratio of 22.582%, which was similar to the Chengguan-Chihe fault zone and the nearly north-south Lianghe fault. The location of the fault zone was consistent with the surface temperature field. There was a strong correlation between the alteration information; the NW-trending Lianghe-Houliu fault zone and Lianghe-Zengxi fault zone were within the gradient of the average temperature curve. It is speculated that the two sides of the fault zone may have different temperatures field; the fault zone that has a strong control effect on the average temperature and alteration intensity distribution has strong activity; the alteration area ratio at the intersection of the fault zone is 4.263 2%, and the average temperature ratio is 21.178%, reflecting the activity at the intersection of the fault zone is strong.

摘要: 断裂构造、水热蚀变信息与地表真实温度场是地热资源的重要指示标志。为研究三者空间分布关系,基于石泉地区的 Landsat8 OLI 遥感影像数据,采用辐射传输方程的方法反演地表温度场;并选用主成分分析法提取羟基水热蚀变信息。以已知断裂为中心,向断裂带两侧建立等间距的缓冲区,统计缓冲区内的平均地表温度与蚀变强度;以距断裂带中心平均距离为横轴,绘制三者之间的关系曲线,进一步描述真实温度场、水热蚀变分布与主要断裂构造之间的关系。结果表明,北西走向的两河-池河断裂带影响范围内平均温度最高,平均温度比为 22.582%,与城关-池河断裂带和近南北走向的两河断裂相似,断裂带位置与地表温度场和蚀变信息之间存在较强的相关性;北西走向的两河-后柳断裂带、两河-曾溪断裂带处于平均温度曲线梯度变化范围内,推测断裂带两侧可能分属不同的温度场;对平均温度、蚀变强度分布具有较强控制作用的断裂带具有较强的活动性;最多断裂带交汇点处的蚀变面积比为 4.263 2%,平均温度比为 21.178%,反映了断裂带交汇点处的活动性较强。

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作者: 彭建兵; 王启耀; 庄建琦; 冷艳秋; 范仲杰; 王少凯

标题: Dynamic formation mechanism of landslide disaster on the Loess Plateau

标题: 黄土高原滑坡灾害形成动力学机制

来源出版物: 地质力学学报 卷: 26 期: 5 页: 714-730 出版年: 2020

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作者关键词: landslides; Loess Plateau; dynamic mechanism; regional tectonic stress; seepage of dynamic water; construction disturbance

作者关键词: 滑坡; 黄土高原; 动力学机制; 区域构造应力; 动水渗透作用; 工程扰动

摘要: Landslide disaster is a major geological problem that threatens the safety of people's life and property, and the construction and operation of towns and major projects on the Loess Plateau. Aiming at the dynamic formation mechanism of landslide on the Loess Plateau, based on a large number of investigation, statistics, tests and theoretical analysis, following conclusions were drawn: The regional tectonic stress is the main driving force for high occurrence of landslides. It is the controlling factor for landslides occurring in different zones and belts and the first internal cause. The tectonic stress of the slope not only creates the structural surface, but also continuously alters and loosens the structural surface and dismembers the integrity of the slope. It is the main driving force for the formation of single landslide and the second internal cause of loess landslide. Loess is a kind of special structural soil with strong water sensitivity, which is prone to disasters under soil stress drive. This disaster-prone property of loess is the internal cause of soil disaster and the third internal cause of loess landslide. A large number of landslides are related to water. Surface water penetrates into the shallow surface of loess in large quantities, which will cause shallow surface collapse and sliding disasters. When water enters the deep loess along the micro, fine and macroscopic dominant channels, it may cause deep-seated landslides. Thus, the seepage of dynamic water is the major external cause of loess landslide. Construction disturbance will not only change the original stress state of slope, but also expand and loosen the existing structural plane. Nowadays, construction disturbance has become an important geological agent to induce geological disasters and is the secondary external cause of loess landslide.

摘要: 滑坡灾害是威胁黄土高原人民生命和财产安全、城镇与重大工程建设与运营的重大地质问题。针对黄土高原滑坡灾害形成的动力学机制问题,在大量的调查统计、试验与理论分析基础上,总结得出区域构造应力是黄土高原滑坡高发的主要驱动力,它是滑坡分区带群发的控制因素,是黄土滑坡的第一元凶;边坡构造应力既造就了结构面,又不断地改造和松动着结构面,持续地肢解着边坡的完整性,它是单体滑坡形成的主要驱动力,是黄土滑坡的第二元凶;黄土是一种特殊的结构土,具有极强的水敏性,在土体应力驱动下极易灾变,黄土的这种易灾特性是土体灾变的内在原因,是黄土滑坡的第三元凶;大量的滑坡发生都与水有关,地表水大量渗入黄土浅表部,会引起浅表崩塌和溜滑灾害,而当水沿着微、细、宏观优势通道进入黄土深部后,就可能引起深层滑坡,因此,动水渗透作用是黄土滑坡的主凶;工程扰动既会改变边

坡原有的应力状态,进而扩展和松动已有的结构面,现今,工程扰动已经成为一种诱发地质灾害的重要地质营力,是黄土滑坡的帮凶。

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标题: Three-dimensional time series movement analysis of the Cuolangma glacier with PO-SBAS technique

标题: PO-SBAS 技术用于错朗玛冰川三维时序运动特征分析

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作者关键词: Spaceborne SAR; Offset-tracking technology; Small baseline subsets; Three-dimensional time-series deformation; The Cuolangma glacier

作者关键词: 星载 SAR; 偏移量跟踪技术; 小基线集; 三维时序形变; 错朗玛冰川

摘要: Mountain glaciers are important regulators and indicators of global climate change. High-resolution and multi-dimensional glacier movement monitoring can provide accurate analysis and early warning to the related disasters. Space-borne SAR is an effective means to

monitor glacier movement. In this paper, Pixel Offset-Small baseline subset is adopted to establish the adjustment model of the three-dimensional time-series deformation with ascending and descending datasets. Sentinel-1 A/B datasets are used to analyze the three-dimensional spatial and temporal motion characteristics of the Cuolangma glacier, which is located on the north slope of the middle section of the Himalayas. The results showed that during the period of 13 April 2017 to 9 December 2017, the maximum east, north and vertical velocities were 9.8 cm/day, 20.5 cm/day and 7 cm/day respectively. Combined with the data of topography and local temperature, we found that the glacier movement is mainly dominated by topography, while the external temperature environment causes local characteristic change of glacier flow. The results can provide a reference for mountain disaster caused by glacier movement.

摘要: 山地冰川是全球气候变化的重要调节器和指示器,高时间分辨率、多维度的冰川流速监测能够对其运动造成的相关灾害进行精准的分析 and 预警.星载 SAR 技术是冰川运动监测的一种有效手段.本文采用了基于小基线集的像素偏移量技术,建立了联合升降轨偏移量的三维时序形变求解平差模型.利用 2017 年升降轨 Sentinel-1A/B 数据监测了喜马拉雅山中段北坡的错朗玛冰川三维时空运动特征.结果表明,错朗玛冰川在 2017 年 4 月 13 日至 2017 年 12 月 9 日时间段内,在东西向上最大流速为 9.8 cm/day,南北方向上以 20.5 cm/day 的最大速度向北运动,垂直向上在坡度最陡峭处冰川最大速度为 7 cm/day.结合地形与当地气温数据,发现该冰川运动整体上以地形因素主导,而外部气温环境会导致冰川流动发生局部特征变化.本文结果可为冰川运动引发的山地灾害研究提供参考.

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作者: 吴博; 赵法锁; 贺子光; 段钊; 吴韶艳

标题: Prediction of the disaster area of loess landslide based on least square support vector machine optimized by bat algorithm

标题: 基于 BA-LSSVM 模型的黄土滑坡致灾范围预测

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文献类型: Article

作者关键词: bat algorithm; least squares support vector machine; loess landslide; disaster area; prediction

作者关键词: 蝙蝠算法; 最小二乘支持向量机; 黄土滑坡; 致灾范围; 预测

摘要: The prediction of landslide disaster area has always been one of the difficulties in landslide research. The loess landslides in South Jingyang plateau were chosen to establish model of disaster area prediction, by electing height, volume, source area length and width of landslide as the influencing factors, which based on the bat algorithm to optimize calculation for least squares support vector machine in the regularization parameters (γ and σ_2). In the meantime, they are compared with multiple linear regression model. The result shows that the model has better prediction accuracy and effect. It can be used as the basis for disaster prevention and reduction in the area.

摘要: 滑坡致灾范围的预测研究一直是滑坡研究的重点难点之一。以陕西泾阳南塬滑坡为研究对象, 选取滑坡高度、体积、滑源区长度以及宽度为影响因子, 采用蝙蝠算法对最小二乘支持向量机中的正则化参数 γ 和 σ_2 进行寻优计算, 建立 BA-LSSVM 滑坡致灾范围预测模型, 并于多元线性回归模型进行对比。结果表明, 该模型具有较高的预测精度和效果, 可作为该地区防灾减灾依据。

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作者: 赵益祯; 曹建农; 张晓栋; 何高波

标题: Topographic gradient effect and spatial pattern of land use in Baota District

标题: 宝塔区土地利用的地形梯度效应与空间格局

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作者关键词: land use; terrain gradient; fractal theory; Baota District

作者关键词: 土地利用类型; 地形; 分维数; 宝塔区

摘要: Terrain is an important geographical factor affecting land use. Loess Plateau land resources and their development and utilization methods are deeply restricted by terrain conditions. Topography is one of the most important natural environmental factors determining land use patterns, and the land use patterns and spatial structure characteristics of the Loess Plateau are deeply restricted by topography. To provide a scientific basis for future land use, protection of forest resources, and economic development in the Loess Plateau, it is necessary to analyze the effects landform changes have on land use. This study analyzed land use data from the end of 2017 for Baota District. In addition, slope, elevation, topographic index, and other indicators were selected to explore land use mechanisms. On this basis, fractal theory is applied to analyze each land use type's spatial structure characteristics. The results show that the spatial distribution of land use types in Baota District has obvious topographic gradient characteristics. Height, slope, and topography significantly influence the formation of land use patterns in Baota District. The predominant distribution of water, construction land, cultivated land, and unused land is mainly concentrated in a range where elevation is less than 1,200 m and the slope is less than 10°. The predominant distribution of forest land and grassland is concentrated in an area where the elevation is greater than 1,200 m and the slope is greater than 15°. With the increase of the topographic index, the comprehensive index of the land use degree in Baota District gradually decreased, thus terrain is the main factor affecting the comprehensive degree of land use in the study area based on this analysis. The comprehensive index of land use degree in Baota District is larger in areas where human activities are concentrated and smaller where vegetation coverage is concentrated. The distribution of land use types in Baota District shows obvious fractal characteristics, with fractal dimensions between 1.2437 and 1.7360. The water fractal dimension is the largest among these and the unused land dimension is the smallest. The large water fractal dimension is due to the complicated water boundaries, whereas the small unused land dimension is due to its simple structure. Land use in the Baota District is restricted by the terrain, and various types of land are affected by the terrain. This study aims to optimize the allocation of land resources on the Loess Plateau and accelerate economic development in the area. Efforts to optimize land resource allocation and promote poverty reduction in poor areas in the Loess Plateau should fully consider the effects of topographical factors, follow the principles of adapting to local conditions, guide the situation according to circumstances, and provide advantageous development by attaching importance to optimizing land use structure and layout.

摘要: 地形是多种地理因子中对土地利用变化产生重要影响的因素之一,黄土高原区域土地利用格局与资源配置深受地形因素的制约。为了给黄土高原地区未来土地利用、保护森林资源和经济健康发展提供依据,需要分析地形变化对土地利用影响。以黄土高原地区中部的宝塔区为讨论范围,采取 2017 年末土地利用矢量数据,选用坡度、高程、土地利用综合度和地形指数多项影响因子,全面剖析地形对土地利用类型分布的影响特征;在此探讨的结果下,利用分形理论探讨各土地利用类型的空间分布结构特点。结果表明:(1)宝塔区不同地形各地类分布表现出显著的空间分布差异,高程、坡度和地形位是宝塔区土地利用分布格局形成的重要影响因素。(2)水域、建设用地、耕地和未利用地的优势分布主要聚集在海拔<1 200 m、坡度<10°的范围内,林地和草地的优势分布集中在高程> 200 m、坡度>15°的区域内。(3)宝塔区土地利用程度综合指数随着地形位指数的增大而逐渐减小。土地利用程度较高的区域集中于人类活动频繁的区域,较低的区域集中于自然地貌区。(4)宝塔区各地类具备明显的分形特点,分维数处于 1.243 7~1.736 0 之间。宝塔区土地利用受地形制约,各地类受地形影响变化明显,本研究以期优化黄土高原土地资源配置,加快推进该地区经济发展速度。

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标题: Experimental Research on Longitudinal Breaching of Landslide Dam under Different Bed Sloplings

标题: 不同沟床坡度堰塞坝溃口下切过程试验研究

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作者关键词: landslide dam; trench bed slope; overtopping process; longitudinal breaching; retrogressive erosion

作者关键词: 堰塞坝; 沟床坡度; 漫顶溢流; 下切侵蚀; 溯源侵蚀

摘要: Flume experiment with varied bed slope gradients ($7^{\circ}, 8^{\circ}, 9^{\circ}, 10^{\circ}, 11^{\circ}, 12^{\circ}, 13^{\circ}$) was conducted to explore the downcutting erosion of landslide dam breach. Test results demonstrated that despite different slope gradients, the downcutting erosion of landslide dam breach under overtopping failure mode can be divided into three stages: breach penetration stage, accelerated erosion stage, and decelerated erosion stage. The slope gradient of trench bed affects the accelerated erosion stage. When the bed slope gradient is greater than or equal to 9° , the dominance of downcutting erosion supplemented by retrogressive erosion is weakened. Moreover, the duration of breaching is in a non-monotonic relation with slope gradient, shortens at first but then elongates along with the expansion of slope gradient. Average downcutting erosion rate and retrogressive erosion rate are also in non-monotonic relation with slope gradient, rises at first but then declines with the increase of slope gradient. When the slope gradient is smaller than 11° , the sensitivity of duration to slope gradient is higher than that to reservoir capacity in front of the dam; and vice versa.

摘要: 为了解堆积于不同坡度沟床上的堰塞坝溃口下切过程,开展了7组不同沟床坡度($7^{\circ}, 8^{\circ}, 9^{\circ}, 10^{\circ}, 11^{\circ}, 12^{\circ}, 13^{\circ}$)的水槽试验。试验结果表明:堆积于不同坡度沟床上的堰塞坝在漫顶溢流破坏模式下具有相似的溃口下切过程,具体可分为3个阶段,即溃口贯通阶段、加速侵蚀阶段、减速侵蚀阶段。不同沟床坡度条件在一定程度上影响溃决的加速侵蚀阶段,当沟床坡度 $\geq 9^{\circ}$ 时,加速侵蚀阶段以下切侵蚀为主、溯源侵蚀为辅的特征现象被削弱;溃决历时与沟床坡度呈非单调关系,随沟床坡度的增加呈现出先减少后增加的变化趋势;平均下切侵蚀和溯源侵蚀率与沟床坡度呈非单调关系,随沟床坡度的增加呈现出先增加后减小的变化趋势。沟床坡度缓于 11° 时,溃决历时对沟床坡度的敏感性高于坝前库容;沟床坡度陡于 11° 时,溃决历时对沟床坡度的敏感性低于坝前库容。

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作者: Cheng Yuxiang; Pei Yinghui; Chen Maoning; Zhou Jie

作者: 成玉祥; 裴迎慧; 陈毛宁; 周杰

标题: Influence of fracture on slope stability caused by underground coal mining

标题: 地下采煤引起的破裂效应对斜坡稳定性影响分析

来源出版物: 干旱区资源与环境 卷: 34 期: 11 页: 125-131 出版年: 2020

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文献类型: Article

作者关键词: Loess slope; underground coal mining; physical model test; fracture effects; slope stability

作者关键词: 黄土斜坡; 地下采煤; 物理模型试验; 破裂效应; 斜坡稳定性

摘要: Considering the differences in the physical and mechanical properties of underlying bedrock and overlying loess, the fractures development laws in overlying loess slope caused by underground coal mining were discussed through physical model tests, and the effect of fractures on slope stability was analyzed. It is concluded that the expansion of fractures has obvious spatial differentiation characteristics and orderly appearance. The fractures can be divided into two kinds: approximately vertical and parallel to the slope surface. The formers are very sensitive to the deformation of the top surface of the bedrock. They expanded with fast speed, wide range, high density, and have the characteristics of tension fractures with wide width and uneven walls. The latter are often generated along with the expansion of the near - vertical fracture and the deformation of the slope. They only gradually appear in the later stage of the test. Their range is concentrated inside the slope and their density is small, and have the characteristics of shear fracture, which is plume - shaped and closed. The analysis of the influence of fractures on the slope stability shows that the fracture density and attitude are the key factors influencing the slope stress state, while the overlying slope change caused by underground coal mining has little effect on the slope stability.

摘要: 文中考虑了下伏基岩与上覆黄土物理力学性质差异性, 通过物理模型试验对地下采煤引起上覆黄土坡体裂隙化规律进行了探讨, 得出裂隙扩展具有明显序次和空间分异特征, 可分为与坡面近垂直裂隙和与坡面近平行裂隙两组, 前者的扩展对基岩顶面变形非常敏感, 扩展速度快, 范围广, 密度大, 具有拉张裂隙的特征, 宽度较宽, 裂隙两壁参差不齐; 后者为前者派生裂隙, 只在试验后期才逐渐出现, 且集中在坡体内部, 密度较小, 具有剪切裂隙的显著特征, 裂隙比较

紧闭,局部呈羽列状。破裂效应对斜坡稳定性的影响分析表明,地下采煤导致的上覆斜坡坡度变化对斜坡稳定性的影响较小,裂隙密度、产状对斜坡应力状态的影响是地下采煤引发斜坡失稳的关键因素之一。

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作者: Peng Jianbing; Cui Peng; Zhuang Jianqi

作者: 彭建兵; 崔鹏; 庄建琦

标题: Challenges to engineering geology of SichuanTibet railway

标题: 川藏铁路对工程地质提出的挑战

来源出版物: 岩石力学与工程学报 卷: 39 期: 12 页: 2377-2389 出版年: 2020

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文献类型: Article

作者关键词: engineering geology; SichuanTibet railway; challenge; key issue; research content

作者关键词: 工程地质; 川藏铁路; 挑战; 科学问题; 研究内容

摘要: The SichuanTibet Railway is of great significance and plays an important role in the

long-term western development and the economic and social development of Tibet. However, as the most difficult railway project in the history of the world's railways, the Sichuan-Tibet railway is faced with many unique complex and urgent scientific and engineering problems during the construction and long-term safe operation in the future, especially geological security risks. Based on the concept of earth science system, in this paper, the engineering geological problems of the Qinghai-Tibet Plateau through which the Sichuan-Tibet Railway crosses are systematically analyzed. It is believed that, in the superficial crust of the region along Sichuan-Tibet railway, there is a loose change circle composed by tectonic deformation circle, rock loosening circle, surface freeze-thaw circle and engineering disturbance circle under the combined action of internal and external factors such as plate compression, plateau uplift, climate change and engineering disturbances. The loose change circle affects and restricts the stability of the regional geological body, engineering geological body, engineering rock-soil body and engineering structure of railway engineering, and causes and controls the occurrence and chain evolution of geo-hazards. It is proposed that the Sichuan-Tibet railway is faced with the top-ten challenges and the core scientific problem behind the project is the disaster-causing mechanisms of the interaction between the plate collision zone and the surface layer. Consequently, five key research directions, including the regional crustal stability and the dynamic mechanism of major disasters under plate compression, the stability of the engineering geological body and the chain evolution mechanism of major geohazards under the background of the Qinghai Tibet Plateau uplift, the stability and importance of engineering rock and soil mass driven by climate change and the geohazard chain amplification mechanism, the engineering structure stability under special geological environment and the mutual-feedback geohazard response mechanism for major projects, and the major project disaster risk prediction and prevention under complex environment, are proposed. The Sichuan-Tibet Railway is a rare high-quality research base for exploring the scientific problems of engineering geology and geohazards of major green corridor projects and the theory of human-land coordination. The research results will play a leading role in the geological safety research of similar major projects around the world.

摘要: 川藏铁路对国家西部大开发战略和西藏经济社会发展具有重大战略意义,然而作为世界铁路史上最难修建的铁路工程,其施工建设与长期运营面临许多重大科学与工程技术问题,其中地质安全风险问题最严峻。基于地球系统科学思想对川藏铁路穿越的青藏高原廊道面临的工程地质问题进行系统分析,认为在板块挤压、高原隆升、气候变化和工程扰动等内外动力作用下,川藏铁路廊道地壳浅表部发育一个由构造变形圈、岩体松动圈、表部冻融圈和工程扰动圈组合成的松弛变动圈,它们影响和制约着铁路工程的区域地质体、工程地质体、工程岩土体和工程结构体的稳定性,孕育和控制着重大地质灾害的发生和链生演化。据此确定工程地质面临着十大挑战,工程背后的核心科学问题是板块碰撞带-地表圈层相互作用致灾机制。由此提出板块挤压驱动下区域地质体稳定性与重大灾害群发机制、高原隆升驱动下工程地质体稳定性与重大灾害形成机制、气候变化驱动下工程岩土体稳定性与重大灾害链生放大机制、工程营力驱动下工程结构体稳定性与重大工程灾变响应机制和复杂艰险环境下重大工程灾害风险预测与防控等5个重点研究方向。川藏铁路是探索重大绿色廊道工程的工程地质与灾害地质科学难题和人地协调理论的难得优质研究基地,研究成果会对全球类似重大工程的地质安全研究起到示范引领作用。

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作者: Jiang Gang; Jia Hongshun; Gu Junkai; Fu Xiao

作者: 姜刚; 贾鸿顺; 顾俊凯; 付笑

标题: An improved multi-source remote sensing image registration method with radiation invariant features

标题: 一种改进的辐射不变特征多源图像配准算法

来源出版物: 测绘科学 卷: 45 期: 11 页: 68-74 出版年: 2020

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文献类型: Article

作者关键词: RIFT; RIFT; phase congruency; radiation-invariant; multi-source remote sensing image registration

作者关键词: 相位一致性; 辐射不变; 多源遥感图像配准

摘要: Aiming at the high computational cost of the radiation invariant feature transformation of the multi-source image matching algorithm, an improved RIFT algorithm is proposed based on it. The maximum value map is used to replace the maximum index map to construct rotation invariant descriptors, which greatly reduces the number of rotation invariant descriptors and improves the calculation speed. Then GLOH-like descriptor is constructed, which makes it have higher uniqueness and rotation invariance, and improves the correct matching rate. The results of registration experiments show that the algorithm is invariant to nonlinear radiation differences, can detect a large number of repeated feature points, and quickly construct rotation invariant descriptors, which can well realize the automatic registration of multi-source remote sensing images.

摘要: 针对多源图像匹配算法辐射不变特征变换(RIFT)计算成本高的问题, 该文提出了改进 RIFT 算法。采用最大值图替换最大索引图来构造旋转不变描述子, 大幅降低了构造旋转不变描述子的数量, 提高了计算速度, 并构造了一种似 GLOH 描述子, 使其具有更高的独特性和旋转不变性, 提高了正确匹配率。配准实验结果表明, 该算法对于非线性辐射差异具有不变性,

能够检测出大量的重复特征点,并快速构造旋转不变描述子,能够较好地实现多源遥感图像的自动配准。

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作者: Chen Nan; Zhang Biao

作者: 陈楠; 张标

标题: Research on topological relation self-adaptation in DLG data update

标题: DLG 数据更新中的拓扑关系自适应研究

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文献类型: Article

作者关键词: DLG; DLG; data update; topological relation; adaptive strategy; consistency maintenance

作者关键词: 数据更新; 拓扑关系; 自适应策略; 一致性维护

摘要: Aiming at the problem of maintaining the consistency of the topological relationship between geographical elements when heterogeneous vector data is converted, a method of adaptively updating the topological relationship is proposed. Based on the analysis of the topological relationship between geographical elements, the change of the topological relationship caused by its spatial changes is researched. Taking the rationality of the changed topological

relationship as the basis of judgment,an adaptive strategy for the topological relationship corresponding to the geographical elements is proposed. The theoretical research is applied to engineering applications. Firstly,the topological relationship adaptive strategy of geographic features is converted into an editable XML document,and then a plugin tool is developed using the ArcGIS Add-in method. It realizes the self-adaptive updating of topological relations among geographical features, reduces manual operations and improves update efficiency.

摘要: 针对异构矢量数据相互转换时地理要素间拓扑关系一致性维护的问题,本文提出了一种拓扑关系自适应更新的方法。在分析地理要素间拓扑关系的基础上,研究其空间变化引起的拓扑关系变化,并以变化后的拓扑关系合理性为判断依据,提出地理要素相应的拓扑关系自适应策略。将理论研究进行工程化应用,先将地理要素的拓扑关系自适应策略转化为可编辑的 XML 文档,然后采用 ArcGIS Add-in 方式开发插件工具,实现了更新 DLG 数据时地理要素间拓扑关系的自适应更新,可以减少人工操作,提高更新效率。

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作者: 王飞; 边会媛; 赵伦; 俞军; 谭成仟

标题: Electrical responses and classification of complex water-flooded layers in carbonate reservoirs: A case study of Zananor Oilfield, Kazakhstan

标题: 复杂碳酸盐岩油藏水淹层电性响应特征与划分标准--以哈萨克斯坦让纳若尔油田为例

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文献类型: Article

作者关键词: Zananor Oilfield; carbonate reservoir; water-flooded layer; electrical response characteristics; relative permeability curve; classification criterion of water-flooded level

作者关键词: 让纳若尔油田; 碳酸盐岩油藏; 水淹层; 电性响应特征; 相渗曲线; 水淹层划分标准

摘要: Experiments of electrical responses of waterflooded layers were carried out on porous,

fractured, porous-fractured and composite cores taken from carbonate reservoirs in the Zananor Oilfield, Kazakhstan to find out the effects of injected water salinity on electrical responses of carbonate reservoirs. On the basis of the experimental results and the mathematical model of calculating oil-water relative permeability of porous reservoirs by resistivity and the relative permeability model of two-phase flow in fractured reservoirs, the classification standards of water-flooded layers suitable for carbonate reservoirs with complex pore structure were established. The results show that the salinity of injected water is the main factor affecting the resistivity of carbonate reservoir. When low salinity water (fresh water) is injected, the relationship curve between resistivity and water saturation is U-shaped. When high salinity water (salt water) is injected, the curve is L-shaped. The classification criteria of water-flooded layers for carbonate reservoirs are as follows: (1) In porous reservoirs, the water cut (f_w) is less than or equal to 5% in oil layers, 5%-20% in weak water-flooded layers, 20%-50% in moderately water-flooded layers, and greater than 50% in strong water-flooded layers. (2) For fractured, porous-fractured and composite reservoirs, the oil layers, weakly water-flooded layers, moderately water-flooded layers, and severely water-flooded layers have a water content of less than or equal to 5%, 5% and 10%, 10% to 50%, and larger than 50% respectively.

摘要: 选取哈萨克斯坦让纳若尔碳酸盐岩油藏孔隙型、裂缝型、裂缝孔隙型及复合型岩心开展水淹层电性响应特征实验,重点分析了注入水矿化度对碳酸盐岩储集层电性响应特征的影响,同时基于利用电阻率计算孔隙型储集层油水相对渗透率的数学模型与发育裂缝的储集层两相流相对渗透率模型,结合实验分析结果制定了复杂孔隙结构碳酸盐岩油藏水淹层划分标准。研究表明:注入水矿化度是影响碳酸盐岩储集层电阻率的主要因素,注入低矿化度水(淡水)时,电阻率与含水饱和度的关系曲线形态呈U型;注入高矿化度水(咸水)时,电阻率与含水饱和度的关系曲线形态呈L型。碳酸盐岩油藏水淹层划分标准具体为:①孔隙型储集层油层含水率(f_w)范围为 $f_w \leq 5\%$,弱水淹层含水率范围为 $5\% < f_w \leq 20\%$;中水淹层含水率范围为 $20\% < f_w \leq 50\%$;强水淹层含水率范围为 $f_w > 50\%$;②裂缝型、裂缝孔隙型、复合型储集层油层含水率范围为 $f_w \leq 5\%$,弱水淹层含水率范围为 $5\% < f_w \leq 10\%$;中水淹层含水率范围为 $10\% < f_w \leq 50\%$;强水淹层含水率范围为 $f_w > 50\%$ 。

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作者: 李宇磊; 张永志; 王帅; 刘泰

标题: Post-Seismic Deformation Processes:Afterslip and Vicoelastic Relaxation Following the 2015 Nepal Mw7.8 Earthquake

标题: 2015 年尼泊尔 Mw7.8 地震的震后形变机制震后余滑效应和黏滞性松弛效应

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文献类型: Article

作者关键词: 2015 Nepal Mw7.8 earthquake; GPS data; spherical dislocation theory; fault afterslip; viscoelastic relaxation

作者关键词: 尼泊尔 Mw7.8 地震; GPS 数据; 球体位错理论; 断层余滑; 地幔黏滞性松弛

摘要: The post-earthquake deformation mechanism of the 2015 Nepal Mw7.8 earthquake is studied by using the relatively perfect theory of spherical displacement and GPS data of one year after Nepal earthquake. Two different models of post-earthquake deformation mechanism are explored: ① Single post-earthquake afterslip model(model 1); ② Combined model of post-earthquake afterslip and viscous relaxation(model 2). The results of model 1 show that the post-earthquake afterslip mainly occurs at the depth of 2035 km and is located in the downdip area of co-seismic rupture; the main component of afterslip is thrust, accompanied by dextral strike-slip components, of which the largest component is 20 cm and 11 cm, respectively; the moment released by the post-earthquake afterslip is 1.23×10^{20} Nm, equivalent to Mw7.33 earthquake. The residual slip distribution obtained by model 2 is consistent with model 1, but the cumulative slip is slightly smaller, and the released seismic moment is 1.1×10^{20} Nm, equivalent to Mw7.32 earthquake. Furthermore, the results of model 2 show that the optimum values of lithospheric elastic layer thickness and mantle viscous coefficient in Nepal seismic source area are 40 km and 2×10^{19} Pa·s, respectively. To sum up, the post-earthquake afterslip effect plays a dominant role and the viscous relaxation effect plays a secondary role in Nepal within one year after the earthquake.

摘要: 利用较为完善的球体位错理论,结合尼泊尔地震震后 1 年 GPS 数据,研究 2015 年尼泊尔 Mw7.8 地震震后形变机制。探索了两种不同的震后形变机制模型:①单一的震后余滑模型(模型 1);②震后余滑和黏滞性松弛联合模型(模型 2)。模型 1 研究结果表明,震后余滑主要发生在 20~35 km 深度处,位于同震破裂的下倾区域;余滑以逆冲为主,伴随有右旋走滑分量,其中最大逆冲和走滑分量分别为 20 cm 和 11 cm;震后余滑释放的地震矩为 1.23×10^{20} Nm,等

效于 Mw7.33 地震。模型 2 得到的余滑分布与模型 1 相一致,但累积滑动量略小,释放地震矩为 1.1×10^{20} Nm,等效于 Mw7.32 地震。模型 2 研究表明尼泊尔地震震源区岩石圈弹性层厚度和地幔黏滞性系数的最优值分别为 40 km 和 2×10^{19} Pa·s。综上所述,尼泊尔地震震后 1 年时间内,震后余滑效应起主导作用,黏滞性松弛效应起次要作用。

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作者: 翟越; 薄杰; 侯亚楠; 屈璐; 徐福顺

标题: Simulation of Indoor Emergency Evacuation based on Cellular Automata

标题: 考虑多因素的元胞自动机室内人员疏散模拟研究

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文献类型: Article

作者关键词: Pathfinder; emergency evacuation; cellular automata; Pathfinder; simulation

作者关键词: 应急疏散; 元胞自动机(cellular automata,CA); 仿真模拟

摘要: In order to improve the simulation of indoor personnel emergency evacuation, cellular automata (CA) is used to simulate indoor personnel evacuation with and without obstacles. The simulation results with and without obstacles can be compared to help study the influence of obstacles on the evacuation path of personnel. The simulation results are compared with the traditional evacuation simulation software Pathfinder, and based on the analysis results, an improved algorithm for personnel exit selection of cellular automata is proposed. The results show that the cellular automata model considering the psychological factors can well simulate the behavior of indoor personnel in evacuation, but there will be the phenomenon of unreasonable

personnels repeated return in the simulation process. By setting the critical number of people around the exit,the algorithm of personnel exit selection is improved,which can effectively eliminate the phenomenon of repeated return in evacuation without destroying the randomness of the original program,and improve the authenticity of cellular automata simulation.

摘要: 为了提高室内人员应急疏散模拟的仿真度,使用元胞自动机(cellular automata,CA)进行了有障碍物和无障碍物两种情况下考虑多种因素的室内人员疏散模拟。有障碍物与无障碍物的模拟结果可以形成对照,帮助研究障碍物对于人员疏散路径的影响。将模拟结果与传统疏散模拟软件 Pathfinder 进行对比分析,并基于分析结果提出了改进元胞自动机人员出口选择的算法。结果表明,考虑心理因素的元胞自动机模型能够很好的模拟室内人员在疏散时的行为,但其在模拟过程中会有人员不合理的反复折返现象。通过设置出口周围的临界人数改进了人员出口选择的算法,能够在不破坏原程序随机性的基础上有效消除人员疏散时的反复折返现象,提高了元胞自动机仿真模拟的真实性。

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作者: 陈沛; 王雁林; 陈新建; 周静静

标题: Research on Creep Constitutive Model of Loess-basic Landslide Slip Zone Soil

标题: 黄土-基岩滑坡滑带土蠕变本构模型研究

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作者关键词: loess-bedrock landslide; low speed creep; sliding-zone soil; creep characteristics; creep model

作者关键词: 黄土-基岩滑坡; 低速蠕变; 滑带土; 蠕变特性; 蠕变模型

摘要: The formation and evolution of the low-speed creeping loess-bedrock landslide is greatly affected by the mechanical properties of the slip zone soil. The creep properties of landslide soils and the establishment of corresponding creep constitutive models are of great significance for studying the overall movement mechanism of landslides. In this paper, a typical loess-basic rock landslide in Yanan was selected as the research object. By performing a direct shear creep test on a saturated undisturbed soil sample of the landslide, its creep characteristics were studied, and the basis of its creep test was studied. On the basis of this, four creep models, Burgers model, Singh-Mitchell model, generalized Kelvin model and self-built empirical model were established, and the four models were compared and analyzed. The results showed that the generalized Kelvin model and self-built empirical model were more suitable for describing such landslides. Creep characteristics of band soil; Burgers model was suitable for describing creep characteristics of slip zone soil under high shear stress; Singh-Mitchell model was more suitable for D_r (0.2, 0.8).

摘要: 低速蠕变型黄土-基岩滑坡的形成演化过程受滑带土力学性质影响较大, 所以研究滑带土的蠕变性质及建立相应的蠕变本构模型对研究滑坡整体运动机制有着重要意义。该文选择延安某一典型黄土-基岩滑坡为研究对象, 通过对该滑坡滑带土的饱和原状土样进行直剪蠕变试验, 分析它的蠕变特性, 并在其蠕变试验的基础上, 建立了 Burgers 模型、Singh-Mitchell 模型、广义 Kelvin 模型及自建经验模型四种蠕变模型, 对比分析四种模型, 结果表明: 广义 Kelvin 模型和自建经验模型较为适合描述此类滑坡滑带土的蠕变特性; Burgers 模型适用于描述较高剪应力下的滑带土蠕变特征; Singh-Mitchell 模型对于 D_r (0.2, 0.8) 较为适用。

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标题: A new deep-towed,multi-channel high-resolution seismic system and its preliminary application in the South China Sea

标题: 深拖式多道高分辨率地震探测系统在南海首次应用

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作者关键词: deep-towed seismic system; plasma spark source; multi-channel cable; high resolution seismic; vertical resolution; horizontal resolution

作者关键词: 深拖地震系统; 电火花震源; 多道拖缆; 高分辨率地震; 垂向分辨率; 横向分辨率

摘要: The proprietary deep-towed,multi-channel high-resolution seismic system (Kuiyang-ST2000) consisting of a plasma electric spark source with the advantages of high sound source level,wide frequency band,and multichannel receiver array(48 channel,interval 3.125m)is capable of operating at 2000min ocean.During operating,the source and the receiving cable are towed to the offshore floor(less than 100m).This shortens the distance between the system and the detected target,reduces the absorption and attenuation of seawater during the propagation of seismic signals,and can overcome multiples,bubbles and ocean noises caused by towing streamers on sea surface.The first test on the ST2000system was completed in the E sea area of the South China Sea(the regional sea floor is about 1500mdeep,and the system working depth is about 1400m).The final imaging profile after fine processing of test data has verified the superiority of the Kuiyang-ST2000system,which overcomes the shortcomings of insufficient resolution of conventional marine multi-channel seismic systems.

摘要: 自主研发的深拖式多道高分辨率地震探测系统(Kuiyang-ST2000)主要由高声源级、宽频带的等离子体电火花震源和 48 道(道间距为 3.125m)数字零浮力拖缆组成,最大作业深度可达 2000m。系统采集作业时将震源及接收缆同时拖曳于近海底(小于 100m),缩短与被探测目

标的距离,降低地震信号在传播过程中因海水吸收导致的衰减,且能克服海面拖曳勘探方式中多次波、气泡效应、海洋噪声等不利因素的影响。应用 Kuifyang-ST2000 系统在中国南海 E 海域进行了首次实际采集试验(工区海底深度约 1500m,系统作业深度约 1400m),所得海试数据具有较高信噪比,经精细处理后的最终成像剖面具有很高垂向、横向分辨率,验证了 Kuifyang-ST2000 系统的优越性,且弥补了海上常规多道地震探测系统分辨率不足的缺点。

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标题: Simulation and Prediction of Temporal and Spatial Changes of NDVI in Weihe River Basin Based on CA-Markov

标题: 基于 CA-Markov 的渭河流域 NDVI 时空变化模拟及预测

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作者关键词: normalized difference vegetation index; CA-Markov model; Weihe River Basin

作者关键词: 归一化植被指数; CA-Markov 模型; 渭河流域

摘要: Dynamic monitoring of vegetation plays an important role in indicating changes in climate and ecological environment. The Weihe River Basin is used as the research area. Firstly, the interannual NDVI value of the study area is calculated based on the MODIS NDVI China monthly synthesis data, and the grade is divided. Then based on the CA-Markov model, the NDVI grade is used as the cell type to calculate the transfer matrix of grades in different periods, in order to simulate the spatial distribution of NDVI in 2015; the simulated NDVI results with raw image data were compared to evaluate simulation accuracy and predict the spatial distribution of NDVI in 2020 and 2025. The results showed that: (1) the CA-Markov model was used to simulate the spatial variation of NDVI in the Weihe River Basin, the Kappa coefficient of the simulated results in 2015 was 0.785 0, the accuracy of the overlay analysis was 73.4%, and meets the accuracy requirements, the CA-Markov model can be used for the prediction of NDVI spatial distribution; (2) there are obvious spatial differences in vegetation cover in the Weihe River Basin; low vegetation cover areas and relatively lower vegetation cover areas mainly distributed in northern Shaanxi Province and the central of Gansu Province in the Loess Plateau, the medium vegetation cover areas mainly distributed in the Weihe River and Beiluohe River; in the valley area, the higher vegetation coverage areas mainly distributed in the Guanzhong Plain and Ziwuling Mountains, and the high vegetation coverage areas mainly distributed in the Qinling and Liupan Mountains; (3) during the period 2015-2025, the predicted vegetation cover in the basin will be further improved; the low vegetation coverage area, lower vegetation coverage area and medium vegetation coverage area will reduce, and the whole space will migrate northward; the area of higher vegetation coverage area and high vegetation coverage area will further increase, and the space will expand northward.

摘要: 为综合分析流域植被覆盖的时空变化特征,进而为生态环境保护提供科学参考,以渭河流域作为研究区域,首先基于MODIS NDVI中国月合成数据计算研究区年际NDVI值,并进行等级划分;而后利用CA-Markov模型,以NDVI等级作为元胞类型,计算了不同时期各等级的转移矩阵,由此模拟了2015年NDVI的空间分布;对比模拟NDVI结果和原始影像数据,评价模拟精度,并预测了2020年和2025年NDVI的空间分布状况。结果表明:(1)利用CA-Markov模型模拟渭河流域NDVI的空间变化,得到2015年模拟结果的Kappa系数为0.785 0,叠置分析的准确度为73.4%,符合精度要求,可以用于NDVI空间分布的预测。(2)渭河流域植被覆盖存在明显的空间差异性,低度植被覆盖区、较低植被覆盖区主要分布于陇中和陕北黄土高原地区;中度植被覆盖区主要分布在泾河和北洛河河谷地区,较高植被覆盖区主要分布在关中平原、子午岭等地,高度植被覆盖区主要分布在秦岭、六盘山等山区。(3)2015-2025年,预测流域植被覆盖状况将进一步改善。其中,低度植被覆盖区、较低植被覆盖区和中度植被覆盖区面积将有所减少,空间上整体向北迁移;较高植被覆盖区和高度植被覆盖区面积进一步增加,空间上向北扩张。

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标题: Geometric Differences and Topology of Tectonic and Vertical Joints of Loess

标题: 黄土垂直和构造节理的几何差异性及拓扑学研究

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作者关键词: loess; joints; geometrical features; topological analysis; connectivity

作者关键词: 黄土; 节理; 几何特征; 拓扑分析; 连通性

摘要: Loess joints are the places where groundwater exists and migrates. They break the soil, and affect the stability and strength of loess, causing enormous losses on both economy and human

lives. Joints are the structural basis of all kinds of loess disasters. Accurate analysis of its development characteristics and distribution rules is crucial to understanding the frequent occurrence of loess disasters. Through systematic field investigation, mathematical statistics and topological analysis of loess in Longxi, we found that: (1) The dominant strikes of loess tectonic joints in Longxi are NNW, NWW and NE, which is influenced by strike-slip fault and reverse tilting fault. (2) The occurrence of dominant tectonic joints group obeys the Gaussian normal distribution, with the dip angle mostly within 60° - 80° . The occurrence of vertical joints are more randomly distributed and highly discrete. (3) The average spacing of both tectonic and vertical joints is wide, the opening of joints belongs to "crack" in standard, and the continuity medium, except that the spacing of vertical joints is more concentrated, while the opening of tectonic joints is smaller by comparison. (4) Topological analysis shows that I-node is the majority. Joints extension process is easily interrupted. Branch ratio is at a low level below 3. Topological analysis is more simple and intuitive to describe connectivity, especially under the help of powerful toolbox in software, and has been discussed for decades in the world, yet is rarely used in relative research in China. The research results provide basic data for the recovery of Neotectonics stress fields, for understanding the basic laws of joints development and the numerical modeling of joints network.

摘要: 黄土节理是地下水的赋存场所和运移通道,它们使土体破碎进而影响稳定性和强度,是各类地质灾害的构造基础,准确分析其发育特点和展布规律,是理解黄土频发灾害的关键步骤。通过现场调查、数理统计和拓扑分析,对陇西地区黄土进行系统研究。结果表明: ①陇西地区主要发育优势走向为 NNW、NWW 和 NE 向的构造节理,这是受区域内走滑断裂带和逆倾滑断裂带影响的结果;②构造节理优势组的产状服从高斯正态分布,倾角多为 60° ~ 80° ,垂直节理的产状随机分布、离散型较强;③2 种节理的平均间距均较宽,张开度属"开裂"范围,延续性中等,但垂直节理的间距分布范围更集中,构造节理的张开度相比更小;④拓扑分析显示 I 型节点占主导,节理延伸过程易被中断,分支比处于 3 以下的低水平,该方法能更简单、直观地描述连通性。研究结果可以为新构造应力场恢复、掌握黄土节理发育基本规律、节理网络数值建模等提供基础数据。

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作者: 刘争宏; 张龙; 郑建国; 张炜; 于永堂

标题: Testing device and experimental study on anti-seepage ability of sliding micrometer tube

标题: 滑动测微管抗渗能力的测试装置及试验研究

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作者关键词: sliding micrometer; pile; stress test; anti-seepage measure

作者关键词: 滑动测微计; 桩基础; 内力测试; 防渗措施

摘要: It is a way to measure the internal force of pile foundation by sliding micrometer, and the anti-seepage measures during the installation of sliding micrometer tube are the key to achieve high quality test, while quantitative research on anti-seepage effect of measures is rare. A set of device for testing the anti-seepage ability of sliding micrometer tube was developed. The seepage flow of three common anti-seepage measures under different pressure differences was tested, and a formula for calculating the seepage flow was developed. The matters needing attention in the installation of the sliding micrometer tube were analyzed according to the site conditions. Test results show that when the internal pressure is higher than the external pressure, the seepage flow rate is much larger than that when the external pressure is larger than the internal pressure. Glue coating is a very effective anti-seepage measure, and generally no particles with a diameter over 0.005 mm will enter the sliding micrometer tube after adopting this measure. Increasing the water head in the sliding micrometer tube is beneficial to reduce impurities entering it, but the water head in the sliding micrometer tube can not be too much higher than the liquid levels in the borehole of the pile. After pouring concrete, if water overflow in the sliding micrometer tube happens, the orifice of the sliding micrometer tube should be closed to limit water overflow, and if the water level in the sliding micrometer tube falls, the orifice of the sliding micrometer tube should be opened to allow gas to enter it.

摘要: 使用滑动测微技术进行桩身内力测试, 测管安装时的防渗处理是该技术实现高质量测试的关键, 已有处理措施鲜有其防渗效果的定量研究。研发了一套滑动测微管抗渗能力测试装置, 对3种常用防渗处理措施不同压差下的渗流量进行了测定, 得到计算渗流量的公式, 结合现场条件分析了测管安装的注意事项。结果表明, 测管内压力大时的渗流量要远大于测管外压力大时的渗流量; 涂胶是一种效果非常好的防渗措施, 采用该措施后一般不会有超过0.005mm粒径的颗粒进入测管; 增加测管内水头有利于减少杂质进入测管, 但测管内水头不能高出桩孔内液面太多; 灌注混凝土后, 若测管内有水溢出应封闭测管限制水的溢出, 若测管内水位下降, 则应开放测管允许气体进入测管。

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作者关键词: BDS-2; BDS-3; satellite antenna phase center correction model; joint precise orbit determination; precise point position

作者关键词: 北斗二号; 北斗三号; 卫星天线相位中心改正模型; 联合精密定轨; 精密定位

摘要: Aiming at the lack of high accurate antenna phase correction (PCC) model for the BDS-2 IGSO and MEO satellites, in the BDS-2 and BDS-3 satellites joint precision orbit determination (POD) and precise point positioning (PPP), in this paper, an improved method for estimating PCV and z-offset parameters is used to refine the B1I/B3I ionosphere-free linear combination PCC model for the BDS-2 IGSO and MEO satellites. Compared with the results obtained using the ground-calibrated PCO model published by BeiDou official, the STD of SLR residuals obtained by the POD using the refined PCC model is reduced by 0.6~2.4 cm, and the improvement percentage is about 8.6%~33.3%. The floating PPP solution results, based on the refined BDS-2 satellite PCC model in this paper and the existing BDS-3 PCC model, have been significantly improved by 9.5 mm (37.2%) in the elevation direction.

摘要: 针对 BDS-2 和 BDS-3 卫星联合精密定轨和精密定位中高精度 BDS-2 IGSO/MEO 卫星天线相位中心改正模型在轨估计模型的缺失问题,本文采用了改进的 PCV 和 z -offset 参数估计方法,精化了 BDS-2 IGSO/MEO 卫星 B1I/B3I 无电离层组合 PCC 模型。数值验证结果表明:相比北斗官方发布的 PCO 地面标定值,本文精化的 PCC 模型使得精密轨道 SLR 残差的 STD 减小了 0.6~2.4 cm,改善百分比为 8.6%~33.3%;基于本文精化的 BDS-2 和已有 BDS-3 卫星精化的 PCC 模型使得精密定位浮点解在高程方向显著提升了 9.5 mm(37.2%)。

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作者: 张继锋; 刘寄仁; 冯兵; 郑一安

标题: Fast forward modeling of the 3D land controlled-source electromagnetic method based on model reduction

标题: 三维陆地可控源电磁法有限元模型降阶快速正演

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文献类型: Article

作者关键词: Controlled-source electromagnetic method; Model reduction; Finite element method; Electromagnetic sounding

作者关键词: 可控源电磁法; 模型降阶; 有限元; 电磁测深

摘要: The main bottleneck of fast forward modeling of 3-D land controlled-source electromagnetics based on the finite element method lies in solving multi-frequency large-scale sparse equations. In this paper, a Krylov subspace projection algorithm based on model reduction is introduced, a model reduction form of the finite element stiffness matrix is derived, and a frequency domain transfer function is constructed. A standard orthogonal vector sequence is used to construct a matrix that is much smaller than the finite element stiffness matrix, which is unrelated to frequency. Through model reduction, it is possible to quickly solve these multiple frequency finite element equations. The variational equation based on the electric field is used, and divergence correction conditions are added to eliminate spurious solutions. The pseudo-delta function is introduced to eliminate the singularity of the source point, which can be applied to 3D finite element numerical simulation of complex models. Such an algorithm may be regarded as the basic principle for a solution to the problem of multiple sources. Using the analytical solution of the layered medium model as the standard, comparison shows that the averaged percentage computing error of the proposed method is 1.72%. Compared with the 3DFEM algorithm using the Pardiso direct solver, the CPU time consumption of the proposed method is reduced by 1/10 of the original one. Therefore, with a required accuracy, it is possible to achieve highly efficient 3-D finite element numerical solutions. In the numerical simulation, with the horizontal and vertical high-low resistance models, we analyze the changes of the electric field and the Cagniard apparent resistivity from the near to the far region, the performance characteristics of false extremes, and the effects of shadow effects, which verify the correctness of the proposed algorithm. Finally, we apply the proposed algorithm to simulation of a stratum collapse column model. The results show that the apparent resistivity cross section looks like as above the collapse column, which is consistent with the model design, and further indicates that the proposed algorithm can be applied to real

complex geoelectric structure.

摘要: 三维陆地可控源电磁法有限元快速正演的主要瓶颈在于多频率大型稀疏方程组求解问题.本文引入一种基于模型降阶的 Krylov 子空间投影算法,推导了有限元刚度矩阵的模型降阶形式,构建了频率域传递函数;采用标准正交向量序列,构建一个远远小于有限元刚度矩阵维度的矩阵,该矩阵与频率无关,通过一次模型降阶即可实现多频点有限元方程快速求解.采用基于电场的变分方程,加入散度校正条件,以消除伪解;引入伪 δ 函数,消除了源点的奇异性,可适用于复杂背景模型三维有限元数值模拟,并为多源的求解奠定了基础;以层状介质模型解析解为标准,通过和基于 Pardiso 直接求解器的有限元算法(3DFEM)进行比较,模型降阶法计算时间小于前者的 1/10,平均相对误差在 1.72%,在满足精度要求下,实现了高效率三维有限元数值求解;分别设计了横向高低阻模型和纵向高低阻模型,分析了从近区到远区电场和卡尼亚视电阻率的变化规律,假极值的表现特征,阴影效应的影响等,从而也验证了该算法的正确性.最后,建立了一个地层陷落柱模型,通过模型降阶有限元正演模拟,发现视电阻率断面图在陷落柱上方出现凹陷,与模型设计吻合,表明该算法对复杂地层模拟具有同样的适用性.

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标题: InSAR monitoring and analysis of landslide deformation after the earthquake in the Zhangmu Port, Tibet

标题: 西藏樟木口岸震后滑坡灾害变形 InSAR 监测分析

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作者关键词: SAR; Zhangmu Port in Tibet; post-earthquake geological disaster; landslide; SAR; small baseline subset; stacking technology

作者关键词: 西藏樟木口岸; 震后地质灾害; 滑坡; 小基线集; Stacking 技术

摘要: The Zhangmu Port, located on the border between China and Nepal, is a national first-class land trading port and the largest border trade port in Tibet. After the Nepal earthquake in 2015, the Zhangmu port was closed due to multiple landslide disasters. In order to investigate the distribution and deformation of landslide disasters in the Zhangmu port area so as to serve regional disaster mitigation and prevention, the InSAR technology was used to process the satellite image data of Sentinel-1A and ALOS-2 covering the area, and by analyzing the annual average rate map of line-of-sight deformation, 17 suspected landslides were delineated, and the time series deformation characteristics of 5 typical landslides were analyzed. From the distribution point of view, the landslides identified by monitoring are basically distributed along the left bank of the Boiqu River on the side of National Highway 318. InSAR survey results show that the landslides in the Zhangmu area affected by the earthquake are mostly distributed on the steep hills along the left bank of the Boiqu River. The ancient landslides on the section of Disigang to Youyi Bridge on the China-Nepal Highway have partially resurrected, and the Zhameila dangerous rock mass collapses and landslides are also developed in the urban area where residents live in Zhangmu Town.

摘要: 位于中国和尼泊尔边境的西藏樟木口岸是国家一类陆路通商口岸,也是西藏最大的边贸中心口岸。2015 年尼泊尔大地震之后,西藏樟木口岸因多次发生滑坡灾害,而导致口岸关闭。为了调查樟木口岸区域滑坡灾害的分布和变形情况及更好的服务于区域减灾防灾,利用 InSAR 技术对覆盖该区域的 Sentinel-1A 和 ALOS-2 两种卫星影像数据进行了处理,并通过分析视线向年均形变速率图,圈定了 17 处疑似滑坡,并对其中的 5 处典型滑坡进行时间序列形变特征分析,监测识别出的滑坡基本沿 318 国道所在一侧的波曲河左岸分布。InSAR 调查结果表明受地震影响樟木地区的滑坡多分布在沿波曲河左岸的陡峭山体上,中尼公路迪斯岗至友谊桥段的古滑坡出现了局部复活的现象,同时樟木镇居民所在的城区也发育有扎美拉山危岩体崩塌滑坡灾害。

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标题: Research on multi-source heterogeneous data fusion algorithm of landslide monitoring based on BP neural network

标题: 基于 BP 神经网络的滑坡监测多源异构数据融合算法研究

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作者关键词: landslide monitoring; multi-source heterogeneous data; data fusion; BP neural network; prediction

作者关键词: 滑坡监测; 多源异构数据; 数据融合; BP 神经网络; 预测

摘要: Aiming at the multi-source heterogeneous data fusion problem of landslide monitoring, a multi-source heterogeneous monitoring data fusion algorithm based on BP neural network is proposed in this paper. The temperature, humidity, wind power, cloudiness, precipitation and accumulated precipitation which affect the landslide deformation are taken as the input variables, and the landslide displacement changes data are taken as the expected output data in this algorithm. And the prediction accuracy of this algorithm can be effectively improved by filtering the environmental factor variables with calculating the correlation and significance of the environmental factor variables and the landslide displacement changes. This algorithm is verified by the monitoring data of the Dangchuan landslide in Heifangtai, Yongjing County, Gansu Province. The results show that the BP neural network data fusion algorithm can be used in the landslide displacement prediction with multi-source heterogeneous monitoring data. After the environmental factor variable filtering, the determination coefficient of the BP neural network data fusion algorithm can achieve 0.985 and the RMSE can achieve 0.4787 mm. Thus the accuracy of deformation prediction can be effectively improved.

摘要: 针对滑坡监测中的多源异构数据融合问题, 论文提出了一种基于 BP 神经网络的多源异构监测数据融合算法。该算法将影响滑坡变形的温度、湿度、风力、云量、单日降水量和累计降水量等多环境因子变量作为输入变量, 以滑坡位移变化量数据作为期望输出数据, 并利用各环境因子变量和滑坡位移变化量的相关性及其显著性进行环境因子变量筛选, 以提高算法的预测精度。论文采用甘肃省永靖县黑方台党川滑坡的实测数据进行了试验, 结果表明: 反向传播(Back-Propagation, BP)神经网络数据融合算法适用于具有多源异构监测数据的滑坡变形预测; 在进行环境变量因子筛选后, BP 神经网络数据融合算法的决定系数达到 0.985, 均方根误差(RMSE)达到 0.4787 mm, 从而有效提高了变形预测结果的精度。

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作者关键词: remote sensing; hyperspectral image classification; small-sized samples; multi-scale; residual network

作者关键词: 遥感; 高光谱图像分类; 小样本; 多尺度; 残差网络

摘要: To solve the problem of low classification accuracy of hyperspectral image classification method based on deep learning for small-sized samples, a classification model based on multi-scale residual network is proposed. By adding a branch structure into the residual module, the model constructs extraction modules based on spectral features and spatial features, respectively, realizes the multi-scale extraction and fusion of spatial and spectral features, and makes full use of the rich spatial and spectral information in hyperspectral images. In addition, dynamic learning rate, batch normalization, and Dropout are used in the proposed model to improve computation efficiency and prevent overfitting. Experimental results show that the proposed method achieves 99.07% and 99.96% of the overall classification accuracy on the datasets of Indian Pines and Pavia University, respectively. Compared with support vector machines and existing deep learning methods, the proposed model effectively improves the classification performance of small-sized sample hyperspectral images.

摘要: 为了解决基于深度学习的高光谱图像分类方法对于小样本数据分类精度低的问题,提出了一种基于多尺度残差网络的分类模型。该模型通过在残差模块中加入分支结构,分别构造了基于光谱特征和空间特征的提取模块,实现了空间特征和光谱特征的多尺度提取融合,充分利用了高光谱图像中丰富的空谱信息。此外,所提模型使用了动态学习率、批归一化以及 Dropout 等来提高计算效率和防止过拟合。实验结果表明,该模型在 Indian Pines 和 Pavia

University 数据集上分别取得了 99.07%和 99.96%的总体分类精度,与支持向量机和现有的深度学习方法相比,所提模型有效地提高了针对小样本高光谱图像的分类性能。

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作者: 邵广周; 独婷

作者: Shao Guangzhou; Du Ting

标题: Detection of shallow underground fissures by time-frequency analysis of Rayleigh waves based on wavelet transform

标题: 基于小波变换的瑞利波时频分析方法探测浅地表裂缝

来源出版物: 应用地球物理 卷: 17 期: 2 页: 233-242 出版年: 2020

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来源出版物: Applied Geophysics 卷: 17 期: 2 页: 233-242 出版年: 2020

文献号: 1672-7975(2020)17:2<233:DOSUFB>2.0.TX;2-7

文献类型: Article

作者关键词: Underground fissure; Rayleigh wave; wavelet transform

作者关键词: 地裂缝; 瑞利波; 小波变换

摘要: Ground fissure is a geological hazard that poses a great threat to human life and, property and the environment. Therefore, it is necessary to detect shallow underground fissures effectively. In this paper, a time-frequency analysis of Rayleigh waves based on the wavelet transform is proposed to detect shallow underground fissures. The arrival time of the directed Rayleigh waves and the diffracted Rayleigh waves from the underground fissure is extracted from the time-frequency spectrum of any two traces. Furthermore, the locations of the underground fissures are calculated according to the time difference relation. Four sets of fracture models and one set of field data were used to test the effectiveness of the wavelet transform of Rayleigh waves. Moreover, the detection results of the actual data are compared with that of the high-density electrical method to further prove its detection effect. The field investigation shows that using the wavelet transform of Rayleigh waves to detect shallow underground fissures is feasible and effective.

摘要: 地裂缝作为一种独特的地质灾害,对人类的生命、财产安全和生存环境造成了极大的威胁。因此,对浅地表裂缝进行探测是非常必要的。本文提出了一种基于小波变换的瑞利波时频分析方法检测浅层地下裂缝。在炮记录任意两道的时-频谱上拾取直达瑞利波到时和来自裂缝的瑞利波侧反射到时,根据时差关系可计算得到裂缝的位置。采用四组裂缝模型和一组野外资料对利用瑞利波小波变换探测地裂缝的效果进行了测试,同时将实际资料的探测结果与高密度电法进行对比,进一步证明其探测效果。野外实际探测表明,利用瑞利波小波变换来探测浅地表裂缝是可行且有效性的。

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作者: Li Hua; Li Tonglu; Zhang Yaguo; Li Ping; Fan Jiangwen

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标题: Relationship between unsaturated permeability curve and pore-size distribution of compacted loess with different dry density

标题: 不同干密度压实黄土的非饱和渗透性曲线特征及其与孔隙分布的关系

来源出版物: 水利学报 卷: 51 期: 8 页: 979-986 出版年: 2020

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文献类型: Article

作者关键词: compacted soil; permeability curve; dry density; pore-size distribution

作者关键词: 压实黄土; 渗透性曲线; 干密度; 孔隙分布

摘要: Water infiltration may induce collapse and differential settlement in compacted loess area, therefore, it is necessary to study its permeability characteristics. The permeability curves of compacted loess with three different dry density are measured by a vertical soil column with filter paper. The results show that with the decrease of matric suction, the permeability curve of compacted loess can be divided into three stages: slow increasing, quick increasing and saturated, and the smaller the dry density is, the more obvious the characteristics of the three stages would be. The variable of the dry density affects the permeability on low suction range, the larger the dry density, the smaller the permeability coefficient. The variable of the dry density doesn't affect the

permeability on high suction range. In addition, its well known that the more the pores in the soil, the larger the permeability. Therefore the pore-size distributions of the three soils are measured by mercury intrusion porosimetry tests. The results show that the amount of micro pores is the same between loess with different dry density, the corresponding permeability are the same too. The larger the dry density, the less the small pores ($1.3 \mu\text{m} < d < 8 \mu\text{m}$), and the smaller the corresponding permeability. Middle and large pores make little influence to the permeability due to its low content.

摘要: 压实黄土在水分入渗条件下容易产生湿陷、不均匀沉降等工程地质问题,因此有必要对其渗透特性进行研究。本文采用基于滤纸法的竖直土柱试验测试了3种不同干密度压实黄土全吸力范围的渗透性曲线。试验结果表明,压实黄土的渗透性曲线随着基质吸力减小分为缓升段、陡升段和饱和段三个阶段,且干密度越小的土三段特征越明显。压实黄土干密度的差异主要影响低吸力段渗透系数,干密度越大,渗透系数越小;基本不影响高吸力段渗透系数。由于渗透系数与孔隙分布密切相关,孔隙越多渗透性越强。因此本文用压汞试验测得了3种土样的孔隙分布曲线。试验表明不同干密度的压实黄土,微孔数量基本相同,对应吸力范围的渗透系数也相同;孔径为 $1.3 \mu\text{m} < d < 8 \mu\text{m}$ 的小孔数量随干密度增大而减小,对应吸力范围的渗透系数也相应地减小;中孔、大孔数量很少,其对土样的渗透性的影响甚微。这反映了渗透性受孔隙分布控制的内在机理。

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作者: 陈楠; 张标

标题: Research on automatic line-changing of point map annotation based on Chinese word segmentation

标题: 基于中文分词的点状地图注记自动换行研究

来源出版物: 测绘工程 卷: 29 期: 4 页: 21-26 出版年: 2020

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文献类型: Article

作者关键词: map annotation; Chinese word segmentation; dictionary; line change labeling

作者关键词: 地图注记; 中文分词; 词典; 换行标注

摘要: In view of the problem that the point map annotation length is too long and needs to be changed, a dictionary-based map annotation automatic line-changing method is proposed in this paper. Based on the analysis of the contents and evaluation criteria of map annotation, the principles of line-changing processing of map annotation are sorted out. Chinese word segmentation technology based on dictionary is introduced into line-changing processing of map annotation. The automatic line-changing design of map annotation based on dictionary is carried out. A plug-in tool for line-changing processing of map annotation is developed by using ArcGIS Add-in mode. The developed plug-in tool is applied to the mapping work of the electronic map. The practical result shows that the plug-in tool developed according to the method proposed

in this paper can realize the automatic line-wrapping processing of the map annotation, which can reduce the manual operation and effectively improve cartographic efficiency.

摘要: 针对点状地图注记长度过长需要换行处理的问题,提出一种地图注记的自动换行方法。在分析地图注记内容和评价准则的基础上,梳理出地图注记换行处理的原则,将基于词典的中文分词技术引入到地图注记的换行处理中,进行基于词典的地图注记自动换行设计,并采用 ArcGIS Add-in 方式开发地图注记换行处理插件工具。将所开发的插件工具应用于电子地图的配图工作中,实践结果表明,文中提出的方法所开发的插件工具可实现地图注记的自动换行处理,能减少人工操作,有效提升制图效率。

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作者: 黄达; 马昊; 孟秋杰; 宋宜祥

标题: Centrifugal model test and numerical simulation for anacinal rock slopes with soft-hard interbedded structures

标题: 软硬互层岩质反倾边坡弯曲倾倒离心模型试验与数值模拟研究

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作者关键词: anacinal slope; soft-hard interbedded structure; toppling deformation; centrifugal model test; DEM

作者关键词: 反倾边坡; 软硬互层; 倾倒变形; 离心模型试验; 离散元数值模拟

摘要: Most of the toppling deformations exposed in western China have soft-hard interlayer structures. The maximum depth even reaches 300 m. In order to further explore the toppling mechanism of soft-hard interbedded anacinal slope, centrifugal model tests and UDEC simulation are combined. The mechanical mechanism of toppling is analyzed through point-to-point relative displacement. Random fissures are preset in rock plates of numerical slopes, and the evolution laws of failure surface are obtained. The results show that the displacement and fracture morphology of numerical model agree well with physical tests. The toppling process of slope can be divided into initial creep stage, steady deformation stage and failure stage. The front part of the slope is compression-shear composite deformation, while the rear part is tension-dominated. The

main fracture surface runs through the whole slope rapidly from the slope toe with a curved shape, and is a tension-shear fracture surface. There are three fracture surfaces in the slope, which can be used as borders to divide the toppling slope into extremely strong toppling zone, strong toppling zone and weak toppling zone. At the anaphase of the deformation, the failure mode of slope toe turns into compression cracking, and the toe rocks gradually separate from parent rocks, leading to the progressive retrogressive failure of slope along different fracture surfaces. The slope is more likely to be damaged when the sum of the dip and slope angle is greater than or equal to 120° . The slope angle mainly affects the damage degree, and the dip controls the deformation scale.

摘要: 西部山区工程建设揭露了众多大型弯曲倾倒变形体,多具有软硬互层结构,水平深度可达 300 m。为进一步探明软硬互层反倾边坡的倾倒变形机制,融合离心模型试验与 UDEC 模拟,研究了此类边坡的破坏模式与影响因素,并通过点对分析,讨论了变形的力学机制。数值模拟时,在岩层内预置随机裂隙,获得了破裂面的演化规律。结果表明:数值模拟与试验的位移曲线及破裂面形态吻合较好,边坡变形可分为起始蠕变阶段、稳态变形阶段和失稳破坏阶段;坡体前部为压剪复合变形,后部则以拉张为主;边坡主破裂面呈弧形,由坡脚快速贯通至坡顶,整体为拉-剪性破裂面;坡体内发育 3 条破裂面,可作为分界线将变形体分为极强倾倒区、强倾倒区和弱倾倒区;坡脚岩体变形后期压致拉裂,逐渐折断脱离母岩,最终导致变形岩体沿不同的破裂面形成渐进后退式破坏;边坡在倾角与坡角之和大于等于 120° 时才较易破坏,坡角主要影响破坏难易,倾角则控制变形规模。

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标题: Deformation mechanism of the Taping H1 landslide in Wushan County in the Three Gorges

Reservoir area

标题: 三峡库区巫山县塔坪 H1 滑坡变形机制

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作者关键词: Three Gorges Reservoir; bedding rock landslide; water level fluctuation; deformation mechanism; numerical simulation

作者关键词: 三峡库区; 顺向滑坡; 水位波动; 变形机理; 数值模拟

摘要: Affected by the water level fluctuations and heavy rainfall, several bedding rock landslides have reactivated since the 175 m trail impoundment in the Three Gorges Reservoir area. The Taping H1 landslide near Quchi in Wushan County is taken as an example, and combining the landslide investigation and monitoring, the deformation characteristics and reactivation mechanism of the landslide are analyzed. The research results show that (1) the Taping H1 landslide is an ancient bedding rock landslide, the rock mass is fragmented and is mainly composed of soft and hard sandstone, mudstone and shale of the Triassic Xiangxi Group, which is sandwiched by multiple layers of weak inter layers, forming a multi-stage slip zone to control landslide deformation. (2) According to the monitoring of surface and underground displacements, the deformation of the landslide is divided into three regions. The maximum horizontal displacement of the landslide leading zone of the landslide with the largest displacement has reached 80 cm. The middle area of the landslide is slowly deformed, and the area of the rear Quchi Township is relatively stable. (3) The numerical simulation results show that the water level fluctuations influences the deformation and stability of the landslide leading edge which is below the water surface, and the heavy rainfall infiltration along the structural plane accelerates the deformation of the front area of the landslide. The middle and front areas of the Taping H1 landslide is currently in the stage of continuous deformation. Under the combined influence of water level fluctuations and short-term heavy rainfall, the Taping H1 landslide shows a slow deformation during the annual flood season, which is consistent with the monitoring results. Landslide prevention projects are urgently needed to improve the stability of the landslide and ensure the safety of the town.

摘要: 自 2008 年三峡库区 175 m 试验性蓄水以来,受库水波动及强降雨影响,沿江库岸发生多起顺向古滑坡变形灾害。以三峡库区巫山县塔坪 H1 滑坡为例,结合近十年滑坡调查勘察与变形监测资料,分析了该滑坡蓄水后的变形特征。通过研究分析认为:(1)塔坪 H1 滑坡为顺层古岩质滑坡,岩体呈碎裂状,岩性主要为三叠系香溪组软硬相间的砂岩、泥页岩,岩层间夹多套软弱夹层,形成了多级滑带控制的滑坡变形。(2)滑坡变形分为 3 个区域,位移量变形最大的滑坡前缘消落带区域,最大水平位移已达 80 cm,其次是处于缓慢变形状态的曲尺场镇前部区域和后部相对稳定的曲尺场镇区域。(3)数值模拟结果显示,库水位周期性波动影响着滑坡前缘涉水区域稳定性变化,短时强降雨沿岩体结构面入渗会加速滑坡中前部区域稳定性快速下降。在水位波动和短时强降雨的共同影响下,塔坪 H1 滑坡在每年汛期呈现缓慢变形。目前塔坪 H1 滑坡中前部处于持续变形阶段,亟需开展滑坡防治工程,提高滑坡稳定性,确保场镇安全。

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标题: Experimental study of anti-sliding mechanism and force of lattice anchor in soil landslide

标题: 土质滑坡格构锚杆抗滑机制及受力试验研究

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作者关键词: soil landslide; lattice anchor; anti-sliding mechanism; anchorage force

作者关键词: 土质滑坡; 格构锚杆; 抗滑机制; 锚固力

摘要: In this paper,a large-scale physical model test of landslide prevention and control was conducted to investigate the deformation and displacement of the lattice anchor system in soil landslide under the surcharged load on the top of the slope.The objectives revealed the anti-sliding mechanism of lattice anchor.The relationship between the anchorage force and slope displacement

and anchor deformation was discussed, and a calculation method of the ultimate anchorage force was proposed. The results showed that when the landslide was initiated, the lattice beam and the slope as a whole-body rotate and slip, the bolts are bent and deformed at the slip surface, which was in a state of bending and tensile stress. The anti-sliding is implemented by the shear resistance of anchors near the sliding surface and by the retaining resistance of the lattice beam with anchors. The ultimate anchorage force of the lattice anchor consists of three parts: initial pre-stress of the bolt, anchor tension caused by bending deformation of the bolt and anchor tension caused by the slope displacement. It can be calculated by the formula: $P=k\Delta l+P_0$. The results can provide some reference for the optimal design of the lattice anchor system.

摘要: 通过滑坡防治格构锚固大型物理模型试验, 分析了土质滑坡格构锚杆体系在坡顶荷载下的变形和位移, 揭示了格构锚杆的抗滑机制, 探讨了锚固力与坡体位移及锚杆变形的关系, 提出了极限锚固力的计算方法。结果表明: 滑坡滑动时, 格构梁与坡体整体发生旋转滑移, 锚杆在滑面处发生了弯曲变形, 处于弯曲和轴向拉伸组合变形状态; 格构锚杆的抗滑作用表现为锚杆在滑面处的抗剪抗滑和锚杆格构梁的挡土阻滑; 格构锚杆的极限锚固力由初始预应力、锚杆弯曲变形引起锚拉力、坡体位移引起锚拉力三部分组成, 可通过公式 $P=k\Delta l+P_0$ 计算。该研究结果可为格构锚固体系的优化设计提供一定的参考。

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标题: Spatiotemporal Dynamics and Tracing of Aerosol over Hainan Island

标题: 海南岛气溶胶时空变化及来源追溯

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作者关键词: AOD; PM_{2.5}; Aerosol Optical Depth (AOD); PM_{2.5}; atmospheric environment; spatiotemporal dynamics; remote sensing; HYSPLIT model; Trace; Hainan Island

作者关键词: 大气环境; 时空变化; 遥感; HYSPLIT 模式; 来源追溯; 海南岛

摘要: To serve as a basis for atmospheric environmental quality monitoring and pollution prevention & control in Hainan, which located in a specific geographical position with great strategic significance and national development potentiality, it is imperative to reveal the spatiotemporal dynamics patterns of aerosol over Hainan Island and clarify the sources of atmospheric pollutants. Hence, this study aims to investigate the spatiotemporal dynamics characteristics of the Aerosol Optical Depth (AOD) over Hainan Island by using the MODIS 3 km spatial resolution data (i.e., MOD04_3K product) from 2003 to 2017. Then, we calculated the 48-h backward trajectories at three above ground levels (10, 500, and 1000 m) of eight typical air pollution events in Haikou city, the capital and largest city of Hainan Province and the starting point to trace the sources of air pollutants in the region, by using the Hybrid Single Particle Lagrangian Integrated Trajectory(HYSPLIT) model. The results indicated that: (1) The average values of AODs during 2003-2017 over Hainan Island region exhibited a notable three-stage stepped-down spatial distribution from northwest to southeast, each of which displayed some distinctly spatial variations. (2) During the fifteen-year period, a slight increase tendency of the annual mean values of AODs was noted with their total mean value of 0.095 over Hainan Island, and the seasonal mean values of AODs were characterized with "spring > autumn > winter > summer", the reasons for which could be derived from the common influences of regional weather systems and local winds, as well as the atmospheric pollutant emissions caused by tourism development. (3) In addition, during periods of typical atmospheric pollution events in Hainan Island (Haikou) from 2013 to 2017, the backward trajectories of air pollutants at three ground levels (10, 500, and 1000m) were primarily from the northeast direction of Hainan Island. Thus, the air pollutants originated from the mainland in the northeast direction such as the Pearl River Delta region were brought to Hainan Island along land tracks or coastal belts by the prevailing northeast winds; the plausible explanation of this could be that the atmospheric pollution events in Haikou occurred because of the joint effects of regional weather (e.g., continental cold high pressure) and local weather (e.g., sea-breeze convergence) systems. Perhaps, findings of this study could contribute to the understanding and assessing dynamic changes of the atmospheric environmental quality situation over decade in Hainan Island region and provide useful references for the establishment of joint prevention and control mechanism for air pollution.

摘要: 海南岛独特的区域和国家战略位置,使得了解和掌握该地区气溶胶时空格局特征及其大气污染物传输来源是海南大气环境质量和污染防治中重要的关注问题。选取 MODIS 3 km 分辨率气溶胶光学厚度(AOD)产品 MOD04_3K,对海南岛 2003-2017 年 AOD 时空变化特征进行分析;以海口市为起始点,采用 HYSPLIT 模式对 8 次典型大气污染事件在 10、500、1000 m 3 个相对地面高度上进行 48 h 后向轨迹计算,以探究该区域大气污染物来源。结果表明:①海南岛 AOD 在空间上呈较为明显的三级阶梯状分布,从西北方向向东南递减,2003-2017 年在不同阶梯的空间变化趋势差异十分显著;② 2003-2017 年海南岛 AOD 年均值为 0.095,各年均值整体呈轻微升高趋势;季节均值差异表现为"春季>秋季>冬季>夏季",此差异除受区域天气系统与地方风向特征的影响外,本区旅游业发展造成的大气污染物排放也不可忽视;③海南岛(海口市)2013-2017 年典型大气污染事件发生期间大气污染气流在 3 个高度上(10、

500、1000 m)的后向轨迹基本保持一致,均主要来自于海南岛东北方向。据此,位于该方向毗邻的珠江三角洲地区陆源大气污染物在东北盛行风的影响下被输送至海南岛,在区域天气系统(如大陆冷高压)和局部天气系统(如海风辐合)共同作用下,是促成该地区大气污染事件发生的重要因素。研究结果对深入理解海南岛近十多年来大气环境状况的变化规律、完善该区域大气污染联防联控机制具有重要的意义。

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标题: Biomass estimation of Caragana microphylla in the shrub-encroached grassland based on terrestrial laser scanning

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作者关键词: 遥感; 地基激光雷达; 灌丛化; 小叶锦鸡儿; 生物量; 体积

摘要: Caragana microphylla is the most representative plant in the shrub-encroached grassland of Inner Mongolia. Accurately estimating the aboveground biomass of Caragana microphylla is critical to study the shrub-encroached grassland ecosystem function further and to monitor the degree of shrub encroachment. Terrestrial Laser Scanning (TLS) can accurately estimate shrub volume by acquiring highdensity point cloud data. It is widely used to measure shrub biomass. However, this scanning method has not been effectively applied in shrub-encroached grassland. In this study, the field-measured TLS point cloud data and the shrub biomass of 42 shrubs were first obtained in five plots (10 m * 10 m) from the shrub-encroached grassland vegetation restoration experimental area of the Chinese Academy of Sciences. The volume of shrub was then calculated using the method of global convex hull, convex hull by slices, volume calculation by sections, volumetric surface differencing, and voxels. The regression analysis was also carried out to predict biomass. Finally, the accuracy of biomass estimation models established by the five methods was compared and analyzed by leave-one-out cross validation. Results showed that TLS can achieve the rapid and accurate inversion of Caragana microphylla biomass without destroying vegetation, which is a reliable alternative technology for traditional field investigation methods. The five methods used in the study were able to estimate biomass effectively. Compared with the global convex hull ($R^2=0.87$, $p<0.001$, $RMSE=30.50$ g), the convex hull by slices ($R^2=0.89$, $p<0.001$, $RMSE=28.01$ g) and the volume calculation by sections ($R^2=0.88$, $p<0.001$, $RMSE=29.03$ g) could effectively reduce the overestimation of the volume caused by outliers, thus improving the accuracy of biomass estimation. The volumetric surface differencing fitted best with the measured biomass ($R^2=0.89$, $p<0.001$, $RMSE=28.89$ g) when the grid size is 3 cm. The standard deviation of height was selected as the optimal height metric of biomass prediction for Caragana microphylla. The method that used voxels explained 90% of the variation in biomass estimates ($R^2=0.90$, $p<0.001$, $RMSE=26.28$ g). Thus, it was the best model for the biomass inversion of Caragana microphylla.

摘要: 小叶锦鸡儿是内蒙古灌丛化草原中最具代表性的景观植物,准确估算小叶锦鸡儿灌丛的地上生物量对研究灌丛化草原生态系统、监测草原灌丛化程度具有重要意义。地基激光雷达 TLS(Terrestrial Laser Scanning)可通过获取高密度点云数据准确估算灌木体积,被广泛应用于反演灌木生物量,但在灌丛化草原中尚未得到有效应用。本研究首先在中国科学院灌丛化草地植被恢复试验区获取了 5 个样方(10 m*10 m)共 42 株灌丛的 TLS 点云数据及实测生物量信息;然后分别使用整体凸包法、切片凸包法、切片分割法、体积表面差分法、体素法 5 种方法计算灌丛体积并与实测生物量进行回归分析;最后,通过留一交叉验证对 5 种方法建立的生物量估算模型精度进行对比分析。结果表明:TLS 可在不破坏植被的情况下实现快速、准

确地小叶锦鸡儿灌丛生物量反演,是传统野外调查方法的可靠替代技术。研究中采用的 5 种方法均能较好地估算灌丛生物量,其中:(1)相比于整体凸包法($R^2=0.87$, $p<0.001$, $RMSE=30.50$ g),切片凸包法($R^2=0.89$, $p<0.001$, $RMSE=28.01$ g)与切片分割法($R^2=0.88$, $p<0.001$, $RMSE=29.03$ g)可有效减弱离群点造成的体积高估,生物量估算精度有所提升;(2)格网大小为 3 cm、高度统计变量选取标准差时,体积表面差分法计算的体积与实测生物量拟合度最好($R^2=0.89$, $p<0.001$, $RMSE=28.89$ g),表明高度标准差是估算小叶锦鸡儿灌丛生物量的强预测因子;(3)体素法解释了生物量估计值 90%的变化($R^2=0.90$, $p<0.001$, $RMSE=26.28$ g),是适合小叶锦鸡儿灌丛生物量反演的最优模型。

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作者: 杨龙伟; 魏云杰; 彭令; 王文沛; 朱赛楠; 王俊豪

标题: KINEMATICAL CHARACTERISTICS OF COLLAPSE IN RED BEDS IN KANGSU TOWN, WUQIA COUNTY, XINJIANG

标题: 新疆维吾尔自治区乌恰县康苏红层崩塌运动学特征研究

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作者关键词: Red beds; Collapse; Failure types; Kinematics; Numerical simulation

作者关键词: 红层; 崩塌-碎屑流; 失稳模式; 运动学; 数值模拟

摘要: This paper examines the kinematical characteristics of the collapse-debris flow in red beds. It presents an evaluation method about spatial prediction of the collapse-debris flow in red beds. It takes the Kangsu collapse in red beds as an example. It uses the aerial photography of the unmanned aerial vehicle and the field geological survey, and combines them with the engineering geological elements of the collapse study area. It analyses the formation mechanism and the failure types of the collapse. The research shows that the collapse is the crack-type collapse. The collapse is mainly controlled by the combination of lithology of dangerous rock mass and structural plane of slope body. The hazard mode is given as follows: Firstly, rocks have the different weathering resistance under the conditions of wind and other external forces. Secondly, under the action of freezing and thawing, the rock mass structure is destroyed. Thirdly, when the unloading fracture zone is expanded further, the bottom of dangerous rock mass can be in an empty state. At last, under the action of gravity, the collapse occurs unsteadily and impacts to the slope surface to form debris flow. And the DAN-W model is used to simulate the motion process of the collapse-debris flow. The calculation results show that the duration of the collapse-debris flow movement is about 50 s, the average thickness about accumulation body reaches 2 m and the maximum speed is $11.5 \text{ m}\cdot\text{s}^{-1}$. And the longest impact distance is 315 m. The calculated results are in good agreement with the actual situation. It proves that DAN-W model can be used to analyze the dynamic hazard effects of the collapse-debris flow in red beds area. The paper provides a reference for the analysis of the formation characteristics and movement effects of similar potential collapse-debris flow hazards in red beds.

摘要: 以新疆维吾尔自治区乌恰县康苏红层崩塌为例, 基于 DAN-W 运动学模型进行了红层崩塌碎屑流空间预测评价, 同时根据无人机航拍图和野外地质现场调查, 结合崩塌研究区的工程地质要素, 分析该崩塌的形成特征和失稳模式。结果表明: 该崩塌为拉裂式崩塌, 主要受危岩体岩性组合和坡体结构面组合控制, 其孕灾模式为差异风化阶段岩体结构变形破坏阶段悬挑危岩阶段崩塌失稳落下阶段, 具有典型的碎屑流运动特征。同时利用动力学模型软件 DAN-W 对该崩塌碎屑流的运动过程进行计算, 得到崩塌碎屑流的运动时长约为 50 s, 堆积体平均厚度达到 2 m, 最大速度为 $11.5 \text{ m}\cdot\text{s}^{-1}$, 冲击最远距离达到 315 m, 与实际情况相符。表明 DAN-W 模型可以用来分析红层崩塌碎屑流的动力学灾害效应, 为红层地区类似的潜在崩塌碎屑流灾害的形成特征和运动效应分析提供借鉴。

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标题: Review of deep-towed,high resolution multi-channel seismic exploration

标题: 深拖多道高分辨率地震探测技术综述

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作者关键词: Deep-towed seismic; Vertical resolution; Lateral resolution; High-resolution; Gas hydrates

作者关键词: 深拖地震; 纵向分辨率; 横向分辨率; 高分辨率; 天然气水合物

摘要: As the exploration of gas hydrate in China's major sea areas gradually enters the period of detailed investigation and exploitation,the high accuracy for the exploration of the spatial distribution of gas hydrate in deep sea has been significantly improved.However, the resolution of conventional marine multichannel seismic systems is insufficient to meet the needs of detailed investigation,exploration and development of gas hydrate resources.In this paper,the techniques and characteristics of the high resolution,deep-towed multi-channel seismic technology are described in detail;The advances of deep-towed multi-channel seismic technology is compared with the conventional marine multichannel seismic, small scale multichannel seismic and OBC technology;Its applications of finely identifying BSR,vent and pockmark have been summarized.Obviously,because the highresolution,deep-towed multi-channel seismic technology is towing the source and hydrophone array near the bottom of the sea(about 100 m)and the source has high main frequency and wider band width,the impact of noise and attenuation caused by the ocean on seismic signals is reduced,and it can overcome the effects of multiple waves and bubble effects in towed seismic exploration on the sea surface,so it has high vertical and horizontal

resolution and high S/N. The specific characteristics will have great application value in the field of gas hydrate exploration and marine engineering.

摘要: 随着我国主要海域的天然气水合物勘探逐步进入详查和开采阶段,对深海天然气水合物矿体空间分布的探查精度要求显著提高,而海洋常规多道地震探测系统分辨率不足,难以满足现阶段深海天然气水合物资源详查、勘探和开发的需要.本文详细阐述了深拖多道高分辨率地震探测技术探测方式及其特点,分析对比了深拖多道地震技术与常规海洋多道地震技术、短排列小道距地震技术及 OBC 地震技术相比的优越性;总结了国外深拖多道高分辨率地震探测装备以及在精细识别 BSR、海底冷泉及海底麻坑等的应用效果.因为深拖多道高分辨率地震探测技术是将震源与采集缆拖曳与近海底(约 100 m)且震源具有高主频、宽频带的特点,从而降低了勘探海洋噪声对地震信号的影响,缩短了与被探测目标的距离,降低了地震信号在传播过程中海水的吸收衰减,并且能够克服海面拖曳地震勘探中多次波、气泡效应的影响,所以其具有很高的纵向分辨率和横向分辨率以及高信噪比特点,将在天然气水合物勘探以及海洋工程领域具有极大的应用价值.

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作者: 曹红业; 张天棋

标题: Atmospheric Correction Algorithm for GF-2 Image Based On a Radiative Transfer Model

标题: 基于辐射传输模型的高分二号影像大气校正方法研究

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作者关键词: 6S; radiation transfer model; GF-2 image; atmospheric correction; look-up table; aerosol optical depth(AOD); 6S

作者关键词: 辐射传输模型; GF-2 影像; 大气校正; 查找表; 气溶胶光学厚度

摘要: The successful launch of the GF-2 satellite indicates that China's remote sensing satellites have entered the era of high spatial resolution of the sub-meter level. Remote sensing images will play an important role in quantitative inversion, ground object recognition, and change analysis. The accuracy of its atmospheric correction is an important factor that affects its quantitative application. Due to the lack of a short-wave infrared band in GF-2, it is impossible to use a dark pixel method for atmospheric correction. A method of atmospheric correction for the GF-2 image based on a radiation transfer model is proposed. The atmospheric correction coefficient lookup table is established by using 6S (Second Simulation of the Satellite Signal in the Solar Spectrum) radiation transfer model. The aerosol optical thickness (AOT) is retrieved by combining synchronous MODIS image data with an improved dark pixel method. The atmospheric correction parameters are determined to eliminate the influence of absorption and scattering of atmospheric molecules and aerosols in the GF-2 image and to achieve atmospheric correction of GF-2 data. Dunhuang radiation correction field with a flat and uniform surface is selected as the experimental area. The accuracy of the correction results is evaluated by synchronous measured data, and the normalized difference vegetation index (NDVI) before and after atmospheric correction is compared. The results show that the minimum relative error is only 0.9%. The image data after atmospheric correction can accurately reflect the reflection characteristics of ground objects. NDVI after atmospheric correction greatly enhances the contrast of vegetation information and highlights the ability of vegetation information discrimination of the GF-2 satellite sensor.

摘要: 高分二号卫星的成功发射,标志着我国遥感卫星进入了亚米级高空间分辨率时代,遥感影像在定量反演,地物识别和变化分析等领域将有重要作用。大气校正的精度是影响其定量化应用的重要因素。由于高分二号遥感数据缺乏短波红外波段,无法采用暗像元法进行大气校正。提出一种基于辐射传输模型的高分二号影像大气校正方法,利用 6S(second simulation of the satellite signal in the solar spectrum)辐射传输模型建立大气校正系数查找表,利用同步 MODIS 影像数据结合改进后的暗像元方法反演气溶胶光学厚度,确定大气校正系数,消除高分二号影像大气分子和气溶胶等的吸收和散射的影响,实现 GF-2 数据的大气校正。选取地表平坦均一的敦煌辐射校正场作为实验区,通过同步的实测数据对校正结果进行精度评价,并且比较大气校正前后归一化植被指数 NDVI。结果表明:最小相对误差仅为 0.9%,大气校正之后影像数据更真实地反映了地物的反射特性;大气校正后的 NDVI 大大增强了植被信息反差,突出了 GF-2 卫星传感器的植被信息区分能力。

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标题: Mode analysis of pore distribution and soil-water characteristic curve of Malan loess under different depositional environments

标题: 不同沉积环境下马兰黄土孔隙分布与土水特征的模式分析

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作者关键词: Malan loess; soil-water characteristic curve; pore size distribution; pedogenesis; filter paper method; coefficient of evaporation and infiltration

作者关键词: 马兰黄土; 土-水特征曲线; 孔径分布; 成土作用; 滤纸法; 蒸渗系数

摘要: In order to examine the relationship between pore size distribution(PSD) and soil-water characteristic curve(SWCC) of loess and its depositional environment,intact Malan loess samples were taken from the upper parts of Loess Plateau in Hepingzhen in Zhengning county of Gansu Province and Jingyang county of Shaanxi Province.On the basis of measuring physical indexes of specimens,mercury intrusion method was used to measure PSD curves of soil samples,and filter paper method was adopted to measure SWCC.The result shows that the PSD curve of Hepingzhen is unimodal;for Jingyang,the PSD curve is bimodal;the PSD curve of Zhengning sample is trimodal while the corresponding SWCC of each soil sample has a stepped shape.The relationship between SWCC and PSD indicates that pore distribution controls the mode of the soil-water characteristic curve.Scanning electron microscope(SEM) photographs of three samples were obtained and the microstructure also showed this phenomenon of regional differentiation.Climatic analysis for each sampling point shows that the difference of PSD curves of the Malan loess in different regions is determined by the strength of pedogenesis.In this paper,the ratio of precipitation to evaporation is defined as the coefficient of evaporation and infiltration(C_{EI}),which is used as an index to describe the strength of pedogenesis.According to the C_{EI} ,the model of PSD is classified as follows:when $C_{EI} \leq 0.3$,PSD is unimodal;when $0.3 < C_{EI} \leq 0.4$,it is bimodal;when $0.4 < C_{EI} \leq 0.5$,it is trimodal,and the corresponding SWCC is single inflection point,double inflection point and three inflection point mode.

摘要: 为研究黄土的孔隙分布(PSD)和土-水特征曲线(SWCC)与黄土沉积环境的关系,在甘肃

榆中县和平镇和正宁县及陕西泾阳县等黄土台塬上部采取原状马兰黄土样,先测定其基本物理指标,再用压汞法测得各土样的 PSD 曲线,同时用滤纸法测得其 SWCC。结果表明:和平镇马兰黄土的 PSD 曲线为单峰形态,泾阳县马兰黄土的 PSD 曲线为双峰形态,正宁马兰黄土的 PSD 曲线具有三峰特点。各土样的 SWCC 具有与 PSD 曲线相对应的阶梯状形态。SWCC 与 PSD 曲线之间的对应关系,说明黄土的土水特征受孔隙分布的控制。获取 3 个原状样扫描电镜图像,微结构显示出这种地域性分异现象。对各采样点的气候环境分析表明,黄土 PSD 曲线之间的差异主要是由成土作用强弱决定的。将降水量与蒸发量的比值定义为蒸渗系数($C_{(EI)}$),作为刻画成土作用强弱的指标。发现当 $C_{(EI)} \leq 0.3$ 时,PSD 曲线为单峰模式; $0.3 < C_{(EI)} \leq 0.4$ 时,PSD 曲线为双峰模式; $0.4 < C_{(EI)} \leq 0.5$ 时,PSD 曲线为三峰模式,相应的 SWCC 分别为单拐点、双拐点和三拐点模式。

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作者: 周静静; 赵法锁; 袁湘秦; 祝艳波; 宋飞

标题: Creep process and the microstructural evolution of sliding-zone soil

标题: 滑带土蠕变过程及微观结构演化分析

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作者关键词: microstructure; creep; quantitative analysis; sliding-zone soil

作者关键词: 微观结构; 蠕变; 定量分析; 滑带土

摘要: Creep behavior of slip zone soil is closely related to its microstructure. The creeping properties and microstructures of sliding soil have been studied a lot before, but few studies have been made on the microstructure changes in the process of soil in the process of creep due to time effect. In this paper, the sliding zone soil of the Erzhuangke north landslide is selected as the research object, and the creep characteristics of the sliding zone soil are examined by direct shear creep test. SEM image scanning and quantitative analyses of soil samples at different stages in the creep process are conducted by environmental scanning electron microscope. The results show that the slip zone soil sample has obvious creep characteristics under 400 kPa positive stress load, and every level of shear stress loading has attenuation creep and steady-state creep stage, when the shear stress value reaches 255 kPa, the specimen is crept and destroyed by the transition soil in the process of creep due to the time effect. After loading at each stage, the soil-like shear strain rate is gradually reduced and eventually stabilized, and in the attenuation creep stage, after shear stress load at all levels, the shear strain rate increases with the increase of loading shear stress. In the process of creep, the number of pores in the soil sample decreases gradually, and the soil particles are repositioned and arranged. As a result, the directivity of pores is enhanced, more and more elongated pores tend to be formed, and the contour of pores becomes smoother, but the

roundness becomes worse. With the occurrence of creep failure, the structure formed in the creep process is rapidly destroyed, the directivity of soil structure is weakened, and the number of pores increases sharply.

摘要: 滑带土的蠕变过程与微观结构密切相关, 前人对滑带土的蠕变性质及微观结构做了大量研究, 但对土体在蠕变过程中因时间效应发生的微观结构变化研究较少。本文选取延安二庄科北区滑坡滑带土为研究对象, 采用直剪蠕变试验研究了滑带土的蠕变特性, 用环境扫描电子显微镜对蠕变过程中不同阶段的土样进行 SEM 图像扫描, 并对其微观结构孔隙特征进行定量分析。结果表明: 滑带土样在 400 kPa 正应力荷载下具有明显蠕变特性, 每一级剪应力加载均出现衰减蠕变和稳态蠕变阶段; 当剪应力值达到 255 kPa 后, 试样发生蠕变破坏, 且滑带土样在蠕变过程中由于时间效应发生了塑性破坏。在每一级加载后, 土样剪应变率均逐渐减小并最终趋于稳定; 在各级剪应力加载后的衰减蠕变阶段, 随着加载剪应力的增大, 剪应变率也增大; 蠕变过程中, 土样的孔隙数逐渐减少, 土颗粒重新定位排列, 孔隙定向性增强, 趋向于长条形的孔隙越来越多, 孔隙轮廓越来越光滑, 但圆形度越来越差。随着蠕变破坏的发生, 在蠕变过程中形成的结构被迅速破坏, 孔隙定向性减弱, 数目急剧增加。

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作者: 孙长明; 马润勇; 尚合欣; 谢文波; 李焱; 刘义; 王彪; 王思源

标题: Landslide susceptibility assessment in Xining based on landslide classification

标题: 基于滑坡分类的西宁市滑坡易发性评价

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作者关键词: landslide susceptibility assessment; landslide classification; artificial neural network; weighted information value model

作者关键词: 易发性评价; 滑坡分类; 人工神经网络; 加权信息量模型

摘要: In the past, all landslides were mostly taken as the research object in the susceptibility evaluation, but the difference in types of landslides was ignored, leading to the fact that the index weight did not accurately reflect its impact on landslides. In order to accurately predict the landslide disaster, predecessors have put forward a variety of evaluation models: expert scoring, logical regression, neural network, and so on. Those studies have promoted the transformation of landslide susceptibility mapping from qualitative to quantitative. On the basis of previous studies, this paper analyses the feature and mechanism of landslides in the city of Xining, and puts forward landslide susceptibility mapping based on landslide classification. Through field investigation, landslides in the whole area are divided into soil landslides and rock landslides. Based on GIS platform, the geological data are extracted as raster data. Finally, the weighted information value is used to evaluate the vulnerability of the study area. Statistical methods and ROC curve are used to calculate the success rate. The results show that after landslide is classified the success rates are 82.61% and 82.30%, increasing respectively by 10.9% and 5.2%. Areas with poor geological conditions on both sides of the Huangshui River are transformed into highly susceptible areas. It is confirmed that landslide susceptibility mapping based on landslide classification is an effective means for landslide susceptibility mapping.

摘要: 以往的滑坡易发性评价多以全体滑坡为研究对象, 忽视了滑坡类型的区别。各评价指标对不同类别滑坡的影响程度不同, 也导致指标权重无法精确地反映其对滑坡的影响。为更准确地对滑坡灾害进行空间预测, 针对西宁市滑坡特征及发育机理, 将全区滑坡分为土质滑坡和岩质滑坡; 在野外实际调查的基础上, 结合相关性分析, 选取坡度、坡向、剖面曲率、平面曲率、工程地质岩组, 以及滑坡点距断层、水系、道路的距离远近等 8 项因素作为滑坡易发性评价指标, 并通过滑坡点分布密度和滑坡点相对分布密度, 分析各评价指标分别对土质滑坡和岩质滑坡的影响; 利用信息量模型, 计算各评价指标对两类滑坡的信息量值, 利用人工神经网络模型, 赋予各评价指标对两类滑坡的权重; 最后基于 GIS 平台利用加权信息量模型对研究区进行易发性评价。通过统计方法和 ROC 曲线法分别计算滑坡易发性评价成功率, 结果表明: 评价成功率可达到 82.61% 和 82.30%, 与未经滑坡分类的成功率比较, 分别提高了 10.9% 和 5.2%; 同时, 经过滑坡分类后, 湟水河两岸地质条件较差的地区转变为滑坡高易发区。

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标题: Experimental research on elastic modulus evolution of chlorite phyllite under cyclic loading

标题: 循环荷载作用下绿泥石千枚岩弹性模量演化规律试验研究

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作者关键词: chlorite phyllite; loading rate; cyclic loading; elastic modulus

作者关键词: 绿泥石千枚岩; 加载速率; 循环荷载; 弹性模量

摘要: Conventional uniaxial compression test and cyclic loading and unloading test of chlorite phyllite from northwest Sichuan were carried out. The strength characteristics of chlorite phyllite at different loading rates were analyzed, and the evolution law of elastic modulus of chlorite phyllite under cyclic loading and unloading conditions was emphatically studied. The results show that the peak strength of chlorite phyllite shows significant rate dependence, and the peak strength increases with the increase of loading rate. The peak strength of cyclic loading and unloading test shows obvious weakening characteristics. With the increase of the number of cycles, the damage

strength threshold of crack increases first and then decreases, which is not affected by the loading rate. The variation of elastic modulus of chlorite phyllite is consistent with that of the loading and unloading path, showing a regular wave shape. The tangential modulus of a single hysteretic loop increases first and then decreases with the increase of stress level; at the same stress level, the tangential modulus increases-slows down-decreases with the increase of the number of cycles.

摘要: 对取自四川西北部典型的绿泥石千枚岩进行常规单轴压缩试验和循环加卸载试验,分析不同加载速率下的强度特征,研究循环加卸载条件下千枚岩弹性模量的演化规律。研究表明:千枚岩峰值强度表现出明显的速率依赖性,即峰值强度随加载速率的增加而增大;循环加卸载时,峰值强度表现出明显的弱化特征;随着循环次数增加,裂纹损伤强度阈值呈现先增大后降低的变化规律,这种变化不受加载速率的影响;千枚岩弹性模量的变化规律与加卸载路径的变化规律一致,呈现出有规律的波浪形;单个滞回环内切线弹性模量随应力水平增加呈现出先增大后减小的趋势;在同一应力水平下,切线模量随循环次数增加呈现出增大-平缓-降低的变化规律。

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标题: 宜居黄河科学构想

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Ecological Yellow River; Harmonious Yellow River; Intelligent Yellow River

作者关键词: 宜居黄河; 科学构想; 安全黄河; 绿色黄河; 生态黄河; 和谐黄河; 智慧黄河

摘要: The problem of the Yellow River is reflected from the river, formed in the region, and rooted in the land. In light of the characteristics and challenges associated with geoscience problems in succeeding the high-quality development of the Yellow River Basin, this paper proposes the concept of so-called livable Yellow River, which consists of five core aspects in a systematic and scientific framework, namely the Safe Yellow River, the Green Yellow River, the Ecological Yellow River, the Harmonious Yellow River and the Intelligent Yellow River. The associated scientific connotation and major research contents of each aspect are illustrated in this paper. Specifically, (1) on the basis of the engineering geology, the Safe Yellow River aims to solve problems encountered in the geological surface process and the related disastrous impacts, so as to meet the geological safety requirements and build the Yellow River safety system; (2) on the basis of hydrogeology, the Green Yellow River focuses on the water cycle process and the related impacts on water and soil environment, thus constructs a green Yellow River system; (3) on the basis of the environmental geology, the Ecological Yellow River explores the evolution law of ecosystem and the related ecological barrier effect, and establishes an ecological Yellow River system; (4) on the basis of the resource geology, the Harmonious Yellow River studies the development mode of resource exploitation and people-land coordination in the Yellow River Basin, and builds a harmonious Yellow River system; (5) on the basis of the big data and information science, Intelligent Yellow River studies the geological information integration and intelligent decision-making platform of the Yellow River Basin, and constructs the intelligent Yellow River system. These five parts support and integrate each other to jointly solve the core and key issues of the livable Yellow River, so as to provide a scientific and technological support in ensuring the long-term stability of the Yellow River and promoting the high-quality development of the entire river basin, and ultimately forming a Happiness Yellow River that benefits the Chinese nation.

摘要: 黄河问题表象于河,形成于域,根植于地。针对于黄河流域高质量发展面临的地球科学问题特点及挑战,本文提出了宜居黄河科学构想,旨在构建一个包括安全黄河、绿色黄河、生态黄河、和谐黄河和智慧黄河 5 大核心内容的体系完善的宜居黄河研究科学架构,并对这 5 个方面的科学内涵和关键研究内容进行了阐述。其中,(1)安全黄河立足于工程地质学,研究黄河流域地质地表过程及其灾害效应,以保障地质安全需求,构建安全黄河体系;(2)绿色黄河立足于水文地质学,研究黄河流域水循环过程及其水土环境变化效应,构建绿色黄河体系;(3)生态黄河立足于环境地质学,研究黄河流域生态系统演化规律及其生态屏障效应,构建生态黄河体系;(4)和谐黄河立足于资源地质学,研究黄河流域资源开发与人地协调的发展模式,构建和谐黄河体系;(5)智慧黄河立足于大数据及信息科学,研究黄河流域地学信息集成与智慧决策平台,构建智慧黄河体系。这 5 个部分相互支撑融合,共同解决宜居黄河的核心关键问题,从而为保障黄河长治久安、促进全流域高质量发展,最终形成造福中华民族的幸福黄河起到科技支撑作用。

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标题: EVALUATION OF SHEAR STRENGTH OF UNSATURATED LOESS USING CONVENTIONAL DIRECT SHEAR TEST

标题: 利用常规直剪试验评价非饱和黄土抗剪强度

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作者关键词: Direct shear test; Shear strength; Filter paper method; Suction; Soil-water

characteristic curve

作者关键词: 直剪试验; 抗剪强度; 滤纸法; 吸力; 土-水特征曲线

摘要: In order to investigate the simplified method for evaluating the shear strength of unsaturated loess, we conduct a series of conventional consolidated quick shear test and the suction test before consolidation as well as after shearing using filter paper method. The data is validated by unsaturated direct shear test. Then we discuss the variation of initial suction and shear suction under normal stress. The research shows that air entry value and residual value of the soil-water characteristic curve control the change of dry density and water content within consolidating. Based on the Vanapallis model, a simple method to predict the shear strength of loess is gained. The proposed model using the initial soil-water characteristic curve, effective cohesion and effective internal friction angle of soil simplifies the procedure and time of shear strength measurement for unsaturated soil. The model provides a novel technique for the application of unsaturated shear strength theory in engineering practice.

摘要: 为了研究一种简化的方法评价非饱和黄土抗剪强度, 本文利用常规直剪仪对非饱和重塑黄土进行固结快剪试验, Whatman's No.42 型滤纸测试固结前和剪切后土样吸力, 研究同一正应力下初始吸力和剪后吸力的变化趋势及机理, 并用非饱和直剪测试结果对常规直剪和滤纸法测得的吸力与强度进行了效验。研究表明, 土-水特征曲线的进气值和残余值对固结前和剪切后干密度和吸力的变化起控制作用, 获得初始吸力与剪后吸力的变化关系。基于 Vanapalli 模型, 提出了利用土样初始土-水特征曲线、有效黏聚力和有效内摩擦角预测非饱和黄土抗剪强度的公式, 研究结果简化了非饱和土强度测试方法, 节约了时间, 为非饱和土抗剪强度理论在工程实践中推广应用提供新思路。

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作者: 宋宇飞; 范文; 李军; 杜珣

标题: RISK ASSESSMENT OF PROPERTY LOSS CAUSED BY UNSTABLE SLOPES UNDER DIFFERENT RAINFALL CONDITIONS A CASE STUDY OF XINGLONG TOWN OF ZHENBA COUNTY

标题: 不同降雨条件下不稳定斜坡财产损失风险评价以镇巴县兴隆镇为例

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作者关键词: Rainfall intensity; Failure probability; Vulnerability; Risk

作者关键词: 降雨强度; 破坏概率; 易损性; 财产损失风险

摘要: Shallow landslide is a common geological hazard in Qinba mountain area. In recent years, the amount of unstable slopes is increasing because of the urbanization. The unstable slope is one of the most serious threatens to the urbanization, because it is very easy changed into shallow landslide with rainfall. It is an urgent to predict the property loss risk caused by unstable slope under different rainfall condition. This paper takes the unstable slopes of Xinglong town as research objective, and assesses the property loss of the buildings affected by the unstable slopes. Firstly, we collect the rainfall data of Xinglong town and fitting these data using Pearson III curve to predict the rainfall intensity at different recurrence periods, and then combine rainfall infiltration model and Monte-Carlo method to calculate the probability of unstable slopes changing into landslides under different rainfall conditions. After that, we calculate the vulnerability and the value of objects affected by unstable slopes by means of vulnerability model combined with survey and exploration data. At the end, we use the risk assessment formula proposed by Fell in 2005 to calculate the property loss risk under different rainfall conditions. The results show the following three findings. (1) 245 buildings are affected by unstable slopes, account for 30.4% of the total buildings in Xinglong town. (2) The risk value of the buildings affected by unstable slopes under the rainfall conditions of no rainfall, 65.57 mm·d⁻¹, 72.88 mm·d⁻¹, 85.91 mm·d⁻¹ are 0.228, 0.697, 1.225 and 1.505 million yuan, respectively. (3) More than 55% of the loss is caused by the unstable slopes 1-2, 2-6, 3-5 and 4-3, and the loss caused by these four unstable slopes under the rainfall conditions of no rainfall is 65.57 mm·d⁻¹, 72.88 mm·d⁻¹, 85.91 mm·d⁻¹ over the total loss are 88.33%, 62.9%, 58.64% and 57.54%, respectively.

摘要: 山区城镇化的加速发展使得切坡、削坡现象普遍发生, 导致城镇周边隐患斜坡的数量增加、规模增加, 诱发隐患斜坡转变为滑坡的临界降雨强度降低, 城镇财产损失风险大大提升。如何准确地对不同强度降雨条件下城镇财产损失的风险进行评价是亟待解决的前沿问题, 本文以镇巴县兴隆镇为例, 通过收集研究区多年降雨数据集, 利用皮尔逊三型水文模型得到研究区不同重现期下的降雨强度, 在此基础上结合野外斜坡调查资料、岩土体实验数据, 采用蒙特-卡洛法计算得到城镇周边不稳定斜坡在不同降雨条件下的破坏概率, 并对斜坡影响范围内的承灾体的易损性和财产价值进行评价, 最终根据财产风险计算公式得到各斜坡在不同降雨工况下的财产损失风险值。风险计算结果表明: 城镇内受不稳定斜坡威胁的房屋共 245 栋, 占总房屋数量的 30.4%, 城镇房屋总价值约为 5260.4 万元, 在天然、10 年、20 年、50 年一遇降雨条件下年损失财产价值分别为 22.8 万元、69.73 万元、122.5 万元、150.5 万元, 其中超过 55% 的财产损失均是由 1-2、2-6、3-5、4-3 这 4 个边坡造成, 并且在降雨强度递增时, 这 4 个边坡

对财产损失风险的贡献在逐步降低,占比分别为: 88.33%、62.9%、58.64%以及 57.54%,可见只要对这 4 个斜坡进行必要的防治即可大幅地缩减财产损失。

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标题: Bayesian estimation and posterior robustness of slope reliability

标题: 边坡可靠度的 Bayes 估计及后验稳健性

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作者关键词: slope; Bayesian theory; posterior distribution; posterior expected loss; robustness

作者关键词: 边坡; Bayes 理论; 后验分布; 后验期望损失; 稳健性

摘要: In this study, the reliability calculation results of slope are analyzed based on the Bayesian theory to improve the accuracy. At the first step, the prior distribution and like hood function were formulated according to the stability parameters of 21 slopes in critical state. Then, the posterior distribution was constructed using the Bayesian theory. The proposed method was implemented in evaluating the stability of a loess slope at the sewage outlet of Xi'an Xianyang International Airport in Jingyang County, Shaanxi Province. Results show that the means of the posterior distributions can be well calculated with lower variance and higher accuracy using the new method. In addition, when applying fluctuations of 5%, 10% and 15% in the values of stability

parameters of the prior distribution, the posterior expected loss showed an increasing tendency, but within 20% in all three situations. These results indicate that the proposed method is quite robust and is capable of providing more accurate stability analysis results for loess slopes.

摘要: 采用边坡自身的稳定性参数构建似然函数,以研究区内 21 个极限状态坡的稳定性参数为样本,建立先验分布,应用 Bayes 理论确定后验分布,应用后验稳健性分析方法对西安咸阳国际机场污水排放口泾阳黄土边坡进行稳定性评价。结果表明:后验分布的均值得到了很好的修正,方差小,精度高;当稳定性评价指标先验分布存在 5%、10%和 15%波动时,后验期望损失依次增大,但均在 20%范围内波动,这表明边坡可靠度的 Bayes 估计法具有很好的稳健性,可对边坡的稳定性进行更为精确地评价。

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标题: Distribution law of thermal conductivity offrozen-thawed sandy soil in Qinghai-Tibet plateau engineering corridor

标题: 青藏高原工程走廊带冻融砂土导热系数分布规律研究

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文献类型: Article

作者关键词: Qinghai-Tibet Plateau engineering corridor; frozen-thawed sandy soil; thermal conduction characteristic

作者关键词: 青藏高原工程走廊带; 冻融砂土; 导热特性

摘要: In order to study the variation law of thermal conductivity of frozen-thawed sandy soil in the Qinghai-Tibet Plateau Engineering Corridor, drilling and sampling were carried out in the Qinghai-Tibet Expressway (Germu-Lhasa section), with silt, medium-fine sand and gravel sand of different grain compositions as the research object. The thermal conductivity of reconstituted frozen-thawed sand was tested by Transient Plane Source Method. The distribution of dry density, natural moisture content and thermal conductivity of three kinds of sand under freezing and thawing conditions was analyzed. The test results show that the distribution law of thermal

conductivity of frozen sand soil is: silt<medium fine sand<gravel sand. The distribution law of thermal conductivity of silt sand is: silt <gravel sand<medium fine sand. According to the experimental data, the empirical formula of the relationship between the thermal conductivity of sand and its dry density and natural water content is fitted to provide a theoretical basis for the construction of the road engineering in the Qinghai-Tibet Plateau Engineering Corridor.

摘要: 为研究青藏高原工程走廊带内冻融砂土的导热系数变化规律,在青藏高速(格尔木~拉萨段)现场钻探取样,以不同颗粒级配的粉砂、中细砂和砾砂为研究对象,采用瞬态面热源法进行重塑冻融砂土的导热系数测试,分析 3 种砂土在冻融状态下干密度、天然含水率及导热系数的分布规律。测试结果表明,冻土砂土的导热系数分布规律为:粉砂<中细砂<砾砂;融土砂土的导热系数分布规律为:粉砂<砾砂<中细砂。根据实验数据拟合出砂土导热系数与其干密度、天然含水率关系的经验公式,为青藏高原工程走廊带内道路工程的建设提供一定的理论依据。

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标题: Geographic Ontology-driven Object oriented Landslide Recognition

标题: 地理本体驱动的面向对象滑坡识别

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文献类型: Article

作者关键词: object oriented; landslide identification; landslide geographic ontology; high

resolution remote sensing image; semantic classification

作者关键词: 面向对象; 滑坡识别; 滑坡地理本体; 高分影像; 语义分类

摘要: The emergence of high spatial resolution remote sensing images has promoted the development of objectoriented image analysis technology,and object-oriented image analysis technology has also been applied to the landslide information extraction.However,because of insufficient use of expert knowledge at this stage,the object-oriented classification technology still cannot be separated from traditional data-driven pattern recognition,different expert analysis results in different object classification,and degree of automation is very low.Aiming at the above problems,the ontology concept in knowledge engineering is introduced to express and model the landslide geographic ontology,so as to realize the automatic extraction of landslide information.This paper uses the geographic ontology-driven interpretation framework to carry out geographic ontology-driven landslide recognition experiments in Heifangtai,Gansu Province.Experimental results show that the object-oriented landslide recognition based on ontology concept can effectively extract landslide information.

摘要: 高空间分辨率遥感影像的出现促进了面向对象影像分析技术的发展,面向对象影像分析技术也由此应用到滑坡信息提取,但现阶段因为该技术对专家知识利用不够,导致其仍不能脱离传统的数据驱动的模式识别范畴,专家分析不同带来对象分类结果不一致,自动化程度较低。针对上述问题,引入知识工程中本体概念,对滑坡地理本体进行表达、建模,实现滑坡信息的自动提取。以甘肃黑方台地区的高分遥感影像数据为例,以地理本体驱动的解译框架进行了滑坡识别实验。实验表明,基于本体概念进行面向滑坡地理对象的信息提取是一种较好的思路,有利于进一步提高滑坡信息计算机提取的自动化程度和精度。

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标题: Three-dimensional adaptive finite-element method for time-domain airborne EM over an anisotropic earth

标题: 时间域航空电磁各向异性大地三维自适应有限元正演研究

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文献类型: Article

作者关键词: Time-domain airborne EM; Anisotropy; Adaptive finite element; 3Dforward modeling; Abnormal recognition

作者关键词: 时间域航空电磁; 各向异性; 自适应有限元; 三维正演; 异常识别

摘要: How to generate a reasonable mesh for the anisotropic medium model with complex electrical structure is the key to obtaining high-precision modeling results. In this paper, we study the adaptive finite-element (FE) method for 3D time-domain airborne EM modeling over an anisotropic earth. By combining the time-domain unstructured FE algorithm and the adaptive mesh refinement technology, we successfully realize the 3D time-domain airborne EM adaptive forward modeling for anisotropic media. To deal with the big difference of EM responses at different time channels, we bring in a temporal weighting to achieve a synchronous refinement of shallow and deep meshes. The reliability of our algorithm is verified by comparing our results with 1D semi-analytic solution. The numerical experiments show that the anisotropic conductivity has a big influence on the mesh refinement. The value of the maximum principal-axis conductivity and its distribution directly determines the mesh refinement. In addition, anisotropic conductivity can also seriously affect the distribution pattern and anomalous amplitude of the three-component EM responses. By using the polarity maps for full-domain apparent resistivity, the direction of the anisotropic principal axis can be well identified.

摘要: 各向异性介质模型电性结构复杂, 如何进行合理的网格剖分成为获得高精度正演结果的关键, 为此本文开展时间域航空电磁各向异性大地三维自适应有限元正演算法研究. 通过结合非结构时间域有限元算法和自适应网格优化技术, 实现各向异性介质条件下三维时间域航空电磁自适应正演. 考虑到时间域航空电磁响应应随时间的衰减特性, 为了综合评价不同时刻的后验误差, 本文将时间作为加权因子, 调整各个时刻后验误差的相对权重, 进而实现对浅部和深部网格的同步优化. 通过与一维解析结果进行对比验证了本文算法的可靠性. 数值实验结果显示电导率各向异性对自适应网格影响严重, 其最大主轴电导率的数值及其分布特征直接决定了网格加密效果. 此外, 各向异性对时间域航空电磁三分量响应的分布形态和异常幅值也会产生严重影响, 利用全域视电阻率极性图, 可以很好地识别各向异性主轴方向.

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标题: A multi-GNSS water vapor tomography method considering boundary incident signals

标题: 顾及边界入射信号的多模水汽层析方法

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作者关键词: 3D water vapor; tomography; GNSS MET; radiosonde data; boundary incident signals

作者关键词: 三维水汽; 层析; GNSS 气象学; 无线电探空数据; 边界入射信号

摘要: Three-dimensional water vapor distribution information with high spatial and temporal sampling can be obtained all-weather by using GNSS water vapor tomography technology, which has become a major research hotspot in GNSS meteorology. At present, the traditional tomography

method based on single navigation system has some shortcomings,such as low utilization rate of observation data and uneven distribution of observation.This paper designs and implements a multi-GNSS water vapor tomography method which takes into account the boundary incident signal.The accuracy of the method is verified by using the observation data of Hong Kong CORS network and radio sounding products.The improvement of the results of water vapor tomography by introducing boundary incident signal and multi- GNSS signal is analyzed in detail.The results show that compared with the traditional GPS tomography method,the proposed water vapor tomography method,which combines the advantages of boundary incident signal and multi-GNSS signal,can obtain more accurate and reliable three-dimensional water vapor information.

摘要: 利用 GNSS 三维水汽层析技术全天候地获取高时空采样率的水汽垂直分布信息,已成为 GNSS 气象学中一大研究热点。当前,基于单一导航系统的传统层析方法存在观测数据利用率低、观测分布不均等不足。本文设计和实现了一种顾及边界入射信号的多模水汽层析方法,采用香港 CORS 网观测数据和无线电探空产品进行精度验证,并详细分析边界入射信号和多模层顶信号的引入对层析水汽结果的改善程度。结果表明:相较于传统 GPS 层析方法,本文采用的融合两类多模层顶信号和边界入射信号的新水汽层析方法,兼备边界入射信号和多模层顶信号的优点,可得到更高精度和更可靠的三维水汽信息。

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标题: A Method for Generating Two-dimensional Microstructure Model of Loess Based on Monte Carlo Method

标题: 基于 Monte Carlo 法的黄土二维微观结构模型构建

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作者关键词: Monte Carlo 法; loess; microstructure model; Monte Carlo method; numerical simulation; scanning electron microscope

作者关键词: 黄土; 微观结构模型; 数值模拟; 扫描电镜

摘要: Simulating the mechanical behavior of loess in micro-scale is an effective way to reveal the mechanical mechanism of loess. Micro-mechanical model of loess is essential. At present, the microstructure of loess is often obtained by optical microscope or scanning electron microscope image, which, however, will lead to particle suspension and overlapping when directly used in two-dimensional modeling. In this paper, a method of randomly generating two-dimensional microstructure model of loess is proposed based on the cumulative distribution curve and the actual particle morphology of loess. Firstly, the cumulative particle distribution curve is divided into several intervals according to the particle size range, and the particle size is randomly extracted from each interval to form a particle size database which satisfies the size distribution. In subsequence, a database of particle morphology is established based on the microscopic images of loess particles. The size and morphology of particles are randomly extracted from the two databases to generate a particle bank with random sizes and morphology. Last but not the least, Monte Carlo method is used to randomly place these particles at the top of the model, hence a two-dimensional microstructure model of loess is established. The model established in this paper accords with the microstructure characteristics of loess and provides an initial model for the simulation and analysis of microscopic mechanical behavior of loess.

摘要: 从微观尺度研究土的力学行为是揭示其力学机理的一种有效途径,为此首先建立其微观结构模型。目前常通过光学显微镜或者扫描电镜图像获取黄土的微观结构,但将其直接用于二维建模时,存在颗粒悬浮和叠置的问题。基于黄土的颗粒累积分布曲线和实际颗粒形态,提出了一种随机生成其二维微观结构模型的方法。首先将颗粒累积分布曲线按粒径范围分为若干区间,从各区间上随机抽取粒径值,形成满足其粒径分布的粒径数据库;再根据黄土颗粒的微观图像建立颗粒的形态数据库。从这 2 个数据库中随机抽取颗粒粒径和形态,生成具有随机大小、形态的颗粒库。采用 Monte Carlo 法将这些颗粒在模型顶端随机投放,建立黄土的二维微观结构模型。该模型为黄土微观力学行为的分析提供了原型。

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作者: Li Hua; Li Tonglu; Jiang Ruijun; Fan Jiangwen

作者: 李华; 李同录; 江睿君; 范江文

标题: Measurement of unsaturated permeability curve using filter paper method

标题: 基于滤纸法的非饱和渗透性曲线测试

来源出版物: 岩土力学 卷: 41 期: 3 页: 895-904 出版年: 2020

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文献类型: Article

作者关键词: unsaturated soil; permeability curve; filter paper method; instantaneous profile method; statistical models

作者关键词: 非饱和土; 渗透性曲线; 滤纸法; 瞬态剖面法; 统计模型

摘要: The permeability is an important parameter which reflects the moisture movement in unsaturated soil. In this paper, a soil column device is designed combining instantaneous profile method and filter paper method to determine permeability function. The device includes a continuous water supply system at the upper part and a soil column composed of soil sample with a cylinder and filter paper at the lower part. During the infiltration, the mass of soil samples and filter papers are measured to determine the water content profile and hydraulic head profile. Then the soil-water characteristic curve and permeability curve are calculated by these data. The Malan loess and the first layer of paleosol from Zhengning, Gansu province are tested. The results show that the method covers a wide range of suction from 1 to 10~5 kPa, and permeability coefficient range of 10~(-5)-10~(-13) m/s. This method is simple, inexpensive, and available for both intact and remolded soil. Moreover, several common statistical permeability models including Childs & Collis-Gerge model, Fredlund model, van Genuchten model, and Priesack & Durner model are used to predict the permeability curve of the two soils. The results show that the predicted results are consistent with the measured results in low suction range, while they are not in high suction range.

摘要: 渗透性曲线是反映非饱和土中水分运移的重要参数,瞬态剖面法是测定渗透性曲线的常用方法。将滤纸法应用于传统的瞬态剖面法,设计了一种土柱装置,用于测定土体的渗透性曲线。该装置包括上部能够持续给水的供水系统及下部由带环刀的土样与滤纸叠置而成的土

柱。在水分下渗过程中,定期测量土样与滤纸的质量以获得土柱的含水率剖面与水头剖面,根据所测数据计算得到土-水特征曲线和渗透性曲线。用此方法测得甘肃正宁马兰黄土与第1层古土壤的渗透性曲线和土-水特征曲线,该方法测量的吸力范围大,为1~10~5 kPa,渗透系数范围在10~(-5)~10~(-13) m/s。用常见的统计预测模型预测了土体的渗透性曲线,并与实测曲线对比发现小吸力范围预测值与实测值相符,大吸力范围预测值偏差较大。

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作者: 吴博; 赵法锁; 吴韶艳

标题: Stability Evaluation of Loess Slope Based on Combined Weighting and Efficiency Coefficient Method

标题: 基于组合赋权-功效系数法的黄土边坡稳定性评价

来源出版物: 灾害学 卷: 35 期: 2 页: 34-38 出版年: 2020

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作者关键词: loess slope; stability evaluation; principal component analysis; entropy method; combinatory weighting; efficiency coefficient method

作者关键词: 黄土边坡; 稳定性评价; 主成分分析法; 熵权法; 组合赋权; 功效系数法

摘要: On the basis of consideration of influence factors of loess slope stability, slope height, slope angle, natural weight, internal friction angle, cohesion, seismic intensity and pore water pressure are selected as evaluation indexes. The subjective weight and objective weight of evaluation index are calculated based on the principal component analysis and entropy weight method respectively.

According to the method of preference coefficient,combinatory weighting is given. The model of stability evaluation of loess slope is established by the effectiveness coefficient method,and 16 loess slope samples are compared and verified. The results show that the model is a rapid, simple and effective evaluation method,which is suitable for the stability evaluation of loess slope.

摘要: 在综合考虑影响黄土边坡稳定性因素的基础上,选取边坡高度、坡度、土体天然重度、内摩擦角、粘聚力、地震烈度和孔隙水压力为评价指标,基于主成分分析法和熵权法分别计算各评价指标的主观权重和客观权重,依据偏好系数法进行组合赋权,采用功效系数法建立黄土边坡稳定性评价模型,并以 16 个黄土边坡样本进行对比验证,结果表明,该模型作为一种快速、简便、有效的评价方法,适用于黄土边坡稳定性评价。

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标题: Finite Difference Forward Modeling of Surface Waves Based on MPI

标题: 基于 MPI 的面波有限差分正演模拟

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作者关键词: MPI; CPML; MPI; high-order staggered-grid; finite-difference; image-method; CPML; region decomposition

作者关键词: 高阶交错网格; 有限差分; 镜像法; 区域分解

摘要: In recent years,the technology of Rayleigh-waveform inversion is highly valued by scholars,because the wave field is calculated and inverted directly without the calculation of conventional dispersion curves.In other words,the waveform inversion method is no longer limited

by the theoretical assumption of horizontal layered media. Rayleigh waveform inversion requires repeated forward and inverse calculations of wave field; in addition, due to the small velocity of the shallow surface, the simulation requires a small grid space to avoid numerical dispersion, which undoubtedly greatly increases the forward modeling calculation amount. Based on the idea of message passing interface (MPI) method, we applied a parallel finite-difference algorithm to wave field simulation to improve the computation efficiency of the forward modeling. Firstly, the whole calculation region was decomposed into several sub-regions; and then, the wave field was computed for each sub-region; finally, the whole wave field was completed together by communicating among sub-regions. In this paper, the detailed implementation methods and steps of the parallel schemes, such as region decomposition, coordinate transformation, region communication, and wave field combination and so on, are given. The analyzing results of the different parallel schemes in elastic model, Kelvin and standard linear solid (SLS) viscoelastic model show that our parallel scheme is feasible and effective. The parallel computation results indicate that multiple processors can significantly reduce the computing time compared with a single processor; however, the communication time between different processors also increases. It is necessary to select the appropriate number of processors in the parallel process. For viscoelastic medium model, the parallel computation efficiency of SLS viscoelastic model is better than that of Kelvin viscoelastic model.

摘要: 近年来,瑞利波波形反演技术因其避开了常规频散曲线计算,直接进行波场计算和反演不再受水平层状介质理论假设的限制,得到广大学者的高度重视。但瑞利波波形反演过程中需要不断进行波场正演和逆推计算。另外,由于浅地表速度较小,模拟计算时需要较小的网格间距才能避免数值频散,这无疑大大增加了正演模拟的计算量。对于这一问题,通常采用并行化设计来提高正演模拟的计算效率。本文基于消息传递接口(MPI)并行有限差分算法,以区域分解思路将模型区间分解成若干子区域,各区域互相通信,共同完成对模型的正演计算。并详细给出了区域分解、坐标转换、区域通信、波场合并等并行方案中的具体实现方法和实现步骤。通过对弹性模型、Kelvin 黏弹性模型和标准线弹性固体(SLS)黏弹性模型不同并行方案的计算结果进行分析,验证了本文并行方案的可行性和有效性。并行计算结果表明,与单处理器计算时间相比,增加处理器数目可以明显减少计算时间,但随着处理器数目的增加,不同处理器之间的通信时间也增大;因此,并行时需要选择合适的处理器数目。对于黏弹性介质模型,SLS 黏弹性模型的并行计算效率优于 Kelvin 黏弹性模型。

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作者: 魏峥嵘; 杨飞龙; 刘保华; 裴彦良

标题: Study of VSP Gaussian beam forward modeling in visco-elastic media

标题: 黏弹介质 VSP 高斯射线正演模拟

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文献类型: Article

作者关键词: Visco-elastic media; VTI media; Gaussian Beam; Forward modeling

作者关键词: 黏弹介质; VTI 介质; 高斯射线束; 正演模拟

摘要: Based on the theoretical analysis of seismic wave propagation characteristics in visco-elastic media, Gaussian beam forward modeling method was used to simulate Vertical Surface Profile(VSP) wave field of visco-elastic media in order to study the characteristics of seismic waves of VSP seismic exploration. With contrasting the result of the record with isotropic media and VTI media forward modeling, the characteristics of seismic waves propagation in visco-elastic media are demonstrated. At the same time, the VSP Gaussian beam forward method can solve the blind zone problem of isotropic structures. Its dynamic characteristics can better reflect the influence of various isotropic media on seismic wave propagation, and the calculation speed is better than the wave equation forward method. The forward results can effectively distinguish seismic waves. Field characteristics, which can provide reference for VSP data processing and interpretation.

摘要: 为了研究黏弹介质中 VSP 地震勘探地震波的波场特征, 在理论分析地震波在黏弹介质中传播特性的基础上, 采用高斯射线束方法对黏弹介质 VSP 地震进行波场正演模拟. 正演结果与各向同性介质及 VTI 介质 VSP 正演对比, 体现了地震波在黏弹介质中传播的特点. 同时 VSP 高斯束正演方法能够解决复杂构造正演盲区问题, 其动力学特征更能反映黏弹介质对地震波传播的影响, 计算速度又优于波动方程类正演方法, 正演结果能有效分辨地震波场特征, 为 VSP 数据处理与解释提供了借鉴.

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标题: Effective Stress Solution for the Cylindrical Cavity Expansion in Unsaturated Soil Considering Suction Effect

标题: 考虑非饱和土吸力效应的圆柱孔扩张有效应力解析

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作者关键词: unsaturated soil; suction; cylindrical cavity expansion; modified Cam-Clay model; pressuremeter test

作者关键词: 非饱和土; 吸力; 圆柱孔扩张; 修正剑桥模型; 旁压试验

摘要: To investigate the suction effect on the stress and strain of soil around cylindrical cavity, the analytical solution of effective stress in unsaturated soils was derived. In the elastic and plastic regions, the Hooke's law and the modified Cam-Clay model were respectively employed. Taking suction as a hardening parameter, the governing equations about stress-strain around the cylindrical cavity were established. By introducing the auxiliary variable, the equilibrium differential equation in Eulerian system was transformed into Lagrangian system. The cylindrical cavity expansion in unsaturated soils was analyzed by solving the first-order ordinary differential equations where the elastic-plastic boundary was the initial conditions. Taking the values of stress and specific volume at the elastic-plastic boundary as initial values, the effects of suction and initial specific volume on the distributions of stress and strain were calculated and analyzed. The results showed that the soil around the cylindrical cavity changed from elastic state to plastic state due to the cavity expansion, and the suction had a significant effect on the stress state of plastic region. With the suction increase, three stress components, as well as the ultimate cavity pressures increased. For loose soils with larger void ratio, the ranges of plastic region reduced with the suction increasing. The specific volume decreased monotonously along the radial direction, which tended to be obvious as the suction increasing. However, for dense soils with smaller void ratio, the effect of suction on the ranges of plastic region was so small that could be ignored. The specific volume near the elastic-plastic boundary increased due to the dilatancy occurring. The larger the suction were, the more obvious of the dilatancy appeared. Finally, the reliability of the proposed method was verified by comparing with the data from lateral pressure test and calculation by the finite element method.

摘要: 为探究吸力效应对圆柱孔周围土体应力应变的影响,推导了非饱和土中的圆柱孔扩张有效应力析解。在弹性区和塑性区分别采用 Hooke 定律和修正剑桥模型,将非饱和吸力作为硬化参数,建立圆柱孔周围土体的应力应变控制方程。通过引入辅助变量,将欧拉坐标系下的平衡微分方程转至拉格朗日坐标系,非饱和圆柱孔扩张问题转换为以弹塑性边界为边值条件求解 1 阶常微分方程组的问题。以弹塑性边界上的应力和初始比体积作为初值,对非饱和土中圆柱孔扩张问题进行分析。结果表明:受扩孔压力作用,圆柱孔周围土体将从弹性状态进入塑性屈服状态,土体初始吸力的变化对塑性区应力状态影响显著。随着初始吸力的增加,圆柱孔周围相同位置处的土体各应力分量增大,极限扩孔压力也随之增大。对于初始孔隙比较大的疏松土体,吸力增大使得圆孔周围塑性区范围缩小;塑性区土体比体积沿径向呈单调减小,吸力越大,比体积减小越明显。对于初始孔隙比较小的密实土体,吸力变化对塑性区范围大小影响不明显;塑性区内土体比体积沿径向先增大后减小。这是因为在弹塑性边界附近处出现了剪胀现象,且吸力越大,剪胀现象越明显。最后,通过与原位旁压试验和已有数值模拟结果对比,对本文方法的可靠性进行了验证。

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标题: Mechanical properties of chlorite phyllite and its degradation mechanism under saturated state

标题: 绿泥石千枚岩力学性质及其饱水劣化机制

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作者关键词: chlorite phyllite; anisotropy; saturated state; degradation; microstructure

作者关键词: 绿泥石千枚岩; 各向异性; 饱水状态; 劣化; 微观结构

摘要: Compression tests and SEM measurement were carried out on phyllite to study the influences of schistosity and water on the mechanical properties, failure modes and softening mechanism of the phyllite were analyzed. The results show that: while the schistosity angles are different the stress-strain curves have basically the same shape with a compaction stage, an elastic stage, a yielding stage and a failure stage. The yield stage of saturated samples is more obvious, the peak strain increases, the stress-strain curve drops slowly; The elastic modulus shows an inverted S-shape and the deformation modulus and compressive strength decrease firstly and then increase shows a U-shaped curve as the schistosity angle varies from 0° to 90° . The elastic modulus and deformation modulus of saturated phyllite decrease by 41.63% to 47.38% and 37.44% to 43.02% respectively. The softening coefficient is 0.49 to 0.70 and reaches minimum while the angle is 30° ; the failure modes of phyllite can be divided into three types: tension-splitting failure, shear-slip failure and tension-shear composite failure. The brittleness of saturated samples is weakened and the shear failure is strengthened; because dissolution of cements among mineral particles and the swell of clay minerals, clay minerals are softened and exfoliated, so the rock mass structure become loose. These microstructure changes resulted in the degradation of mechanical properties.

摘要: 针对工程中常见的千枚岩,进行了不同片理角度的压缩试验以及相关的 SEM 测试,分析了片理面和含水量对其力学性质和破坏模式的影响以及千枚岩的软化机理。研究结果表明:(1)不同片理角度千枚岩的应力-应变曲线大体一致,都经历了压密段、弹性段、屈服段和破坏段;饱水岩样的屈服段更加明显,峰值应变增加,应力-应变曲线跌落变缓。(2)千枚岩的各向异性显著,片理角度从 0° 到 90° ,弹性模量呈倒 S 型变化规律,变形模量和抗压强度呈先减小后增大的 U 型变化规律;饱水千枚岩的弹性模量和变形模量分别下降了 41.63%~47.38%, 37.44%~43.02%,强度软化系数为 0.49~0.70,其中 $\beta=30^{\circ}$ 时软化系数最小。(3)千枚岩的破坏模式可分为 3 种类型:张拉劈裂破坏,剪切滑移破坏和张拉-剪切复合破坏。饱水试样的破碎程度低,脆性减弱,剪切破坏增强。(4)黏土矿物颗粒吸水膨胀、颗粒间胶结物溶解,使得黏土矿物软化、剥落,岩体结构变得松散,这些微结构的改变导致了千枚岩力学性质的劣化。

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标题: Shear creep properties for sliding-zone soil of the slow-moving landslides

标题: 低速缓动滑坡滑带土剪切蠕变特性

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作者关键词: 低速缓动滑坡; 滑带土; 直剪蠕变试验; 蠕变特性; 剪应变率

摘要: The creep properties of the slip zone soil play a controlling role in the formation and evolution of slow-moving landslides. In this paper, the slip zone soil of a typical slow-moving landslide, Erzhuangke north district landslide, was selected as the research object. In order to study its shear creep properties, the direct shear creep test for the saturated sample of the slip zone soil was carried out with different normal stress levels. The results show that the slip zone has obvious creep characteristics, including transient deformation, decay creep and steady creep. The deformation of the decay creep and transient deformation stage increases with the increase of shear load, and decay creep lasts longer. The isochronous stress-strain curve exhibits nonlinear characteristics, and it has an obvious inflection point. The strength loss occurs under the long-term load, and the larger the normal stress, the more the strength loss. The shear strain rate in the decay creep stage becomes smaller and smaller over time. And the shear strain rate increases with the increase of shear stress. The shear strain rate decreases with the increase of normal stress before the creep damage starts. That means, the deeper the landslide depth, the slower the slip speed.

摘要: 滑带土的蠕变特性对低速缓动滑坡的形成演化过程起着控制性作用。本文选取典型的低速缓动滑坡二庄科北区滑坡的滑带土为研究对象,在不同正应力水平作用下,通过对该滑带土的饱和试样进行直剪蠕变试验,研究了它的剪切蠕变特性。结果表明:该滑带土具有明显的蠕变特性,均包括瞬时变形、衰减蠕变和稳态蠕变 3 个阶段;随着剪切荷载的增大,衰减蠕变阶段及瞬时变形阶段的变形量均增大,衰减蠕变持续时间更长;其等时应力应变曲线呈现出非线性特征,且曲线具有明显拐点;在长期荷载作用下出现强度损失,且正应力越大,强度损失越大;随着时间增大,衰减蠕变阶段的剪应变率越来越小,且剪应力越大,剪应变率越大;在蠕变破坏前的阶段,剪应变率随正应力增大而减小,即滑坡埋深越深,滑速越慢。

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标题: A study of hysteresis of soil and water characteristics of intact loess

标题: 原状黄土土水特征滞后性研究

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作者关键词: 土水特征曲线; 滞后性; 原状黄土; 天然含水率; 孔隙分布

摘要: There are few studies on hysteresis of soil and water characteristic curve(SWCC) of intact loess, and most of the existing studies focus on remolding soil samples. In order to study the hysteresis characteristics of intact loess in the full suction range,Malan loess (L1) and Lishi loess (L5) in Jingyang were taken as the research objects,their wetting and drying SWCCs were determined by filter paper method and pressure plate instrument. And their pore distribution and

mineral composition were measured by mercury intrusion method and X-ray diffraction, respectively. The results show that the SWCCs measured by filter paper method and pressure plate instrument are consistent in the range of pressure plate instrument (0 ~ 600 kPa), and the results of two methods are more consistent in the process of drying. Within the total suction range (0 ~ 30 000 kPa) measured by filter paper method, the hysteresis of SWCC is characterized by three stages. That is, in the vicinity of natural water content (L1 14.2%, L5 17.3%), SWCC of the two layers of loess has almost no hysteresis; the water content is higher than a certain range of natural water content (L1 is greater than 19.2% and L5 is greater than 18.3%), and there is extremely obvious hysteresis; lower than a certain range of natural water content (L1 is less than 11.2% and L5 is less than 15.4%), there is a weak hysteresis. Repeated drying and wetting cycles under natural conditions result in no hysteresis of SWCC near the natural water content; the potentiation of limited pores on the ink-bottle effect leads to strong hysteresis at high water content; the hydration of clay minerals results in a weak hysteresis at low water content.

摘要: 现有的土水特征曲线(SWCC)滞后性的研究多针对重塑土,原状黄土土水特征曲线滞后性特征的研究较少。为研究全吸力范围内原状黄土的滞后特征,以泾阳马兰黄土(L1)和离石黄土(L5)为研究对象,采用压力板仪和滤纸法测定增湿和减湿 SWCC,采用压汞法测定孔隙分布特征,X 衍射分析矿物成分。结果表明,在压力板仪测试基质吸力范围内(0 ~ 600 kPa), 滤纸法和压力板仪测定的 SWCC 具有一致性,且在减湿过程中两种方法的测试结果更为一致。滤纸法测得的全吸力范围(0 ~ 30 000 kPa)内,黄土 SWCC 滞后性存在三段性特征。即在天然含水率(L1 14.2%、L5 17.3%)附近,黄土 SWCC 几乎无滞后性;含水率高于天然含水率一定范围(L1 大于 19.2%、L5 大于 18.3%), 存在极为明显的滞后性;低于天然含水率一定范围(L1 小于 11.2%、L5 小于 15.4%), 存在弱滞后性。天然状态下反复干湿循环,导致黄土 SWCC 在天然含水率附近无滞后性;黄土限制孔隙对墨水瓶效应的增益作用,导致高含水率下黄土 SWCC 呈强滞后性;黏土矿物的水合作用,导致低含水率下 SWCC 呈弱滞后性。

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标题: MOMENT DEFICITS ON THE MAJOR FAULTS AND EARTHQUAKE HAZARD ASSESSMENT IN THE EASTERN HIMALAYAN SYNTAXIS

标题: 喜马拉雅东构造结主要断裂的地震矩亏损与危险性评估

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Himalayan Syntaxis

作者关键词: 滑动速率; 地震矩亏损; 地震复发周期; 东构造结

摘要: The Eastern Himalayan Syntaxis(EHS)is a critical region for studying the tectonic evolution of Tibetan plateau,which was affected by the intense seismic activities.We use the theory of moment balance,GPS velocities and historical earthquake records to analyze the moment deficits in the EHS,assess the future seismicity and further to predict the recurrence interval of the 1950 Chayu M_S8.6 earthquake.We first collected multiple sets of GPS velocity fields and combined them to reduce the systematic bias.Then a micro-blocks model,constrained by GPS velocities,was built by TDEFNODE software to simultaneously invert the fault elastic strain parameters and rigid motion parameters based on the grid research and simulated annealing methods.The long-term slip rates on the faults were further estimated by the differential motions between the neighboring blocks.The results show that the nearly NS dextral strike-slip faults,Naga Fault and Sagaing Fault,slip with the average rates of ~ 10.6 and $\sim 16.6\text{mm/a}$,which are consistent with the lateral extrusion in the Tibetan plateau.However,the Main Frontal Thrust shows a distinguished sinistral strike-slip feature($6 \sim 10\text{mm/a}$),possibly caused by the NNE pushing from the Indian plate to the Eurasian plate.On the other hand,because the EHS is located in frontal area of the collision between Indian and Eurasian plate,most faults show thrusting feature.The most obvious one is the Mishimi Fault,slipping with the rate of 23.3mm/a ,implying that the convergence rate of the Indo-European plates is largely absorbed by this fault.The moment accumulation rate in the EHS is higher than the average rate in the Tibetan plateau and the total moment accumulation is $(1.150.03) \times 10^{(22)} \text{ N}\cdot\text{m}$ in the last 200a.About 59.7% and 21.6% of the moment accumulation rate concentrate on the Main Frontal Thrust and Mishimi Fault.Second,we selected the earthquake records occurring on the upper crust since 1800AD to analyze the moment release in the EHS based on the data from the International Seismological Centre,United States Geological Survey,and catalogue of historical strong earthquakes in China and some other previous studies.In addition,the Global Centroid Moment Tensor Project and linear regression method were adopted to estimate the relationship between body wave magnitude(m_b),surface wave magnitude(M_S),local magnitude(M_L)and the moment(M_0).Then we further estimated the total fault moment release in the EHS, $(5.502.54) \times 10^{(21)} \text{ N}\cdot\text{m}$,which is significantly lower than the total moment accumulation.About 79.2% of the moment release occurs on the Mishimi Fault,this is because the 1950 M_S8.6 Chayu earthquake is assumed to have ruptured on this fault.Finally,the present-day moment deficits on the faults in the EHS were calculated by the differences between the moment accumulation and release,which represent the possibility to produce earthquakes on the upper crust faults in the future.The largest moment deficit was found on the Main Frontal Thrust near Bhutan,which is able to rupture with $M_W 8.1$ +.Similarly,earthquakes with $M_W 7.5$ + and $M_W 7.3$ + have the potentials to occur on the Naga Fault and the Jiali Fault near Tongmai.However,the future earthquake scales may be less than $M_W 7.1$ on the remaining faults.Moderate minor earthquakes are the main activity in the area near the Yarlung Zangbo Suture zone and the southern Sagaing Fault.Although the Chayu M_S8.6 earthquake occurred near the Mishimi Fault and the eastern MFT,the earthquake risk on those two faults cannot be ignored.Meanwhile,no matter which fault produced the Chayu earthquake,its recurrence will likely be 660a to 1 030a.

摘要: 喜马拉雅东构造结是研究青藏高原构造演化的关键地区,地震活动频繁。文中基于地震矩平衡理论,利用 GPS 资料与历史地震目录分析东构造结地区的地震矩亏损,继而评估该区

未来的地震活动。结果表明:研究区总体的地震矩累积率高于青藏高原的平均水平,近 200a 内的累积总量达 $(1.150.03) \times 10^{(22)} \text{N} \cdot \text{m}$,明显高于地震矩的释放总量 $(5.502.54) \times 10^{(21)} \text{N} \cdot \text{m}$ 。而地震矩亏损量最高的主前缘断裂不丹段具备发生 $M_{\text{W}}8.1$ 以上地震的可能,那加山断裂及嘉黎断裂通麦段则不排除未来发生震级大于 $M_{\text{W}}7.5$ 与 $M_{\text{W}}7.3$ 地震的可能,其余断层发生强震($M_{\text{W}}7.1$ 以上)的概率相对较低。而对于米什米断层与主前缘断层东段,虽然察隅 $M_{\text{S}}8.6$ 地震发生于此,但这 2 条断层未来的地震危险性仍不容忽视,且无论察隅地震发生于哪条断层,其复发周期均为 660~1 030a。

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标题: Research on the establishment of global tropospheric delay model with high precision and its applications in ground-based GNSS techniques

标题: 全球高精度对流层延迟建模及其在地基 GNSS 技术中的应用研究

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文献类型: Article

作者关键词: 全球高精度; 流层延迟; 应用研究

摘要: 对流层延迟是空间大地测量技术的一种主要误差源。在 GNSS 中,一般采用模型化或参数估计的方法削弱对流层延迟影响。目前已建立的对流层经验模型均是基于单一数据源,时空分辨率和精度有限,且现有的模型应用研究大多局限于定位解算的直接改正法。本文旨在建立高精度的对流层延迟模型,发展其在地基 PPP 和 GNSS-IR(GNSS interferometric reflectometry)技术中应用的新方法,围绕多源对流层延迟产品精度评估、多源对流层延迟模型和高精度湿延迟模型建立、对流层延迟模型在 PPP 以及地基 GNSS-IR 技术中的应用展开研究,主要工作和贡献如下。

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标题: Recursive Calculation Method for the Second Kind of Associated Legendre Functions and Its First and Second Derivatives

标题: 第二类连带勒让德函数及其一阶、二阶导数的递推计算方法

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作者关键词: earths gravitational field; ellipsoid harmonic series; the second kind of associated Legendre functions; Gauss hypergeometric function; recursive calculation method

作者关键词: 地球重力场; 椭球谐级数; 第二类连带勒让德函数; Gauss 超几何函数; 递推计算方法

摘要: This paper derives the ellipsoid harmonic series of earths gravitational field about the second kind of associated Legendre functions and its first and second derivatives recursive calculation method, and it compares their results with those of traditional Jekeli recursive method. The result shows that the numbers with maxima of about 30 is required terms of the revised Jekelis recurrences is about half numbers compared with the traditional recurrences, when the recursive computation has the same convergence accuracy. As degree n , order m and convergent k increase, the revised Jekelis recurrences is all fulfilled to 1×10^{-6} . Therefore, we also can see that the relationship of the height h and degree n in the ellipsoid approximation, as similar with the approximation of spherical harmonics $(R/r) \sim (n+1)$ in different heights.

摘要: 推导出了地球重力场位模型椭球谐级数表达式中的第二类连带勒让德函数及其一阶、二阶导数的修正 Jekeli 递推计算方法, 并与传统的 Jekeli 递推计算方法的结果进行比较。结果表明, 在递推计算收敛精度相同的条件下, 修正 Jekeli 递推计算比传统 Jekeli 递推计算需要的收敛项数减少一半, 最大约为 30 项; 随着阶次 n 、 m 的增大以及收敛项 k 的增加, 修正 Jekeli 递推计算的第二类连带勒让德微分方程的精度一直保持在 1×10^{-6} 左右; 不同高度下, 阶数 n 与高度 h 之间的关系与球近似下 $(R/r) \sim (n+1)$ 的阶数 n 与高度 h 之间的关系相似。

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标题: Information Extraction and Noise Suppression of GNSS Landslide Deformation Based on S-Transformation

标题: 基于 S-变换的 GNSS 滑坡变形监测数据信息提取与抑噪

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作者关键词: GNSS; S-transformation; GNSS; deformation monitoring of landslide; wavelet; signal denoising

作者关键词: S-变换; 滑坡变形监测; 小波; 信号抑噪

摘要: We propose a denoising method based on S-transformation for deformation monitoring data. Firstly, we perform time-frequency analysis of the monitoring data by S-transformation, and obtain the two-dimensional time-frequency matrix. Then, we design the time-frequency filter according to the two-dimensional time-frequency matrix. Finally, we use the time-frequency analysis inverse transform method to reconstruct the signal. The effectiveness of the method is verified by simulation data and landslide deformation data. The results show that compared with the wavelet filtering method, the deformation data processed by the S-transformation filtering method is superior in both RMSE and SNR, which can accurately extract the deformation characteristics of the monitoring points.

摘要: 提出一种基于 S-变换的变形监测数据抑噪方法。首先采用 S-变换对监测数据进行时

频分析,得到二维时频矩阵,再根据二维时频矩阵设计时频滤波器,最后利用时频分析反变换方法重构信号。采用模拟数据和滑坡变形实测数据对该方法的有效性进行验证。结果表明,相较于小波滤波方法,经该方法处理后的变形数据的 RMSE 和 SNR 均较优,可准确提取监测点的变形特征,为滑坡变形预测预报提供可靠的监测数据。

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标题: Data Decoding Method of the Displacement Sensor and Its Application in Landslide Monitoring

标题: 一种位移传感器数据解码方法及其在滑坡监测中的应用

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作者关键词: displacement sensor; data transmission; data decoding; landslide deformation monitoring

作者关键词: 位移传感器; 数据传输; 数据解码; 滑坡变形监测

摘要: This paper introduces the remote transmission method of displacement sensor data,expounds the displacement sensor data decoding algorithm,and verifies the accuracy and reliability of the decoded data.The displacement sensor is applied to the deformation monitoring of the Dangchuan landslide in Heifangtai,and the real-time deformation information of the landslide monitoring points is obtained,providing technical support for landslide deformation monitoring and early warning.

摘要: 介绍位移传感器数据远程传输方法,阐述位移传感器数据解码算法,并验证解码数据的准确性及可靠性。同时,将其应用于黑方台党川滑坡的变形监测,获得了滑坡监测点的实时形变信息,可为滑坡变形监测和预警提供技术支撑。

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作者: 高阳; 张文萍; 孙学栋; 周在华; 张宝权; 白军

标题: Tectonic evolution in Changshaling transfer zone and its relation with hydrocarbon accumulation

标题: 长沙岭转换带构造演化特征及其与油气的关系

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文献类型: Article

作者关键词: Ying'er sag; Changshaling transfer zone; tectonic evolution; episode of faulting; fault-horst reservoir

作者关键词: 营尔凹陷; 长沙岭转换带; 构造演化; 断裂分期; 断垒块油气藏

摘要: Fault block-lithologic reservoirs in Changshaling transfer zone exhibit complicated fault-formation intersections due to the occurrence of multiphase tectonic movements, and it is hard to investigate the fault system and hydrocarbon accumulation using seismic data with poor quality. Based on preceding studies, we focus on tectonic evolution history, structure interpretation, episodes of faulting, and trap features to establish the relations among structures, sands, faults, and hydrocarbon migration and accumulation. We conclude that ① Changshaling transfer zone is the product of two-phase extensional tectonic movements in the Early Cretaceous extension and fault depression period. Basement-involved extensional tectonic movement occurred at the early stage, when west-inclined normal faults came into being. Overburden-slippage extensional tectonic movement occurred at the late stage, when east-inclined plough-type normal faults appeared and intersected early faults; ② early west-inclined syndepositional faults gave rise to fault-bench belts and thus dominate the lateral distribution of sedimentary systems. Accommodation faults gave birth to an ancient land form with fault troughs alternating with fault ridges. Sands migration was dominated by fault troughs, and sands distribution was dominated by the ancient land form at the depositional stage of the Cretaceous Xigou Formation; ③ early west-inclined faults played a role in hydrocarbon preservation, and late east-inclined faults played a role in hydrocarbon migration. Fault-horst reservoirs are the product of these two-phase faulting activities. In summary, hydrocarbon accumulation is dominated by structures; each fault block has a reservoir; oil and gas concentrate in the structural highs.

摘要: 长沙岭构造带发育复杂断块-岩性油气藏,受多期构造运动影响,断裂发育、切割关系复杂,且断裂发育带地震资料成像品质较差,导致断裂识别难度大、发育期次认识不清、成藏规律认识不系统。为此,在前人研究基础上,通过分析构造演化史精细解释构造,分析断裂期次和圈闭特征,研究构造控砂、断裂与油气运聚关系,明确了油气富集规律。获得以下认识:①长沙岭转换带的断裂主要形成于早白垩世拉张断陷期的两期伸展构造运动,早期为基底卷入伸展构造运动,主要发育西倾正断层,晚期为盖层滑脱伸展构造运动,主要发育东倾犁式正断层,对早期断层切割强烈。②早期西倾同沉积断层形成多级断阶带,控制沉积体系的平面展布;调节断层控制形成断槽、断梁相间的古地貌;白垩系下沟组沉积时期,具有断槽输砂、古地貌控砂沉积特征。③早期西倾断层对油气主要起封堵、保存作用,晚期东倾断层主要起运移、输导作用,在两期断层共同控制作用下形成断垒块油气藏,具有构造控油、一块一藏、高块富集的特点。

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作者: 杜建涛; 闫丽; 赵超英

标题: Multidimensional deformation monitoring using InSAR technology in Yuxian mining area

标题: 蔚县矿区地面沉陷 InSAR 多维形变监测

来源出版物: 煤田地质与勘探 卷: 48 期: 1 页: 168-173 出版年: 2020

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作者关键词: Interferometric Synthetic Aperture Radar(InSAR); Small Baseline Subsets(SBAS); subsidence monitoring; two-dimensional deformation; Yuxian mining area

作者关键词: 合成孔径雷达干涉(InSAR); 小基线集; 沉陷监测; 二维形变; 蔚县矿区

摘要: Yuxian County in Hebei Province is one of the largest mining areas in North China. This area has been suffering serious ground deformation due to underground mining activity, which not only threatens mining safety, but also seriously damages local ecological environment. To obtain the surface deformation map of the overall mining area and to analysis the spatiotemporal evolution features, 61 C-band descending track and ascending track Sentinel-1A/B images from July 2017 to September 2018 were processed based on Interferometric Synthetic Aperture Rader(InSAR) technique. In addition, the two-dimensional deformation time series of Xixizhuang mine were obtained by using the multi-dimensional deformation time series estimation method with fusion multi-source SAR data. The results show that: Except Nanliuzhuang mine, the other three mines all have different degrees of ground subsidence disaster during the monitoring period; the area with annual deformation rate higher than -10 cm/a reached 2.16 km²; the deformation results obtained from different track data are different from each other; the main deformation in Xixizhuang mine is vertical deformation with obvious east-west horizontal deformation. The results provide beneficial data reference for ground subsidence monitoring and coal safety mining

in Yuxian mining area.

摘要: 河北蔚县是我国华北地区最大的地下采煤区之一,该地区长期存在采矿塌陷灾害,不仅威胁采矿安全,而且严重破坏当地生态环境。本文基于合成孔径雷达干涉(InSAR)这一新型空间对地观测技术,采用 61 景 Sentinel-1A/B 干涉宽幅(Interferometric Wide swath,IW)模式数据进行矿区形变观测,获取整个矿区在 2017-2018 年间的地表形变空间分布特征,并对矿区地表的沉降量级及面积进行详细的统计分析。此外,采用融合多轨道 SAR 数据的多维形变时序估计方法,对西细庄矿数据进行东西向和垂向的二维形变分解,获取该矿的二维形变时间序列。结果表明:除南留庄井田外,其余三大井田在监测期间均存在不同程度的地面沉陷灾害;整个矿区年沉陷速率超过 -10 cm/a 的区域达到了 2.16 km^2 ;受成像几何影响,不同轨道数据获取的形变结果存在一定差异;西细庄矿以垂向形变为主,伴随明显的东西向水平形变。研究结果为蔚县矿区地面沉陷监测与煤矿安全开采提供数据参考。

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标题: Positioning method using epoch-differenced phase and GRAPHIC observation

标题: 联合历元间差分相位和 GRAPHIC 组合的定位方法

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文献类型: Article

作者关键词: single-frequency; epoch-difference; point positioning; group and phase ionospheric correction (GRAPHIC); precision

作者关键词: 单频; 历元差分; 单点定位; 非差半组合观测量(GRAPHIC); 精度

摘要: In order to further study on the low-cost, miniaturized and real-time navigation solutions in

the industry of general aviation and unmanned aerial vehicle, the paper proposed a single-frequency and single-point positioning method based on differential phase between epochs and group and phase ionospheric correction (GRAPHIC), which could be used in real-time navigation without the information of additional corrections for ephemeris, clocks or ionospheric delays. Finally the method was validated by IGS observatory data, and result showed that: after convergence, the RMS of single-frequency positioning in the E, N and U directions could be 0.54, 0.35 and 0.71 m, respectively, and the accuracy of the three-dimensional position could reach 0.96 m, which means that the results would be improved by 6.14 %, 56.43 %, and 73.3 %, respectively, comparing with those of traditional single-frequency pseudo-range point positioning; furthermore, the results could be significantly better than those of dual-frequency pseudo-range point positioning.

摘要: 为了进一步研究通用航空及无人机产业中低成本、小型化及实时性导航的解决方案,提出 1 种基于历元间差分相位和非差半组合观测量(GRAPHIC)的单频单点定位方法,该方法不需要外部的星历、钟差或电离层改正信息,可用于实时导航。采用国际全球卫星导航定位系统服务组织(IGS)观测站数据对该方法进行验证,结果表明:滤波收敛之后,单频定位结果在 E、N 及 U 方向的精度(RMS)分别达到 0.54、0.35 及 0.71 m,3 维位置精度达到 0.96 m,与传统的单频伪距单点定位结果相比,分别提高了 6.14 %,56.43 %,73.3 %,也显著优于双频伪距单点定位的精度。

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作者: Hu Dongming; Sui Lichun; Ding Mingtao

作者: 胡东明; 隋立春; 丁明涛

标题: DEM generation in difficult areas based on InSAR and weighted fusion

标题: 困难地区 InSAR 技术和加权融合的 DEM 生成

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文献类型: Article

作者关键词: InSAR; SAR; InSAR; DEM extraction; coherence factor weighting; DEM fusion

作者关键词: 合成孔径雷达; DEM 生成; 相干系数加权; DEM 融合

摘要: Synthetic aperture radar interferometry (InSAR) technology has the characteristics of all-day and all-weather, and it can extract DEM quickly and efficiently in a wide range. DEM can be generated normally by InSAR technology even in rainforests covered by cloud and fog all year round. In the second chapter, DEM in the research area is generated by InSAR, which verifies the feasibility of this method. Due to dense vegetation in the study area and a large area of water swamp, low coherence and partial incoherence phenomena exist in the InSAR processing process, which easily leads to errors and cavities in DEM generated based on InSAR technology. To solve this problem, a pixel-level fusion method based on coherent basis as a weighted function is proposed in this paper, where SRTM DEM and AW3D30 DEM are used as exogenous data to fuse with InSAR DEM. In this way, the problems of errors and cavities in DEM generation based on InSAR technology can be solved, and the integrity of DEM can be guaranteed.

摘要: 合成孔径雷达干涉测量(InSAR)技术具有全天时全天候的特点,可以大范围、快速、高效地提取 DEM。即使在常年被云雾覆盖、降雨频繁的热带雨林地区, InSAR 技术也能正常生成 DEM。本文利用 InSAR 生成了研究区的 DEM,验证了该方法的可行性。由于研究区植被茂密且有大面积的水域沼泽,导致 InSAR 处理过程中存在低相干和部分失相干现象,极易造成基于 InSAR 技术生成的 DEM 存在错误和空洞。针对这一问题,提出了像素级的以相干依据作为加权函数的融合方法,将 SRTM DEM 和 AW3D30 DEM 作为外源数据与 InSAR DEM 进行融合,解决了基于 InSAR 技术生成 DEM 存在错误和空洞的问题,保证了 DEM 的完整性。

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作者: 刘苗苗; 焦文海; 贾小林

标题: GPS signal enhancement analysis in the US-Iranian conflict

标题: 美伊冲突中的 GPS 信号增强分析

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文献类型: Article

作者关键词: GPS; GPS; signal enhancement; signal to noise ratio; receiver type; antenna type

作者关键词: 信号增强; 信噪比; 接收机类型; 天线类型

摘要: This paper analyzes the GPS power enhancement in the US-Iranian conflict in June 2019, and analyzes the power enhancement of GPS P(Y) code from receiver type, antenna type and satellite model. The analysis shows that the power enhancement values of the stations of different types of receivers are significantly different, while the power enhancement values of the stations using different types of antennas are not much different. In addition, in the case of the same receiver or antenna type, the same type of satellite power enhancement value comparison results of the same group of co-location stations are consistent.

摘要: 对 2019 年 6 月美伊冲突事件中的 GPS 功率增强进行了分析, 具体从接收机类型、天线类型以及卫星型号三部分对 GPS P(Y) 码的功率增强进行了分析, 分析表明, 采用不同类型接收机的测站, 其功率增强值明显不同, 而采用不同类型天线的测站, 其功率增强值相差不大; 此外, 在接收机或天线类型相同情况下, 同组并址站的相同类型的卫星功率增强值对比结果呈一致性。

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作者: Gao Xiao; Yang Zhiqiang; Ku Xinbo; Zheng Rong

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标题: 3D-coordinate interpolation for UAV high dynamic positioning based on cubic spline interpolation

标题: 基于三次样条插值实现无人机高动态运动轨迹插值

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文献类型: Article

作者关键词: UAV; high-dynamic; cubic spline; 3D-coordinate

作者关键词: 无人机; 高动态; 三次样条; 三维坐标

摘要: Aerial triangulation, assisted by differential GNSS, is essential part of precise positioning of UAV image elements. As the sampling frequency of GNSS module usually does not exceed 50Hz, higher sampling frequency would be a serious problem for software and hardware of UAV. In this paper, 3D-coordinate interpolation for high dynamic positioning of UAV is realized based on cubic spline interpolation approach, whose applicability has been tested by real measurements. The experimental results show that clamped spline is more suitable for high dynamic interpolation of UAV. When the sampling frequency is higher than 5Hz, plane interpolation accuracy is better than 1cm and elevation interpolation is better than 2.2cm.

摘要: 差分全球卫星导航系统(GNSS)技术辅助空中三角测量技术可实现无人机影像元素的高精度绝对定位. 机载GNSS模块采样频率一般不超过50Hz, 更高的采样频率对GNSS模块软硬件提出更高的要求. 本文基于三次样条函数实现无人机高动态定位的三维坐标插值, 并通过实测数据检验三次样条函数的适用性, 实验结果表明, 固支样条更适用于无人机高动态运动轨迹坐标插值, 当采样频率高于5Hz时, 平面插值精度优于1.0cm, 高程插值精度优于2.2cm.

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标题: Spatial interpolation of monthly average air temperature during winter-spring season using sparse samples:A case study in Manas River Basin in Xinjiang

标题: 稀疏样本下冬春季月平均气温空间插值研究以新疆玛纳斯河流域为例

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文献类型: Article

作者关键词: generalized regression neural network(GRNN); temperature; spatial interpolation; sparse sample; Manas River Basin

作者关键词: 广义回归神经网络(GRNN); 气温; 空间插值; 稀疏样本; 玛纳斯河流域

摘要: For preparation of air temperature spatial data used in the simulation of snow cover to snow melting process in the Manas River Basin with sparse meteorological stations in the middle part of Tianshan Mountains,Xinjiang,this paper carried out the analysis of environmental variables influencing air temperature in winter and spring (2015-11-2016-04) using least square correlation method so as to determine the optimal set of environmental variables through collinearity detection.Here the optimal factor set is composed of five environmental variables:latitude,elevation,NDVI,terrain slope and aspect.Then the Generalized Regression Neural Network (GRNN) model was constructed for spatial interpolation of monthly mean air temperature.Finally,the proposed GRNN model was trained with observation data of 119 stations among the total 139 in the region,and the spatial interpolation model of monthly air temperature for the six months in winter and spring were determined.Also the regression error of the proposed model was analyzed with Root Mean Square Error (RMSE) and the Mean Relative Error (MRE) as measures using the rest observation data of 20 stations as test samples.Results show that the averagely RMSE value of this model is 1.46 in six months,which is superior to the traditional GWRK method with an average RMSE value of 2.22.In addition,from the spatial interpolation maps of air temperature of 6 months,the varying trend of the interpolated air temperature using our model is consistent with that of actual circumstances.The temperature of each spatial site is positively correlated with its elevation,and varies with the type of surface coverage.In summary,the proposed GRNN model with combination of interpolation strategy has shown an improved interpolation accuracy and better spatial consistency for spatial interpolation of air temperature even if few meteorological observation stations were provided.

摘要: 针对我国典型高寒山区新疆天山中段玛纳斯河流域积雪-融雪过程模拟中气温空间数据的制备问题,以气象站点稀少的玛纳斯河流域为研究区域,利用最小二乘相关分析法开展了冬、春季(2015年11月-2016年4月)气温环境变量分析,通过共线性检测确定了纬度、海拔、坡度、坡向、NDVI 5个环境变量组成了最优因子集,构建了基于广义回归神经网络(GRNN)的月平均气温空间插值模型。采用区域内139个站点中的119个观测站点数据作为训练数据

对 GRNN 模型进行训练,确定了冬、春季 6 个月的区域气温空间插值模型。利用剩余的 20 个观测站点数据作为检验样本,以均方根误差(RMSE)和平均相对误差(MRE)为评价指标,对模型的回归误差进行分析。结果表明:本模型 6 个月的平均 RMSE 值为 1.46,优于传统的地理加权回归克里金(GWRK)方法(其平均 RMSE 值为 2.22)。此外,从不同月份的气温空间插值分布图来看,本文模型空间插值后的气温变化趋势与实际变化趋势一致。从气温的空间分布情况来看,各空间点的气温与其海拔高程呈正相关,且随地表覆盖类型变化。这也表明本文提出的插值策略并组合建立的 GRNN 模型对于稀疏气象站点条件下的气温空间插值精度更高,一致性较好。

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标题: Establishment of regional terrestrial reference frame considering coordinate characteristic and stability

标题: 顾及基准站坐标动态特性与稳定性的区域框架构建

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文献类型: Article

作者关键词: Coordinate dynamic characteristic; Stability; Reference frame; Empiric Mode Decomposition(EMD)

作者关键词: 坐标动态特性; 稳定性; 框架; 经验模态分解

摘要: The tectonic movement and Nonlinear effect has the significant effect to the fiducial stations, The key of the location service and regional deformation analysis is that establish the regional terrestrial reference frame considering high precision and currency. This paper proposed a method of taking account of the coordinate dynamic characteristic and stability. The western of China city was carried out for comparison, the experiments shows that it is feasible, the better to take into account of the coordinate dynamic characteristic, nonlinear variance and vertical motion, also can detect the micro-dynamic variation.

摘要: 基准站受构造运动与非线性因素的影响, 如何构建高精度、现势性强的精细区域框架是位置服务与形变分析的关键。笔者提出顾及基准站坐标动态特性与稳定性的区域框架构建方法。以我国西部与东部某城市的多年连续运行基准站数据为例进行试算对比, 试验结果表明: 该方法可行的, 较好地顾及了基准站的坐标特性与非线性影响, 考虑了基准站的垂直运动规律, 可构建高精度的区域基准, 可发现区域基准的微动态变化。

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标题: Research on neural network-assisted integrated navigation algorithm

标题: 神经网络辅助的组合导航算法研究

来源出版物: 导航定位学报 卷: 8 期: 1 页: 93-98 出版年: 2020

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文献类型: Article

作者关键词: neural network; federated filtering; combined navigation; data fusion; out of lock

作者关键词: 神经网络; 联邦滤波; 组合导航; 数据融合; 失锁

摘要: In the environment of high dynamics and strong interference, the satellite navigation signal is weak or even unlocked, and a single inertial navigation error accumulatescan not meet the navigation accuracy requirements. An Elman neural network-assisted integrated navigation federated filtering algorithm is proposed, Based on the feedback characteristics of the Elman netural network and the parallel processing capability of the federated filte perform, We first train the neural network before the GPS signal is lost. When the satellite signal is out of lock, the neural network is used to implement prediction and solution. The MATLAB simulation experiment proves that the algorithm can effectively suppress the accumulation of inertial navigation errors when the satellite signal is out of lock, which has some reference value.

摘要: 针对在高动态、强干扰的环境下,单一导航源无法满足导航要求,组合导航技术应运而生,其中捷联惯导系统(SINS)及全球定位系统(GPS)组合导航应用最为广泛。当卫星导航信号较弱甚至失锁时,单一的惯性导航误差逐渐积累,无法满足导航精度要求,提出 1 种埃尔曼(Elman)神经网络辅助的组合导航联邦滤波算法,基于 Elman 神经网络内部反馈特性和联邦滤波的并行处理能力,在 GPS 信号失锁前对神经网络实施训练,当卫星信号失锁时启用神经网络实时预测与解算。最后通过 MATLAB 仿真实验证明了该算法可以在卫星信号失锁时有效抑制惯导误差的累积,具有一定的参考价值。

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标题: Spatial-temporal analysis of land use change in ecologically vulnerable regions of the Loess Plateau in northern Shaanxi Province:A case study of Zhidan County

标题: 陕北黄土高原生态脆弱地区土地利用变化的时空分析:以志丹县为例

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文献类型: Article

作者关键词: land use change; spatiotemporal change; information entropy; Zhidan County

作者关键词: 土地利用变化; 时空变化; 信息熵; 志丹县

摘要: In order to research the frequent change of land use and the unreasonable structural relationship between human and land in the Loess Plateau region, this paper takes Zhidan County of Shaanxi Province as the research area, and by employing the GIS technology, carries out visual interpretation based on three-phase remote sensing Landsat images in 2008, 2012 and 2016; besides, the spatial and temporal change characteristics of land use is studied by combining land transfer matrix, change map and information entropy. The results show that from 2008 to 2016, the land of the forest areas changed dramatically, with the forest land as the largest area in the stable mode of change, and the area of residential and traffic construction land expanded remarkably; the area of woodland, garden-land, grassland and waters decreased in varying degrees; and the cultivated land and woodland are still the main types of land use in Zhidan County. The transformation between cultivated land and woodland was very obvious. To sum up, land use in Zhidan County is developing stably. The research results are intended to provide a scientific basis for urban land use planning and sustainable development in the Loess Plateau in northern Shaanxi.

摘要: 由于黄土高原区域存在土地利用变化剧烈、人地关系结构不合理的问题,以陕西省志丹县为讨论范围,GIS技术为支持,对2008、2012年和2016年的3期遥感Landsat影像进行目视解译,将土地转移矩阵、变动图谱和信息熵结合起来,对研究区域进行土地利用时空变化特征研究.结果显示:2008-2016年间,研究区域林地面积变化幅度最大,稳定型变动方式中林地所占面积最大,住宅和交通用地面积扩张显著;林地、园地、草地和水域呈现出缩减趋向,志丹县土地利用仍旧以耕地和林地为主要类型,并且耕地与林地相互间的转化十分显著.总之,志丹县土地利用结构向稳定方向发展,其结论以期能够对陕西北部黄土高原城市土地合理利用和高效管理提供根据.

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标题: DETERMINATION OF SOIL-WATER CHARACTERISTIC CURVE VARIABLES
BASED ON VG MODEL

标题: 基于 VG 模型确定土水特征曲线基本参数

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作者关键词: Soil-water characteristic curve; VG model; Air-entry value; Residual state

作者关键词: 土水特征曲线; VG 模型; 进气值; 残余状态

摘要: The variables of the soil-water characteristic curve (air-entry value, residual suction and slope at the inflection point) are very critical parameters in the strength theory, percolation theory and volume change behavior of unsaturated soil. It is often obtained by conventional graphical method, which is subjective and inaccurate. This study presents the methods for determining the variables of unimodal and bimodal SWCC based on VG model using the measured SWCC data of the four layers of undisturbed loess in Luochuan standard section. SWCC data were measured by filter paper method and best fitted using Van Genuchten's equation. Consequently the best fitting parameters were obtained, and the proposed methods were validated using the measured unimodal and bimodal SWCC data. The water evaporation test in the natural state was carried out. Then the evaporation residual saturation $S_{(rzf)}$ was determined according to the relationship between the mass moisture content and the evaporation time. According to the relative errors between $S_{(r1)}$, $S_{(r2)}$ and $S_{(rzf)}$ ($S_{(r1)}$ and $S_{(r2)}$ were acquired from the two methods for determining the residual state, respectively), the comparison was made between the two methods for determining the residual state. The results suggest that the proposed methods can produce reasonable variables and determine the residual state effectively related to the unimodal and bimodal SWCC.

摘要: 土水特征曲线基本参数(进气值、残余吸力值和反弯点的斜率等)在非饱和土的强度理

论、渗流理论以及体变特性等方面都是非常重要的参数,常常通过传统画图法来确定,其精确度难以保证。以洛川标准剖面 4 层原状黄土为研究对象,基于 VG 模型提出单峰和双峰 SWCC 基本参数的确定方法;采用滤纸法测得 SWCC 数据点,基于 VG 模型进行最优化拟合,获取拟合参数,利用单峰和双峰 SWCC 数据点验证该方法的可行性;进行自然状态下的水分蒸发试验,根据质量含水率与蒸发时间的关系确定蒸发残余饱和度 $S_{(rzf)}$,依据 $S_{(r1)}$ 、 $S_{(r2)}$ ($S_{(r1)}$ 和 $S_{(r2)}$ 分别由确定残余状态的两种方法得到)与 $S_{(rzf)}$ 的相对误差值,比较了两种确定残余状态的方法。结果表明:对于单峰和双峰 SWCC 曲线,该方法都可以得到合理的基本参数并有效地确定其残余状态。

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作者: 王丽霞; 张茗爽; 隋立春; 张双成; 杨耘

标题: Ecological Function Regionalization in the Weihe River Basin

标题: 渭河流域生态功能区划

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文献类型: Article

作者关键词: ecological function regionalization; principle; indicator system; spatial analysis; Weihe River Basin

作者关键词: 生态功能区划; 原则; 指标体系; 空间分析; 渭河流域

摘要: Ecological function regionalization is the basis for scientific management and sustainable exploitation of natural resources. In this study, the Weihe River Basin was taken as the research object to develop a reasonable index system according to the current ecological environment in the drainage basin, and the GIS and RS means were used to regionalize the study area. Moreover, the emphases of conservation and construction of the ecological environment were worked out based on considering the dominant ecological functions or the main ecological problems in each functional area. The results showed that the Weihe River Basin could be divided into seven ecological functional zones, and the corresponding construction priorities were formulated: ① Drought prevention and control zone: It should be strictly forbidden to cut down vegetation, and the drought-tolerant vegetation should be advisably cultivated for preventing soil drought; ② Farming zone: The agricultural structure should be rationally adjusted; ③ Animal husbandry development zone: The advantages of agro-pastoral ecotone should be paid great attention to; ④ Water conservation zone: It was suggested to establish the vegetation protection areas and national forest parks and vigorously develop the water conservation projects; ⑤ Wind prevention and sand fixation zone: It was suggested to plant sand-fixing plants and prevent land desertification; ⑥ Vegetation protection zone: It was suggested to protect the existing vegetation, continuously strengthen greening, and reasonably maintain the vegetation resources; ⑦ Soil erosion control zone: It was suggested to protect and rationally exploit the water and soil resources. The study results could provide a scientific basis for effectively exploiting and utilizing the natural resources and rationally taking some measures to protect the ecological environment in the study area.

摘要: 以渭河流域为研究对象, 根据流域生态环境现状, 建立合理的指标体系, 结合 GIS 与 RS 技术对研究区进行区划, 并针对各功能区的主导生态功能或主要生态问题制定相应生态环境保护与建设重点。结果表明: 渭河流域可被划分为 7 个生态功能区: ①防旱抗旱区; ②农业种植区; ③牧业发展区; ④水源涵养区; ⑤防风固沙区; ⑥植被保护区; ⑦土壤侵蚀控制区。本研究为区域有效开发利用资源, 合理制定生态环境保护措施提供科学依据。

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作者: 董鸾花; 李萍; 夏增选; 李同录; Griffiths D V; 侯晓坤

标题: Parameters-based Bayes Estimation and Its Application in the Reliability Analysis of Loess Slope

标题: 基于参数相关的 Bayes 估计及在黄土边坡可靠度分析中的应用

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作者关键词: loess slope; Bayes theory; reliability; correlation

作者关键词: 黄土边坡; Bayes 理论; 可靠度; 相关性

摘要: There is a correlation between each loess strength parameters. In the traditional slope stability calculation, the loess strength parameters c and ϕ are often seen as two independent random variables. The neglect of their correlation leads to calculation deviation. In this paper, the two-dimensional joint normal distribution is used as the distribution profile of the loess strength parameters, and the Bayes formula is to optimize the parameters. Taking as an example of the potential landslide in the sewage outlet of Xi'an Xianyang Airport, the reliability index of the slope is calculated. The results show that Bayes makes it possible to reduce the variance of the estimated results, to get more reliable estimated results of loess strength parameter and what's more, to avoid errors caused by small sample size. Correlation coefficient nearly has no effect on stability coefficient, but has much effect on the reliability index and the failure probability. The stability of the slope will be over-estimated without considering the positive correlation coefficient of c and ϕ value. The stability of the slope will be seriously under-estimated when the c and ϕ negative correlation is not taken into account. The estimated strength parameters from Bayes of two-dimensional joint normal distribution evaluate accurately the stability of loess slope.

摘要: 黄土强度参数具有一定的相关性。在传统的边坡稳定性计算中,常把黄土强度参数 c 、 ϕ 值视为独立的 2 个参数,忽略了其相关性,导致计算结果存在一定的偏差。笔者采用二维联合正态分布拟合黄土强度参数的概率密度函数,应用 Bayes 公式对函数参数的取值进行优化。以西安咸阳机场排污口潜在滑坡为例,计算该边坡可靠性指标。研究结果表明,利用 Bayes 考虑了工程经验,估计结果的方差减小,使得黄土强度参数估计结果更为稳健,同时也减小因样本数量太少而产生的误差。相关系数对稳定系数几乎没有影响,对可靠度指标和失效概率的

影响较大。当利用可靠度理论评价边坡稳定性时,不考虑 c 、 ϕ 值正相关系数,边坡的稳定性则会被高估;不考虑 c 、 ϕ 负相关性时,将严重低估边坡的稳定性。采用二维联合正态分布的 Bayes 估计强度参数,可对黄土边坡稳定性进行更为准确的评价。

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作者: 何国辉; 黄强兵; 王涛; 刘妮娜

标题: NUMERICAL ANALYSIS OF DYNAMIC RESPONSE OF HIGH-SPEED RAILWAY SUBGRADE ORTHOGONALLY CROSSING GROUND FISSURE ZONE

标题: 高铁路基正交跨越地裂缝带动力响应数值分析

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作者关键词: High-speed railway; Ground fissure; Natural foundation; Subgrade; Finite element numerical simulation; Train loads; Dynamic response

作者关键词: 高速铁路; 地裂缝; 天然地基; 路基; 有限元数值模拟; 列车荷载; 动力响应

摘要: This paper takes the Datong-Xi'an passenger transport line subgrade orthogonally crossing ground fissure zone as research object. It establishes the foundation-ground fissure-embankment dynamic calculation model of high-speed railway with the finite element numerical method. It simulates and analyzes the dynamic response characteristics of subgrade on natural foundation with and without ground fissure zone under the action of high-speed train load. The results show that the response of dynamic displacement, acceleration and dynamic stratum stress of subgrade in natural site without ground fissure under train load is basically steady without obvious differences. In ground fissure site, the dynamic displacement of subgrade and the acceleration of embankment body both increases in the hanging wall and decreases in the footwall of active ground fissure zone, and the attenuation amplitude of dynamic displacement and acceleration of the subgrade in the footwall is greater than that of the hanging wall of ground fissure zone in perpendicular direction of train line. The critical influence depth of acceleration induced by ground fissure is about 15 m below the ground. The dynamic stress in subgrade reduces in the hanging wall and increases in the footwall of ground fissure. The dynamic stress critical depth of subgrade in ground fissure site is 10 m below the ground. The research results can provide scientific basis for the construction of high-speed railway and disaster prevention and mitigation in ground fissure development area in China.

摘要: 本文以大西客运专线高速铁路正交跨越地裂缝带为研究对象, 基于有限元数值方法建立了高速铁路地基-地裂缝-路堤动力计算模型, 模拟分析了高速列车荷载作用下有、无地裂缝带天然地基上路基的动力响应差异特征及影响规律。计算结果表明: 列车荷载作用下无地裂缝带场地, 路基动位移、加速度和动应力响应基本平稳, 没有明显差异现象; 而地裂缝带场地路基动位移、路堤本体内加速度均表现为上盘增大、下盘减小, 垂直于线路走向路基动位移、加速度幅值衰减下盘大于上盘, 地裂缝对加速度影响的临界深度约为地表以下 15 m; 地裂缝的存在引起其上盘路基出现动应力降低和下盘动应力增强现象, 地裂缝场地沿深度方向路基动应力影响的临界深度为地表以下 10 m。上述研究结果可为我国地裂缝发育区高速铁路建设与防灾减灾提供科学依据。

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作者: 徐明祥; 黄强兵; 王庆兵; 李明镠; 雷建

标题: Settlement rules of shallow-buried metro tunnel construction in the Xi'an ground fissure section

标题: 西安地裂缝地段浅埋暗挖地铁隧道施工沉降规律

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作者关键词: metro tunnel; ground fissure; shallow-buried excavation; numerical simulation; ground settlement; tunnel deformation

作者关键词: 地铁隧道; 地裂缝; 浅埋暗挖法; 数值模拟; 地表沉降; 隧道变形

摘要: Ground fissure is one of the most typical urban geo-hazards in Xi'an, and the stratum deformation and ground settlement caused by metro tunnel construction in the ground fissure section is a prominent engineering geological and geotechnical engineering problem. In this paper, the Xi'an metro line 6 is taken as the engineering background, and the ground settlement and tunnel deformation induced by the excavation of CRD method in the ground fissure section is simulated with the finite element method. The results show that the ground surface settlement caused by excavation is characterized by an inverse s-shaped change and the excavation footage of the hanging wall have a greater influence range than that of the footwall in the ground fissure section. The ground surface settlement in the center line of the tunnel is staggered in the ground fracture zone and a concentrated settlement area appears at 5 m near the hanging wall of the ground fissure. The influence area of the shallow-buried excavation on the surface is about 80 m in ground fissure zone, which is about 45 m in the hanging wall and about 35 m in the footwall. In this range, the impact of the underground excavation on the nearby surface structures should be considered. In the process of excavation, the ground settlement process of the hanging wall is longer and larger than that of the footwall and the lateral deformation laws of the ground surface conforms to the Gaussian curve distribution. The settlement values of the hanging wall are larger than that of the footwall, and the width and settlement value of the tunnel groove increase at the

position of the hanging wall near the ground fissure. The maximum settlement of the arch roof occurs at 5 m away from ground fissure, with a value of 25 mm, while the uplift deformation of 27 mm occurs on the arch bottom at the ground fissure zone. The deformation of the arch top and arch bottom is staggered near the ground fissure zone. The influence areas of the shallow-buried excavation of tunnel on the arch roof and bottom are 50 m and 55 m, respectively. The tunnel lining near the hanging wall of the ground fissure zone during excavation construction should be supported in time to prevent soil collapse and lining deformation. The research results can provide a scientific basis and technical guidance for the underground excavation construction of the metro tunnel crossing ground fissure zone in Xi'an.

摘要: 地裂缝是西安市最典型的地质灾害之一,地裂缝地段地铁隧道施工引起地层及地表沉降是较为突出的工程地质和岩土工程问题。文章以西安地铁六号线浅埋暗挖隧道穿过 f8 地裂缝为工程背景,基于有限元数值模拟,对地裂缝地段交叉中隔墙法(CRD 工法)暗挖施工引起的地表沉降和隧道变形进行了分析。结果表明:暗挖施工引起的地表沉降随开挖进尺呈反 S 型曲线变化特征,地裂缝带上盘的开挖进尺影响范围大于下盘;隧道中心线地表沉降在地裂缝带出现错台且靠近上盘 5 m 处出现集中沉降区;地裂缝地段隧道暗挖施工对地表的影响区范围约为 80 m 即上盘约 45 m、下盘约 35 m,在此范围应考虑暗挖施工对附近地表建(构)筑物的影响;开挖过程中地裂缝带上盘沉降过程变长且大于下盘;地表横向变形曲线符合高斯分布,上盘沉降大于下盘,在上盘靠近地裂缝位置处地表沉降槽宽度、沉降量明显增大;距地裂缝带 5 m 处上盘拱顶出现最大沉降,其值为 25 mm,而在地裂缝位置处拱底出现 27 mm 的隆起变形,拱顶和拱底变形在地裂缝带附近出现错台;地裂缝带隧道暗挖施工对拱顶、拱底影响区范围分别为 50 m 和 55 m,靠近上盘地裂缝位置附近隧道暗挖施工衬砌应及时支护,防止土体塌落与隧道变形。研究结果可为西安地铁隧道穿越地裂缝带暗挖施工提供科学依据和技术指导。

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标题: Study on Dynamic Response of High-speed Railway Subgrade Crossing Ground Fissure Zone and Optimization of Foundation Reinforcement of CFG Piles

标题: 跨地裂缝带高速铁路基动力响应及 CFG 桩地基加固优化研究

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文献类型: Article

作者关键词: high-speed railway; subgrade; ground fissure; CFG pile; orthogonal test design; dynamic response; optimization of foundation reinforcement

作者关键词: 高速铁路; 路基; 地裂缝; CFG 桩; 正交试验设计; 动力响应; 地基加固优化

摘要: Based on the study of the Datong-Xian Passenger Dedicated Line,dynamic finite element numerical calculation and orthogonal test design,the dynamic response of high-speed railway subgrade crossing ground fissure zone under different ground water levels and different foundation conditions,and the influence of CFG pile on the reinforcement effect were studied.The results show that the dynamic stress and acceleration fluctuate greatly in ground fissure zone,and the dynamic stress and acceleration inside the embankment decrease by nearly 50% and 70% along the direction of depth respectively.The dynamic stress and acceleration amplitude of the foundation are obviously different due to the different levels of ground water in the hanging wall and foot wall.The CFG piles reduce the embankment acceleration and the dynamic stress at the bottom of the subgrade,and the dynamic stress reduction is greater than the acceleration.For dynamic stress,the influence of pile spacing is the greatest,followed by pile length and pile diameter.For acceleration,the influence of pile spacing is the greatest,followed by pile diameter and pile length.The optimal reinforcement scheme of foundation includes 1.2 m pile spacing,8.0 m pile length,and 0.3 m pile diameter in the hanging wall;1.2 m pile spacing,16 m pile length and 0.6 m pile diameter in the foot wall of ground fissure zone.The results can provide reference to the design of high-speed railway subgrade across the ground fissure zones.

摘要: 以大西客运专线为研究背景,基于动力有限元数值模拟和正交试验设计,研究了地下水位差异和不同地基条件下跨地裂缝带高速铁路基的动力响应及 CFG 桩对地基加固效果的影响,结果表明:路基动应力和加速度响应在地裂缝带处出现较大波动,路堤中动应力沿深度方向衰减近 50%,加速度衰减近 70%;上、下盘地下水位差导致地基动应力和加速度幅值出现明显差异;CFG 桩降低了路堤加速度和路基下部动应力,且动应力降低幅度要大于加速度;对于动应力,桩间距的影响最大,桩长次之,桩径最小;对于加速度,桩间距的影响最大,桩径次之,桩长最小;地基优化加固方案为:上盘桩间距 1.2 m,桩长 8.0 m,桩径 0.3 m;下盘桩间距 1.2 m,桩长 16 m,桩径 0.6 m。研究结果可为跨地裂缝带高速铁路基设计提供参考。

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作者: Huang Qiangbing; Xue Liming; He Guohui; Wang Tao

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标题: Dynamic Response of Double-Track Subgrade of High-Speed Railway Crossing Ground Fissure Zone

标题: 高速铁路跨地裂缝带双线路基动力响应

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文献类型: Article

作者关键词: High-speed railway; Double-track subgrade; Ground fissure zone; Natural foundation; Train load; Dynamic response

作者关键词: 高速铁路; 双线路基; 地裂缝带; 天然地基; 列车荷载; 动力响应

摘要: Taking the Daxi passenger dedicated line crossing the ground fissure zone of the Dongguan substation in Qixian County, Taiyuan Basin of Shanxi Province as the engineering background, Midas/GTS finite element analysis software was used to establish a three-dimensional dynamic finite element calculation model of the ground fissure zone-subgrade-natural foundation. The vertical dynamic response of natural foundation subgrade was studied under the conditions of double-track train operation in opposite directions and single-track train operation. The laws of the vertical dynamic response of natural foundation subgrade on the hanging and foot walls of ground fissure zone under the conditions of double-track train operation in opposite directions at different train speeds were investigated. Results show that the ground fissure zone has a significant impact on the dynamic response of subgrade, and the hanging wall is greater than the footwall. The dynamic displacement, dynamic acceleration and dynamic stress of the subgrade change greatly in waveform along the longitudinal direction of the subgrade under the condition of double-track

train operation in opposite directions. However, the change under single track train operation is more stable, and the dislocation only occurs at ground fissure zone, and the dynamic response of the subgrade under double-track train operation is significantly greater than that under single-track train operation. The dynamic stress of the subgrade increases sharply near the ground fissure zone under double-track train operation in opposite directions. The critical effect depths of the dynamic stress and acceleration in the subgrade are 35 m and 20 m respectively, and the dynamic displacement decreases along the vertical direction in a quadratic function relationship. The dynamic displacement and dynamic stress in subgrade crossing ground fissure zone meet the first-order function relationship with the train speed, while the acceleration and train speed meet the quadratic function relationship.

摘要: 以大西客运专线跨山西太原盆地祁县东观变电站地裂缝带为工程背景,采用 Midas/GTS 有限元分析软件,建立地裂缝带-路基-天然地基三维动力有限元计算模型,进行高速铁路双线对向和单线行车条件下天然地基路基的垂向动力响应以及双线对向行车条件下不同车速时地裂缝带上下盘天然地基路基垂向动力响应的规律研究。结果表明:地裂缝带对路基动力响应影响显著,且上盘大于下盘;双线对向行车时路基动位移、动加速度和动应力沿路基纵向均呈波形变化且变化较大,而单线行车时变化较平稳,仅在地裂缝带位置处出现错台现象,且双线行车时路基动力响应明显大于单线行车时;双线对向行车时路基动应力在地裂缝带附近出现骤增现象,动应力和动加速度在路基中的影响临界深度分别为 35 和 20 m,动位移沿垂向衰减呈 2 次函数关系;跨地裂缝带路基动位移和动应力与车速满足 1 次函数关系,加速度与车速满足 2 次函数关系。

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标题: Vulnerability analysis of steel frame structures considering energy dissipation capacity of beam end

标题: 考虑梁端耗能能力影响的钢框架结构易损性分析

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作者关键词: steel frame; joint energy dissipation; vulnerability analysis; local structural forms; cumulative damage

作者关键词: 钢框架; 节点耗能; 易损性分析; 局部构造; 累积损伤

摘要: Lack of energy dissipation capacity,the steel frame structure using welded beam-to-column joints might be damaged under strong earthquakes..Taking a steel frame structure as an example,20 actual ground motion records are selected to analyze the vulnerability of the steel frame structure.The study shows that the collapse and failure of the ordinary steel frame structure using welded beam-to-column joints is caused by the lack of structural energy dissipation capacity.In addition to the structural deformation capacity,the energy dissipation capacity should be taken into account for evaluating the seismic performance of the structure.In the improved steel frame structure,the energy dissipation capacity is significantly improved.The displacement-based failure occurs before the cumulative damage-based failure,and in this case,the evaluation results based on deformation are more reliable.

摘要: 一般采用梁柱焊接节点钢框架结构在遭遇强烈地震地震作用下,结构倒塌破坏可能由于是耗能能力不足所导致。以某钢框架结构为算例,选取 20 条实际地震动记录,对结构进行易损性分析,对比不同损伤指标和不同梁端构造形式的钢框架结构抗震性能差异。研究显示:对梁柱焊接的普通钢框架结构,其倒塌破坏是由于结构耗能能力不足所导致的,评价结构抗震性能不仅需考虑结构变形能力,尚需同时考虑结构耗能能力;对于改进形式的钢框架结构,结构耗能能力得到显著提高,使得位移首超破坏先于累积损伤破坏,此时基于变形的评价结果更加可靠。

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作者: 张义蜜; 王万银; 熊盛青

标题: Research on the vertical recognition ability of gravity and magnetic data of point(line)source model with given survey accuracy

标题: 给定观测精度下的点(线)源模型重力与磁力垂向识别能力研究

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作者关键词: Vertical recognition; Gravity anomalies; Gravity tensor; Reduction to the pole(RTP) of magnetic anomalies; Vertical magnetization magnetic tensor

作者关键词: 垂向识别能力; 重力异常; 重力张量; 化极磁力异常; 垂直磁化磁力张量

摘要: Gravity and magnetic exploration have been widely used in geophysical exploration because of the advantages of high efficiency, low cost and wide working range. Most researches on the vertical recognition ability of gravity and magnetic data were considered without survey accuracy. Hence, theoretical research on gravity anomalies, magnetic anomalies and tensor vertical detection ability of isolated anomaly are still necessary with the given gravity and magnetic survey accuracy. The research on vertical recognition ability is based on forward theory of the gravity and magnetic field to study the relationship between amplitude and survey accuracy with given survey accuracy to eliminate the influence of the background field, which improves the reliability of the research results. The study shows that for isolated anomalies, the gravity tensor has a stronger vertical recognition ability than gravity anomalies at a certain shallow depth. This depth is proportional to the ratio of the gravity anomaly survey accuracy to the gravity tensor survey accuracy. The vertical magnetization magnetic tensor has a stronger vertical recognition ability than the polar magnetic anomalies at a certain shallow depth. This depth is proportional to the ratio of the polar magnetic anomalies survey accuracy to the vertical magnetization magnetic tensor survey accuracy. The magnetic field has a stronger vertical recognition ability than gravity at a certain shallow depth. This depth is proportional to the ratio of magnetization to residual density, gravity survey accuracy to magnetic survey accuracy. This result will guide the practical application of gravity and magnetic exploration.

摘要: 重、磁勘探具有效率高、成本低、工作范围广等优点,已在地球物理勘探中得到了广泛

应用.前人大多在不考虑重、磁勘探观测精度的条件下进行了垂向识别能力的研究,但在考虑重、磁观测精度条件下,重力(重力异常、重力张量)与磁力(磁力异常、磁力三分量、磁力张量)对孤立异常的垂向识别能力如何则需要进行深入的理论研究.本文从重、磁场正演理论出发,以球体(点源模型)和无限延伸水平圆柱体(线源模型)为例,考虑给定观测精度条件下,以重力和磁力幅值大小与观测精度的关系来研究垂向识别能力,从而消除了背景场的影响,提高了研究结果的可靠度.通过研究表明,对于孤立异常,重力张量在浅部一定深度内比重力异常的垂向识别能力强,该深度与重力异常和重力张量观测精度的比值成正比;垂直磁化磁力张量在浅部一定深度内比化极磁力异常的垂向识别能力强,该深度与磁力异常与磁力张量观测精度的比值成正比;磁力在浅部一定深度内比重力的垂向识别能力强,该深度与地质体的磁化强度和剩余密度比值、重力观测精度和磁力观测精度比值成正比.通过重力和磁力垂向识别能力的研究将为重、磁勘探的实际应用起到指导作用.

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标题: A new recognition method for source locations and attributes based on correlation analysis of gravity and magnetic anomalies

标题: 基于重磁异常相关分析的场源位置及属性识别方法

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作者关键词: Gravity and magnetic anomalies; Source identification; GMCP; South China Sea Basin

作者关键词: 重磁异常; 场源识别; 属性判别参数; 南海海盆

摘要: The traditional gravity and magnetic correspondence analysis tends to be highly correlated outside the field source area. In order to overcome this weakness, we propose a new identification method for source positions and attributes based on similarity and vertical derivative of the potential field and put forward a new gravity and magnetic correlation parameter (GMCP), which can effectively reduce the range of the potential field source to be identified and indicate the field intensity information. The distribution of the non-zero areas of GMCP reflects the size of the source. GMCP discriminant parameter values of positive and negative reflect the source attributes. When GMCP is greater than zero, it is a positive correlation indicating that there are high-density and high-magnetization or low-density and low-magnetization homologous bodies in this region. When GMCP is less than zero, it is negative correlation indicating that there are high-density and low-magnetic or low-density and high-magnetic density homologous bodies in this region. When GMCP tends to zero, it means no gravity-magnetic homologous geological body. Tests on complex models with different noise levels and actual data processing of South China Sea Basin prove the correctness and validity of the identification method proposed in this paper.

摘要: 针对传统的重磁对应分析在场源区域外趋于高相关度的缺点, 本文提出了一种基于相关系数和垂向导数的重磁场源位置及属性识别方法, 给出了一个新的重磁场源平面位置及属性判别参数 (GMCP), 该参数能够有效地缩小重磁场源的识别范围. 判别参数 GMCP 值非零分布范围反映了场源的规模. GMCP 值的正负反映了场源属性, 当 GMCP 大于零时为正相关, 代表了该区域存在高磁高密度或低磁低密度的重磁同源地质体; 当 GMCP 小于零时为负相关, 代表了该区域存在高磁低密度或低磁高密度的重磁同源地质体; GMCP 趋于零, 则表示无重磁同源地质体. 两组不同干扰水平的同源复杂组合模型实验、两组不同源组合模型试验以及南海中央海盆实际重磁数据处理结果均验证了该重磁场源位置及属性识别方法的正确性和有效性.

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建筑工程学院

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标题: Features of karst development and geotechnical effects in the Liaoshan Tunnel on the E-Han expressway

标题: 峨汉高速廖山隧道岩溶发育规律及其工程效应浅析

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作者关键词: E-Han expressway; karst tunnel; development regularity; controlling factors; engineering effects

作者关键词: 峨汉高速; 岩溶隧道; 发育规律; 控制因素; 工程效应; 地质灾害; 突水突泥

摘要: The Liaoshan tunnel on the E-Han expressway is located in a karst area of southwest China with frequent geological hazards. Based on the investigation of the geological environment in the karst area, this work clarified the characteristics of karst development in the tunnel site area, analyzed its law and controlling factors, and examined its effects on the site. The results show that the karst morphology in the tunnel site area is diverse, characterized by multiple scales, diversity, and dense development. The karst shows significant selectivity, directionality, layering, heterogeneity, and system coherence and other laws, in which stratigraphic lithology and its combination are the material basis, topographic features and geological structural characteristics are the dominant conditions, and hydrogeological conditions are the decisive factors. The engineering effects of karst development are mainly expressed in 3 aspects, the stability of the tunnel, karst gushing water inrush and effect of tunnel life cycle. The existence of bad karst geological bodies and karst water-rich spaces can easily induce stability problems such as large cave deformation and karst collapses at the bottom of the tunnel as well as local static karst water outbursts and lake water flood and mud flooding disasters, sometimes even affecting the stability and durability of the tunnel structure during the operation period.

摘要: 峨汉高速廖山隧道地处西南岩溶区,岩溶地质灾害频发。在开展岩溶区地质环境调研的基础上,厘清隧址区岩溶发育特征,浅析隧址区岩溶发育规律及其控制因素,最后探究了岩溶发育的工程效应。结果表明:隧址区岩溶形态多样,呈现多尺度、多样化、密集性发育的特征;岩溶在控溶因素的耦合作用下表现出显著的选择性、方向性、分层性、不均匀性以及系统连贯性等规律,其中地层岩性及其组合情况是物质基础,地形地貌与地质构造特征是主导条件,而水文地质条件是决定性因素;岩溶发育的工程效应表现在隧洞稳定性、岩溶涌水突泥和全寿命周期内的影响三个方面,不良岩溶地质体及岩溶富水空间的存在极易诱发洞身大变形、隧底岩溶塌陷等稳定性问题,以及局部静态岩溶水突出与湖水倒灌等涌水突泥灾害,甚至对隧道结构在运营期内的稳定性和耐久性造成不利影响。

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标题: State-of-the-art review on displacement-dependent earth pressure formulations of rigid retaining walls via mathematical fitting functions

标题: 刚性挡墙位移土压力的数学拟合公式研究综述

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文献类型: Review

作者关键词: displacement of retaining walls; displacement-dependent earth pressure; mathematical fitting; movement mode; unsaturated soil

作者关键词: 挡墙位移; 位移土压力; 数学拟合公式; 位移模式; 非饱和土

摘要: Variation laws of earth pressure accounting for the displacement of a retaining wall can be well described by mathematical fitting, which is usually based on the earth pressure at rest or the active and passive earth pressures to illustrate the displacement-earth pressure of retaining walls through constructing various mathematical functions. This study subdivides displacement-dependent earth pressure formulations into six categories according to different functional forms, including trigonometric, exponential, hyperbolic, power, sigmoid and other functions. Characteristics and deficiencies of displacement-dependent earth pressure formulations are summarized, and future researches are provided. The findings of this study show that main differences of mathematical fitting are attributed to determination of function forms as well as undetermined parameters as well as their magnitudes, which results in the uncertainty of mathematical fitting and the generality of research. A reasonable and practical mathematical fitting function has three features: boundary condition and initial value satisfied, parameters with clear meaning and representing the interaction between a retaining wall and soils. In terms of test studies, it is necessary to perform targeted research on different movement modes of a retaining wall, and model tests of earth pressure are conducted on clay, unsaturated soil, collapsible loess, expansive soil, among others. In terms of theoretical calculations, displacement-dependent earth pressure formulations using different mathematical fitting functions are compared to explore their rationality and applicability as well as to reveal intrinsic mechanisms between earth pressure of a retaining wall and its displacement. Displacement-dependent earth pressure of a retaining wall in unsaturated soil needs to be paid more attention. The choice and measurement of different parameters are improved and validated by model tests in order to accelerate the process of engineering applications for mathematical fitting functions.

摘要: 在研究土压力与挡墙位移关系时,可采用数学拟合方法表征土压力随挡墙位移的变化规律。数学拟合方法常以静止土压力、主/被动土压力为基础,通过构造数学函数来描述挡墙位移土压力,但所采用的数学函数形式各不相同。将挡墙位移土压力的数学拟合公式按函数形式分为:三角函数、指数函数、双曲线函数、幂函数、S型函数以及其他函数等6大类,总结了位移土压力数学拟合公式的特点与不足,并指出需进一步研究的方向。结果表明:数学拟合公式的主要差异在于函数形式选择和待定参数及取值不同,导致了数学拟合公式的多样性与研究的广泛性。合理实用的位移土压力数学拟合公式需具备3方面特征:边界条件与初值满足、参数含义明确以及能反映挡墙与土体之间的相互作用。在试验方面,应持续对挡墙不同位移模式开展针对性研究,并进行黏性土、非饱和土、湿陷性黄土、膨胀土等的土压力试验;在理论计算方面,应加强位移土压力数学拟合公式间对比分析,探究各自的合理性及适用性,揭示土压力与挡墙位移关系的内在机理。拓展对非饱和土挡墙的位移土压力研究,完善参数选择、模型验证,以加快工程应用进程。

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标题: Theoretical and Field Measurement of Occupants Window Opening Behavior in an Office Building of Xian in a Season of Transition
标题: 西安地区某办公建筑过渡季开窗行为特征及其影响因素分析
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文献类型: Article
作者关键词: transition season; office building; window opening behavior; thermal comfort; indoor air quality
作者关键词: 过渡季; 办公建筑; 开窗行为; 热舒适; 室内空气品质
摘要: This study presents the results of a field study of manual control of windows in a season of transition (autumn).The study was carried out in 5 typical individual offices within a research institutes building in Xian, a city located in the cold region of China.In total,windows were open and closed for 670 and 1 365 hours respectively during the working days in a season of transition (autumn).The opening duration and closing duration accounted for 33% and 67% of the total duration.Moreover,the results showed that windows were closed more frequently than they were opened during the working,lunch break and departure periods; once a window was opened at arrival,it wouldnt be left in its position for a long duration until the departure.The binary logistic model was constructed based on the internal and external parameters.The results indicated that external temperature has no significant impact on the windows state.After the original variables were standardized using the Z-score method,the regression results indicated that occupants behavior had the strongest correlation with window-opening behavior and concentration of indoor PM_{2.5},followed by indoor temperature.The odds ratio (OR) of window-opening behavior and concentration of indoor PM_{2.5} was 7.181 and 2.442 respectively.
摘要: 本研究选取位于我国寒冷地区的西安市某研究院办公楼作为研究对象,对其过渡季(秋季)开窗行为进行实测研究。经统计分析发现,在工作日期间开、关窗时长分别为 670 h 和 1 365

h,各占总时长的比值为 33%、67%;并且在工作、 午休、离开 3 个时间段内的关窗频率高于开窗频率,表明窗户状态并非在开启后会持续至离开办公室时才关闭。基于室内外环境参数建立二元逻辑回归开窗模型,结果表明室外温度对开窗行为没有显著性影响。利用 Z-score 法将原始变量进行标准化后,对比回归结果发现,室内 PM_{2.5}浓度与开窗行为紧密相关,室内温度次之,其优势比(Odds Ratio,OR)值分别为 7.181 和 2.442。本研究通过实测获取了窗户状态、室内空气品质以及热湿环境现状,分析了开窗行为特征及其影响因素并建立了开窗行为模型,有利于正确引导室内人员开关窗,从而营造舒适健康的办公环境,对未来的办公建筑能耗模拟具有一定的参考意义。

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作者: 赵均海; 李莹萍; 陈彦雄

标题: Analysis of Axial Compression Bearing Capacity of CFRP Confined RPC Filled Steel Tube Columns

标题: CFRP-钢管 RPC 短柱轴压承载力分析

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作者关键词: unified strength theory; CFRP confined RPC filled steel tube columns; interface bond; size effect; axial compression bearing capacity

作者关键词: 统一强度理论; CFRP-钢管 RPC; 界面黏结; 尺寸效应; 轴压承载力

摘要: Based on the unified strength theory, the calculation formula of bearing capacity of CFRP confined RPC filled steel tube columns under the axial compression was deduced considering the intermediate principal stress and the assumptions that steel tube and RPC are both in a three-dimensional stress state and CFRP is in a uniaxial tensile stress state. Based on this, new ultimate bearing capacity formula was derived considering the bond strength and the size effect. Comparing the theoretical results with the experimental data, the model considering the interface bond and the size effect match better with the relevant experimental data. The good comparison agreement verifies the correctness of the theoretical formula. The larger the specimen size is, the more obvious the size effect is, and the better the calculation results match the test results. The effects of the intermediate principal stress, the confinement index and the friction coefficient on the bearing capacity were obtained through the parametric analyses.

摘要: 基于统一强度理论,充分考虑中间主应力对碳纤维增强复合材料(CFRP)-钢管活性粉末混凝土(RPC)短柱的影响,考虑钢管与 RPC 处于三向应力状态,CFRP 处于环向受拉应力状态,推导得出了 CFRP-钢管 RPC 受压短柱的极限承载力公式.在此基础上进一步提出了考虑界面黏结影响和尺寸效应的 CFRP-钢管 RPC 轴压短柱的承载力统一解.将理论计算结果与有关文献的试验数据进行对比,验证了理论计算公式的正确性.研究表明:考虑了界面黏结影响和尺寸效应的计算结果与试验结果吻合更好,且试件尺寸越大,尺寸效应越明显,计算结果越贴合试验结果,并进行了参数分析,同时得到中间主应力系数、钢管套箍指标和摩擦系数等对承载力的影响规律.

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标题: Research on equivalent period and equivalent damping ratio of shear walls

标题: 剪力墙的等效周期和等效阻尼比研究

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作者关键词: shear walls; equivalent linearization; equivalent period; equivalent damping ratio; four-fold line hysteresis model

作者关键词: 剪力墙; 等效线性化; 等效周期; 等效阻尼比; 四折线滞回模型

摘要: The elastoplastic response of the structure can be calculated by the equivalent stiffness and equivalent damping ratio in the equivalent linearization method. In order to study the equivalent stiffness and damping ratio of reinforced concrete shear walls, the simplified four-fold line force-displacement hysteretic model of shear walls is analyzed, and the formulas for calculating the equivalent stiffness, equivalent period and equivalent damping ratio are derived at the yield points and peak points. To verify the accuracy and applicability of the above proposed formulas, the equivalent stiffness and equivalent damping ratio of 42 reinforced concrete shear wall specimens are calculated and compared by the formulas herein and the formulas in FEMA 440. The results show that the equivalent period and equivalent damping ratio obtained by the calculation formula developed in this paper and the formula proposed by FEMA 440 are in good agreement with the experimental values. Therefore, the proposed formula is more reasonable in calculating the equivalent period and equivalent damping ratio of shear walls.

摘要: 结构弹塑性反应可用等效线性化方法中的等效刚度和等效阻尼比进行计算。为研究钢筋混凝土剪力墙的等效刚度和等效阻尼比,通过分析剪力墙的力-位移简化四折线滞回模型,推导了其屈服点和峰值点的等效刚度、等效周期和等效阻尼比的计算公式。为验证其准确性和适用性,采用提出的峰值点等效刚度、等效阻尼比公式和 FEMA 440 建议的公式,分别计算了 42 片钢筋混凝土剪力墙试件的等效刚度和等效阻尼比,并进行了对比分析。结果表明:提出的计算公式和 FEMA 440 建议的公式所得到的等效周期和等效阻尼比值与试验值比较吻合,因此,所提出的计算剪力墙的等效周期和等效阻尼比的公式较为合理。

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标题: Setback Distance for Seismic Fortification and Avoidance of Structures in Ground Fissure Sites

标题: 地裂缝场地结构抗震设防避让距离研究

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文献类型: Article

作者关键词: ground fissure; frame structure; earthquake resistance; setback distance; dynamic response

作者关键词: 地裂缝; 框架结构; 抗震; 避让距离; 动力响应

摘要: Based on geological exploration data obtained along the Xi'an Metro Line 2, in this study, we used ABAQUS finite element software to establish an interaction model for a ground fissure site and structure. In the experiment, the structure was placed at different distances from the ground fissure followed by the application of a seismic wave equivalent to that of the El Centro earthquake. We then compared the changes in the story drift ratio and shear force of the frame columns at the different locations to study the working characteristics of the near-ground fissure structure under earthquake. We determined the dynamic response law of the structure for different setback distances, which were then compared with the variation law of peak acceleration of the ground surface. The results showed that the magnification of the story drift ratio was 30%-41% for a hanging wall structure and 18%-22% for a footwall structure. With increases in the setback distance, the peak acceleration gradually decreased, as did the degree of structural damage. The peak ground acceleration showed a gentle linear decline, and the magnification of the maximum story drift ratio decreased from 41% to 21%. Variation in the peak ground acceleration does not fully reflect the dynamic response law of a near-ground fissure structure. The dynamic time history response law of a structure located at a ground fissure site obviously differs from that at a regular site. The maximum horizontal seismic influence coefficient must be adjusted when a structure located at a ground fissure site is designed for seismic resistance.

摘要: 以西安地铁二号线沿线地质勘查资料为基础, 借助 ABAQUS 有限元软件建立地裂缝场地与结构共同作用模型, 将结构分别置于距地裂缝不同距离的位置, 并施加 El-Centro 地震波, 通过比较不同位置结构的层间位移角、框架柱剪力的变化情况, 研究近地裂缝结构在地震作用下的工作特性, 找出不同避让距离下的结构动力响应变化规律, 并与地表峰值加速度的变化规律进行对比分析, 为地裂缝场地结构的避让距离选取提供参考。结果表明: 上盘结构层间位移角放大幅度为 30%~41%, 而下盘结构层间位移角放大幅度为 18%~22%, 上盘结构的破坏程度远大于下盘结构。随避让距离的增大, 地表加速度峰值逐渐减小, 结构破坏情况相应减弱, 但地表峰值加速度表现出较为平缓的线性下降, 而其上部结构的峰值位移曲线则出现大幅

度的下降,甚至在近地裂缝处产生突变,其最大层间位移角放大幅度由 41%降为 21%,地表加速度峰值的变化并不能完全反映出近地裂缝结构的动力响应规律。位于地裂缝场地的结构动力时程响应规律明显区别于普通场地上的结构,对位于地裂缝场地的结构进行抗震设计时应水平地震影响系数最大值 α_{phamax} 进行调整。

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作者: 常召群; 邢国华; 白涛; 刘林伟; 刘伯权; 武名阳

标题: Modified Variable Angle Truss Model for Bearing Capacity of Concrete Beams with Plain Steel Reinforcement

标题: 光圆钢筋混凝土梁承载力分析的修正变角桁架模型

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作者关键词: strut-tie model; various angle truss model; plain bar; bond; concrete beam

作者关键词: 拉压杆模型; 变角桁架模型; 光圆钢筋; 粘结; 混凝土梁

摘要: In the ancient concrete building, concrete beams with plain steel reinforcement under the load will evolve from flexural failure to shear failure with the increase of service time. The existing bearing capacity analysis model of the concrete beam with plain steel reinforcement couldn't distinguish these two failure modes. By selecting concrete beam reinforced with plain bars as research object, the calculated formula of bonding strength between plain steel bar and concrete was proposed and the effect of relatively small bond strength on the load bearing capacity of concrete beams was analyzed in detail. Based on the strut-tie model and the standard truss model, the bearing capacity of the concrete beams was calculated. The results showed that the average ratio of the test values to the analytical values of the strut-tie model and the standard truss model was 1.460 and 1.309, respectively, and the variance was 0.858 and 0.781, respectively. The

variable angle truss calculation model was established which could distinguish the failure mode of the concrete beams with plain steel reinforcement. The suggested model was validated by the experimental data of 32 concrete beams. The average ratio of the test results of the bearing capacity of the concrete beams to the calculated values of the variable angle truss model was 1.034 and the variance was 0.100, which indicated that test results and prediction results were in a good agreement. The modified variable angle truss model could precisely predict the failure mode of the reinforced concrete beam with plain steel bar. Thus, the suggested model could be used to calculate the load bearing capacity and analyze the failure mode of concrete beams reinforced with plain steel bars.

摘要: 在古旧混凝土建筑中,光圆钢筋混凝土梁在荷载作用下随着服役时间的增长将由正截面受弯破坏演变为斜截面剪切破坏,但已有光圆钢筋混凝土梁的承载性能分析模型尚不能区别这两种破坏模式。作者以光圆钢筋混凝土梁为研究对象,提出光圆钢筋粘结强度计算公式,深入分析了光圆钢筋粘结强度低对混凝土梁承载力的影响。基于拉压杆模型和标准桁架模型分别对光圆钢筋混凝土梁的承载力进行了计算,理论分析结果表明梁体承载力的试验值与理论计算值之比的平均值分别为 1.460 和 1.309,方差分别为 0.858 和 0.781,上述模型因未能充分考虑箍筋与弯剪段混凝土的抗剪贡献,致使计算结果与试验结果之间误差较大。进一步提出了可辨别光圆钢筋混凝土梁发生多种失效模式的变角桁架计算模型,并通过 32 根光圆钢筋混凝土梁的试验数据对修正后的变角桁架模型进行验证。结果表明:光圆钢筋混凝土梁承载力的试验值与理论值之比的平均值为 1.034,方差为 0.100,二者吻合较好,且可准确预测光圆钢筋混凝土梁的破坏模式。因此,本文建议的修正变角桁架模型可用于光圆钢筋混凝土梁的承载力计算与破坏模式预测分析。

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标题: EXPERIMENTAL STUDY ON MECHANICAL BEHAVIOR OF STEEL REINFORCED CONCRETE STOCKY COLUMN WITH MONOSYMMETRIC CROSS-SHAPED STEEL UNDER AXIAL COMPRESSION

标题: 单轴对称十字型钢混凝土短柱轴压性能试验研究

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作者关键词: composite column; monosymmetric cross-shaped steel; axial compression test; load-carrying capacity; ductility

作者关键词: 组合柱; 单轴对称十字型钢; 轴压试验; 承载力; 延性

摘要: To investigate the axial compression behavior of the composite column with monosymmetric crossshaped steel, 9 stocky columns were tested under axial compression. The experimental parameters were the crossshaped steel eccentricity ratio, concrete strength, steel ratio and volume-stirrup ratio. The failure pattern, the loaddeformation curves, the law of strain change of the specimens were obtained by the test. The stress mechanism and the influences of four parameters on axial compression behavior of the composite columns were analyzed. Based on Mander model, a calculation method of axial bearing capacity for the composite column is proposed by partitioning different confined areas of concrete. The experimental results show that the specimen failure was concentrated in the reverse cross-shaped steel eccentric direction. The steel profile, longitudinal bar, stirrup and concrete can work together, and the strength of them can be mobilized. The axial compressive bearing capacity and ductility of the specimen decrease with the increase of eccentricity and stirrup spacing of cross steel. Increasing the concrete strength and the steel ratio can enhance the axial bearing capacity of the specimens. However, increasing the concrete strength reduced the ductility of the specimens. The axial bearing capacities of the specimens calculated by the JGJ138-2016, EC4 and ACI318-14 are relatively conservative. Calculation results from the axial bearing capacity formula proposed for the composite column under axial compression agree well with the test results.

摘要: 为研究单轴对称十字型钢混凝土柱轴压性能,对9根短柱进行轴压试验,试验参数为十字型钢偏心率、混凝土强度、含钢率和配箍率。试验得到试件破坏形态、荷载-变形曲线、应变变化规律,分析了组合柱受力机理及各参数对其轴压性能的影响,基于Mander本构模型,通过划分不同的混凝土约束区,提出该组合柱轴压承载力计算方法。结果表明:试件破坏集中在纵向H型钢偏心方向远侧;型钢、纵筋、箍筋及混凝土协同工作,各种材料强度充分利用;试件轴压承载力和延性随十字型钢偏心率和箍筋间距增大而降低;混凝土强度和含钢率提高,试件轴压承载力提高,但试件延性随混凝土强度提高而显著降低;采用中国JGJ138-2016、欧洲EC4和美国ACI318-14计算的试件轴压承载力均偏低,该文提出的轴压承载力计算方法计算值与试验值吻合良好。

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作者: 段留省; 夏瑞林; 周天华

标题: Finite element analysis on tensile performance of high-strength steel plate composite bolt

标题: 高强钢板组合螺栓抗拉性能有限元分析

来源出版物: 哈尔滨工业大学学报 卷: 52 期: 10 页: 102-110 出版年: 2020

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作者关键词: blind bolt; steel plate drilling and tapping; stress distribution; thickness to diameter ratio; failure mode; thread

作者关键词: 单边螺栓; 钢板攻丝; 应力分布; 厚径比; 破坏模式; 螺纹

摘要: Drilled and tapped high-strength steel plates are possible replacements of nuts and can be combined with high-strength bolts to form new assemblies that are used as blind bolts for steel tube column frame joints. In order to study the tensile capacity and failure mechanism of steel plate composite bolts, on the basis of our experimental research results, 64 specimens were tested under monotonic tensile load by ABAQUS software. The thicknesses of four types of steel plates (i. e., Q345B, 45#, Q460C, and Q690D) and the diameters of five specifications of high-strength bolts (i. e., M16, M20, M24, M27, and M30) in grade 10.9 were investigated. Results show that the Q345B, Q460C, and Q690D steel plates can replace the 45# steel plate. The tensile value of the steel plate composite bolts can be designed as 70% of the ultimate tensile load of the screw thread under reliable anchored. For thin steel plates, the bolt was pulled out, the steel plate thread experienced shear failure, the out-of-plane deformation of the steel plate was larger than 1/200 of the support distance, and the screw maximum stress located in the anchoring area. For thick steel plates, the bolt experienced tensile fracture, and the screw maximum stress located in the structural area. The positions of the maximum stress of the steel plates in the two failure modes were both at the first thread. In order to avoid the steel plate thread failure in the steel plate composite bolt, it is

suggested that the thicknesses of Q345B,Q460C,and Q690D steel plates should be no less than 1.15d,1.10d, and 0.95d,respectively. Based on the elastic mechanics and thread-related research,the formula for tensile capacity of high-strength steel plate composite bolts was derived. The calculated results were in good agreement with the finite element results. The research results can provide a reference for the design of high-strength steel plate composite bolts.

摘要: 高强钢板钻孔攻丝后替代螺母,与高强螺杆组合成一种新的单边螺栓连接副,可用于钢管柱框架节点.为研究钢板组合螺栓抗拉承载力和破坏机理,在本组试验研究的基础上对 4 类钢板组合螺栓共 64 个试件进行单调拉伸数值模拟,以板厚和螺杆直径为研究变量,包括 Q345B、45 号钢、Q460C 和 Q690D 四种钢材和 10.9 级 M16、M20、M24、M27 和 M30 五种规格高强螺栓.结果表明: Q345B、Q460C 和 Q690D 均可作为 45 号钢的替代材料;钢板组合螺栓在锚固可靠的条件下,可按螺杆螺纹极限抗拉荷载的 70%作为其抗拉设计值;钢板较薄时,发生钢板螺纹滑牙破坏,螺栓拔出,螺杆最大应力位于锚固区,钢板向外凸起,凸起量大于支点间距的 1/200;钢板较厚时,发生螺杆拉断破坏,螺杆最大应力位于构造区,两种破坏模式中钢板的最大应力均位于钢板螺纹第一扣处.为保证钢板组合螺栓不发生钢板螺纹滑牙破坏,建议 Q345B 钢板厚度不宜低于 1.15d; Q460C 钢板厚度不宜低于 1.10d; Q690D 钢板厚度不宜低于 0.95d,根据弹性力学和螺纹传力机理推导高强钢板组合螺栓抗拉承载力公式,公式计算结果与有限元结果吻合良好,研究成果可为钢板组合螺栓的设计提供参考.

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作者: 熊二刚; 祖坤; 张倩; 谭赐; 赵娜娜; 丁怡洁

标题: Experimental Study on Mechanical Behavior of RC Beams Based on Compressive Force Path Method

标题: 基于压力路径法的 RC 梁受力性能试验研究

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作者关键词: compressive force path method; shear capacity; experimental study; shear-to-span ratio; stirrup

作者关键词: 压力路径法; 抗剪承载力; 试验研究; 剪跨比; 箍筋

摘要: In order to study the mechanical behavior of reinforced concrete beams based on compressive force path method, six groups of specimens with shear-to-span ratios of 4.0, 3.0, 2.5, 2.0, 1.5 and 1.0, with two beams in each group, were designed. Through the monotonic loading test, the influence of different shear-to-span ratios on the mechanical behavior of reinforced concrete beams based on compressive force path method was investigated. By comparing the results with those of reinforced concrete beams under the Chinese code for design of concrete structures, the mechanical properties such as failure process and failure mode, ultimate load, load-deflection curves and load-strain curves were analyzed. The results show that the stress transmitted along the compressive force path is the main factor affecting the shear capacity of the test beams. Under the six different shear-to-span ratios in the test, the shear capacity of the beam reinforced by the compressive force path method can be well guaranteed, and the ultimate loads are not significantly different from those of the beams designed by the current code in China, but the amount of shear stirrup according to the compressive force path method can be desirably reduced. In addition, more stirrups can be saved with smaller shear-to-span ratio. The effectiveness and rationality of the compressive force path method was finally verified by experiments.

摘要: 为研究基于压力路径法的钢筋混凝土梁的受力性能, 设计了剪跨比分别为 4.0、3.0、2.5、2.0、1.5、1.0 的 6 组试件, 每组 2 根梁, 通过单调加载试验, 探讨了剪跨比对压力路径法配筋梁受力性能的影响规律, 并将结果与我国混凝土结构设计规范配筋梁进行了对比, 分析了破坏过程及破坏模式、极限荷载、荷载-挠度变化、荷载-应变变化等力学性能。结果表明: 试验梁中沿压力路径传递的应力是影响构件抗剪承载力的主要因素, 在所采用的 6 种剪跨比下, 压力路径法配筋梁能保证梁的抗剪承载力, 其极限荷载与规范法配筋梁的相差并不明显, 但基于压力路径法配筋能够减少箍筋用量, 且剪跨比越小, 所节约的箍筋量越大。试验结果验证了基于压力路径法配筋的合理性及有效性。

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标题: Superposition Method for Bearing Capacity of Cold-formed Thin-walled Steel Built-up Box Section Short Columns

标题: 冷弯薄壁型钢拼合箱形截面短柱承载力叠加法

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作者关键词: cold-formed thin-walled steel; built-up box section short columns; local buckling; experiment; finite element analysis; superposition method

作者关键词: 冷弯薄壁型钢; 拼合箱形截面短柱; 局部屈曲; 试验; 有限元分析; 叠加法

摘要: Based on the effective width method(EWM) in the Chinese code GB50018-2002 and the EWM and direct strength method(DSM) in the North American code, the local buckling bearing capacity of 66 cold-formed thin-walled steel(CFS) built-up box section short columns composed of C-section and U-section assemblies connected by ST4.8 self-tapping screws was calculated by using the available results from experiment and finite element parametric analysis. The comparison between theoretical values and experimental and finite element(FE) values shows that the calculation results obtained from the EWM in GB50018-2002 and American Iron and Steel Institute(AISI) are conservative, while the results calculated by DSM are accurate but unsafe. Based on the above results, a superposition method was presented, and a theoretical calculation model for CFS built-up box-section short columns failed in local buckling under axial compression was proposed. Then, according to the variable parameter results of 48 finite element specimens, the combination coefficient(α) of the theoretical calculation formula was obtained from regression analysis, and the formula for calculating the ultimate bearing capacity of the built-up columns was obtained. Finally, the applicability and accuracy of the proposed design method were verified by comparing with the test data and the calculation results of Chinese and American codes. It also provides a simple method for calculating the bearing capacity of CFS built-up box-section short columns.

摘要: 基于中国规范 GB 50018-2002 中的有效宽度法和北美规范中的有效宽度法及直接强度法, 利用已有的试验数据和文章中有限元参数分析结果, 计算了 66 根通过 ST4.8 自攻螺钉将单肢 C 形及单肢 U 形截面构件连接而成的冷弯薄壁型钢(CFS)拼合箱形截面短柱局部屈曲的承载力. 理论值与试验和有限元值比较分析表明: 中国规范 GB 50018-2002 和北美规范有效宽度

法计算结果偏于保守,而北美规范直接强度法可以准确预测构件的承载力,但会存在不安全现象.基于以上结果,给出了关于冷弯薄壁型钢拼合箱形截面短柱局部屈曲承载力的计算方法---叠加法,并提出了关于 CFS 拼合箱形截面轴压短柱的理论计算公式.然后依据 48 根有限元试件的变参数结果,回归分析得出理论计算公式的组合系数 α ,得到计算拼合柱极限承载力的公式.最后通过与试验数据及中美规范计算结果对比,验证了承载力叠加法的适用性与准确性,也为 CFS 拼合箱形截面短柱承载力的计算提供了简易的方法.

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标题: Numerical Simulation and Test Validation for Concreted Filled Steel Tube Columns Under Blast Loading

标题: 钢管混凝土柱抗爆性能数值模拟与实验验证

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作者关键词: structural engineering; concrete-filled steel tube column; blast loading; dynamic response

作者关键词: 结构工程; 钢管混凝土柱; 爆炸荷载; 动力响应

摘要: Based on the LS-DYNA nonlinear finite element program and multi-material fluid-solid coupling method, the finite element model was developed to analyze dynamic responses and damage mechanisms of concreted filled steel tube(CFST)columns under blast loading, which were

validated through comparison between simulated results and tested ones of the full-scale specimens. The effects of main parameters including the section form, the scale distance, the concrete strength, the steel strength and the section shape characteristics on the blast-resistant performance of the CFST columns were investigated with the finite element model. The results indicate that, the CFST columns have excellent anti-blast performances, and the proposed finite element model predicts the dynamic responses of the CFST columns under blast loading efficiently; the anti-blast performance of circular CFST columns is better than that of square ones; increasing the material strength and the length-width ratio of a rectangular CFST column can improve the blast-resistant performance, and decreasing the radius-thickness ratio of a circular CFST column also can promote that resistance.

摘要: 利用 LS-DYNA 非线性有限元程序, 基于多物质流固耦合方法, 建立了爆炸荷载作用下钢管混凝土柱的动态响应数值模型. 对比分析了模拟结果与足尺构件的爆炸破坏实验结果, 验证了数值模型和计算方法的有效性, 并运用参数化分析方法, 研究了截面形式、比例距离、混凝土强度及钢材等级、截面形状特性等关键参数对钢管混凝土柱抗爆性能的影响. 研究结果表明: 钢管混凝土柱具有优越的抗爆性能, 所建立的数值模型能够有效地分析钢管混凝土柱在爆炸荷载作用下的动态影响及破坏形态; 圆形截面钢管混凝土柱的抗爆性能优于方形截面; 提高材料等级、减小圆形截面钢管混凝土柱的径厚比、增大矩形截面钢管混凝土柱的长宽比, 均有利于提升钢管混凝土柱的抗爆特性.

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作者: Yan Weiheng; Ji Minghui; Dai Peng; Zhang Yujie

作者: 颜卫亨; 姬明辉; 代鹏; 张玉杰

标题: Numerical simulation of snow drifting on pyramidal hipped roof

标题: 攒尖四坡屋面风致雪漂移的数值模拟

来源出版物: 计算力学学报 卷: 37 期: 5 页: 585-595 出版年: 2020

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文献类型: Article

作者关键词: pyramidal hipped roof; snow drifting; numerical simulation; roof partition; snow distribution factor

作者关键词: 攒尖四坡屋面; 风致雪漂移; 数值模拟; 屋面分区; 积雪分布系数

摘要: Numerical simulation was conducted to research snow drifting on pyramidal hipped roof based on Euler-Euler method and one-way coupling assumption of wind and snow, using computational fluid dynamics software. The Mixture model was selected to simulate snow drifting around a cube and on a stepped flat roof. Reliability and reasonability of the numerical simulation method was verified by comparing simulation results with observed data, and key techniques and parameters of a numerical wind tunnel were discussed and analyzed and discussed. The analysis models and cases were designed according to functional requirements of a pyramidal hipped house. The partition of roof was determined on the basis of trial calculation. Regarding wind speed at 5 m/s, 7 m/s, 9 m/s, 11 m/s, 13 m/s, 15 m/s, wind direction 0°, 15°, 30°, 45°, and roof slope 25°, 30°, 34°, 40°, 45° as variable parameters, through numerical simulation of 120 working conditions for a pyramidal hipped house, the basic law of erosion and deposition on roof is obtained, and snow distribution factor which can be used for snow resistance design is put forward. The results show that the change of wind direction angle will lead to a great change in the snow distribution on the roof, and changes in wind speed and roof slope have a great impact on the overall snow cover.

摘要: 为获得攒尖四坡屋面的风致雪漂移规律, 基于欧拉-欧拉方法和风雪单向耦合假定, 运用计算流体动力学软件, 选取 Mixture 模型分别对立方体周边和高低屋面上的风致雪漂移运动进行数值模拟, 将模拟结果与两者的实地观测数据对比, 探讨分析数值风洞的关键技术和参数设置, 验证数值模拟方法的合理性与可靠性。依据攒尖四坡房屋的使用功能要求, 设计分析模型与分析工况, 在试算的基础上对屋面进行分区。以风速 5 m/s, 7 m/s, 9 m/s, 11 m/s, 13 m/s 和 15 m/s, 风向角 0°, 15°, 30° 和 45° 以及屋面坡度 25°, 30°, 34°, 40° 和 45° 为分析参数, 对攒尖四坡房屋的 120 种工况进行数值模拟, 得到屋面各分区侵蚀沉积的基本规律, 提出可用于抗雪设计的屋面积雪分布系数。研究表明, 风向角的改变会使屋面积雪分布状态发生较大程度的变化, 风速和屋面坡度的变化对屋面整体积雪量有较大影响。

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作者: Zhang Changguang; Gao Benxian; Shan Yepeng; Li Zonghui

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标题: Unified plastic solution for stress and displacement of tunnels in cold regions considering transversely isotropic frost heave

标题: 横观各向同性冻胀寒区隧道应力与位移的塑性统一解

来源出版物: 岩土工程学报 卷: 42 期: 10 页: 1825-1831 出版年: 2020

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文献类型: Article

作者关键词: cold-region tunnel; unified strength theory; frost-heave force; intermediate principal stress; transversely isotropic frost heave

作者关键词: 寒区隧道; 统一强度理论; 冻胀力; 中间主应力; 横观各向同性冻胀

摘要: The unified strength theory is used as a yield criterion to determine the plastic state of frozen surrounding rock of tunnels in cold regions. Taking comprehensive influences of the intermediate principal stress effect and transversely isotropic frost heave on the strength of frozen surrounding rock into account, a unified analytical plastic solution for the stress and displacement of tunnels in cold regions is proposed. A method is then introduced to address the plastic state of frozen surrounding rock. Furthermore, discussions, verifications and parametric studies of the proposed solution are performed. It is found herein that the validity of the unified solution is demonstrated by comparing with the results from Mohr-Coulomb criterion and circumscribed Drucker-Prager criterion available in the reference, thus it is of extensive theoretical significance and good engineering application prospect. The intermediate principal stress has a significant impact on the displacement of frozen surrounding rock, and then more rock strength potentialities are achieved. The frost-heave force increases with the increase of the anisotropic frost-heave coefficient and the volumetric frost-heave strain. It results in that the stability of tunnels in cold regions decreases, and effective insulation measures are taken to reduce the frost-heave effect of the surrounding rock. The result of this study can provide some theoretical suggestions for the design of tunnels in cold regions.

摘要: 以统一强度理论作为寒区隧道冻结围岩塑性状态的判定依据, 考虑中间主应力效应和横观各向同性冻胀对围岩强度的综合影响, 建立了寒区隧道应力与位移的塑性统一解析解, 给出冻结围岩塑性状态的判定方法, 并对所得解答进行讨论、验证和参数分析。研究表明: 统一解的正确性被有关文献的 Mohr-Coulomb 准则解答和外接圆 Drucker-Prager 准则解答所验证, 具有广泛的理论意义和良好的工程应用前景; 中间主应力对冻结围岩位移的影响显著, 应考虑中间主应力效应以充分发挥寒区隧道的承载潜能; 围岩不均匀冻胀系数和体积冻胀率的增加均导致冻胀力增大, 使得寒区隧道稳定性降低, 应采取有效保温措施予以缓解围岩冻胀效应。该结果可为寒区隧道设计提供一定的理论指导。

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作者: Wang Yihong; Zhao Xiaoqin; Yao Shengfa; Liu Xi

作者: 王毅红; 赵小琴; 姚圣法; 刘喜

标题: Experiments on the performance of bond anchorage between high strength variable rib reinforcement and concrete

标题: 高强变肋钢筋与混凝土间粘结锚固性能梁式试验

来源出版物: 重庆大学学报. 自然科学版 卷: 43 期: 9 页: 32-40 出版年: 2020

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文献类型: Article

作者关键词: high strength steel bar; shape of reinforcement; transverse rib spacing; bonded anchorage; beam test

作者关键词: 高强钢筋; 钢筋外形; 横肋间距; 粘结锚固; 梁式试验

摘要: To study the influence of the increase of cross rib spacing on the bond-slip behavior between 630 MPa high-strength steel bars and concrete, a test was carried out on the bond-slip behavior between steel bars and concrete by the beam bond test method, with using 42 standard shape steel bars and reinforcement with increased cross rib spacing. The influences of the thickness of concrete cover, diameter of rebars and anchorage length on the bond and anchorage performance of two types of rebars and concrete were analyzed. The results show that the bond strength between 630 MPa high-strength steel bar and concrete with increased cross rib spacing is not lower than that of standard shape high-strength steel bars, and the change of bond strength of two types of steel bars and concrete is basically consistent with that of concrete strength, steel bar diameter and anchorage length. The increase of the distance between transverse ribs has no significant effect on the bond-slip behavior of 630 MPa steel bar and concrete.

摘要: 为研究横肋间距增大对 630 MPa 级高强钢筋与混凝土间的粘结锚固性能的影响,文中采用梁式粘结试验方法,对 42 根标准外形钢筋和横肋间距增大钢筋与混凝土的粘结锚固性能进行试验,对比分析了混凝土保护层厚度、钢筋直径、锚固长度等因素对两类钢筋与混凝土粘结锚固性能的影响。结果表明:横肋间距增大的 630 MPa 级高强钢筋与混凝土的粘结强度不低于标准外形高强钢筋,两类钢筋与混凝土的粘结强度随混凝土强度、钢筋直径、锚固长度变化规律基本一致。横肋间距增大对 630 MPa 钢筋与混凝土的粘结锚固性能无显著影响。

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作者: 柴少波; 王昊; 井彦林; 贾能

标题: Experimental study on dynamic compression characteristics of rock with filled joints after cumulative damage

标题: 充填节理岩石累积损伤动力压缩特性试验研究

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文献号: 1000-6915(2020)39:10<2025:CTJLYS>2.0.TX;2-#

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作者关键词: rock mechanics; filled joints; cumulative damage; dynamic compression; mechanical properties; joint thickness

作者关键词: 岩石力学; 充填节理; 累积损伤; 动态压缩; 力学特性; 节理厚度

摘要: The dynamic mechanical behaviour of filled rock joints and its influence on stress wave propagation are important bases for dynamic response analysis and safety evaluation of rock mass engineering. In view of the lack of research on the cumulative damage and the strength weakening of filled joints by dynamic loading disturbance, series of tests are carried out on the artificial filled

jointed rock samples to study the damage evolution rule under the cumulative impacts and its influences on the dynamic mechanical properties in this present paper. A simply equipped drop hammer impact device is used to carry out multiple pre-impact tests on the jointed rock samples, then the cumulative damage law is analyzed through the change of the wave velocity. On this basis, the dynamic impact tests of SHPB are carried out on filled jointed rock samples after different numbers of pre-impact. Based on the test results, the influence of cumulative damage on the dynamic mechanical properties of the filled jointed rock is analyzed from the aspects of strength deformation characteristics, wave propagation characteristics and energy dissipation.

摘要: 充填节理的动态力学特性及其对应力波传播规律的影响是岩体工程响应和安全性评价的重要依据。由于现有对充填节理岩石累积损伤及动力强度弱化特性研究较少, 研究对人工充填节理岩石试样展开了系列试验, 分析了岩样累积冲击作用下的损伤演化规律及其对动态力学性能的影响。首先, 利用简易落锤冲击装置对岩样进行多次预冲击试验, 通过波速变化分析了充填节理岩样的累积损伤变化规律。在此基础上, 对不同次数预冲击作用后的充填节理岩石试样进行了 SHPB 动态冲击破坏试验。通过试验结果, 分别从岩样的强度变形特征、波传播特性以及能量耗散等方面分析了累积预冲击作用对充填节理岩石动态力学性能的影响。

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标题: Research on evacuation efficiency of high-rise building in case of fires considering incentive mechanism

标题: 激励机制下的高层建筑火灾人员疏散效率研究

来源出版物: 中国安全科学学报 卷: 30 期: 8 页: 79-85 出版年: 2020

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作者关键词: high-rise building fire; evacuation efficiency; incentive mechanism; expectation theory; potential stimulation

作者关键词: 高层建筑火灾; 人员疏散效率; 激励机制; 期望理论; 潜能激发

摘要: In order to explore influence of incentive mechanism on high-rise building fire evacuation, potency, expectation and instrumentality were analogized in evacuation studies by using Vroom's expectation theory, potential value that evacuees can be stimulated was quantified and its impacts on evacuation speed were analyzed. Then, with fire evacuation of a high-rise commercial building as an example, influence of incentive mechanism on evacuation speed was introduced and compared with cases without considering it. The results show that with incentive mechanism, it takes 500 s to evacuate which will be 630 s otherwise. The former has higher evacuation efficiency as a whole while that of the latter is close to 0 after 520 s. Incentive mechanism significantly increases human body's tolerance limit of fire products, reduces impact of smoke on evacuation speed in early stages of fire, and delays life-threatening time point, thus improving evacuation efficiency indirectly.

摘要: 为探究激励机制对高层建筑火灾人员疏散的影响,采用弗鲁姆期望理论,将效价、期望值、工具性类比到疏散研究中,量化逃生人员可被激发的潜能值,分析对疏散速度的影响;以某高层商业建筑火灾疏散为例,将激励机制对疏散速度的影响导入疏散分析,并与未考虑激励机制的情况进行比较。结果表明:考虑激励机制的疏散时间为 500 s,未考虑激励机制的疏散时间为 630 s,前者疏散效率整体较高,后者在 520 s 后,疏散效率接近于 0;激励机制显著增加了人体对火灾产物的耐受极限,使得火灾初期的烟气对疏散速度的影响降低,将威胁生命的时间点延后,间接提高了疏散效率。

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标题: Study on Flexural Performance of Cold-formed Thin-walled Steel-Fine Aggregate Concrete Composite Beams

标题: 冷弯薄壁型钢-细石混凝土组合梁抗弯性能研究

来源出版物: 湖南大学学报. 自然科学版 卷: 47 期: 9 页: 23-32 出版年: 2020

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作者关键词: cold-formed thin-walled steel; fine aggregate concrete; composite beam; bending bearing capacity; experimental study

作者关键词: 冷弯薄壁型钢; 细石混凝土; 组合梁; 抗弯承载力; 试验研究

摘要: In order to study the flexural performance of cold-formed thin-walled steel-fine aggregate concrete composite beams, static tests were carried out on three composite beams with different shear structures. The failure mode and bearing capacity of composite beams were investigated. The failure characteristics of composite beams include shear failure and torsion of joist web, plastic yield of upper flange of the joists, pull-out of part of the shear screws and cracks in concrete, which lead to overall failure of composite beams. The test results show that setting shear connectors has insignificant effect on the ultimate bearing capacity, but can increase the bending stiffness. An ANSYS finite element model is established for numerical simulation as well as parametric analysis based on the calibrated model. The results show that reducing the screw spacing, increasing the strength of steel, increasing the web height of joists or the thickness of concrete can improve the bearing capacity. Bending bearing capacity formulas with a modified coefficient which considers the influence factors of the web height of joists and screw spacing are proposed. The accuracy of the proposed formulas is verified by comparing the theoretical calculation results with the experimental results and finite element analysis results.

摘要: 为研究冷弯薄壁型钢-细石混凝土组合梁的抗弯性能,对 3 个不同抗剪构造的组合梁进行了单调静载试验,考察了组合梁的破坏形式、承载能力等.组合梁的破坏特征为托梁腹板剪切破坏并出现扭转,托梁上翼缘屈服、部分抗剪螺钉拔起、混凝土出现贯通裂缝继而组合梁发生整体破坏.试验结果表明:设置抗剪件对组合梁极限承载力无显著影响但可提高组合梁抗弯刚度.建立 ANSYS 有限元模型进行数值模拟,并对验证后的有限元模型进行变参数分析,研究结果表明:减小螺钉间距、提高钢材强度、增加托梁腹板高度、增加混凝土厚度均会提高组合梁承载力.最后,基于考虑托梁腹板高度、螺钉间距等影响因素修正系数 η ,提出了组合

梁抗弯极限承载力公式,并与试验结果、有限元结果对比,验证了公式的正确性.

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标题: Study on Shear Test Method of Earthen Based Masonry Along Mortar Joint

标题: 生土基砌体沿通缝抗剪试验方法研究

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作者关键词: earthen based materials; masonry; shear strength; test method; analytic hierarchy process

作者关键词: 生土基材料; 砌体; 抗剪强度; 试验方法; 层次分析法

摘要: To determine a suitable shear test method of earthen based masonry along mortar joint, the effects of block type, horizontal mortar joint, load position and mortar joint material on the shear resistance of the masonry concrete along the joint were analyzed by conducting double shear tests on 48 different types of earthen based masonry. Based on the analytic hierarchy process, the different shear test methods were comprehensively evaluated, and a suitable method for the

masonry of the earthen based masonry was determined. The results showed that the shear test method had a significant effect on the shear resistance of the masonry joints along the mortar joints. The shear strength of the specimens containing horizontal mortar joints was generally higher than that of the 3-brick specimens. The load position had a certain influence on the shear strength of the 6-brick specimen. The shear strength of the half-brick specimen was higher than that of the whole brick specimen in most cases. The bonding properties of special mortar with the block is preferably. The shear strengths of mortar specimens were 10~65 times that of slurry specimens. The 4-brick specimens showed significant advantages in terms of test operability and specimen stress state, and the comprehensive evaluation value was the highest, i.e., 0.32. The 4-brick shear test method was recommended as the shear test method of earthen based masonry along mortar joint.

摘要: 为确定一种适用于生土基砌体沿通缝抗剪试验方法,通过对 48 个不同种类生土基砌体进行双剪试验,分析了块材种类、水平灰缝、荷载作用位置、灰缝材料等因素对生土基砌体沿通缝抗剪性能的影响,基于层次分析法对不同抗剪试验方法进行综合评价,确定了一种适用于生土基砌体沿通缝抗剪的试验方法。结果表明:抗剪试验方法对生土基砌体沿通缝抗剪性能存在显著影响,含有水平灰缝的试件抗剪强度一般高于不含水平灰缝的 3 砖试件抗剪强度;荷载作用位置对于 6 砖试件的抗剪强度存在一定影响,半砖受荷试件的抗剪强度大多数情况下高于整砖受荷试件的抗剪强度;专用砂浆与块材的黏结性能较好,砂浆试件的抗剪强度约为泥浆试件的 10~65 倍;4 砖试件在试验操作性和试件受力状态方面均表现出显著优势,层次分析法的综合评价值最高,为 0.32,建议采用 4 砖抗剪试验方法作为生土基砌体沿通缝抗剪的标准试验方法。

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标题: Study on the strength relation of cubic specimens, adobes and masonry

标题: 标准试件、土坯及土坯砌体强度关系研究

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作者关键词: earth material; standard specimen; adobe; adobe masonry; compressive strength; strength relationship

作者关键词: 生土基材料; 标准试件; 土坯; 生土砌体; 抗压强度; 强度关系

摘要: In order to obtain the relationship of compressive strength between earth materials cubic specimens, adobe and adobe masonry, the cube specimens, adobe block specimens and adobe masonry specimens are manufactured by compacted and molded processing respectively. Through uniaxial compressive tests, the failure modes, stress-strain curves and compressive strength of all kinds of specimens are obtained. The compressive strength of standard cubic specimens, adobe and adobe masonry is compared and analyzed, and the relationship between the compressive strength of standard cubic specimens, adobe and masonry is established. The results show that the compressive strength ratio of compacted adobe between cubic specimen, adobe and adobe masonry is 1 : 0.88 : 0.29, and that of molded adobe between cubic specimen, adobe and adobe masonry is 1 : 0.72 : 0.52. The compressive strength of molded specimens is lower than that of corresponding compacted specimens, but the deformation performance is better than that of compacted specimens. The establishment of the relationship of compressive strength has guiding significance for the strength selection of different kinds of earth specimens and the conversion of the strength of standard specimens in practical engineering, and can also provide reference for the formulation of relevant norms and standards.

摘要: 为了得到生土基材料标准立方体试件、土坯及土坯砌体之间的抗压强度关系,分别采用干打和湿制两种传统工艺制作标准立方体试件、土坯块材试件和土坯砌体试件,通过单轴抗压试验,获得各类试件的破坏形态、应力-应变曲线、抗压强度,对比分析了标准立方体试件、土坯、土坯砌体间抗压性能的差异,建立了生土基材料立方体试件、土坯和砌体的抗压强度关系。研究表明:干打标准立方体试件、土坯及土坯砌体的抗压强度比值为 1 : 0.88 : 0.29;湿制标准立方体试件、土坯及土坯砌体的抗压强度比值为 1 : 0.72 : 0.52。由湿法制作的试件,其抗压强度均明显低于相应的干打试件,但变形性能优于干打试件。该抗压强度关系的建立对实际工程中不同种类生土基试件强度的取值及标准试件强度的换算有指导意义,也可作为相关规范、标准的制定提供参考。

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标题: Research on Shear Strength of Interior Joints in Corroded Reinforced Concrete Frame

标题: 锈蚀钢筋混凝土框架中节点抗剪强度研究

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作者关键词: Concrete structures; Corrosion; Joints; Shear strength; Coupling effect

作者关键词: 混凝土结构; 锈蚀; 节点; 抗剪强度; 耦合作用

摘要: With the increasing of service time, due to the corrosion of steel bars, the bearing performance of reinforced concrete frame joints under erosion environment is reduced, which seriously affects the safety of building structures. Based on existing theoretical models of shear strength of reinforced concrete frame joints, the calculation formula of shear strength of corroded reinforced concrete frame joints was proposed by considering the effect of steel bars corrosion. The test results of 11 sets of corroded reinforced concrete joints were used to validate the suggested model. The results show that the ratios between test values and calculated values of shear strength of corroded joints is 0.951, and the variance is 0.075, which is in good agreement. The calculation method proposed in this paper can analyze the bearing capacity of corroded reinforced concrete frame joints.

摘要: 随着服役时间的增长, 侵蚀环境下钢筋混凝土框架节点因钢筋发生不同程度的锈蚀而造成承载性能下降, 严重影响建筑结构的安全使用。本文在已有钢筋混凝土框架节点抗剪强度理论模型的基础上, 考虑钢筋锈蚀对框架节点受力性能的影响, 建立锈蚀钢筋混凝土框架中节点受剪承载力计算公式。通过 11 组锈蚀钢筋混凝土节点试验数据, 对建议理论模型进行验证。研究表明, 锈蚀钢筋混凝土节点受剪承载力试验值与理论计算值之比的平均值为 0.951, 方差为 0.075, 二者吻合较好, 本文建议的计算方法可用于锈蚀钢筋混凝土框架中节点承载力分析。

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标题: 单箱多室波形钢腹板箱梁的横向受力分析

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作者关键词: bridge engineering; composite box girder with corrugated steel webs; finite element method and experiment method; transverse force; effective distribution width; multiple wheel loads; single-box multi-cell

作者关键词: 桥梁工程; 波形钢腹板箱梁; 有限元与试验方法; 横向受力; 有效分布宽度; 多点加载; 单箱多室

摘 要 : To investigate the characteristics of transverse force in the top slabs of a single-box triple-cell composite box girder with corrugated steel webs (CBGCSW) and the effective distribution width under wheel loads, a finite element model of a single-box CBGCSW with single-cell, double-cell and triple-cell was established. The regulation of transverse stress and effective distribution width of three different box girders were compared. The results of finite element analysis, which had been verified by scaled-models tests, show that the transverse force in a single-box multi-cell CBGCSW can be approximately simplified as that of a single-box single-cell box girder. However, there is a big error in calculating the effective distribution width of CBGCSW according to the current code. Using finite element models, the influences of the

transverse location of wheel load, the distance between webs, the length of flange slabs, the thickness of top slabs, the size and type of corrugated steel webs on the effective distribution width of a single-box single-cell CBGCSW were analyzed. It is shown that the transverse location of wheel load and the distance between webs of loading chambers are the most important factors. The practical calculation formulas of the effective distribution width of a single-box single-cell CBGCSW were obtained by the surface fitting according to results of parametric analysis. The formulas of the effective distribution width of a single-box multi-cell CBGCSW were proposed to be 0.9 times of that of a single-cell CBGCSW. Finally, the transverse stress in the top slab of a single-box triple-cell CBGCSW were analyzed as an illustration under transverse single and multiple wheel loads, separately. The transverse stress was calculated by the elastic frame method, using the effective distribution width calculated by formulas proposed and the current code method. The results, compared with the finite element analysis, show that when transverse multiple wheel loads were imposed the calculated transverse stress may be unsafe, on the condition that the effective distribution width of different chambers were adopted as the same value. Consequently, the stress reduction factor of transverse stress in adjacent chamber which is presented in this paper are proposed to improve accuracy. The formulas presented are more accurate than those of current code, and the errors can be reduced by 20%-40%, comparing with current code method.

摘要: 为研究单箱多室波形钢腹板箱梁桥在车轮荷载下的横向受力特点及有效分布宽度,建立了单箱单室、双室、三室波形钢腹板箱梁的有限元模型,对比分析了3种截面箱梁的横向应力和有效分布宽度的规律。通过缩尺模型梁试验,验证了有限元分析结果。通过研究发现,单箱多室波形钢腹板箱梁的横向受力可近似简化为单室箱梁,但按照目前规范计算波形钢腹板箱梁的有效分布宽度存在较大误差。利用有限元模型,研究了荷载横向作用位置、腹板中心间距、悬臂板长度、顶板厚度、波形钢腹板尺寸及类型等参数对单箱单室箱梁有效分布宽度的影响,结果表明荷载横向作用位置和箱室腹板中心间距是最重要影响因素。通过对参数分析结果进行曲面拟合,得到了单箱单室波形钢腹板箱梁的有效分布宽度计算公式;单箱多室箱梁有效分布宽度可按0.9倍的单室箱梁有效分布宽度计算。最后,以某单箱三室波形钢腹板箱梁桥为例,按照该文公式求得有效分布宽度,采用弹性框架法计算了横向单点和多点车轮荷载作用下箱梁的顶板横向应力,并与有限元模型、桥规方法计算结果进行了对比,发现:横向多点车轮加载时,忽略不同箱室有效分布宽度的差异会使横向应力计算结果偏不安全,建议采用该文提出的应力折减系数考虑此因素影响;按照该文方法计算的横向应力结果更精确,与规范方法相比误差可减小20%~40%。

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标题: Static Test of Micro Steel Fiber High-Strength Lightweight Aggregate Concrete

标题: 微细钢纤维高强轻骨料混凝土静力试验研究

来源出版物: 建筑材料学报 卷: 23 期: 4 页: 955-962 出版年: 2020

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作者关键词: lightweight aggregate concrete(LWAC); micro steel fiber; mechanical property;
flexural toughness; strength formula

作者关键词: 轻骨料混凝土; 微细钢纤维; 力学性能; 弯曲韧性; 强度公式

摘要: The static mechanical properties of micro steel fiber high-strength lightweight ceramsite aggregate concrete(MSFHLAC)with different steel fiber volume fractions,sand ratio and water-cement ratio were investigated.The test mainly includes cubic compressive strength,splitting tensile strength,flexural strength,shear strength and bending toughness,etc.In addition,various strength models and mutual relations of MSFHLAC were given.The workability of freshly mixed concrete was shown to reduce with the increase of micro steel fiber volume fraction.When the fiber volume fraction is greater than 1.5%,its fluidity is obviously affected.Micro steel fiber can significantly improve all strength and toughness indexes of HLAC.The tensile and shear strength of materials are improved particularly obviously at low fiber volume fraction(0.5%,1.0%).The MSFHLAC has a better elastoplasticity in the whole bending deformation stage,it is close to the ideal elastoplastic materials.The sand ratio and water-cement ratio have some influence on the strength and toughness of MSFHLAC,but the variation range is within 10%.

摘要: 采用高强页岩陶粒、微细钢纤维和矿物掺和料制备微细钢纤维高强轻骨料混凝土(MSFHLAC)试件,研究了微细钢纤维体积分数、砂率和水灰比对 MSFHLAC 试件立方体抗压强度、劈裂抗拉强度、弯折强度、抗剪强度和弯曲韧性等静态力学性能的影响,同时给出了 MSFHLAC 试件的各项强度模型以及相互关系.结果表明:新拌混凝土的工作性能随着微细钢纤维体积分数的增加而降低,当微细钢纤维体积分数大于 1.5%时,对新拌混凝土的流动性影响明显;微细钢纤维可以显著改善高强轻骨料混凝土(HLAC)的各项强度和韧性指标,且在低纤维体积分数(0.5%和 1.0%)时,材料的抗拉强度和抗剪切强度增长尤为显著;MSFHLAC 试件在整个弯曲变形阶段弹塑性较好,较接近理想弹塑性材料;砂率和水灰比对 MSFHLAC 试件的各项强度和韧性虽有一定影响,但变化幅度基本在 10%以内.

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标题: Development and Application of Multi-point Independent Loading Testing System for Tunnel Lining

标题: 隧道衬砌多点独立加载试验系统研发与应用

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作者关键词: Tunnel engineering; Model test; Multi-point independent loading test system; Loading accuracy; Secondary lining; Mechanical behavior; Crack

作者关键词: 隧道工程; 模型试验; 多点独立加载试验系统; 加载精度; 二次衬砌; 力学性能; 裂缝

摘要: Tunnel lining model test is an indispensable method to study the mechanical and cracking behaviors and guide the design optimization as well as maintenance and reinforcement of tunnel lining structure. This paper introduces a multi-point independent tunnel loading testing system which can apply load on the fifteen key positions of a large size lining model at a low speed and high precision based on the load distribution pattern and magnitude of secondary lining, realizing physical simulation of load induced deformation and cracking behaviors of lining structure under complex loading conditions. Taking a lining section with shallow overburden of certain loess tunnel as the background, a model test of load induced deformation of secondary lining with 1 : 10 similarity ratio is conducted on the basis of site monitoring results of load applied on the secondary lining, and the cracking characteristic and the law of strains changes of secondary lining

are summarized. The results show the loading effect of this system is good and the loading accuracy meets the requirements of engineering test, and the test result is helpful to predict the cracking development and determine the key area of lining reinforcement.

摘要: 隧道衬砌模型试验是一种研究衬砌力学性能和开裂行为、指导隧道衬砌结构设计优化与维修加固的重要试验手段。文章介绍了自主研发的隧道衬砌多点独立加载试验系统,该系统能够按照二次衬砌荷载的分布形态和量值,对大尺寸衬砌模型的15个关键位置进行低速高精度加载,实现复杂受力条件下衬砌结构受力变形和开裂行为的物理模拟。以某黄土隧道浅埋段衬砌断面为试验背景,基于二次衬砌受荷现场监测结果,利用该试验系统进行了相似比为1:10的二次衬砌受力变形模型试验,归纳总结了二次衬砌的开裂特征与应变变化规律。结果表明,该系统加载效果良好,加载精度满足工程试验要求。其试验结果有助于预测二次衬砌裂缝病害发展,明确衬砌加固重点区域,可为衬砌的维修加固提供帮助。

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标题: Seismic performance analysis of self-centering concentrically braced steel frame structures

标题: 自复位中心支撑钢框架结构抗震性能分析

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作者关键词: self-centering; concentrically braced frame; inter-story drift ratio; residual deformation; seismic performance

作者关键词: 自复位; 中心支撑钢框架; 层间位移角; 残余变形; 抗震性能

摘要: To study the seismic performance of self-centering concentrically braced

frame(SC-CBF)structure,the static elasto-plastic analysis,low-cycle repeated loading analysis and elasto-plastic time-history analysis were conducted for a four-story SC-CBP structure,and compared with the traditionally concentrically braced frame(CBF)structure.The effects of different GAP element stiffnesses and cross-sectional areas of prestressed tendon were investigated on the self-centering performance and seismic performance of the SC-CBF structure.The results show that the SC-CBF structure has strong lateral resistance,a small base shear force under earthquake action and a slight residual deformation after unloading.The SC-CBF structure has a better ductility than the CBF structure.The displacement of the structure under the action of very rare earthquake is large,the structure dissipates more energy;the inter-story drift ratio is large and the residual displacement is small,exhibiting its desirable seismic behavior and self-centering performance;while the mechanical behavior of prestressed tendons is significantly affected by the stiffness of the GAP element.However,the overall mechanical and ductility performances of the structure are slightly affected by the influence of the stiffness of the GAP unit,the cross-sectional area of the prestressed tendons has a remarkable influence on the structural overall performance.

摘要: 为了研究自复位中心支撑钢框架(SC-CBF)结构的抗震性能,对一四层 SC-CBF 结构进行了静力弹塑性分析、低周往复加载分析和动力弹塑性时程分析,并与中心支撑钢框架(CBF)结构进行对比,探究了不同 GAP 单元刚度和预应力筋截面积对 SC-CBF 结构自复位性能及抗震性能的影响规律。结果表明:与传统 CBF 结构相比,SC-CBF 结构的抗侧能力强,地震作用下基底剪力小,卸载后的残余变形较小,具有良好的延性性能;在极罕遇地震作用下 SC-CBF 结构的位移响应大,耗散的能量多,层间位移角大而残余位移小,表现出良好的自复位性能和抗震性能;GAP 单元刚度对预应力筋的受力性能影响较为明显,对结构的整体受力性能和延性性能影响较小,但结构的整体受力性能和延性性能受预应力筋截面积影响显著。

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标题: Experimental investigation on seismic performance of assembled concrete-filled double-skin steel tube-steel beam frames

标题: 装配式复式钢管混凝土柱-钢梁框架抗震性能试验研究

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作者关键词: concrete-filled double-skin steel tube; composite structure; fabrication; quasi-static experiment; seismic performance

作者关键词: 复式钢管混凝土; 组合结构; 装配式; 拟静力试验; 抗震性能

摘要: In this paper, a structural system that could realize fully-assembled construction of concrete-filled doubleskin steel tube (CFDST) frames was proposed. The system includes assembled CFDST column-to-column connections and assembled block-type beam-to-column connections. To evaluate the effects of these proposed connections on the seismic performance of CFDST frames, quasi-static test on three 1 : 2 scaled frame models (including a frame with weldbolt beam-to-column joint, a frame with assembled beam-to-column joint and a frame with assembled column and beam-to-column joint) was conducted. The failure modes, hysteretic performance, ductility, strength and stiffness degradation of these specimens were obtained. All of these specimens exhibit good lateral resistance and ductility, the maximum inter-story drift and the displacement-based ductility coefficient of most of the test specimens exceed 4% and 4, respectively. The results show that: both of CFDST frames with traditional and with proposed connections have good seismic performance; the proposed column-to-column connection is reliable and has little influence on lateral resistance, lateral stiffness and ductility of the CFDST frames; the proposed block-type beam-to-column connection could improve the ductility of the CFDST frames, and it could slightly increase the lateral resistance of the CFDST frames.

摘要: 为实现钢管混凝土框架完全装配式施工,提出了装配式复式钢管混凝土柱-钢梁框架结构,该结构包含复式钢管混凝土装配式柱-柱拼接节点和装配式加强块梁柱节点。为研究这些连接形式对复式钢管混凝土框架抗震性能的影响,完成了 3 榀 1 : 2 缩尺框架模型(包括 1 榀节点栓焊连接框架、1 榀装配式节点框架和 1 榀柱与节点全装配式框架)的拟静力试验,得到各试件的破坏模式、滞回性能、延性、刚度与承载力退化。3 个模型均表现出良好的承载能力和延性,试验模型的最大层间位移角超过 4%,位移延性系数大多超过 4。结果表明:传统连接复式钢管混凝土框架和采用装配式方案后的框架均具备良好的抗震性能;所提的柱-柱拼接节点性能可靠,对框架的承载力、刚度和延性的影响很小;所提的加强块梁柱节点可有效改善框架的延性,并略提高框架的承载力。

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第 27 条, 共 59 条

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作者: 谷雅秀; 王俊炜; 刘广东; 潘嵩; 李模华; 王新如

标题: Study on a New Type of Annular Elliptic Finned Tube Evaporative Condenser

标题: 新型椭圆形套管-管翅式蒸发式冷凝器研究

来源出版物: 制冷学报 卷: 41 期: 4 页: 103-110 出版年: 2020

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文献类型: Article

作者关键词: evaporative condenser; finned tube heat exchanger; annular elliptic tube; theoretical analysis; in-situ measurement

作者关键词: 蒸发式冷凝器; 管翅式换热器; 椭圆形套管; 理论分析; 现场实测

摘要: A new evaporative condenser with an annular elliptic finned tube heat exchanger (AEFTHE) was designed and theoretically analyzed in this study. The cooling water flowed inside the round inner tube, while the spray water and cooling air passed outside the elliptical outer tube. The refrigerant flowing between the inner and outer tube was simultaneously condensed by the cooling water, spray water and cooling air. The theoretical heat transfer analysis of the annular elliptic finned tube evaporative condenser was based on the in-situ measurement about the round finned tube evaporative condenser (RFTEC) in Futong Metro Station of Line 14 in Beijing. The simulation results were compared with the actual operating data of the traditional RFTEC. The result showed that the pressure drop in the AEFTHE was 11.18% to 14.65% lower than that of the round finned tube heat exchanger (RFTHE) when the inlet air temperature was 27 °C and air velocity was in the range 3-4 m/s. The outlet refrigerant temperature of the AEFTHE was 2.66 °C to 10.21 °C lower than the simulation value of the RFTHE when the temperature of spray water was in the range 27.5-33.5 °C. The outlet refrigerant temperature of the AEFTHE was 1.9 °C to 4.3 °C lower than the measured value of the RFTHE under the same conditions when the inlet refrigerant temperature was greater than 44 °C. The total heat transfer coefficient of the AEFTHE

was 47.42% higher than that of the RFTHE under the same conditions.

摘要: 本文设计了一种新型椭圆形套管-管翅式蒸发式冷凝器,该冷凝器采用套管结构,制冷剂在圆型内管与椭圆形外管之间的环形区域流动,同时与内管中的冷却水、外管外的喷淋水及冷却空气进行热量交换。以北京阜通地铁站为实测地点,对位于该站的圆管-管翅式蒸发式冷凝器运行数据进行现场实测,以实测数据为基础对椭圆形套管-管翅式蒸发式冷凝器进行传热理论和机理分析,并通过 Fluent 数值模拟,将模拟结果与圆管-管翅式蒸发式冷凝器的实际运行数据进行对比。研究表明:当空气入口温度为 27 °C、空气流速为 3~4 m/s 时,椭圆形套管-管翅式换热器管外压降与圆管-管翅式换热器相比降低 11.18%~14.65%;当喷淋水温度为 27.5~33.5 °C 时,椭圆形套管-管翅式换热器出口制冷剂温度比圆管-管翅式换热器模拟值低 2.66~10.21 °C;当入口制冷剂温度大于 44 °C 时,椭圆形套管-管翅式换热器出口制冷剂温度比圆管-管翅式换热器实测值低 1.9~4.3 °C,其总传热系数比圆管-管翅式换热器提高 47.42%。

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标题: Distribution Method of Node Flow Based on Non-revenue Water and Business Sales Data

标题: 基于产销差和营销数据的节点流量分配方法研究

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文献类型: Article

作者关键词: water supply network model; node flow distribution; non-revenue water (NRW); business sales data

作者关键词: 供水管网模型; 节点流量分配; 产销差; 营销数据

摘要: In order to solve the problem of inaccurate node flow distribution of water supply network hydraulic model,a new node flow distribution method based on a water supply network hydraulic modeling project in J city was proposed.This method first divided the water supply area according to the business sales data,and adopted GIS technology to find the water consumption node by using the water meter up-tracking method.Node flow in the allocation method was the sum of the business scales node flow and the non-revenue water node flow.Business scales node flow was determined by business scales data.The traditional linear flow method and the population density method were used to distribute the difference between the production and sales of the nodes in each water supply area.The node flow rate assigned by the two methods could meet the requirements of flow monitoring point error and pressure measuring point relative error.After comparison,it was found that the model accuracy was higher when the population density method was applied for the flow distribution calculation.

摘要: 为了解决供水管网水力模型节点流量分配不准确的问题,基于 J 市供水管网水力建模项目提出新的节点流量分配方法,此方法先根据营业收费数据将供水区域划分区块,再利用 GIS 技术,采用水表上溯法找出用水量节点,该流量分配方法中的节点流量是营销节点流量和产销差节点流量之和。营销节点流量通过营销数据确定;在各个供水区域分别采用传统沿线流量法和人口密度法分配节点产销差流量。结果表明,两种方法所分配的节点流量都可满足流量监测点误差以及测压点相对误差要求,对比后发现应用人口密度法进行流量分配计算时,模型精度更高。

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标题: RESEARCH ON SHEAR DAMAGE EVOLUTION AND SERVICEABILITY PERFORMANCE OF DEEP FLEXURAL MEMBERS WITH HIGHSTRENGTH LIGHTWEIGHT AGGREGATE CONCRETE

标题: 高强轻骨料混凝土深受弯构件剪切损伤演化与服役性能研究

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文献类型: Article

作者关键词: high-strength lightweight aggregate concrete; deep flexural members; serviceability performance; diagonal crack width; load level

作者关键词: 高强轻骨料混凝土; 深受弯构件; 服役性能; 斜裂缝宽度; 荷载水平

摘要: Accidental overload, prolonged environmental erosion and the deformation caused by temperature change, etc., easily lead to strength reduction and cracking of deep flexural members, eventually affecting their serviceability. A total of 15 high-strength lightweight aggregate concrete (HSLWAC) deep flexural members are tested to systematically study their damage evolution laws under shear load. The influencing factors for the shear service ability including shear span-depth ratio (a/h_0), bearing plate width (l_b) and beam sectional height are considered. The relationship between diagonal crack width and load level is established based on the trend of crack propagation, and the application of diagonal crack width limiting value in current codes to such members is discussed. Test results show that the maximum diagonal crack widths of specimens exhibit an increasing trend with the increase of a/h_0 and l_b , and a sufficient amount of horizontal and vertical web reinforcement can effectively inhibit the diagonal cracking of such members. Both the normalized diagonal cracking strength and the maximum diagonal crack width are less affected by the size effect. During the entire shear failure process, the diagonal crack width shows a significant correlation with the applied load, and the serviceability performance index on the basis of normal weight concrete specimens is able to predict the serviceability behavior of HSLWAC specimens. However, it is difficult to satisfy the diagonal crack width limiting value for HSLWAC members designed according to the minimum stirrup ratio in Chinese code, so the minimum stirrup ratio should be appropriately increased.

摘要: 偶然的超越荷载、长期的环境侵蚀及温度变形等易导致深受弯构件斜截面的服役能力降低,出现开裂,影响正常使用。完成 15 根高强轻骨料混凝土深受弯构件受剪性能全过程试验,系统研究了剪切荷载作用下的损伤演化规律,分析了剪跨比、加载板宽度和截面高度对构件受剪服役能力的影响,基于裂缝发展趋势建立裂缝宽度与荷载水平的宏观对应关系,探讨了相关规范中正常使用阶段斜裂缝宽度限值对该类构件的适用性。研究表明:随剪跨比和加载板宽度增大,试件最大斜裂缝宽度呈增长趋势,且配置足够数量的水平和竖向腹筋能够有效抑制深受弯构件的斜向开裂,试件名义斜向开裂强度和最大斜裂缝宽度均受尺寸效应影响较小;受剪全过程中试件的宏观剪切裂缝宽度与相应承担荷载水平呈现显著对应关系,且基于普通混凝土深受弯构件试验数据建立的服役性能评价指标可用于高强轻骨料混凝土深受弯构件服

役性能预测;按我国规范中最小腹筋配筋率设计的高强轻骨料混凝土深受弯构件难以满足斜裂缝宽度限值要求,建议适当增大腹筋最小配筋率。

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标题: Modified infiltration model for saturated-unsaturated loess based on Green-Ampt model and its parametric study

标题: 基于 Green-Ampt 模型的饱和-非饱和黄土入渗改进模型及其参数研究

来源出版物: 岩土力学 卷: 41 期: 6 页: 1991-2000 出版年: 2020

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作者关键词: loess; infiltration; Green-Ampt model; stratified hypothesis

作者关键词: 黄土; 水分入渗; Green-Ampt 模型; 分层假定

摘要: The theoretical analysis of water infiltration in loess is very important for predicting deformation and strength weakening of loess. However, there are still some problems lying in the application of existing Green-Ampt infiltration analysis model using into homogeneous foundation of loess area. Based on the assumption of saturated-unsaturated stratification of loess, the modified infiltration model also considered the actual variation of permeability coefficient of soil with the depth of infiltration. The proposed approach modified the Green-Ampt model with an actual case for validation. Combined with the relation between Philip model and Green-Ampt model, as well as the actual permeability coefficient changed with time, the hydraulic

parameters were estimated by measuring the variations of cumulative infiltration and water content with time. The results showed that compared with WGAM and Kostiakov models, the modified model was more effective in loess area. Based on the modified model, the effects of saturated permeability coefficient, saturated water content, initial water content and matrix suction on water infiltration depth were analyzed. The sensitivity of the parameters was analyzed and compared. It was found that the change of initial and saturated water contents of soil greatly influenced the calculation results of the model. The present research is of great significance for the relative investigation of infiltration in loess area.

摘要: 黄土中水分入渗理论分析对预测土体附加变形及强度弱化十分重要,但现有针对均质地基的 Green-Ampt 入渗分析模型运用于黄土区还有较多不足。基于黄土入渗饱和-非饱和和分层假定,考虑入渗过程中土体实际渗透系数随深度的变化,对 Green-Ampt 模型进行修正,并用实例进行了验证;通过测量累积入渗量和含水率的时变规律,并结合 Philip 模型与 Green-Ampt 模型的相关关系及实际渗透系数随时间的变化关系获取模型参数。结果表明,相比于 WGAM 和 Kostiakov 模型,修正模型在黄土区的应用效果更好。在修正模型基础上,分析了饱和渗透系数、饱和含水率、初始含水率以及基质吸力对水分入渗深度的影响规律,并对参数的敏感指数进行了分析与对比。发现土体初始和饱和含水率变化对模型计算结果产生较大影响。该模型的建立对黄土地区水分入渗规律相关研究有一定的积极作用。

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作者: Yuan Chunyan; Wang Kun; Chen Hongyan; Liu Xing; Lang Yujia

作者: 袁春燕; 王坤; 陈虹燕; 刘兴; 郎雨佳

标题: Study on correction method of fire evacuation speed based on personnel psychological and environmental factors

标题: 基于人员心理-环境因素的火灾疏散速度修正方法研究

来源出版物: 中国安全生产科学技术 卷: 16 期: 7 页: 112-118 出版年: 2020

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文献类型: Article

作者关键词: high-rise building; fire evacuation; psychological behavior characteristics; fuzzy logic; correction method

作者关键词: 高层建筑; 火灾疏散; 心理行为特征; 模糊逻辑; 修正方法

摘要: In order to explore the influence of personnel's behavior psychology on the evacuation efficiency in the fire risk environment, based on the characteristics of people's behavior psychology under fire such as complex, abstract and difficult to directly quantify, the fuzzy sets, fuzzy rules and membership functions were applied to quantify the behavior psychology of personnel with the fuzzy logic method, and its influence on the evacuation speed was studied. Through the numerical analysis of smoke in the high-rise building fire, considering the influence of fire smoke and group behavior on the evacuation, the formula method was used to calculate the reduction value of personnel's evacuation speed. Taking the fire evacuation of a high-rise commercial building as an example, the corrected evacuation speed and evacuation path of personnel were introduced into the evacuation analysis and compared with the uncorrected results. The results showed that the uncorrected evacuation time of the commercial building was 470 s, while the corrected evacuation time was 670 s, so the corrected evacuation time was longer, and the risk of personnel was greater.

摘要: 为探究人在火灾环境下的行为心理对疏散效率的影响, 基于火灾下人员行为心理特征具有复杂、抽象、难以直接量化的特性, 通过模糊逻辑方法, 应用模糊集合、模糊规则和隶属度函数量化人的行为心理, 研究其对疏散速度的影响; 考虑火灾烟气和群体行为对疏散的影响, 通过对高层建筑火灾状况下的烟气进行数值分析, 并运用公式法得出人员的疏散速度折减值; 以某高层商业建筑火灾疏散为例, 将修正后人员的疏散速度和疏散路径引入疏散分析并与未修正的结果进行比较。结果表明: 未修正的商业建筑疏散时间为 470 s, 修正后的疏散时间为 670 s, 修正后的疏散时间更长, 人员危险性更大。

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作者: 王毅红; 赵一迪; 牛行行; 姚圣法; 刘喜

标题: Experimental study of bond-anchorage properties of a new type high-strength rebar with concrete

标题: 新型高强钢筋与混凝土粘结锚固性能试验

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文献类型: Article

作者关键词: high strength rebar; bond-anchorage; failure mode; bond-slip curves; anchorage length

作者关键词: 高强钢筋; 粘结性能; 破坏形态; 粘结-滑移曲线; 锚固长度

摘要: In order to investigate the failure mode, bond-anchorage strength and bond-slip properties of specimens, 48 specimens of 400 N/mm² ordinary steel rebars and 630 N/mm² high strength steel rebars bonded with concrete were studied by central pull-out test. On the basis of statistical regression, the formula for calculating the bond strength of 630 N/mm² high strength steel rebars is given, and the design proposal of anchorage length is put forward. The results show that the failure modes of common steel rebar and high strength steel rebar are similar. The bond-slip curves are similar. Under the same conditions, the bond strength of high-strength steel rebar is higher than that of common steel rebar. Similar to ordinary steel rebars, the bond strength between high-strength steel rebars and concrete increases with the increase of concrete strength, the decreases of anchorage length and the diameter of steel rebars. Compared with ordinary steel rebar, the change of concrete strength or anchorage length of steel rebar has more significant effect on the bond strength of high strength steel rebar. The formula for calculating anchorage length in Code for Design of Concrete Structures (GB50010-2010) is applicable to 630 N/mm² high strength steel rebars.

摘要: 通过对 48 个 400 N/mm² 级普通钢筋和 630 N/mm² 级高强钢筋与混凝土粘结锚固试件进行中心拔出试验, 分别从试件破坏形态、粘结锚固强度、粘结滑移性能等方面进行对比分析, 在统计回归的基础上给出了 630 N/mm² 级高强钢筋粘结强度的计算公式, 提出锚固长

度的设计建议。研究表明:普通钢筋与高强钢筋试件的破坏形态类似,粘结-滑移曲线变化规律相近;在相同条件下,高强钢筋粘结强度高于普通钢筋;与普通钢筋类似,高强钢筋与混凝土的粘结强度随混凝土强度的提高、锚固长度和钢筋直径的减小而增大;混凝土强度和钢筋锚固长度变化对高强钢筋的粘结强度影响比普通钢筋更为显著;《混凝土结构设计规范》(GB50010-2010)锚固长度计算公式适用于 630 N/mm² 高强钢筋。

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作者: 秦朝刚; 白国良; 吴涛; 刘伯权; 徐亚洲; 苏宁粉

标题: Earthquake damage performance assessment of high monolithic precast concrete shear wall structure

标题: 高层装配式剪力墙结构地震损伤性能评估

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文献类型: Article

作者关键词: high monolithic precast shear wall structure; damage evaluation; performance level; story drift; damage index

作者关键词: 高层装配式剪力墙结构; 损伤评估; 性能水平; 层间位移角; 损伤指数

摘要: According to the seismic damage performance evaluation criterion of concrete shear wall structure, the earthquake damage performance of high monolithic precast concrete shear wall structure was evaluated in combination with different seismic responses during shaking table

test. The crack development law, failure mode and seismic responses of the main anti-lateral force components (prefabricated shear wall and cast-in-place connection region) and energy-consuming component (superimposed coupling beam) excited by seismic waves were used to divide the earthquake damage into six levels. Then, detailed damage performance level of the structure was proposed. Based on the improved Park-Ang two-parameter damage model, the damage index of integral structure was calculated by the story damage indexes at different peak accelerations. Finally, two types of performance quantification, namely story drift and damage index were proposed to evaluate the seismic performance of high monolithic precast shear wall structure under earthquake action. The results show that the relative proportions of story displacement damage and hysteresis energy consumption damage in each floor reflect the damage mechanism of the structure under elastic and plastic conditions. Moreover, the two proposed performance level quantitative indexes can effectively evaluate the performance of the structure.

摘要: 基于混凝土剪力墙结构的地震损伤性能评估标准,并结合振动台试验研究中高层装配式剪力墙结构的不同地震响应,评估其地震损伤性能。根据地震波作用下结构主要抗侧力构件即预制剪力墙/现浇连接部位和耗能构件即叠合连梁的裂缝发生发展规律、破坏形态及地震响应,将其地震破坏等级划分为6级,给出相应的结构性能水平,并基于改进的 Park-Ang 双参数损伤模型,在不同加速度峰值时由各楼层的损伤指数求得结构的损伤指数;最终提出整体结构基于层间位移角和损伤指数的2类性能量化指标,以评价结构在地震作用下的性能状态。研究表明:各楼层位移损伤和滞回耗能损伤的相对比例可以反映结构在弹性和塑性状态下不同的损伤机理;基于层间位移角和结构损伤指数的性能量化指标可以有效评价高层装配式剪力墙结构的不同性能水平。

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标题: Influence Analysis of Different Structural Parameters on Seismic Performance of Low-rise Lightweight Steel Buildings

标题: 结构参数对低层轻钢房屋抗震性能影响分析

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文献类型: Article

作者关键词: low-rise lightweight steel building; shaking table tests; dynamic characteristics; seismic behavior; finite element analysis

作者关键词: 低层轻钢结构; 振动台试验; 动力特性; 抗震性能; 有限元分析

摘要: In order to investigate the influence of different structural parameters on the seismic performance of low-rise lightweight steel buildings, the finite element model of lightweight steel building was established by ABAQUS based on the experimental results. It shows that the finite element analysis results, in terms of fundamental frequency, acceleration and displacement responses, agree well with the experimental results. Furthermore, a parametric study based on the verified model under 9-degree frequent occurring and maximum considered earthquakes was carried out. The results show that the increase of the sheathing number and adding diagonal bracing can improve the fundamental frequency, acceleration and displacement responses of buildings, but the change of the sheathing material has little effect on it; the wall opening ratio has obvious effect on the structural response of the building under earthquake. Thus, the wall opening ratio should not be greater than 29.09%; decreasing the aspect ratio and choosing regular plan layout of lightweight steel buildings result in the increase of the natural frequency and decrease of the acceleration response and displacement response.

摘要: 为研究不同结构参数对低层轻钢房屋抗震性能的影响,以已有试验结果为基础,采用 ABAQUS 软件建立轻钢房屋的有限元模型,计算得到的房屋自振频率、加速度反应及位移反应等均与试验结果吻合较好,验证了有限元模型的正确性。在此基础上,对验证后的房屋模型在 9 度多遇及 9 度罕遇地震作用下进行了变参数分析。研究结果表明:采用增加覆面板数量、增设柱间斜撑的墙体构造形式可提高房屋的自振频率、加速度及位移响应;但改变覆面板材料对整体结构的动力特性及地震响应影响较小;墙体开洞率对房屋在地震作用下的结构响应影响明显,因此墙体开洞率不应大于 29.09%;轻钢房屋长宽比减小,平面布置更规则,结构自振频率增大,加速度及位移响应降低。

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作者: 颜卫亨; 张雯; 王西凤; 吴东红

标题: Wind-induced snow drift on the surface of a house with two slopes protruding from a flat abdomen

标题: 平面腹部凸出双坡房屋表面风致雪漂移研究

来源出版物: 空间结构 卷: 26 期: 2 页: 40-48 出版年: 2020

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文献类型: Article

作者关键词: double-slope house; protruding abdomen; wind-induced snow drift; snow distribution

作者关键词: 双坡房屋; 腹部凸出; 风致雪漂; 积雪分布

摘要: In order to study wind-induced snow drift effect on the surface of a house with two slopes protruding from a flat abdomen, based on computational fluid dynamics principle and two-phase flow theory, the ICEM CFD software was used to conduct the numerical modeling. The Mixture multiphase flow model in the FLUENT software was adopted to carry out a numerical simulation of snow conditions around the cube. The simulated data was compared with the measured data, and numerical wind tunnel parameter and boundary condition were established. On this basis, numerical wind tunnel for 125 kinds of working conditions is calculated, given the wind speed of 5m/s, 7.5m/s, 10m/s, 12.5m/s and 15m/s, the wind angle of 0°, 45°, 90°, 135°, 180°, and flat belly bulge of 5 kinds of relative size as analysis parameters. The wind-induced surface distribution of snow drift was obtained. Considering the distribution nonuniformity of snow, the surface was partitioned, and snow distribution coefficient of each partition was obtained. The study shows that the protruding area of abdomen has obvious influence on the main structure. If only the snowpack coefficient of single span and double slope roof is taken into consideration, there may be safety hidden danger, and the designer should pay attention to it. The distribution of wind-induced snow drifts on the surface of the house is obviously uneven, so it should be divided into sections for the

snow-sensitive structure to reveal the adverse snow distribution.

摘要: 为研究平面腹部凸出双坡房屋表面风致雪漂效应,基于计算流体动力学原理和两相流理论,运用 ICFM CFD 软件进行数值建模.采用 FLUENT 软件中的 Mixture 多相流模型对立方体及高低屋面风致雪漂情况进行数值模拟,与实测数据进行对比分析,建立数值风洞的参数设置及边界条件.在此基础上,以风速为 5m/s、7.5m/s、10m/s、12.5m/s、15m/s,风向角为 0°、45°、90°、135°、180°,以及平面腹部凸出的 5 种相对尺寸为分析参数,对 125 种工况进行数值风洞计算,得到房屋表面风致雪漂分布规律,计及其分布规律的不均匀性,对其表面进行分区,得到可供抗雪设计的各分区积雪分布系数.研究表明:腹部凸出区域对主体结构影响明显,若仅参考单跨双坡屋面面积雪系数进行设计,存在安全隐患,设计人员应予以注意;风致雪漂在房屋表面明显分布不均,因此对风雪敏感结构,应对其表面进行分区,以揭示其不利积雪分布情况.

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作者: Yuan Chunbo; Ma Hongjuan; Zhang Wenshan; Li Xiaomeng; Zhao Xiaohong

作者: 袁春博; 马宏娟; 张文杉; 李晓萌; 赵晓红

标题: Cd~(2+) adsorption characteristics of alum sludge from waterworks

标题: 给水厂铝污泥对 Cd~(2+)的吸附性能

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作者关键词: Cd~(2+); alum sludge; modified; adsorb; Cd~(2+)

作者关键词: 铝污泥; 改性; 吸附

摘要: Alum sludge was used as adsorbent to remove Cd~(2+) in wastewater. The effect of dosage, particle size, initial concentration of Cd~(2+), pH and different modification temperature on adsorption performance were studied. Adsorption kinetics and isothermal adsorption experiments showed that the adsorption process conformed to the quasi-second-order kinetics and

Freundlich isothermal adsorption equation. The maximum adsorption capacity of Cd~(2+) was 3.32 mg /g, and chemisorption was the rate limiting. Thermal modification can enhance the adsorption of Cd~(2+) on aluminum sludge, and the higher the calcination temperature, the stronger the adsorption capacity of modified aluminum sludge. The adsorption capacity of Cd~(2+) by 200, 400, 600 °C modified alum sludge was 1.2, 1.5 and 2.2 times of original alum sludge, respectively.

摘要: 采用铝污泥作为吸附剂去除废水中的 Cd~(2+), 研究铝污泥投加量、粒径、初始 Cd~(2+) 浓度、溶液 pH 以及不同改性温度对吸附性能的影响。动力学实验和等温吸附实验表明, 铝污泥对 Cd~(2+) 的吸附结果符合准二级动力学和 Freundlich 等温吸附方程; Cd~(2+) 的最大吸附量为 3.32 mg /g, 化学吸附是速率限制步骤。高温改性能够增强铝污泥对 Cd~(2+) 的吸附能力, 且煅烧温度越高, 改性后的铝污泥吸附能力越强。经 200, 400, 600 °C 改性的铝污泥对 Cd~(2+) 的吸附量分别为原始铝污泥的 1.2, 1.5, 2.2 倍。

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标题: Study on the Wind Pressure Distribution Characteristics and Shape Optimization of Gable Roof House with Partially Protruding Plane

标题: 平面局部凸出的双坡房屋表面风压特性分析及体型优化研究

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文献类型: Article

作者关键词: computational fluid dynamics; partially protruding plane; t-shaped plane; l-shaped plane; shape coefficient

作者关键词: 计算流体动力学; 平面局部凸出; 丁形平面; L形平面; 体型系数

摘要: Based on the basic theories of computational fluid dynamics and atmospheric boundary layer, the wind pressure distribution characteristics of the double-slope camping houses with local convexity are studied. On this basis, the structural shape of the building is rationally optimized. During the research, Fluent software was used to analyze and calculate the model, and the numerical simulation was compared with the results of TTU measurement to determine the relevant parameters of the numerical wind tunnel. The models are built based on the functional requirements of the use of camping houses in China and the spatial scale required for human activities. The wind pressure distribution on the house surface is calculated and analyzed considering the changes of wind direction angle, relative size of auxiliary buildings and layout of buildings. The wind pressure distribution law is finally summarized as the wind load shape coefficient of the house, so that it can be used in wind resistance design. Furthermore, the average value, extreme value and standard deviation of the wind pressure on the house surface are used as the optimization targets, and the shape of the double-slope camping house with partial convexity is optimized. Finally the reasonable building shape of each house type with the least wind effect is obtained to improve wind resistance. The analysis results show that due to the existence of auxiliary structures protruding from the double-slope camping houses, the air movement around the building will be affected, so that the wind pressure distribution law of the building surface changes, and even more, reversal of the wind load shape coefficient of the main building will appear. In view of the above situation, it can be seen that the influence of the auxiliary building on the wind pressure of the building surface must be taken into account in the wind resistance design.

摘要: 以计算流体动力学和大气边界层基本理论为依据,对平面局部凸出的双坡野营房屋表面风压分布特性展开研究,在此基础上对其建筑外形进行合理的优化。研究过程中运用 Fluent 软件对模型进行分析和计算,并将数值模拟与 TTU 实测的结果进行对比,进而确定数值风洞的相关参数。将我国野营房屋使用的功能要求以及人体活动所需的尺度等作为依据,在此基础上建立模型,并在风向角、辅助建筑相对尺寸和建筑平面布置形式等的变化下,计算分析房屋表面的风压分布规律,最后将结果归纳为房屋的风荷载体型系数,以便抗风设计使用。进一步将房屋表面风压的平均值、极值和标准差作为优化目标,对平面局部凸出的双坡野营房屋的体型进行优化,最终得到该类型房屋风作用最小的合理建筑外形,以提高其抗风性能。结果表明:轻型双坡野营房屋因自身凸出的辅助建筑的存在,建筑周围的气流运动会受到影响,从而使建筑表面风压分布规律发生变化,更会出现主体建筑局部风荷载体型系数发生变号的现象,鉴于以上情况,可知辅助建筑对建筑表面风压的影响在抗风设计中必须予以重视。

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作者: 邢国华; 武名阳; 常召群; 张广泰; 柳明亮

标题: LOAD BEARING CAPACITY AND FAILURE MODE OF CORRODED PRESTRESSED CONCRETE BEAMS

标题: 锈蚀预应力混凝土梁承载力及破坏模式研究

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作者关键词: prestressed concrete beams; truss-arch model; failure mode; bearing capacity; corrosion

作者关键词: 预应力混凝土梁; 桁架-拱模型; 破坏模式; 承载力; 锈蚀

摘要: With the increase of service time, prestressed concrete beams under corrosive environment attacking will gradually exhibit the deterioration of ductility and load bearing capacity due to the corrosion of stressed tendons in erosion environment, which seriously affects the safety of building structures. In order to study the load bearing capacity of prestressed concrete beams under a corrosive environment, the corroded prestressed concrete beams under concentrated loads was taken as the research object, and the deteriorated property of corroded materials and the effect of prestressing for load bearing capacity were analyzed. Based on the truss-arch model, the distribution coefficients of truss role and arch role were calculated, and the calculation formula for load bearing capacity along with the assessment method of failure mode of the prestressed concrete beams were proposed. The experimental data of 76 prestressed concrete beams were used to validate the suggested model. The results show that: for the load bearing capacity of prestressed concrete beams, the calculated values are in a good agreement with the test values, and the mean

value and the variance of the ratio between them are 1.116 and 0.033, respectively. Using the proposed model, the prediction of the failure mode agrees well with the observed failure mode of experimental concrete beams, and the suggested method can reflect the fact that the failure mode of the concrete beams changed by time as the corrosion degree increases. Thus, the proposed model can be applied to calculate the load bearing capacity and assess the failure mode of corroded prestressed concrete beams.

摘要: 随着服役时间增长,侵蚀环境下预应力混凝土梁因受力筋发生锈蚀而造成其延性与承载力降低,严重影响结构的安全使用。为分析侵蚀环境下预应力混凝土梁的承载性能,以集中荷载作用下锈蚀预应力混凝土梁为研究对象,分析混凝土梁锈蚀后各材料性能的劣化与预应力对其承载能力的影响,基于桁架-拱模型给出了桁架作用与拱作用的荷载分配系数,建立了预应力混凝土梁承载力计算模型及破坏模式判别方法,并通过 76 根预应力混凝土梁的试验数据对建议模型进行验证。研究结果表明:预应力混凝土梁承载力试验值与计算值之比的平均值为 1.116,方差为 0.033,吻合较好;基于建议分析模型对预应力混凝土梁破坏模式的预测判别与试验梁破坏模式符合程度较高,且该模型能反映预应力混凝土梁随着锈蚀程度增大其破坏模式发生演变这一特征。该文建议的理论模型可用于锈蚀预应力混凝土梁的承载力计算与破坏模式预测分析。

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标题: Artificial Neural Network Prediction Model for Compressive Strength of Compacted Earth Blocks

标题: 压制生土砖强度的人工神经网络预测模型

来源出版物: 华南理工大学学报. 自然科学版 卷: 48 期: 7 页: 115-121 出版年: 2020

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作者关键词: RBF neural network; BP neural network; compacted earth block; compressive strength; regression analysis model

作者关键词: RBF 神经网络; BP 神经网络; 压制生土砖; 抗压强度; 回归分析模型

摘要: A BP neural network model and a radial basis (RBF) neural network model were set up respectively to predict the compressive strength of compacted earth blocks. The prediction model for the compressive strength of compacted earth blocks was based on 91 groups of experimental research data collected under the action of multiple factors by domestic and foreign scholars, and the influence of compaction pressure, moisture content, cement content and height-thickness ratio on the compressive strength of compacted earth block was considered. The neural network predicted results were compared with the predicted results of regression analysis model and the experimental values. The results show that the prediction accuracy of artificial neural network model is better than that of regression analysis model. And there is a complex nonlinear relationship that the regression analysis model cannot handle between the compressive strength of the compacted earth block and its mixture ratio, compaction pressure and height-to-thickness ratio. The overall prediction effect of BP neural network model is good, but it is easy to fall into local optimum. RBF neural network model can reliably predict the compressive strength of compacted earth blocks. The mean value of the ratio between the predicted results and the experimental values is 1.007, with a standard deviation of 0.085. The prediction model has a high accuracy and can effectively solve the complex nonlinear relationship between compressive strength and its influencing factors, and it can provide reference for the design of mix proportion for compacted earth blocks.

摘要: 为了获得压制生土砖抗压强度预测模型,针对成型压力、含水率、水泥含量及高厚比对压制生土砖抗压强度的影响,基于国内外研究中的 91 组压制生土砖抗压强度试验数据,分别建立了用于预测压制生土砖抗压强度的 BP 神经网络模型和径向基(RBF)神经网络模型,并将模型预测结果分别与试验结果及回归分析模型进行对比。结果表明:人工神经网络模型对压制生土砖抗压强度的预测精度显著优于回归分析方法;压制生土砖抗压强度与其配合比、成型压力及高厚比间存在复杂的非线性关系,回归分析模型不适用于解决此类复杂问题;BP 神经网络模型的整体预测效果较好,但容易陷入局部最优;RBF 神经网络模型能可靠地预测压制生土砖抗压强度,预测结果与试验结果比值的平均值为 1.007,标准差为 0.085,该预测模型具有较高精确度,能有效解决压制生土砖抗压强度与其影响因素间复杂的非线性关系,可为压制生土砖的配合比设计提供参考。

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标题: Experimental study on standard specimen for measuring compressive strength of earth block masonry

标题: 生土基砌体抗压强度测量标准试件的试验研究

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作者关键词: earth materials; masonry; height-to-thickness ratio; capping; compressive properties

作者关键词: 生土材料; 砌体; 高厚比; 找平方式; 抗压性能

摘要: The molded adobe masonry prisms and compacted adobe masonry prisms were prepared and tested in unconfined compression test to investigate the influences of the height-to-thickness ratio of specimen and capping on the compressive performance of earth masonry prisms. The results show that the compressive performance of earth masonry prisms are sensitive to the change of height-to-thickness ratio of specimen and the stipulation on the height-to-thickness ratio of compressive specimens in "standard for test methods of basic mechanical properties of masonry" does not apply to earth masonry prisms. When the height-to-thickness ratio of specimen is 3-4, the failure modes of the two kinds of earth masonry prisms are unified, which can truly reflect the compressive state of masonry members, and the test data are stable. It is suggested that the height of standard specimens for measuring compressive strength of earth masonry prism should be determined according to the height-to-thickness ratio of 3-4. Leveling the loading surface of the specimen with fast anhydrite can ensure that the top surface of the two kinds of earth masonry

prism are in close contact with the loading plate, and the discreteness of measured compressive strengths are small. It is suggested that the leveling method of fast anhydrite self-leveling be used for leveling the top of standard specimens.

摘要: 通过对湿制土坯砌体和干打土坯砌体进行单轴抗压试验,分析试件高厚比和加载面找平方式对生土基砌体抗压性能的影响。研究表明:生土基砌体抗压性能对于试件高厚比的变化更为敏感,我国砌体基本力学性能试验方法标准中关于标准砌体抗压试件高厚比应控制在 3~5 的规定不能适用于生土基砌体;当试件高厚比为 3~4 时,2 类生土基砌体破坏形态统一,能真实反映砌体构件受压状态,且试验数据稳定性较好,建议生土基砌体强度标准试件的高度应按高厚比为 3~4 确定;采用快硬石膏自流平对试件加载面进行找平可保证 2 类生土基砌体顶面与加载板紧密接触,且所测得砌体抗压强度离散性较小,建议生土基砌体强度标准试件顶部找平方式选用快硬石膏自流平找平方式。

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作者: 王毅红; 苏顺; 董飞; 姚圣法; 刘喜

标题: Experimental study on bond behavior of high strength ribbed steel bars with variable shape parameters

标题: 外形参数变化的高强带肋钢筋粘结性能试验研究

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文献类型: Article

作者关键词: 630 MPa high strength steel bar; bond and anchorage performance; reinforcement rib spacing; shape of reinforcement

作者关键词: 630 MPa 高强钢筋; 粘结锚固性能; 钢筋肋距; 钢筋外形

摘要: In order to study the influence of the increase of rib spacing of 630 MPa high-strength steel bar with crescent pattern on its bond and anchorage performance with concrete, the standard shape

crescent pattern steel bar with strength grade 630 MPa(T63) and the new shape crescent pattern steel bar with increased spacing (TB63) between transverse ribs are selected to make reinforced concrete specimens. Considering the three factors of concrete strength, anchorage length and diameter of steel bar, the tensile test is carried out to analyze the failure of reinforced concrete. The morphology, bond strength and bond slip properties are compared and analyzed. The experimental results show that the bond strength of the new - shaped crescent high-strength reinforced concrete specimens with increased cross rib spacing is slightly higher than that of the standard-shaped crescent high-strength reinforced concrete specimens, which indicates that the increase of the rib spacing is beneficial to the improvement of bond strength. Two kinds of reinforced concrete specimens have the same failure mode under the same conditions, and the change rule of bond-slip curve is basically the same. The slip amount of crescent-shaped high-strength reinforced concrete specimens with increased cross rib spacing at the peak of bond-slip curve is slightly smaller than that of standard crescent-shaped high-strength reinforced concrete specimens, and the peak bond stress is slightly larger than that of standard crescent-shaped high-strength reinforced concrete specimens. The change of concrete strength has a more significant effect on the bond strength of high strength reinforced concrete specimens with crescent pattern. The influence of anchorage length on the bond strength of crescent - shaped high-strength reinforced concrete specimens with increased transverse rib spacing is significant, and the influence of steel diameter on the bond strength of the two kinds of steel bars to concrete is basically the same. The anchorage length of 630 MPa crescent rib reinforced bar with larger rib spacing can be determined according to the relevant provisions of the current Code for Design of Concrete Structures in engineering application by increasing the rib spacing of 630 MPa high-strength steel bar with larger rib spacing, whose bond anchorage performance is not lower than that of the steel bar with standard rib spacing.

摘要: 为研究月牙纹 630MPa 高强钢筋肋距加大对钢筋与混凝土粘结锚固性能的影响,分别选用强度等级为 630MPa 的标准外形月牙纹钢筋(T63)和横肋间距增大的新外形月牙纹钢筋(TB63)制作拉式钢筋混凝土锚固试件,考虑混凝土强度、锚固长度、钢筋直径三个变化因素,通过拉式试验,从破坏形态、粘结强度、粘结滑移性能等方面进行了对比分析。试验研究表明:横肋间距增大的新外形月牙纹高强钢筋混凝土试件的粘结强度略高于标准外形月牙纹高强钢筋混凝土试件的粘结强度,说明钢筋肋距的增大有利于粘结性能的提高。两种钢筋混凝土试件,在同等条件下的破坏形态相同,粘结滑移曲线变化规律基本相同,横肋间距增大的新外形月牙纹高强钢筋混凝土试件在粘结滑移曲线峰值处的滑移量略小于标准外形月牙纹高强钢筋混凝土试件,而峰值粘结应力略大于标准外形月牙纹高强钢筋混凝土试件。混凝土强度变化对标准外形月牙纹高强钢筋混凝土试件的粘结强度的影响更显著。锚固长度的变化对肋间横距增大的新外形月牙纹高强钢筋混凝土试件粘结强度的影响变化比较显著,钢筋直径的变化对两种钢筋与混凝土的粘结强度的影响变化基本相同。月牙纹 630MPa 高强钢筋肋距加大其粘结锚固性能不低于标准肋距的钢筋,由此判断,加大肋距的月牙纹 630MPa 高强钢筋的锚固长度在工程应用中可使用现行《混凝土结构设计规范》的相关规定。

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作者: Wu Tao; Liu Xi; Wei Hui; Huang Hua

作者: 吴涛; 刘喜; 魏慧; 黄华

标题: Experimental study on shear behavior and size effect of high strength lightweight aggregate concrete deep flexural members

标题: 高强轻骨料混凝土深受弯构件受剪性能及尺寸效应试验研究

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作者关键词: deep flexural member; lightweight aggregate concrete; size effect; shear behavior; shear model

作者关键词: 深受弯构件; 轻骨料混凝土; 尺寸效应; 受剪性能; 受剪计算模型

摘要: To avoid the potentially dangers caused by size discrepancies between actual structure and scaled model, a total of 15 lightweight aggregate concrete (LWAC) deep flexural members with section height of 500-1 400 mm and shear span-effective depth ratio of 0.85-1.73, was tested to study the size effect, failure mechanism, shear bearing capacity and design method. The shear behavior, including failure process, failure modes, load-deflection curves, loads at characteristic points, reinforcement strains and inclined crack propagation, were systematically analyzed. The accuracy and applicability of strut-and-tie model-based code provisions and shear models for specimens were verified. The test results indicate that there are two different failure modes, namely, shear-compression failure and diagonal splitting failure, which are independent of beam section sizes. With the increase in section height from 500 mm to 1 400 mm, significant size effect on normalized ultimate shear stress is manifested with an approximately 37% decrease. Instead, the increasing shear span-effective depth ratio leads to an appreciable reduction in both the normalized cracking and ultimate shear stresses. Calculation results show that, the GB 50010-2010 Code for design of concrete structures without reasonable consideration of size effect on the strength of LWAC leads to conservative results. The predictions obtained from EC2, ACI

318, Tan-Cheng and Tang-Tan models show good agreement to the test results. It is suggested that a rational effective struts coefficient shall be considered when using CSA code.

摘要: 为避免实际结构与缩尺模型因尺寸效应引起的安全隐患,应对剪切作用下轻骨料混凝土深受弯构件的破坏机理、承载能力和设计方法进行研究,为此,完成了对称集中荷载作用下截面高度在 500~1 400 mm、剪跨比为 0.85~1.73 的 15 根 LC60 级的高强轻骨料混凝土深受弯构件受剪性能试验,观察破坏过程与破坏形态,分析了荷载-跨中挠度曲线、特征荷载、钢筋应变、斜裂缝等的发展趋势,研究其尺寸效应作用机理,分析了典型模型和计算方法的适用性。试验结果表明:试件破坏形态与尺寸大小无关,主要包括剪压和斜向劈裂两种破坏模式;随截面高度增大其尺寸效应作用显著,截面高度由 500 mm 增大至 1 400 mm,归一化极限荷载降低约 37%;随剪跨比减小,归一化开裂荷载/极限荷载均呈降低趋势。计算表明,对轻骨料混凝土强度未进行折减时,采用我国 GB 50010:2010《混凝土结构设计规范》中未准确考虑尺寸效应影响的计算公式,结果较为保守,未合理考虑尺寸效应对深受弯构件抗剪强度的影响,采用欧洲 EC2 规范、美国 ACI 318 规范、Tan-Cheng 及 Tang-Tan 等基于拉压杆的受剪承载力模型进行计算时,其预测值与试验值吻合良好。而采用加拿大 CSA 规范计算时,应根据剪跨比合理选取有效压杆系数。

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作者: Su Jizhi; Liu Boquan; Ma Yudong; Xing Guohua; Huang Jiao

作者: 苏佳智; 刘伯权; 马煜东; 邢国华; 黄娇

标题: Relationship between inter-story drift of RC frame structures and deformation of members

标题: 钢筋混凝土框架结构层间位移与构件变形关系研究

来源出版物: 建筑结构学报 卷: 41 期: 6 页: 149-160 出版年: 2020

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作者关键词: reinforced concrete frame structure; beam-column subassembly; inter-story drift;

member deformation

作者关键词: 钢筋混凝土框架结构; 梁柱组合体; 层间位移; 构件变形

摘要: The proportion of the lateral displacements arised from individual nonlinear deformations in beam-column subassemblage to the structural inter-layer displacements was analyzed based on the exterior-joints and interior-joints of three-story,three-span reinforced concrete plane frames under low cyclic loading. Besides,the transformational relationship between the inter-story drift of RC frame and the deformation of local components was established. The results show that the influence of beam-end rotation on the shear deformation of joint is greater than that of column in the frame structure characterized by beam-hinge failure mechanism, and the beam-column subassemblage takes on the structural plastic deformation as a whole. The deformation of local components may exceed the limiting values of performance levels even the inter-story drift angle of the structure meets the requirements, so it is improper to use the deformation of single member instead of the whole structural displacement as the collapse criterion. For the substructure with the beam-end bending failure mode, the deformation of beams takes up the largest part of interstory drift, the deformation of columns takes the second and the shear deformation of joints takes the smallest. Based on the elastic theory analysis, a plasticity reduction coefficient was proposed during the plastic stage and a high precision conversion formula between the inter-story drift of structure and local deformation of components is established. The calculated results are in agreement with the test results basically.

摘要: 基于课题组已完成的钢筋混凝土 3 层 3 跨平面框架低周反复加载试验,以边(中)节点区域作为重点研究对象,分析了梁柱组合体中各种非线性局部变形引起的侧移在结构总层间变形中所占比例的变化规律。在此基础上,建立了构件局部变形与结构层间位移的转换关系。研究表明:对于发生梁铰破坏机制的框架结构,梁端转动对节点剪切变形的影响大于柱端转动,梁柱组合体作为整体共同承担结构的塑性变形;当结构整体位移角满足相应性能水平限值时,局部构件的变形仍有可能超限,简单利用单个构件的变形代表结构整体的变形是不合理的;对于破坏形式为梁端弯曲破坏的框架子结构,随着损伤加剧结构进入非弹性阶段后,梁变形成为层间位移的主要成分,柱变形引起的层间位移所占比例次之,节点剪切变形引起的层间位移所占比例最小;通过弹性理论分析,在塑性阶段引入塑性折减系数,推导建立的构件局部变形与结构层间位移转换关系式具有相对较高的精度,计算结果与试验实测数据基本吻合。

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作者: Huang Hua; Guo Peng; Wu Xianbing; Zhang Fantao

作者: 黄华; 郭朋; 吴先兵; 张凡涛

标题: Influence of Cable Breaking on Mechanical Properties of Double-steel-arch-pylon Cable-stayed Bridge

标题: 断索对双钢拱塔斜拉桥力学性能的影响

来源出版物: 公路交通科技 卷: 37 期: 4 页: 62-71,117 出版年: 2020

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作者关键词: bridge engineering; mechanical property; FE simulation; double steel arch tower cable-stayed bridge; horizontal cable; geometric shape; cable force

作者关键词: 桥梁工程; 力学性能; 有限元模拟; 双钢拱塔斜拉桥; 水平索; 线形; 索力

摘要: To study the influence of cable breakage on the mechanical properties of double-steel-arch-pylon cable-stayed bridge, a 3D simulation model of a bridge in Xi'an City is established by using FE software MIDAS/civil. First, the parameters of the model are compared with the design values and specifications to verify the rationality of the model. Then, the change rules of girder geometric shape, cable force, stresses of girder and cable pylon after the cable breakage of different positions and different numbers are analyzed. The result shows that (1) Under normal operation condition, the influence of cable breakage on the main girder geometric shape is greater than that of horizontal cable, the influence of the middle cables' breakage on the geometric shape of the main girder span is greater than those of the outside cables and the inside cables, the influence of stay cables on the geometric shape of the main girder segment between the 2 tied beams can be neglected. (2) The breakage of any cable will cause the increases of the adjacent cable forces, the breakage of outside cable will cause the obvious decrease of the cable forces of adjacent horizontal cables and the cable forces of another span. However, the breakage of the inside cable has little influence on the reduction of the forces of the adjacent horizontal cables and the other span cables. The breakage of horizontal cable will cause the decreases of the 2 adjacent cable forces, and the decrease value is basically the same. (3) The changes of main girder deflection and cable force after double cables' breaking are almost in accordance with the superposition principle. After double cables' breaking, the maximum displacement of the main girder increases by 50.2%, but it still meets the requirement of 1/500 deflection-span ratio and the longitudinal symmetrical broken cables are more dangerous than the transverse symmetrical and originally symmetrical broken cables. (4) A small number of broken cables will not cause the structure to reach the ultimate bearing capacity. When 2 dangerous cables break simultaneously, the maximum residual cable force after broken is 836 MPa, and the safety factor is still 2.2. (5) The influence of cable breakage on the bearing capacity of residual cables is higher than that on main girders and pylons.

摘要: 为了研究拉索断裂对双钢拱塔斜拉桥力学性能的影响,采用有限元软件 MIDAS/Civil 建立了西安市某大桥的三维仿真模型,首先将该模型的各项参数与设计值及规范进行对比以验证模型的合理性,然后分析了不同位置、不同数量的拉索断裂后,主梁线形、拉索索力、主梁及索塔应力的变化规律。结果表明:正常运营条件下,斜拉索断裂对主梁线形的影响大于水平索,中间索断裂对跨主梁线形的影响大于外侧索和内侧索,拉索对两系梁之间主梁段线形的影响基本可以忽略;任意拉索的断裂会引起其附近拉索索力增加,外侧斜拉索断裂会导致与其相邻水平索的索力以及另一跨斜拉索索力明显降低,但内侧斜拉索的断裂对与其相邻的水平索和另一跨斜拉索索力的降低不太明显,水平索断裂会引起与其相邻的两根斜拉索索力下降,且下降量值基本相同;双索断裂后主梁挠度和索力变化均近似符合叠加原理,双索断裂后,主梁位移最大增加 50.2%,但仍满足 1/500 挠跨比的要求,纵向对称断索较横向对称断索和原点对称断索危险;少量拉索断裂不会引起结构达到极限承载能力,当两根危险索同时断裂,断索后剩余拉索索力最大为 836 MPa,安全系数仍然达到 2.2;断索对剩余拉索承载力的影响要高于对主梁和索塔的影响。

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作者: 孙艺嘉; 吴涛; 刘喜; 魏慧

标题: Deflection Analysis of Fiber-reinforced High-strength Lightweight Aggregate Concrete Flexural Members Reinforced with GFRP Bars

标题: GFRP 筋纤维增韧高强轻骨料混凝土受弯构件挠度分析

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作者关键词: bridge engineering; GFRP-reinforced concrete flexural member; model test;

deflection; high-strength lightweight aggregate concrete; steel fiber; stiffness analytic method

作者关键词: 桥梁工程; GFRP 筋受弯构件; 模型试验; 挠度; 高强轻骨料混凝土; 钢纤维; 刚度解析法

摘要: To investigate the deformation regularity of steel fiber-reinforced high-strength lightweight aggregate concrete (HSLAC) beams reinforced with glass fiber-reinforced polymer (GFRP) bars, 10 beams fabricated using high-strength lightweight aggregate concrete were tested. The effects of steel fiber content, type of reinforcement, GFRP reinforcement ratio, and GFRP bar diameter on the deflection in different loading phases were analyzed. Strain and stress conditions for GFRP-reinforced concrete beams at service load level were specified. Based on the stiffness analytic and the measured data of GFRP-reinforced normal weight concrete beams collected from previous studies, the equation of the nonuniformity coefficient of strain in GFRP bars was established. In addition, the equation was modified by considering the effects of lightweight aggregate, steel fiber, and GFRP reinforcement ratio; based on this, the deflections of the specimens were calculated and compared with the theoretical values that were predicted according to the design codes, namely: ACI 440.1R-15, GB 50608-2010, CSA S806-12, and ISIS-M03-07. Test results show that the modes of GFRP rupture, balanced failure, and concrete crushing, are sequentially obtained as the reinforcement ratio constantly increases. The moment-deflection curves of the beams that failed by concrete crushing consist of three segments, namely, pre-cracking, crack development, and concrete crushing stages. The specimens damaged by FRP rupture and balanced failure are observed to only exhibit responses that are associated with the first two segments. It is observed that the addition of steel fibers increases the post-cracking stiffness and reduces the brittleness of concrete crushing failure. Increasing the reinforcement ratio leads to a decrease in the deformation of the beams, whereas the bar diameter exhibits a marginal effect. GB 50608-2010 slightly underestimates the deflections at service load level, whereas the predictions according to ACI 440.1R-15 are conservative. ISIS-M03-07 and CSA S806-12 ensure a sufficient safety margin. Furthermore, the proposed equation yields reasonable deflection predictions with low discreteness.

摘要: 为研究 GFRP 筋纤维增韧高强轻骨料混凝土梁变形规律,完成 10 根高强轻骨料混凝土梁受弯性能试验,重点分析了纤维掺量、纵筋种类、GFRP 筋配筋率和 GFRP 筋直径对试件不同受力阶段变形的影响;明确了 GFRP 筋混凝土受弯构件正常使用阶段应变及应力分布;基于刚度解析法,结合文献中 GFRP 筋普通混凝土受弯构件挠度实测数据,给出 GFRP 筋应变不均匀系数计算公式,综合考虑轻骨料、钢纤维及 GFRP 筋配筋率的影响对其进行修正;基于该公式对各试件使用荷载下的挠度进行计算,并与美国规范(ACI 440.1R-15)、中国规范(GB 50608-2010)和加拿大规范(CSA S806-12, ISIS-M03-07)的计算结果进行对比分析。结果表明:随配筋率的增大,试件破坏模式依次表现为 GFRP 筋拉断破坏、平衡破坏和混凝土压碎破坏;混凝土压碎破坏试件弯矩-挠度曲线分为开裂前阶段、裂缝开展阶段和受压破坏阶段,而平衡破坏和 GFRP 筋拉断破坏试件仅具有前 2 个阶段。轻骨料混凝土掺入钢纤维能够抑制构件开裂后刚度退化,降低混凝土压碎破坏脆性;提高 GFRP 筋配筋率可减小试件变形, GFRP 筋直径对其无显著影响。采用中国规范(GB 50608-2010)计算试件正常使用极限状态下的挠度,结果稍显不安全;美国规范(ACI 440.1R-15)计算结果略偏保守;加拿大规范(ISIS-M03-07)与(CSA S806-12)计算值均具有一定的安全储备;建议公式计算结果较为准确且离散性较低,能够用于该类构件挠度的计算。

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作者: Tian Wei; Wang Zhen; Zhang Li; Yu Chen

作者: 田威; 王震; 张丽; 余宸

标题: Mechanical properties of 3D printed rock samples subjected to high temperature treatment

标题: 高温作用后 3D 打印岩体试样力学性能初探

来源出版物: 岩土力学 卷: 41 期: 3 页: 961-969 出版年: 2020

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文献类型: Article

作者关键词: geotechnical engineering; 3D printing; high temperature; mechanical properties; prefabricated cracks

作者关键词: 岩土工程; 3D 打印; 高温; 力学性能; 预制裂隙

摘要: Geotechnical engineering often encounters high temperature environment. It is important to study the mechanical properties of rock samples printed in 3D subjected to high temperature treatment to promote the application of 3D printing technology in engineering field. Using GS19 sand and furan resin as printing substrates, rock samples with highly consistent internal structure were prepared by 3D printing technology and the mechanical properties of rock samples printed in 3D subjected to different temperature treatments were studied. The reasons for the change in mechanical properties of rock samples printed in 3D at different temperatures were analyzed from the microscopic level by scanning electron microscopy. The optimal temperature of 3D printed rock samples are proposed and the failure characteristics of 3D printing rock samples with prefabricated cracks after optical mechanical temperature action are studied. The uniaxial compressive strength and splitting tensile strength of 3D printed rock samples increase first and then decrease with increasing temperature. The optimal mechanical temperature is 150 °C. After the optical mechanical temperature effect, the failure process of 3D printed rock samples with different inclined cracks includes four stages, i.e. compaction, micro-crack initiation, stable crack propagation and penetration failure. The initial crack initiation locations appear at the prefabricated cracks, but with the change in inclination of prefabricated cracks, the propagation

path always tends to the direction of load loading and is approximately centrosymmetrical.

摘要: 实际岩土工程中经常遇到高温环境,研究 3D 打印岩体试样在高温作用后的力学性能对促进 3D 打印技术在工程领域的应用具有重要意义。以 GS19 砂和呋喃树脂作为打印基材,运用 3D 打印技术制备内部结构高度一致的岩体试样,研究不同温度作用后 3D 打印岩体试样的力学性能,结合电镜扫描试验从微观层面上分析不同温度作用后 3D 打印岩体试样力学性能产生变化的原因。提出了 3D 打印岩体试样的最优力学温度,并研究了含预制裂隙的 3D 打印岩体试样在最优力学温度作用后的破坏特征。研究表明:3D 打印岩体试样的单轴抗压强度与劈裂抗拉强度随温度的不断升高均呈现先增大后降低的规律,最优力学温度为 150 °C;在最优力学温度作用后,含不同倾角预制裂隙的 3D 打印岩体试样的破坏过程包含压密、微裂纹萌生、裂纹稳定扩展、贯通破坏 4 个阶段,裂纹的初始萌生位置均出现在预制裂隙处但随着预制裂隙倾角的变化而有所不同,扩展路径总是趋向于荷载加载的方向并大致呈中心对称形式。

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作者: Wang Tong; Qi Jingyao

作者: 王彤; 齐晶瑶

标题: Devoting to the education and research of water distribution system for more than 60years,passing on the torch of knowledge from generation to generation the glorious years of Prof.Zhao Hongbin,Harbin Institute of Technology

标题: 六十余载管网路,砥砺前行薪火传记哈尔滨工业大学赵洪宾教授的水墨人生

来源出版物: 给水排水 卷: 46 期: 5 页: 154-160 出版年: 2020

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作者关键词: 业内人; 学术高峰; 清晰敏捷

摘要: 业内人都清楚,中国给水管网事业的进步与发展,留下了赵洪宾老师倾心专研、努力实

践的足迹。赵洪宾老师勇于攀登学术高峰,一生致力于给水管网系统的研究,60年如一日,将我国给水管网研究带到国际水平。如今86岁的赵洪宾老师体格硬朗,精神矍铄,声音洪亮有力,思维清晰敏捷,言语中洋溢着对自己桃李满天下的欣慰与自豪。每每回首往事,无不感慨万千。

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作者: 杨利伟; 龙再柱; 龙朋成; 江旺; 赵传靓; 赵红梅

标题: Study on the Performance of Continuous Flow Chlorella MFC Based on Inlet Velocity

标题: 基于进水流速的连续流小球藻 MFC 性能研究

来源出版物: 水处理技术 卷: 46 期: 5 页: 46-51 出版年: 2020

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文献类型: Article

作者关键词: microalgae microbial fuel cell; influent flow rate in anode; electricity generation characteristics; COD removal rate

作者关键词: 小球藻生物阴极 MFC; 阳极进水流速; 产电特性; COD 去除率

摘要: In view of the characteristics of large-scale aquaculture wastewater separation and the problems of contemporary water treatment technology, based on the research of intermittent flow MFC, synchronous wastewater treatment, electricity production and chlorella biomass energy recovery, continuous flow of small balls treatment experiment of algae biocathode type MFC on source separation of pig wastewater was carried out. The study found that MFC achieved maximum values of stable output voltage, coulombic efficiency and maximum power density, which was 537.2623.78 mV, 14.39%±0.58% and 2 740.30 mW/m² respectively when flow rate was 1 mL/6.5 min. COD removal rate gradually increased with the decrease of influent flow rate, reaching the maximum at 1 mL/10 min of influent flow rate, which was 77.58%±0.48%; when the influent flow rate was 1 mL/3.0 min, the maximum resistance of MFC was 437.14 Ω. After reducing the anode influent flow rate to 1 mL/5.0 min, the MFC obtained the minimum internal resistance value of 197.53 Ω, which was 7.63% and 25.14% lower than the influent flow rates of 1 mL/6.5 min and 1 mL/10.0 min, respectively; From the aspects of electricity generation performance, COD removal effect, cathode microalgae growth status and cathode dissolved oxygen concentration, the overall performance of the MFC was best when the influent flow rate was 1 mL/6.5 min.

摘要: 针对规模化养殖源分离废水的特点和当代水处理技术存在的问题,在间歇流 MFC 研究的基础上,基于同步废水处理、产电能及小球藻生物质能回收,进行了连续流小球藻生物阴极型 MFC 对源分离养猪废水的处理实验。研究发现 MFC 在 5 种不同进水流速条件下,当流速为 1 mL/6.5 min 时,稳定输出电压值、库仑效率和最大功率密度达到最大值,分别为 537.2623.78 mV、14.39%0.58%和 2740.30 mW/m²;COD 去除率随着进水流速的减小逐渐增大,在 1 mL/10min 进水流速时达到最大,为 77.58%0.48%;当进水流速为 1 mL/3.0 min 时,MFC 的内阻达到最大,为 437.14 Omega;减小阳极进水流速为 1 mL/5.0min 后,MFC 得到了最小的内阻值,为 195.73 Omega,较 1 mL/6.5 min 与 1 mL/10.0 min 进水流速时分别低了 7.63%与 25.14%;从产电性能、COD 去除效果、阴极微藻生长状况及阴极溶解氧浓度等方面综合分析,该 MFC 在进水流速为 1 mL/6.5 min 时,系统整体性能表现最佳。

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标题: Seismic behavior of cold-formed thin-walled steel plate shear wall

标题: 冷弯薄壁型钢-钢板剪力墙抗震性能试验研究

来源出版物: 建筑结构学报 卷: 41 期: 5 页: 65-75 出版年: 2020

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作者关键词: cold-formed steel; steel plate shear wall; seismic performance; quasi-static test; load carrying mechanism

作者关键词: 冷弯薄壁型钢; 钢板剪力墙; 抗震性能; 拟静力试验; 受力机制

摘要: In order to study the seismic performance of cold-formed thin-walled steel plate shear wall system, low-cycle reciprocating load tests were carried out on the cold-formed thin-walled steel plate shear wall with built up side columns and middle arranged thin steel plate. The effects of the thickness and shape of side columns cross sections on the seismic performance of shear walls were compared. The failure modes, hysteresis curves, skeleton curves, load and displacement characteristic values of specimens were obtained, and the failure modes, ductility, energy dissipation capacity, bearing capacity and stiffness degradation of the structures were analyzed. The results indicate that the cold-formed thin-walled steel thin steel plate shear wall has good seismic performance. Increasing the thickness of side columns and choosing cap-shaped side columns can improve the bearing capacity, stiffness and energy dissipation performance of the shear wall. The design values of shear capacity and elastic lateral stiffness of three specimens are calculated, which are higher than those of the cold-formed thin walled composite walls. Combined with the failure characteristics, three stress stages of cold-formed thin-walled steel plate shear wall were proposed. The side column played a controlling factor to the failure of shear wall. The strength of side column should be ensured in engineering design, and the idea of strong side column and weak steel plate should be adopted.

摘要: 为研究冷弯薄壁型钢-钢板剪力墙结构的抗震性能,对冷弯薄壁型钢边柱内置薄钢板剪力墙进行低周往复加载试验,对比不同边柱截面厚度及截面形式对其抗震性能的影响。试验中得到了冷弯薄壁型钢-钢板剪力墙的破坏形态、荷载-位移滞回曲线、骨架曲线、荷载及位移特征值,并对结构的破坏特征、延性、耗能能力、承载力及刚度退化进行分析。结果表明:冷弯薄壁型钢-钢板剪力墙具有良好的抗震性能;增加边柱截面厚度及选用帽形边柱均可提高剪力墙的承载力、刚度及耗能性能。计算3个试件受剪承载力设计值和弹性抗侧刚度,其值均高于常用冷弯薄壁组合墙体的;结合破坏特征提出冷弯薄壁型钢-钢板剪力墙3个受力阶段;边柱对剪力墙破坏起控制因素,工程设计中应保证边柱承载能力,宜采用强边柱、弱钢板的设计理念。

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标题: Experimental study on dewaterability by ferric salt and aluminum salt combined with potassium silicate conditioning sludge

标题: 铁铝盐复合硅酸钾调理污泥脱水性能试验研究

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作者关键词: sludge conditioning; dewaterability; potassium silicate

作者关键词: 污泥调理; 脱水性能; 硅酸钾

摘要: The effects of dosage of FeCl_3 , AlCl_3 , $\text{Al}_2(\text{SO}_4)_3$, $\text{Fe}_2(\text{SO}_4)_3$ on sludge dewaterability and the effects of these four conditioners combined with K_2SiO_3 on sludge dewatering performance were studied. The results showed that the optimum dosage of FeCl_3 , AlCl_3 , $\text{Al}_2(\text{SO}_4)_3$, $\text{Fe}_2(\text{SO}_4)_3$ was 4%, 8%, 6%, 8%, respectively. And 4% FeCl_3 had the best conditioning effect, which reduced specific resistance to filtration (SRF) from $5.033 \times 10^{-6} \text{ s}^2/\text{g}$ to $2.688 \times 10^{-6} \text{ s}^2/\text{g}$ and capillary suction time (CST) from 28.1 s to 16.8 s. When these four conditioners were combined with 2% K_2SiO_3 respectively, the conditioning effect was better than that of single agent. The best one was the compound conditioning of 4% FeCl_3 and 2% K_2SiO_3 , which reduced SRF to $1.652 \times 10^{-6} \text{ s}^2/\text{g}$ and CST to 12.2 s. When the conditioner improves the sludge dewaterability, the sludge viscosity will also decrease, and the sedimentation performance will also be improved, but the use of K_2SiO_3 will slightly deteriorate the sludge settling performance.

摘要: 研究了 FeCl_3 、 AlCl_3 、 $\text{Al}_2(\text{SO}_4)_3$ 、 $\text{Fe}_2(\text{SO}_4)_3$ 4 种调理剂单独调理污泥时投加量对污泥脱水性能的影响, 以及这 4 种调理剂分别与 K_2SiO_3 复合调理时对污泥脱水性能的影响。结果表明, 使用单一药剂调理污泥时, FeCl_3 、 AlCl_3 、 $\text{Al}_2(\text{SO}_4)_3$ 、 $\text{Fe}_2(\text{SO}_4)_3$ 的最佳投药量分别为 4%、8%、6%、8%。并且其中 4% 的 FeCl_3 调理效果最佳, 使污泥比阻 (SRF) 由 $5.033 \times 10^{-6} \text{ s}^2/\text{g}$ 降低至 $2.688 \times 10^{-6} \text{ s}^2/\text{g}$, 毛细吸水时间 (CST) 由 28.1 s 降低至 16.8 s; 这 4 种调理剂分别与 2% 的 K_2SiO_3 复合投加时调理效果均优于单一药剂调理效果, 其中效果最佳的是 4% 的 FeCl_3 与 2% 的 K_2SiO_3 复合调理, 使 SRF 降低至 $1.652 \times 10^{-6} \text{ s}^2/\text{g}$, CST 降低至 12.2 s。调理剂在改善污泥脱水性能时, 污泥粘度也会降低, 且沉降性能也得到改善, 但 K_2SiO_3 的使用会对污泥沉降性能产生微小的不利影响。

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标题: Flexural behavior of steel fiber-reinforced high-strength lightweight aggregate concrete beams reinforced with glass fiber-reinforced polymer bars

标题: GFRP 筋钢纤维高强轻骨料混凝土梁受弯性能试验研究

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作者关键词: high-strength lightweight aggregate concrete beam; glass fiber-reinforced polymer(GFRP)bar; steel fiber; flexural behavior; deflection

作者关键词: 高强轻骨料混凝土梁; 玻璃纤维增强筋; 钢纤维; 受弯性能; 挠度

摘要: Nine beams reinforced with glass fibre-reinforced polymer(GFRP)bars and one beam reinforced with steel rebars fabricated using high-strength lightweight aggregate concrete were tested. The experimental results in terms of flexural strength, deflection, crack width, and failure mode were presented and the influences of parameters, including steel fiber content, type of reinforcement, reinforcement ratio and bar diameter, were discussed. The equations recommended by the design codes ACI 440.1R-15, GB 50608-2010, CSA S806-12 and ISIS-M03-07 were employed to assess the flexural behavior in terms of cracking moment, ultimate moment, deflection, and crack width of the test beams. The test results show that FRP rupture failure, balanced failure, and concrete crushing failure are sequentially obtained as the reinforcement ratio constantly increases. The failure surfaces in the compression zone cross the interior of the aggregates and are relatively smooth. Adding steel fibers improves the rigidity and restrains the propagation of the cracks of the specimens. Besides, the cracking moment and load-carrying capacity are increased by 51.71% and 22.10%, respectively, due to the addition of fibers. Increasing the GFRP reinforcement ratio increases the stiffness of the beams, while GFRP bar diameter has a marginal effect on the deflection and cracking behavior. Furthermore, the beams reinforced with GFRP bars exhibit more rapid stiffness degradation compared to their steel reinforced counterparts. The equations recommended by the design codes overestimate the strength of specimens without adequate reinforcement and the theoretical results are scattered. However, the strength of beams failed by concrete crushing are underestimated. The formula for effective moment of inertia was modified considering the effects of lightweight aggregate and steel fiber on the rigidity degeneration of the beams. The theoretical values calculated by the recommended equation agree well with the test results.

摘要: 完成了9根配GFRP筋和1根配钢筋的高强轻骨料混凝土梁受弯性能试验,观察其破坏过程与破坏形态,分析了纤维掺量、纵筋类型、配筋率及纵筋直径等参数对试件承载能力、弯矩-跨中挠度曲线、裂缝宽度等受弯性能的影响,采用美国ACI 440.1R-15、中国GB 50608-2010和加拿大CSA S806-12、ISIS-M03-07等规范中的建议模型,通过开裂弯矩、承载力、挠度和裂缝宽度等参数评估了各国规范对该类构件的适用性。结果表明:随配筋率的增大,试件破坏模式依次表现为受拉破坏、平衡破坏和受压破坏,受压区破坏面贯穿骨料内部,较为光滑;掺入钢纤维能够有效抑制混凝土裂缝开展,延缓构件刚度退化,使开裂弯矩平均提高51.71%,承载力平均提高22.10%;增大GFRP筋配筋率能够提高构件刚度,但GFRP筋直径变化对试件变形及裂缝宽度无显著影响;GFRP筋梁开裂后刚度退化较配钢筋的对比试件迅速。各国规范计算结果表明:受拉破坏试件承载力计算结果较离散,且均偏于不安全;对于平衡破坏和受压破坏的试件预测结果均偏于保守,有足够安全储备。考虑轻骨料和钢纤维对构件刚度退化规律的影响,修正有效惯性矩并给出建议挠度计算模型,计算结果与试验结果吻合较好。

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标题: Comparison of energy consumption between high-rise residential series and parallel partition water supply

标题: 高层住宅串联分区与并联分区供水能耗对比

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作者关键词: Secondary water supply; Series partition water supply; Energy consumption calculation; High efficiency and energy saving

作者关键词: 二次供水; 串联分区供水; 能耗计算; 高效节能

摘要: In view of the fact that the traditional parallel partition water supply modes are independent, the total water supply units amount per district is small, and the user water non-uniformity is large, the application of the series partition water supply method in high-rise residential buildings is studied, combined with a specific example, using the numerical solution method. The cumulative energy consumption of the series and parallel partition water supply methods shows that under the theoretical calculation conditions, the energy saving rate of the serialized district water supply method is 14.77%, which provides reference for the selection of high-rise building water supply mode from the perspective of energy saving.

摘要: 针对传统并联分区供水方式各区独立, 每区给水当量总数少, 用户用水不均匀性较大等问题, 对串联分区供水方式在高层住宅中的应用进行研究, 结合一具体算例, 利用数解法计算串联分区和并联分区供水方式的全天累计能耗, 结果表明在理论计算工况条件下, 该算例串联分区供水方式节能率达 14.77%, 从节能角度为高层建筑供水方式的选择提供参考。

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标题: Experimental study on mechanical properties of masonry mortar for raw-soil blocks

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文献类型: Article

作者关键词: masonry mortar; admixture; compressive strength; shear strength; bonding property

作者关键词: 砌筑泥浆; 掺合料; 抗压强度; 抗剪强度; 粘结性能

摘要: In order to study the effects of straw and quicklime on the mechanical properties of masonry mortar of raw-soil blocks, mortar specimens with seven different proportions were tested in uniaxial compression tests and double shear tests. The effects of changes in straw and quicklime on the compressive properties, shear properties and bonding properties of mortar were studied from the aspects of failure mode, compressive strength, shear strength and peak deformation. The results show that with the increase of the amount of quicklime, the compressive strength and shear strength of the mortar are reduced to some extent, and the peak displacements of the compression specimen and the shear specimen are reduced. As the amount of straw increases, the compressive strength of the mortar decreases, but the shear strength gradually increases. Moreover, straw improves the mortar toughness, inhibits the lateral deformation of masonry, and can improve the shear strength and deformation capacity of masonry.

摘要: 为研究稻草和生石灰对生土基块材砌筑泥浆力学性能的影响,采用单轴抗压试验和双剪试验对7种不同配合比的泥浆试件进行测试。分别从试件破坏形态、抗压强度、抗剪强度及峰值变形等方面研究稻草和生石灰掺量变化对砌筑泥浆抗压性能、抗剪性能及粘结性能的影响。结果表明:随着生石灰掺量的增多,泥浆的抗压强度及抗剪强度均有不同程度的降低,且抗压试件及抗剪试件的峰值位移均有所减小;随着稻草掺量的增多,泥浆的抗压强度虽有减小,但抗剪强度逐渐提高,且稻草提高泥浆韧性,抑制砌体横向变形,可提高砌体的抗剪强度及变形能力。

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作者: 何皎洁; 徐雨虹; 杨悦; 杨利伟

标题: The influence of valence states for Ce-MOF derived nanocomposites on the capability of phosphate adsorption and the mechanisms

标题: 不同价态 Ce-MOF 衍生材料的吸附除磷性能及机理比较

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文献类型: Article

作者关键词: MOF; phosphate; adsorption; ruthenium-based nanocomposites; wide pH; metal organic skeleton derivatives; partial thermal decomposition

作者关键词: 磷酸盐; 吸附; 铈基纳米复合材料; pH 值宽; 部分热分解

摘要: Through heat treatment in N₂ atmosphere, a series of multi-stage micro/nano cerium matrix composites were derived from Ce-MOF. Ce-MOF completely decomposes in air to form cerium dioxide, and the valence state changed from trivalent to tetravalent. However, calcination at a lower temperature (400 °C or 500 °C) in N₂ would result in a stable partial pyrolysis of Ce-MOF(N) with a higher Ce (III) content. Compared with the completely decomposed product, although the completely decomposed product had a higher specific surface area, the phosphate adsorption effect of the partially decomposed sample was 2-4 times of that of the completely decomposed product. This difference showed that the different valence states of Cerium based materials had a significant impact on the phosphorus removal performance. Compared with cerium ions(IV), cerium ions(III) played a major role in the combination with phosphate. Compared with Ce-MOF(A), Ce-MOF(N) was a kind of Ce based nano material with high Ce(III) content. Its saturated adsorption capacity was 187.2 mg·g⁻¹, and the adsorption speed was fast. The pH range was very wide, from 2 to 12, and it also had high selectivity for phosphate in the presence of competitive anions. At the same time, Ce-MOF(N) had significantly enhanced phosphate adsorption capacity under alkaline conditions compared with the commonly used metal salt adsorbents. This was because the partial hydrolysis of Ce(III) on the surface brings more hydroxyl groups and increases the active sites of phosphate ion exchange. In addition, through the analysis of FTIR, XPS, XRD and zeta potential, the adsorption mechanism of Ce (III) on phosphate was mainly electrostatic attraction, ion exchange and surface deposition, while the electrostatic attraction of Ce-MOF(A) was the main mechanism.

摘要: 通过在 N₂ 气氛中的热处理, 从 Ce-MOF 中衍生出一系列多级的微/纳米铈基复合材料. Ce-MOF 在空气中完全分解形成二氧化铈, 价态由三价转变为四价. 而在 N₂ 中较低温度 (400 °C 或 500 °C) 下煅烧会形成稳定的部分热解的 Ce-MOF(N), 具有较高的 Ce(III) 含量. 与完全分解的产物相比, 虽然完全分解的产物具有较高的比表面积, 但是部分分解的样品对磷酸盐的吸附效果是完全分解产物的 2-4 倍. 这种差异证明铈基材料的不同价态对除磷性能有显著影响, 相比于四价铈离子, 三价铈在与磷酸盐结合中起主要作用. 与 Ce-MOF(A) 相比, Ce-MOF(N) 是一种高 Ce(III) 含量的铈基纳米材料, 其饱和吸附容量为 187.2 mg·g⁻¹, 吸附速度快, pH 适用范围极广, 为 pH 2-12, 并且在竞争阴离子存在下也对磷酸盐具有很高的选择性. 与此同时, 相比于常用的金属盐吸附剂, Ce-MOF(N) 在碱性条件下具有明显增强的磷酸盐吸附能力. 这是因为表面 Ce(III) 的部分水解带来了更多的羟基, 增加了磷酸根离子交换的活性位点.

此外,通过分析 FTIR、XPS、XRD 和 Zeta 电位,Ce(III)样品对磷酸根的吸附机理主要为静电吸引,离子交换和表面沉积,而对于完全分解的铈基材料 Ce-MOF(A)静电吸引是主要机理.

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作者: Bai Liang; Li Yilin; Zhang Cai; Wang Chen

作者: 白亮; 李易林; 张才; 王晨

标题: Research on longitudinal shear capacity of ECC composite slabs with closed profiled steel plate

标题: 缩口型压型钢板-ECC 组合楼板纵向剪切承载力研究

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文献类型: Article

作者关键词: PVA-ECC; profiled steel plate; composite floor; PVA-ECC; longitudinal shear capacity

作者关键词: 压型钢板; 组合楼板; 纵向剪切承载力

摘要: The bond slip behavior has a great influence on the shear bearing capacity of composite floor. Using PVA-ECC material instead of traditional concrete can effectively improve the brittleness of concrete and the shear performance of composite floor. By using the method of force balance, the shear force slip curve of the ECC composite slabs with closed profiled steel plate was obtained, and the contact effect between the ECC and the profiled steel plate was considered reasonably, to obtain the finite element model of the ECC composite slabs with closed profiled steel plate. The analysis of the longitudinal shear bearing capacity shows that the finite element analysis and the test results are in good agreement, and the accuracy of the finite element model is verified. On this basis, the finite element method was used to analyze the variable parameters of different shear span, floor slab, profiled steel plate thickness and PVA-ECC strength. Referring to the calculation method of longitudinal shear bearing capacity of concrete composite slabs with profiled steel plate, the calculation formula of longitudinal shear bearing capacity of the ECC composite slabs with closed profiled steel plate was proposed.

摘要: 粘结滑移性能对组合楼板受剪承载力影响较大, 使用 PVA-ECC 材料代替传统混凝土, 能够有效改善混凝土的脆性, 提高组合楼板受剪性能。采用力平衡方法得到缩口型压型钢板-ECC 组合楼板剪切力-滑移曲线, 合理地考虑 ECC 与压型钢板接触作用, 得到缩口型压型钢板-ECC 组合楼板有限元模型, 对纵向剪切承载力进行分析, 有限元分析与试验结果符合较好, 验证了有限元模型的准确性。在此基础上, 采用有限元方法对不同剪跨、楼板、压型钢板厚度及 PVA-ECC 强度等因素进行变参数分析, 参考压型钢板混凝土组合楼板纵向剪切承载力计算方法, 提出缩口型压型钢板-ECC 组合楼板纵向剪切承载力计算公式。

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作者: 吴函恒; 晁思思; 刘向斌; 周天华; 任璐杰

标题: Experimental study on seismic behavior of cold-formed steel framing walls infilled with lightweight modified FGD gypsum

标题: 轻质脱硫石膏改性材料填充冷弯型钢组合墙体抗震性能试验研究

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作者关键词: cold-formed steel framing wall; flue gas desulfurization (FGD) gypsum; quasi-static test; seismic behavior

作者关键词: 冷弯型钢组合墙体; 脱硫石膏; 拟静力试验; 抗震性能

摘要: In order to investigate the seismic behavior of cold-formed steel (CFS) framing walls infilled with the lightweight modified flue gas desulfurization (FGD) gypsum, five full scale specimens were tested under reversed cyclic horizontal load. The failure mode, shearing capacity, lateral stiffness, hysteretic behavior, ductility and deformation and energy dissipation were investigated. Experimental results show that the infilled gypsum behaves as a diagonal compressive bracing to resist the horizontal force. The failure modes of the walls with infilled gypsum are characterized by the bond-slip cracks between infilled gypsum and wall frames, and the compressive damage at the corners of the individual part of infilled gypsum. Compared with the unfilled specimens, the shear capacity and lateral stiffness of the infilled specimens increase by 55% ~ 88% and 142% ~ 217%, respectively. It is noted that the shear capacity of the walls increases with the compressive strength of gypsum. However, the increase in shear capacity is lower than the increase in the compressive strength of gypsum.

摘要: 为研究轻质脱硫石膏改性材料填充冷弯型钢组合墙体的抗震性能,对5片轻质脱硫石膏改性材料填充冷弯型钢组合墙体的足尺试件进行低周反复加载试验。研究该类墙体的破坏机理、承载力及抗侧刚度、滞回性能、延性及变形、耗能性能等。试验结果表明:填充墙体内填充石膏分块形成斜向受压带,发挥其抗侧力功能,最终以各块填充物与墙架立柱之间的黏结滑移破坏以及轻质石膏块角部的受压破坏为主要破坏特征;较空腔墙体,填充墙体的受剪承载力和抗侧刚度均有大幅度提高,受剪承载力提高了55%~88%,抗侧刚度提高了142%~217%;随着填充材料强度的提高,墙体的抗侧刚度和受剪承载力逐步提高,但其提高幅度低于材料强度的提高幅度。

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标题: Experimental study on seismic behavior of high-strength concrete columns reinforced with multiple composite central reinforcement

标题: 高强混凝土多重复合芯柱抗震性能试验研究

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文献类型: Article

作者关键词: core column; type of stirrups; low-cyclic reversed loading; seismic behavior

作者关键词: 芯柱; 配箍形式; 低周反复荷载; 抗震性能

摘要: Eight high-strength concrete columns reinforced with multiple composite central reinforcement were designed and fabricated to conduct research about the construction of a subway station project. Taking the axial compression ratio, stirrup form and stirrup ratio as the main variables, the low-cyclic reversed load tests were carried out to analyze the failure process and failure modes, and the hysteretic behavior, skeleton curve, deformation capacity, stiffness degradation and energy dissipation capacity were systematically studied. The Park-Ang damage model was utilized to analyze the damage evolution law of the columns. Based on the philosophy of performance-based design, the relationships between damage index and damage degree of the column specimens were given. The results showed that the column specimens experienced bending-shear failure and shear failure. With the increase of axial compression ratio, the peak loads increased significantly, but the deformation performance, the ductility, the bearing capacity, the stiffness and the energy dissipation capacity decreased. With the increase of stirrup ratio, the hysteretic loop area of the columns, the ductility and the energy dissipation capacity increased, while the peak load, the bearing capacity and the stiffness degeneration decreased. The change of stirrup type can significantly influence the energy dissipation capacity of the specimens. The hysteretic behavior, deformation performance and energy dissipation capacity of specimen C-DC-100 and C-SC-100 were better, which indicated that these stirrup forms could effectively restrain the concrete in the core area, so the seismic behavior of the columns was improved. The damage indices of all specimens were between 0.17 and 0.35 at the story drift of about 1/50, and no serious damage was observed, which proved the good seismic behavior of high-strength concrete columns reinforced with multiple composite central reinforcement. The columns were destroyed at story drifts from 1/29 to 1/21, and the damage indices of the columns were greater than 1.0.

摘要: 以某地铁站房工程为背景, 设计并制作了 8 个高强混凝土多重复合芯柱试件, 选取轴压比、箍筋形式、配箍率为变量, 进行低周反复荷载试验研究, 分析其破坏过程及形态, 系统研究

该类多重复合芯柱的滞回性能、骨架曲线、变形能力、刚度退化和耗能能力,应用 Park-Ang 损伤模型对该类新型混凝土柱的损伤演化规律进行分析,基于性能化设计理念给出高强混凝土多重复合芯柱的损伤指数与破坏程度的对应关系。研究表明:高强混凝土多重复合芯柱发生弯剪破坏和剪切破坏;随轴压比增大,峰值荷载增大,但变形性能和延性降低,承载力衰减和刚度退化加快,耗能能力明显减弱;随配箍率增大,芯柱试件滞回环面积增大,延性提高,承载力衰减和刚度退化减缓,耗能能力显著增强;配箍形式对芯柱试件耗能能力影响较大,其中试件 C-SC-100 和 CDC-100 的滞回性能、变形性能、耗能能力明显改善,表明外螺旋内圆和内外双圆箍筋的配箍方式增强了核心区混凝土的约束,从而提高该类芯柱的抗震性能;层间位移角 $1/50$ 时,各试件损伤指数 D 为 $0.17 \sim 0.35$,均未发生严重破坏,表明该类多重复合芯柱抗震性能较好,复合芯柱最终破坏时的层间位移角为 $1/29 \sim 1/21$,且损伤指数均大于 1。

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作者: Meng Qinglong; Wang Wenqiang; Ge Junling

作者: 孟庆龙; 王文强; 葛俊伶

标题: Simulation and Experimental Research on Control Strategies for the VAV Air-conditioning System

标题: 变风量空调系统控制策略仿真与实验研究

来源出版物: 建筑科学 卷: 36 期: 2 页: 44-50,78 出版年: 2020

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文献类型: Article

作者关键词: VAV system; total air volume method; impedance; control strategy

作者关键词: 变风量系统; 总风量法; 阻抗; 控制策略

摘要: When VAV (variable air volume) air-conditioning system is running, the strong dynamic characteristics can be reflected by the real-time change of the air volume. However, coupling between VAV terminals may lead to unstable operation of the system. The control of the VAV system is mostly conducted from the perspective of automatic control in lack of the control strategy based on the characteristics of the VAV air-conditioning system. Therefore, an improved total air volume method is proposed in this paper. According to hydraulic characteristics of the variable air volume system, the influence of variations in the end valve position on the air supply volume of the fan is analyzed. Moreover, the real-time variation law of the impedance of the air duct system is detected. Control modules are adopted to read the control amount and the adjustment amount before reaching the control of the fan. The proposed strategy is carried out under different working conditions through the full-scale experimental platform and the TRNSYS simulation platform. Averages of the improved total air volume method, the static pressure method and the total air volume method are 0.085, 0.178 and 0.145, respectively. The best control effect can be seen in the total air volume method. Under the cooling condition in summer, operating powers of the fan under three control strategies are compared. The energy consumptions controlled by the static pressure method and the total air volume method are 5.83% and 19.68%, respectively, higher than that of the improved total air volume method. The improved total air volume method provides a new idea for avoiding long adjustment time and system oscillation in the process of fan frequency adjustment, and a reliable basis for achieving a better control effect and effectively reducing energy consumption of the fan.

摘要: 变风量空调系统实际运行时,风量的实时改变体现出强动态特性,各末端之间存在耦合,导致系统运行会出现不稳定状况。目前针对变风量系统的控制多是从自动控制角度出发,而根据 VAV 空调系统特性制定的控制策略较为缺乏。为此,提出 1 种改进型总风量法。从变风量系统水力特性的角度,分析末端阀位变化对风机送风量的影响,找出风管系统阻抗实时变化规律。再利用控制模块读取控制量与调节量,直接达到对风机的控制。通过全尺寸实验平台和 TRNSYS 模拟平台对所提策略开展不同工况下的研究得:改进型总风量法、变静压法、总风量法的评价指标平均值分别为 0.085, 0.178, 0.145,改进型总风量控制效果最好;夏季供冷工况下,对比 3 种控制策略的风机运行功率,在系统等风量条件下,变静压法和总风量法控制下的能耗较改进型总风量法高出 5.83% 和 19.68%;改进型总风量法,为避免风机频率调节过程中调节时间长和系统振荡提供新思路,为实现较好的控制效果的同时能有效地降低风机能耗提供可靠依据。

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标题: Experimental investigation on seismic performance of assembly CFDST frame with beam-connected steel plate shear walls

标题: 装配式复式钢管混凝土框架梁端连接钢板剪力墙抗震性能试验研究

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文献类型: Article

作者关键词: concrete-filled double-skin steel tube; assembly structures; steel plate shear wall; beam-connected; experimental investigation; seismic performance

作者关键词: 复式钢管混凝土; 装配式结构; 钢板剪力墙; 梁端连接; 试验研究; 抗震性能

摘要: This paper proposes a novel assembly concrete-filled double-skin steel tube (CFDST) frame with beam-connected steel plate shear wall (BSW) system,including beam-to-column,column-to-column and frame-to-wall assembly connections,which are used for all-bolt assembly construction of the proposed novel system. To investigate the seismic behavior of the proposed system, three 1: 2-scaled models were tested under cyclic loads. The seismic performance of the test specimens are obtained,including failure modes,hysteretic curves,displacement ductility, and etc. The specimens exhibit good seismic performance,in which the maximum inter-story drift of these specimens exceeds 4%,and the displacement-based ductility coefficient exceeds 4. The failure process of the CFDST frame-BSW specimens includes tension fieldformed after buckling of BSW,tearing of the BSW nearby the frame-to-wall connections,and the forming of the plastic hinges at the beam-to-column connections and column bases. The test results show that the BSW fails prior to the CFDST frame,the BSW and the frame can be used as the first defense line and the second line,respectively. The BSW can enhance the strength,stiffness and ductility of the CFDST frame,and the relationship between the enhancements and the numbers of the BSW is approximately linear. The proposed frame-to-wall connection is reliable to ensure the interoperability of the BSWs and the CFDST frame,so as to promote fully-use of the performance of the BSWs. The test results can provide reference for the seismic design of CFDST frame-BSW system.

摘要: 提出装配式复式钢管混凝土框架-梁端连接钢板剪力墙新型结构体系,包含装配式梁柱连接、装配式柱柱拼接和装配式框架-剪力墙连接技术方案,可实现结构体系的全螺栓装配式连接。为研究所提装配式体系的抗震性能,开展3榀1:2缩尺模型拟静力试验,得到各试件的破坏模式、滞回曲线、位移延性等性能参数。发现3个模型均表现出良好抗震性能,最大层间位移角均超过4%,位移延性系数均超过4。框架-梁端连接钢板剪力墙(BSW)的破坏过程为:BSW屈曲后形成明显的拉力带,随后BSW在与框架的连接处发生撕裂,最后框架在梁柱节点和柱底区域形成塑性铰。试验结果表明:BSW先于框架发生破坏,可为框架提供第一道抗震防线,框架则为第二道;BSW可有效提高框架结构的承载力、刚度和延性,且提高的幅度与

BSW 的个数呈近似线性关系;所提 BSW 与框架的装配式连接可靠,可保证 BSW 与框架在整个加载过程中的协同工作能力,进而促使 BSW 的性能得以充分发挥。系列试验结果为所提新型装配式复式钢管混凝土框架-梁端连接钢板剪力墙结构体系的抗震设计提供依据。

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水利与环境学院

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作者: 邓若兰; 杨银科; 李强; 于淼

标题: Analysis of geochemical characteristics of the geothermal water in a typical geothermal well in Xianyang area

标题: 咸阳地区某典型地热井的地热水地球化学特征分析

来源出版物: 地球环境学报 卷: 11 期: 5 页: 546-553 出版年: 2020

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作者关键词: geothermal field of Xianyang City; geothermal water; isotopes; hydrochemical characteristics

作者关键词: 咸阳地热田; 地热水; 同位素; 水化学特征

摘要: Background, aim, and scope Geothermal water resources are the products of the interaction between geothermal energy, groundwater and rocks and minerals, and can be used as a heat source, water source and mineral resources, which is a new type of green energy. Geothermal water resources have obvious advantages in relieving energy pressure, adjusting energy structure and improving environmental quality, but they are not inexhaustible. The distribution of geothermal wells in urban areas of Xianyang is dense, and the amount of geothermal water extraction is large, but the long-term extraction of geothermal heat has caused the supply of groundwater with lower temperature or high-temperature thermal fluid at depth, thus causing changes in the chemical

characteristics of geothermal fluid. The study of geothermal well hot water geothermal system changes and causal characteristics has become an inevitable requirement for the efficient and reasonable use of geothermal water resources in Xianyang region. Materials and methods In this paper, the sampling site was selected as 185 coalfield geological team (34°22'N, 180°44'E), Zhouling Township, Weicheng District, Xianyang City, Shaanxi Province. In 1999 and 2017, water chemistry samples were collected in the region to collect hot water samples. In this paper, the water quality data of 1999 and 2017 and the data of multi-year water temperature changes were integrated, and the research results of other scholars in the research area were taken into consideration to study the change trend of the chemical composition, water temperature and water-rock balance of geothermal water. In addition, the characteristics of geochemical factors of the hot water well and regional geothermal fluid were also comprehensively analyzed. According to the research and analysis of δD , $\delta^{18}O$, $\delta^{14}C$ isotopes of geothermal water, the origin of geothermal water and its isotopic hydrological characteristics in this region are revealed and discussed. It is hoped that this paper will provide scientific basis for the efficient utilization, management and protection of geothermal resources in this region as well as the prospect of geothermal industry development. Results According to the stable hydrogen and oxygen isotopes, the geothermal water supply elevation was calculated to be 1200 m. From the $\delta^{14}C$ test age of 20251 a, it can be seen that XY1 well geothermal water belongs to the cause of precipitation infiltration in Beishan Mountain Area in the last glacial period of the Quaternary. Well XY1 was mainly used to exploit the thermal reservoir of Bahe formation in Lantian, with no change in the chemical type of geothermal water and the dynamic of water-rock equilibrium, and little change in water temperature. There was no shallow low temperature water supply in the thermal reservoir, nor deep high temperature water supply. Discussion Based on the correlation between $\delta^{18}O$ and δD values in the geothermal water of the well and the chemical composition of the groundwater, it can be inferred that the thermal reservoir fluid is the residual sedimentary water mixed with the ancient leaching water.

摘要: 地球化学方法是了解地热系统特点、变化及起源的重要手段,合理开发利用地热资源的前提。基于咸阳地热田 XY1 地热井 1999 年与 2017 年两期水质资料、多年水温变化资料,参考其他学者在研究区取得的研究成果,综合分析了该热水井及区域地热流体地球化学因子的变化特征。根据地热水 δD 、 $\delta^{18}O$ 、 $\delta^{14}C$ 同位素分析,探讨了该地区地热水的起源及其同位素水文特征。结果表明:该热水井水温变化不大,水-岩平衡状态未改变,大部分离子组分浓度呈上升趋势,水质变差。水化学类型未改变,为 Cl-Na 型,其中多种水化学组分浓度达到一定标准,可作为医疗热矿水开发利用。研究区热储层以消耗静态储层为主,无现代降水补给。该井地下热水属于第四纪末次冰期北山山区海拔 1200 m 大气降水入渗成因,为混入古溶滤水的残存沉积水。建议生产过程中应采取地热水回灌措施,使地热资源开发具有可持续性。

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标题: Schiff Bases Containing p-Phenylenediamine and p-Phenylenedicarbaldehyde and Their Complexes: Preparation and Electrochemical Properties

标题: 对苯二胺缩对苯二甲醛席夫碱及其配合物的制备和电化学性能

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作者关键词: polymeric Schiff base; coordination polymer; electrochemical performance; supercapacitor

作者关键词: 席夫碱聚合物; 配位聚合物; 电化学性能; 超级电容器

摘要: The polymeric Schiff base (PT) was synthesized by the condensation reaction of p-phenylenediamine and terephthalaldehyde, and electrochemical properties of PT with different molar ratios of monomers were investigated. The lone pair electron of the nitrogen atom in the PT can coordinate with various metal ions (PT-M), and the results measured indicate that PT-M possesses better electrochemical performance compare with PT. The as-prepared samples were characterized by X-ray diffraction (XRD), infrared spectrum (IR), thermogravimetry-differential scanning calorimetry (TG-DSC), scanning electron microscope (SEM) and energy spectrum (EDS). The intensity of XRD peaks of PT-M decreased in comparison with the PT, indicating that the tendency of molecular chain arrangement from order to disorder because metal ions entering polymer molecular skeleton through coordination chemical bonds. Electrochemical properties of PT and PT-M were evaluated by means of cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). The results show

that the polymeric Schiff base aluminum complex (PT - Al) exhibits outstanding electrochemical performance, and its capacitance can reach $649.6 \text{ F} \cdot \text{g}^{-1}$ at a current density of $0.5 \text{ A} \cdot \text{g}^{-1}$, together with remaining 80.9% after 1 000 GCD cycles at the current density of $8 \text{ A} \cdot \text{g}^{-1}$.

摘要: 以对苯二胺和对苯二甲醛为原料缩合制备出对苯二胺缩对苯二甲醛席夫碱聚合物(PT),研究了采用不同物质的量之比的单体所制备的聚合物的电化学性能。利用席夫碱聚合物中 N 原子上的孤对电子与不同金属离子配位形成席夫碱配位聚合物(PT-M),并对所形成聚合物的电化学性能进行了研究。采用 X 射线衍射(XRD)、红外(IR)、热重-差示扫描量热法(TG-DSC)、扫描电子显微镜(SEM)和能谱(EDS)对产物进行了表征,PT-M 的 XRD 峰强度相比于 PT 明显降低,表明金属离子配位进入分子链骨架中引起的空间位阻减少了分子链排列的有序性。采用循环伏安、恒电流充放电和交流阻抗评价了所制备的配位聚合物材料的电化学性能。研究发现,聚席夫碱铝配合物(PT-Al)表现出较优的电化学性能,在 $0.5 \text{ A} \cdot \text{g}^{-1}$ 的电流密度下其电容值为 $649.6 \text{ F} \cdot \text{g}^{-1}$,并且具有较好的循环稳定性,在 $8 \text{ A} \cdot \text{g}^{-1}$ 的电流密度下循环 1 000 次后仍有 80.9% 的电容保持率。

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标题: Predicting Change in Water Availability for Jinghui Irrigation District Using Ensemble Empirical Mode Decomposition and Back Propagation Neural Network

标题: 联合 EEMD 与 BP 神经网络的灌区水源情势预测研究

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作者关键词: water resources; annual runoff; forecasting; nature of runoff and sediment; irrigation district

作者关键词: 水资源; 年径流量; 预测; 水沙规律; 灌区

摘要: **【Background】** Climate change and intensification of human activities have impacted hydrological cycling, resulting in a sharp decline in river inflow, frequent occurrence of extreme weathers and decline of groundwater table. The change in water resources has led to a great challenge to water resource management for both industry and agriculture, especially the massive irrigated areas in arid and semi-arid areas which rely on water diverted from rivers for irrigation. It is urgent to improve our understanding of potential change in water resource and irrigation demand to safeguard food production in these regions. **【Objective】** The inflow to the Jing river has been in decline and the available water for diverting to Jinhui irrigation district has been reduced as a result. The purpose of this paper is to analyze the factors affecting the change in water resources at the head of Jinhui Irrigation district in Zhangjiashan and predict its potential change.

【Method】 A model based on the ensemble empirical mode decomposition (EEMD) and the back propagation (BP) artificial neural network was established. The measured hydrological data was used to train and correct the model prior to being used to predict runoff and sediment yield in the next 10 years from 2018 to 2027 at Zhangjiashan. In the meantime, we also analyzed the available surface water resources for the irrigation district. **【Result】** ①The combination of the EEMD and the BP neural network could take the most of each to predict the nonstationary time series of the hydrological data. ②The change in water runoff and sediment yield at the head of the canal of the irrigation district was relatively consistent and simultaneous, both rising first followed by a decline in the next 10 years from 2018 to 2027. ③The average annual runoff will be approximately 1.186 billion m^3 , slightly higher than the average over 1996-2017, while the average annual sediment yield will be about 100 million tones, slightly lower than the average over 1996-2017. ④The available water resources at Zhangjiashan from 2019 to 2027 will be relatively stable, approximately 779 million m^3 annually, slightly higher than the average over 1996 to 2017, and can meet the demand of the irrigation district for water diversion at current level. But management is required to ensure enough water will be able in dry years. **【Conclusion】** The errors of the model were in acceptable range, and the predicted results matched well with the measured data. The EEMD-BP model is accurate and reliable for predicting annual runoff and sediment yield, and it thus provides an alternative to help improve efficient utilization and management of water resources so as to safeguard agricultural production in the studied irrigation district.

摘要: 泾河作为泾惠渠灌区渠首地表水源,来水逐年减少。【目的】分析探讨泾惠渠灌区渠首水源形势,保障灌区水资源管理及粮食生产安全。【方法】研究建立了基于 EEMD-BP 的水文序列预测模型,通过对模型进行训练和校正,最终预测了未来十年(2018-2027 年)泾河来水来沙形势,分析了渠首的水资源可利用量。【结果】将 EEMD 与 BP 神经网络二者结合,可有效发挥各自优势,验证期各项评估指标也较为理想;灌区渠首水沙变化较为同步,在未来一定

时期二者趋势均为短暂的上升后再下降,年均径流量约为 11.87 亿 m³,较当前略有上升,年均输沙量约为 1 亿 t,较当前略有下降,预测结果延续了泾河水沙多年变化的大致趋势;灌区渠首可利用水资源量相对比较平稳,平均水资源可利用量约为 7.79 亿 m³,可满足引水灌溉需求,但应注意一些干旱年份水资源的调蓄利用,谨防发生灌溉水短缺问题。【结论】验证表明模型误差在可接受范围内,且预测系列的变化趋势与当前实测系列完全一致,建立的 EEMD-BP 模型预测年径流及泥沙效果良好,预测结果具有较高的可信度。

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标题: Hydrogeological characteristics and progress of water-preserving coal mining in Weibei Coalfield

标题: 渭北煤田地下水特征及保水采煤研究进展

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作者关键词: 渭北煤田; 绿色开采; 保水采煤; 岩溶地下水

摘要: Green mining has become the most basic requirement for mine construction. As an important part of the green mining technology system, water-preserving coal mining focuses on solving the problems of groundwater resources and ecological environment protection in mining areas. By summarizing the hydrogeological characteristics of karst groundwater in Weibei Coalfield, and clarifying the relationship between coal mining and limestone karst water, the achievements made in the research of water-preserving coal mining in Weibei Coalfield were generally reviewed. The results show that the karst groundwater level in Weibei Coalfield has a downward trend as a whole. The groundwater table has dropped by about 18.5 m at a rate of 0.64 m/a in the past 30 years. The eastern part of Chenghe Mining Area and the No.5 coal seam of Hancheng mining area are both below the karst water level, and coal mining is seriously threatened by karst water. The water inrush mechanism of the No.5 coal seam have two types: ① The effective water barrier of the floor is thicker, and the fault cuts the aluminum between K2 (Quartz sandstone and limestone water-bearing rock group of the Upper Carboniferous Taiyuan Formation) and the second member of Fengfeng Formation limestone aquifer. In the mudstone water-resistant layer, the water pressure failure and the mining floor failure area are connected to each other, resulting in water inrush; ② The containment layer is relatively thin, and the damage area caused by the high-pressure water head is connected to the mining floor failure area, which leads to water inrush. The K2 and below water-resistant layer shall be fully grouted to produce an effective aquifer of 25~30 m, which can realize water-preserved coal mining in the area. The water-preserving coal mining technology on the confined water in Weibei Coalfield has certain reference significance in similar areas.

摘要: 绿色开采已经成为矿山建设的最基本要求。保水采煤作为绿色开采技术体系的重要组成部分,重点在于解决矿区煤层开采过程中地下水资源和生态环境保护问题。通过总结渭北煤田岩溶地下水的水文地质特征,阐明煤层开采与奥灰岩溶水的关系,综述渭北煤田开展保水采煤研究中取得的成果。结果表明:渭北煤田奥灰岩溶水位整体上呈下降趋势,近30年内水位下降了18.5 m左右,下降速率为0.64 m/a。澄合矿区东部及韩城矿区5号煤层均处于岩溶水位水平之下,煤层开采受到岩溶水的严重威胁。5号煤层底板突水机理包括:①底板有效隔水层较厚,断层切割K2(上石炭统太原组石英砂岩和灰岩含水岩组)与峰峰组二段灰岩含水层之间的铝质泥岩隔水层,水压破坏与采动底板破坏区相互导通,产生突水;②有效隔水层相对较薄,高承压水头产生的破坏区与采动底板破坏区相连,发生突水。将K2及以下隔水层全面进行注浆改造,使其产生25~30 m的有效隔水层,能实现保水采煤。围绕着注浆改造保水采煤,渭北煤田在地质条件综合探测、注浆材料研发、带压开采预测、地下水监测等方面都取得长足进展。渭北煤田承压水体上保水采煤技术在类似地区具有借鉴意义。

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标题: 淡水环境中氮污染同位素示踪的研究进展

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作者关键词: 氮污染; 同位素示踪; 地下水; 地表水

摘要: The situation of nitrogen pollution in the freshwater environment is grim. The nitrogen pollution of the water environment seriously threatens the health of residents, and it is imminent to control nitrogen pollution. At present, the effective means of nitrogen pollution control is to determine the source of nitrogen pollution and actively reduce and control the input of nitrogen sources. This paper analyzes the current status of domestic and international groundwater and surface water nitrogen pollution, domestic and foreign technical measures to identify nitrogen sources, and the migration and transformation of groundwater and surface water nitrogen pollution. The results show that domestic groundwater and surface water flow from south to north, from The degree of nitrogen pollution from east to west and the types of groundwater and surface water pollution have significant consistency, and the nitrogen pollution of surface water and groundwater has a positive response mechanism. Groundwater is mainly polluted by nitrate nitrogen, and the pollution grade is mostly grade III; surface water is mainly polluted by ammonia nitrogen and total nitrogen, and grades are mostly grade IV and V. Due to the import of a large number of nitrogen-containing compounds, eastern and southern China have become ammonia nitrogen and total nitrogen. Areas with severe nitrogen pollution. Based on the analysis of the

nitrogen pollution characteristics of groundwater and surface water in different regions,the traditional water chemical analysis method,isotope tracing technology and isotope model are used comprehensively to not only identify the source of nitrogen pollution,but also identify the source of nitrogen and determine the contribution rate of the source of nitrogen.In order to reveal the migration and transformation process and mechanism of nitrogen pollution in groundwater and surface water.The research results provide a scientific basis for identifying the risks caused by nitrogen pollution of surface water and groundwater,and protecting freshwater resources and the environment.Due to the interaction between groundwater and surface water,nitrogen isotopes will undergo corresponding transformations during the process of nitrogen migration and transformation.Their mineralization,nitrification,and denitrification directly affect the fractionation of nitrogen isotopes,so they are accurately quantified and identified.The source of pollution has also become a problem to be overcome.

摘要: 淡水环境氮污染形势严峻,水环境的氮污染严重威胁着居民的健康,氮污染治理迫在眉睫。目前氮污染治理的有效手段是确定氮污染来源,积极减控氮源输入。文章分析了国内地下水和地表水的氮污染现状、国内外识别氮源的技术手段以及地下水和地表水氮污染的迁移转化等研究进展。结果表明,国内的地下水和地表水由南到北,从东到西的氮污染程度及地下水和地表水污染类型具有显著的一致性,地表水和地下水氮污染具有积极的响应机制。地下水主要受硝态氮污染,污染等级多为III级;地表水主要受氨氮和总氮污染,等级多为IV和V级。由于大量含氮化合物的输入,中国东部和南部已成为氨氮和总氮污染严重地区。在分析不同地区地下水和地表水氮污染特征基础上,综合利用传统的水化学分析法、同位素示踪技术和同位素模型,不仅可判别氮污染的来源,而且可识别氮源并确定氮源的贡献率,从而揭示地下水与地表水中氮污染的迁移转化过程和机理。研究结果为识别地表水、地下水受氮污染所带来的风险,保护淡水资源与环境提供了科学依据。由于地下水与地表水是相互作用的关系,氮同位素在氮迁移转化的过程中会发生相应转化,其矿化作用、硝化作用、反硝化作用等直接影响氮同位素的分馏,因此精确地定量化识别污染源亦成为需要克服的难题。

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标题: Preparation of composite photocatalytic materials and treatment of dye wastewater

标题: 复合光催化材料的制备及对染料废水的处理研究

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作者关键词: 生物炭; 二氧化钛; 光催化; 亚甲基蓝

摘要: Discussing the combined adsorption and photocatalytic oxidation, the composite photocatalyst(Ti-AC)was prepared from grapefruit activated carbon and titanium tetrachloride by hydrothermal method, titanium study load, reaction time,pH,c omposite photocatalyst dosing quantity, the initial solution concentration on MB wastewater treatment effect.The results show that the compound photocatalyst 1Ti-AC has a good removal efficiency of 94.17% for MB solution at the dosage of 2.8 g/L,pH of 7, temperature of 25 °C,and adsorption time of 5 h.The process of adsorption was Freundlich model,multi-molecular layer adsorption.

摘要: 将吸附法与光催化氧化法结合起来,以水热法由柚子皮生物活性炭(AC)、四氧化钛制备复合光催化剂(Ti-AC),研究钛负载量、反应时间、pH、复合光催化剂投加量、溶液初始浓度等对亚甲基蓝(MB)废水处理效果的影响。结果表明,复合光催化剂 1Ti-AC 投加量在 2.8 g/L,pH 为 7,温度 25 °C,吸附时间为 5 h 时,对 MB 溶液的去除率为 94.17%,具有良好的去除效果。吸附过程呈 Freundlich 模型,为多分子层吸附。

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标题: Interaction Mechanism Between Microorganism and Cr at Sediment-water Interface under Hydrodynamic Conditions

标题: 动水条件下沉积物-水界面微生物与铬的相互作用机理

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作者关键词: microorganism; reduction; adsorption/complexation; sediment-water interface; chromium

作者关键词: 微生物; 还原作用; 吸附络合作用; 沉积物-水界面; 铬

摘要: Through the indoor flume simulation experiment of sediment-water interaction, the adsorption and reduction capacity of Cr(VI) and the growth characteristics of microorganism in sediment were investigated. Especially, the migration and transformation mechanism of Cr in sediment-water interface was discussed. The results showed that the sediment microbial colonies went through four stages: initial adaptation stage, rapid growth stage, competitive growth stage and stable stage for the increasing concentration of Cr(VI) in overlying water. Under the high concentration of Cr(VI) ($>0.1 \text{ mg} \cdot \text{L}^{-1}$), the microbial communities were mainly *Bacillus cereus*, *Bacillus annularis* and *Bacillus subtilis* on the surface of sediment. Under the action of microorganism, the reduction rate of Cr(VI) was about 47.56%, and the adsorption rate of Cr on the sediment increased significantly, with the maximum of 53.63%. The reductive enzymes and ions released by *Bacillus cereus* and *Bacillus subtilis* reduced Cr(VI) to Cr(III) continuously in the sediment-water interface. Then, $\text{Cr}(\text{OH})_3$ precipitation and complexation precipitation was formed in the weak alkaline environment, which increased Cr content in the surface sediment while reduced the content of chromium in the water environment. This study could provide a theoretical guidance and scientific support for the pollution and self purification of chromium in rivers.

摘要: 通过沉积物-水相互作用的室内水槽模拟实验,在上覆水 Cr(VI)不断更新条件下,分析了沉积物中 Cr(VI)的吸附还原能力和微生物的生长特征,探讨了微生物作用下沉积物-水界面重金属铬的迁移转化机理。结果表明,在上覆水 Cr(VI)浓度不断增加条件下,沉积物微生物菌落经历了初步适应期、快速增长期、竞争生长期和稳定期 4 个阶段。在高铬($\text{Cr(VI)} > 0.1 \text{ mg} \cdot \text{L}^{-1}$)条件下,沉积物表层微生物群落主要是蜡状芽孢杆菌(*Bacillus cereus*)、环状芽孢杆菌(*Bacillus annularis*)和枯草芽孢杆菌(*Bacillus subtilis*)。在微生物作用下,Cr(VI)还原率稳定于 47.56% 左右;由于微生物作用,沉积物对铬的吸附率明显升高,可达 53.63%。微生物蜡状芽孢杆菌和枯草芽孢杆菌释放的还原性酶和还原性离子将沉积物-水界面的六价铬不断还原为三价铬,在弱碱性环境中形成 $\text{Cr}(\text{OH})_3$ 沉淀和络合沉淀,增大了表层沉积物中铬的含量,降低了水环境中铬的含量。研究成果对河流铬污染自净起到了理论指导和科学支撑作用。

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标题: Rational Flood Season Staging and Limit Flood Levels of Cascade Reservoirs in Downstream Jinsha River

标题: 金沙江下游梯级水库汛期分期及汛限水位合理性研究

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作者关键词: flood season staging; limit flood level; water resources utilization; fuzzy set analysis; intertemporal sampling method; cascade reservoirs in downstream Jinsha River

作者关键词: 汛期分期; 汛限水位; 水资源利用; 模糊集分析法; 跨期选样法; 金沙江下游梯级水库

摘要: Determining flood season stages and corresponding water levels in flood season stages rationally could help coordinate the contradiction between flood control benefit and power

generation benefit of reservoirs, and is also of great significance to give full play to flood control and power generation capacity of reservoirs and improve the utilization rate of flood resources in flood season. In this paper, the flood season of cascade reservoirs (Wudongde, Baihetan, Xiluodu, and Xiangjiaba) in the lower reaches of Jinsha River is divided into stages according to the incoming flood using the improved fuzzy set analysis method, and the staged limit water level of cascade reservoirs is determined through the mapping relationship between membership degree and flood control capacity. The stages and corresponding limit flood levels are revised with intertemporal sampling method. Research results reveal that the preflood season of cascade reservoirs in the lower reaches of Jinsha River is July 1-July 14, main flood season July 15-September 16, and post-flood season September 17-October 24. The reasonable limit flood level for the four reservoirs is 962 m, 800 m, 575 m and 374 m, respectively. The staged limit flood levels are verified through the flood process of different typical floods. The staging results obtained in this study and the phased limit flood level of each reservoir could improve the economic benefits of reservoirs' power generation under the premise of flood control safety, and enhance the utilization rate of flood resources in flood season.

摘要: 汛期分期以及分期汛限水位的合理确定,能够较好地协调水库防洪效益与发电效益之间的矛盾,对充分发挥水库的防洪、发电能力,以及提高汛期洪水资源利用率具有重要意义。基于改进的模糊集分析方法并依据金沙江下游乌东德、白鹤滩、溪洛渡、向家坝4个梯级水库入库洪水对其汛期进行分期,通过隶属度与防洪库容的映射关系确定梯级水库分期汛限水位,提出利用跨期选样法对分期结果及汛限水位进行修正。研究结果表明:金沙江下游梯级水库前汛期为6月1日-7月14日,主汛期为7月15日-9月16日,后汛期为9月17日-10月24日,4个梯级水库合理汛限水位分别为962,800,575,374 m。通过不同典型洪水放大的洪水过程检验了分期汛限水位的合理性。研究得到的金沙江下游梯级分期结果及各库分期汛限水位,均能够在满足防洪安全的前提下提高水库发电等经济效益,在一定程度上提高了汛期洪水资源的利用率。

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标题: Adsorption -photocatalysis coupling effect with a nano-TiO₂@yeast carbon composite photocatalyst in the degradation of tetracycline hydrochloride and response surface optimization

标题: 纳米 TiO₂@酵母碳球对盐酸四环素的吸附-光催化协同效应及响应面优化

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作者关键词: 纳米 TiO₂; 酵母碳球; 吸附-光催化协同; 盐酸四环素; 响应面优化

摘要: A nano-TiO₂@yeast carbon composite photocatalyst has been prepared by a biological self-assembly strategy. The composition and structure of product were characterized by SEM and XRD. Using tetracycline hydrochloride as the target pollutant, we analyzed the effect of varying the loading of nano-TiO₂ particles on the photocatalytic efficiency of composite samples and evaluated the functional coupling effect between the nano-TiO₂ particles and the yeast carbon carriers. The results showed that the nano-TiO₂@yeast carbon composite exhibited high photocatalytic efficiency in the degradation of tetracycline hydrochloride. A mass ratio of TiO₂ and yeast of 1 : 1 was found to be the optimal loading of TiO₂ in the composite. The excellent photocatalytic properties can be attributed to the efficient functional coupling between the adsorption and photocatalysis processes. The optimum photocatalytic conditions determined using response surface methodology, were found to be a catalyst temperature of 40.2 °C, pH of 5.89, and a catalyst /pollutant concentration ratio of 0.76, under these conditions the tetracycline hydrochloride

degradation ratio reached 90.86%.

摘要: 通过生物自组装法制备得到纳米 TiO₂@酵母碳球复合光催化材料,采用扫描电子显微镜和 X-射线衍射仪对样品进行表征。以盐酸四环素作为目标污染物,分析了 TiO₂ 负载量对样品光催化性能的影响,同时对酵母碳球与纳米 TiO₂ 之间的吸附-光催化协同效应进行了分析和评价。实验结果表明:纳米 TiO₂ 在酵母碳球表面的负载显著地提升了纳米 TiO₂@酵母碳球的光催化性能,当纳米 TiO₂ 与酵母质量比为 1 : 1 时,所制备的 TiO₂@酵母碳球对盐酸四环素的光催化效果最佳,具有较好的吸附-光催化协同效应。响应面优化实验表明:当反应温度为 40.2 °C,pH 为 5.89,催化剂、盐酸四环素的浓度比为 0.76 时,体系对盐酸四环素的光催化降解率达到 90.86%。

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作者关键词: treated wastewater irrigation; domestic; industrial; microbial community; environmental factors

作者关键词: 再生水灌溉; 生活源; 工业源; 微生物群落; 环境因子

摘要: To investigate the long-term effects of irrigation with treated domestic and industrial wastewater on the microbial community structure of the soil, Illumina MiSeq high-throughput sequencing technology was applied. Groundwater irrigated soil was used as a control. The effects of soil environmental factors and their interactions on the microbial community structure were investigated. Compared with the groundwater irrigation, irrigation with treated domestic wastewater can significantly increase the contents of TOC, DOC, Eh, $\text{NH}_4^{+}\text{-N}$, and TP, whereas irrigation with treated industrial wastewater can increase the contents of Cd, Cr, Cu, Pb, and Zn in the soil. Irrigation with treated wastewater also increases the relative abundance of Acidobacteria and Planctomycetes, and reduces the relative abundance of Firmicutes and Tectomicrobia. The effects of treated wastewater from different sources on functional microorganisms in soil are also different; irrigation with treated domestic wastewater can increase the relative abundance of Chloroflexi and Nitrospirae, whereas irrigation with treated industrial wastewater has negative effects on the abundance of Actinobacteria. The results of db-RDA analysis show that TN, TP, DOC, and Eh are the main factors that impact the microbial communities in soils irrigated with treated domestic wastewater ($P < 0.05$), and heavy metals are the main factors that impact the microbial communities in soils irrigated with treated industrial wastewater ($P < 0.05$). Compared with groundwater irrigation, treated wastewater irrigation can change the correlations between soil environmental factors, which in turn affect the microbial community structure. The growth of microorganisms in soils irrigated with treated domestic wastewater is mainly controlled by the

increase in the nutrients such as DOC, TN, and TP and changes in soil redox conditions. The abundance of microorganisms in soil irrigated with treated industrial wastewater is significantly correlated with the accumulation of heavy metals.

摘要: 为研究不同来源再生水灌溉对土壤微生物群落结构的影响,以地下水灌溉土壤为对照,采用 Illumina MiSeq 高通量测序技术对长期利用生活源和工业源再生水灌溉的土壤微生物群落结构进行分析,进一步探究土壤环境因子及其相互作用对微生物群落结构的影响。结果表明,与地下水灌溉相比,长期生活源再生水灌溉可显著提高土壤中 TOC、DOC、Eh、NH₄⁺-N 和 TP 的含量,长期工业源再生水灌溉导致 Cd、Cr、Cu、Pb 和 Zn 在表层土壤大量累积。再生水灌溉显著增加了土壤中 Acidobacteria 和 Planctomycetes 的相对丰度,降低了 Firmicutes 和 Tectomicrobia 的相对丰度,且不同来源再生水对土壤中功能微生物的影响不同,生活源再生水灌溉可显著增加 Chloroflexi 和 Nitrospirae 的相对丰度,而工业源再生水灌溉对 Actinobacteria 具有显著的抑制作用。db-RDA 分析结果表明,生活源再生水灌溉土壤菌群主要受 TN、TP、DOC 和 Eh 影响 ($P < 0.05$),工业源再生水灌溉土壤菌群主要受重金属影响 ($P < 0.05$)。长期再生水灌溉可改变土壤环境因子间的相互作用,进而影响微生物群落结构,生活源再生水灌溉土壤中微生物主要受 DOC、TN 和 TP 等营养物质含量的增加和氧化还原条件的改变控制,工业源再生水灌溉土壤中微生物与重金属的积累显著相关。

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标题: Runoff drainage system design for highway bridges crossing sensitive water

标题: 敏感水体公路桥梁桥面径流排水系统设计方法

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作者关键词: bridge engineering; dangerous chemicals; runoff of bridge; groove; initial rainfall runoff; collecting tank

作者关键词: 桥梁工程; 危险化学品; 桥面径流; 排水管槽; 初期雨水径流量; 收集池

摘要: In order to prevent water pollution caused by dangerous chemicals leaking accident and initial rainfall runoff,a runoff collection system in highway bridges which go across the sensitive water was designed.There were two parts in this system,one was draining pipe(groove),the other was collecting tank.Based on the principles for urban rainwater draining system designing and runoff characteristics on bridges,a half-opened groove structure and 1 year storm recurrence period were introduced to do hydraulic calculating for longitudinal draining pipes/grooves.According to the concept of storm intensity,a method for estimating the lasting time and the runoff quantity of initial rainfall were discussed.And then the volume of collecting tank was designed in this way.Based on the pollution characteristics of fine particles and the physical

characteristics of dangerous chemicals,a construction of collecting tank was introduced.An example was given to illustrate the dangerous chemicals effectively of initial rainfall runoff,which using the traditional collecting tank and the proposed tank.The results show that there are two tanks in the proposed system,No.1 tank is designed for initial rainfall collecting,No.2 tank is designed for dangerous chemicals collecting.Runoff is drained into No.1 tank to let the fine particles to be deposited.The exceeding runoff is drained into No.2 tank,which is designed with galleries,and the water running through the bottom of the third partition wall.The dangerous chemicals which is lighter than water and unmixing with water can be easily collected.The two-pool system would not only make sure the fine particles in the initial rainfall runoff to be deposited,but also effectively collect the dangerous chemicals leaking in a traffic accident at the mean while.It is proved that the design would effectively prevent the sensitive water from being polluted.1 tab,5 figs,25 refs.

摘要: 为减轻公路运输事故中危险化学品产生的径流对敏感水体的影响,并净化桥面降雨径流,探索了跨越敏感水体公路桥梁桥面径流排水系统的设计方法,包含了桥梁纵向排水管槽设计和径流收集池设计 2 个部分内容。根据城市雨水管道设计原理,结合桥面径流排水特征,提出采用半开放结构的明槽作为排水管槽,并依据暴雨重现期为 1 年的径流量计算桥梁纵向排水管槽尺寸。基于暴雨强度的概念,探讨初期降雨历时及桥面初期雨水径流量的估算方法,并在此基础上提出了径流收集池池容的设计方法。基于桥面雨水径流细小颗粒物的污染特性和桥面事故径流危险化学品的物理特性,提出径流收集池结构的设计方法。并采用 Stokes 公式并结合沉淀要求的表面水力负荷,通过实例验证了提出的收集池与传统的事事故径流收集池容积对初期雨水危险化学品沉淀的效果。研究表明:提出的径流收集池包含初期雨水收集池(池 1)和危险化学品事故径流收集池(池 2),降雨初期桥面径流先进入池 1,初期雨水中细小颗粒物在池 1 中经过充分沉淀去除;当径流超过初期雨水量时,将超量径流引入池 2,池 2 采用廊道式设计且第 3 道隔墙底部过水,轻密度危险化学品借助密度差被隔离在前 3 区上部空间,以达到降雨期间危险化学品事故径流收集而减轻对敏感水体污染的目的。该双池结构不仅可保障初期雨水中细小颗粒物在沉淀池中充分沉淀去除,同时,也可有效收集降雨期间危险化学品事故径流,减轻对地表水体的污染。

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标题: Study on preparation and modification of layered compound FeOCl photocatalytic materials

标题: 层状化合物 FeOCl 光催化材料的制备及改性研究

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作者关键词: FeOCl; FeOCl; preparation; modification; photocatalysis

作者关键词: 制备; 改性; 光催化

摘要: This paper analyzes the structural characteristics of FeOCl, several main preparation methods(chemical gas phase transfer method,partial thermal decomposition, liquid phase stripping and annealing method)and modification methods(morphology control, intercalating modified and compound modification),and according to the advantages and disadvantages of FeOCl, the future development trend of the material is prospected.

摘要: 归纳了 FeOCl 的结构特点,主要制备方法(化学气相迁移法、部分热分解法、液相剥离法、退火法)以及改性研究(形貌调控、插层改性与复合改性),介绍了其在水处理方面的应用,并根据其存在的优缺点进行了总结和展望。

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标题: Dynamics of Soil Water Potential Under Plastic Membrane and Geotextile Cloth Mulching in Mu Us Desert Land

标题: 毛乌素沙地地膜-地布覆盖下土壤水势动态

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作者关键词: plastic membrane-geotextile ground cover; soil water potential; freezing-thawing period; Mu Us sandy land

作者关键词: 地膜-地布覆盖; 土壤水势; 冻融期; 毛乌素沙地

摘要: A one-year continuous field monitoring study at fixed observation positions was conducted on a sand belt site in the southeast edge of Mu Us desert land, with continuous monitoring of soil water potential and temperature. With the sand surface first reshaped into furrow-and-ridge form, the in-situ field test had 3 treatments, i.e., the ridge section one was covered with plastic membrane plus weed-blocking geotextile (MB); section two covered with weed-blocking geotextile only (DB); and section three exposed or uncovered to serve as the blank contrast (CK). Soil water potential and temperature were monitored using MPS-6 probes at 5, 15, 30 cm below the furrow surface, at 30 minute intervals, along with meteorological data above the soil surface. Results showed that: (1) The daily variations of soil water potential under the 3 treatments all showed characteristics of a Cosmic function, the daily soil water potential at the 5 cm depth was the most varied in the three groups, varying between -600 and -120 kPa, and showing MB > CK > DB. At the 15 cm depth, the value was higher with smaller variation between -180 and -90 kPa, showing DB > CK > MB. At the 30 cm depth, the soil water potential is virtually stable, with high water potentials for MB and DB stabilized at about -100 kPa, and much lower stable potentials for CK at

about-285kPa;(2)The annual variation of soil water potential showed two valleys,including the freezing-thawing period in the winter and the strong evaporation period in the summer.The annual averages among the 3groups show that:at 5cm MB>CK>DB,at 15cm DB>CK>MB,and at 30cm MB=DB>CK.The main reasons are that under the condition of MB and DB,the accumulated heat in the soil during the day time is higher,and the upward temperature gradient at night is higher,then the soil water at 15cm depth moves up and accumulates under the surface membrane and it would be evaporated without the membrane.Therefore,the water potential at 5cm below the surface is larger,while the water potential at 15cm is smaller.At the same time,under the condition of MB,the rainfall infiltration depth is the largest,so is the surface water content;Under MB and DB conditions at 30cm,the water potential is approximately the same,but both are larger than that under CK.The predominant reason is that the rainfall in this area is small,and most rainfall cannot infiltrate to 30cm depth without mulching;(3)When the 3groups were analyzed for the total 0-30cm soil layer,the soil water potential was greatly affected by relative humidity and wind speed of the atmosphere during freezing-thawing period.In the non-freezing-thawing period,soil water potential was most influenced by wind speed,followed by atmospheric temperature and relative humidity.It can be concluded that the moisture retention effects at 5 cm soil depths was better with MB treatment,while DB was better for 15cm soil depth,and both MB and DB were better for 30cm soil depth.These results could be used as a reference for sand fixation and revegetation in the desert area.

摘要: 在毛乌素沙地东南缘风沙滩区进行为期1年的野外连续定位观测试验,设置3组覆垄沟渗处理,即地膜加防草地布覆垄(MB)、防草地布覆垄(DB)和无覆垄空白对照(CK)。利用MPS-6水势温度传感器监测沟表下5,15,30cm深度30min间隔的土壤水势和土壤温度。结果表明:(1)3组处理的土壤水势日变化均呈现余弦曲线变化特征,在5cm土层处土壤水势日变幅较大,土壤水势值为-600~-120kPa,呈MB>CK>DB;在15cm土层处,土壤水势较高且变幅较小,变化在-180~90kPa,呈DB>CK>MB;在30cm土层处,土壤水势保持基本稳定,MB与DB处理的水势较高,稳定在-100kPa左右,CK较低,稳定在-285kPa左右;(2)土壤水势年内变化存在2个低谷,主要发生在土壤水处于冻结状态的冬季和蒸发强烈的夏季;3组处理土壤水势年均值表现为:5cm处,MB>CK>DB;15cm处,DB>CK>MB;30cm处,MB=DB>CK,主要原因是覆盖条件下,白天土壤积温较高,夜间向上的温度梯度大,15cm处土壤水分上移速度较快,地表膜布下积水,无膜布则蒸发,故表现为地表以下5cm处MB水势较大,15cm处水势较小;同时,MB条件下降雨入渗量最大,表层水分大;30cm处MB和DB条件下,水势近似相同,但都大于裸地,主要原因是该地区降雨量较小,大部分降雨在无覆盖条件下不能下渗至30cm处;(3)3组处理在0-30cm土层,冻融期土壤水势受大气相对湿度及风速影响较大,非冻融期土壤水势受风速影响最大,其次是大气温度与相对湿度。试验表明5cm土层MB保湿效果更好,而15cm土层DB的保湿效果更好,30cm土层MB和DB条件下水势接近,此结果可为沙漠地区固沙和植被恢复提供参考。

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作者: 赵倩; 赵剑强; 王莎; 冯鑫; 刘威

标题: Simultaneous Partial Nitration and Denitrification Phosphorus Removal Efficiency by SBR Side-Stream Phosphorus Removal

标题: SBR 侧流除磷强化同步亚硝化反硝化除磷效率

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作者关键词: side-stream phosphorus removal; phosphorus-rich supernatant; simultaneous partial nitration and denitrification (SPND)

作者关键词: 侧流除磷; 富磷上清液; 同步亚硝化反硝化(SPND)

摘要: Simultaneous partial nitration and denitrification (SPND) was realized by SBR in anaerobic/aerobic/anoxic (A/O/A) mode with C/N of influent as 7. In order to solve the problem of phosphorus removal in SPND process, sodium acetate (CH₃COONa) was added to the influent

to enhance anaerobic phosphorus release and then the phosphorus-rich supernatant was discharged. When the phosphorus removal effect disappeared, the phosphorus removal was strengthened again according to the first method. The results showed that the mass concentration of $\text{PO}_4^{3-}\text{-P}$ in effluent was less than 0.5 mg/L after enhanced phosphorus removal, and two times enhanced lasted for 2 and 16 d respectively. The average removal rates of $\text{PO}_4^{3-}\text{-P}$ were 95.83% and 96.67%, respectively. The average removal rates of $\text{NH}_4^+\text{-N}$ and TN were 95.83% and 96.67%, respectively. The microbial diversity increased after enhancing, there were 8 species of genus whose abundance was more than 1%. The abundance of PAOs increased from 3.74% to 4.04%, and that of GAOs decreased from 8.63% to 4.37%.

摘要: 采用 SBR 装置,进水 COD/p(TN)为 7,以厌氧-好氧-缺氧(A/O/A)的运行模式实现同步亚硝化反硝化(SPND)。为解决 SPND 工艺中除磷问题,实验在进水中额外添加一次乙酸钠,强化厌氧释磷后排出富磷上清液。当除磷效果消失时,依照第 1 次的方法再一次强化除磷。结果表明,强化后出水 $\text{PO}_4^{3-}\text{-P}$ 的质量浓度小于 0.5mg/L,其持续时间分别达 2 d 和 16 d, $\text{PO}_4^{3-}\text{-P}$ 平均去除率分别为 95.8%、96.7%; $\text{NH}_4^+\text{-N}$ 和 TN 的平均去除率分别为 99.5%和 97.2%。强化后微生物多样性增加,丰度大于 1%的菌属增加 8 种。聚磷菌(PAOs)丰度由 3.74%增长至 4.04%,聚糖菌(GAOs)丰度由 8.63%降至 4.37%。

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作者: 刘珊; 赵春朋; 李涛; 冯婷; 刘丹荣; 张悦; 魏莉

标题: Adsorption of Cu(II) by modified chitosan gel ball

标题: 改性壳聚糖凝胶球对 Cu(II)的吸附

来源出版物: 环境化学 卷: 39 期: 7 页: 2013-2021 出版年: 2020

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作者关键词: CS; Cu(II); CS-NFeMs-PEG; CS; modification; Cu (II); CS-NFeMs-PEG; adsorption

作者关键词: 改性; 吸附

摘要: CS-NFeMs-PEG gel spheres were prepared by using chitosan (CS) as parent-loaded Fe (NFeMs) and under crosslinking of PEG. By intermittent batch test to explore the gel ball under different conditions of Cu(II) adsorption effect. The optimal adsorption pH of CS-NFeMs-PEG gel spheres was 5.5. The equilibrium time of adsorption was about 20 h and the adsorption process was more consistent with the quasi-second-order dynamic model. The adsorption process was spontaneous, endothermic and entropy increasing. According to the adsorption isotherm fitting, saturated adsorption capacity of Cu(II) was 133.4 mg·g⁻¹. Infrared spectrum analysis showed that CS loaded NFeMs and reacted with PEG form complex substance. Scanning electron microscopy analysis showed that CS-PEG-NFeMs had three-dimensional network structure inside. After 5 times of desorption regeneration, the adsorption capacity remained about 70 mg·g⁻¹ and the material had good recycling property.

摘要: 以壳聚糖(CS)为母体负载纳米铁(NFeMs),并在聚乙二醇(PEG)交联作用下制备CS-NFeMs-PEG凝胶球,通过间歇批次试验探索该凝胶球在不同条件下对Cu(II)吸附效果。CS-NFeMs-PEG凝胶球的最佳吸附pH值为5.5,吸附平衡时间20 h,吸附过程更符合拟二级吸附动力学模型;该吸附过程是自发、吸热、熵增过程;吸附等温线拟合得Cu(II)的饱和吸附量为133.4 mg·g⁻¹;红外图谱分析表明,CS成功负载NFeMs并与PEG交联生成复合物;扫描电镜表征说明,CS-NFeMs-PEG凝胶球内部呈三维网状结构。经5次脱附再生后吸附量保持在70 mg·g⁻¹左右,材料具有较好的循环使用性。

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标题: Water-air two phase migration law of remolded unsaturated loess

标题: 重塑非饱和黄土中水-气两相运移规律研究

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作者关键词: unsaturated loess; water-air migration; soil column test; wetting front; volume moisture content; air pressure difference

作者关键词: 非饱和黄土; 水-气运移; 土柱试验; 湿润锋; 体积含水率; 气压差

摘要: The essence of water infiltration in loess area is the joint action of water and air migration. Under the influence of heavy precipitation of a long period, moisture infiltration is easier to form a closed condition at the bottom of the soil layer away from the slope, and an open condition is formed near the slope area. In order to analyze the water-air migration law in loess, the remolded soil column test was carried out under closed and open conditions, and the measured data of water content and air pressure in soil columns were statistically analyzed. The results showed

that under the open and closed conditions, migration velocity of the wetting front was the largest at the beginning, the volume moisture content increased first and then decreased. The moisture content decreased and then tended to stabilize under the closed condition, whereas the moisture content still fluctuated slightly under the open condition. Besides, under the open condition, the air pressure difference increased first and then decreased, and eventually oscillated near 0. While under the closed condition, the air pressure difference of the shallow layer rose with fluctuations, and that of the deep layer oscillated and then decreased to a stable rate. Therefore, in the process of landslide treatment, the influence of water and air should be considered at the same time to formulate more comprehensive and efficient prevention and control measures.

摘要: 黄土区水分入渗的实质是水、气两相运移共同作用。长时间强降水影响下,水分入渗更易在远离边坡的土层底部形成封闭条件,而在靠近边坡区域形成开放条件。为深入剖析黄土中水-气运移规律,分别在封闭和开放条件下进行了重塑土柱试验,并统计分析了土柱内实测的含水率和气压数据。结果表明:在开放和封闭条件下,湿润锋运移速度初始时最大;体积含水率均为先增大后减小,封闭条件下含水率减小后趋于稳定,而开放条件下含水率仍存在小幅波动;开放条件下气压差先增大后减小,最后在 0 附近振荡,而封闭条件下浅层气压差波动上升,深层气压差振荡后减小趋于稳定。因此,在滑坡治理过程中应同时考虑水、气两相共同的影响,制定更为全面、高效的防治措施。

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标题: Adsorption behavior of Rhodamine B used by sludge pyrolysis char

标题: 污泥热解半焦对罗丹明 B 吸附行为研究

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作者关键词: 吸附; 污泥热解半焦; 罗丹明 B; 水处理技术

摘要: The adsorption behavior of simulated Rhodamine B (RhB) dye wastewater was studied by using sludge pyrolysis char as adsorbent. The effects of adsorbent dosage, initial concentration of RhB solution, temperature and pH on the results of sludge pyrolysis char adsorption RhB were investigated. The results showed that the increase of sludge char dosage, temperature and pH increase could improve the removal rate of RhB. The skeletal action of SiO₂, the large comparative area and the good pore structure provided more adsorption sites for adsorbing RhB. As the initial concentration of RhB increases, a higher concentration difference promotes the migration of RhB molecules from the surface of the adsorbent to the interior thereof, increasing the adsorption amount of RhB. The pseudo-second order kinetic model and the intraparticle diffusion model could describe the adsorption kinetic process more accurately. The overall isothermal adsorption data is satisfactorily explained by a Langmuir isothermal adsorption model than Freundlich, and the theoretical saturated adsorption capacity of sludge pyrolysis char for RhB is 46.51 mg /g at temperature of 25 °C. The thermodynamic calculations result showed that RhB in the sludge pyrolysis char adsorption water is a spontaneous endothermic process.

摘要: 以污泥热解半焦为吸附剂,研究其对模拟罗丹明 B(RhB)染料废水的吸附行为。考察了吸附剂投加量、 RhB 溶液初始浓度、温度、pH 对半焦吸附 RhB 结果的影响。结果表明,半焦投加量、温度及 pH 的升高均可提高 RhB 的去除率, SiO₂ 的骨架作用、较大的比表面积及良好的孔隙结构为吸附 RhB 提供了更多的吸附点位。随着 RhB 初始浓度的增加,更高的浓度差推动 RhB 分子由吸附剂表面向其内部迁移,提高了 RhB 的吸附量。准二级动力学模型和颗粒内扩散模型能较准确地描述吸附动力学过程。吸附平衡研究表明, Langmuir 模型比 Freundlich 模型能更好地拟合吸附过程,最大饱和吸附量为 46.51 mg /g。热力学计算结果显示,污泥热解半焦吸附水中 RhB 为自发的吸热过程。

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作者: Zhang Chi; Ma Chan; Lu Yitong

作者: 张驰; 马婵; 卢奕彤

标题: Determination of dissolved oxygen in water through fluorescence spectrometry with associated particles for cationic surfactant

标题: 阳离子表面活性剂缔合微粒荧光光谱法测定水中溶解氧

来源出版物: 应用化工 卷: 49 期: 6 页: 1572-1575,1582 出版年: 2020

文献号: 1671-3206(2020)49:6<1572:YLZBMH>2.0.TX;2-N

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文献类型: Article

作者关键词: dissolved oxygen; Winkler method; Rhodamine 6G

作者关键词: 溶解氧; 碘量法; 罗丹明 6G

摘要: I₃⁻ and Rhodamine 6G(Rh6G) were used to react in the medium of manganese sulphate-sulphate to form ionic association. Adopting fluorescence spectrophotometry measured dissolved oxygen (DO) in water; researching the effects of reaction conditions (KI concentration, reaction time,manganese sulfate concentration, sulfuric acid concentration,Rh6G concentration) on the reaction system (sensitivity, accuracy, spectral intensity). The results showed that the concentration of I₃⁻ increased with the increase of KIO₃ concentration,and the binding degree of Rh6g-I₃ association particles increased accordingly. The linear relationship between KIO₃ concentration and the fluorescence intensity of Rh6g-I₃ association particles was very clear. Finally adopted a linear relation with the regression equation $\Delta I = 12.699C - 4.7869$ and correlation coefficient $R^2 = 0.9945$,which presented well when the concentration of 0.375 mmol /L KI,7.5 mmol /L MnSO₄,5.0 mmol /L H₂SO₄, 10 living mol /L Rh6G and the concentration of KIO₃ reacted in the range of 0.1169 ~ 3.51 mmol /L for 30 min at room

temperature.

摘要: 用 I₃⁻ 和罗丹明 6G(Rh6G)在硫酸锰-硫酸盐介质中反应,形成离子缔合物,采用荧光分光光度法测定水中溶解氧(DO)。研究了反应条件(KI 浓度、反应时间、硫酸锰浓度、硫酸浓度、Rh6G 浓度)对反应灵敏度、准确度、光谱强度的影响。结果表明,随着 KIO₃ 浓度的增加,I₃⁻ 的浓度随之增加,Rh6G-I₃⁻ 缔合微粒的结合度相应增加,KIO₃ 浓度与 Rh6G-I₃⁻ 缔合粒子的荧光强度的线性关系非常清晰。采用浓度为 0.375 mmol /L KI、7.5 mmol /L MnSO₄、5.0 mmol /L H₂SO₄、10 μmol /L Rh6G,在室温下反应 30 min,KIO₃ 的浓度在 0.116 9 ~ 3.51 μmol /L 范围内 ΔI 呈现良好的线性关系,回归方程 ΔI = 12.699C - 4.786 9,相关系数 R² = 0.994 5。

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作者: Qiao Xiaoying; Xiao Ping; Wang Jihua; Li Junting; Wang Lin

作者: 乔晓英; 肖平; 王继华; 李俊亭; 王林

标题: Reconstruction project of Zhengzhou groundwater balance experiment site: promotion of the key application problems of experiment site monitoring data

标题: 郑州地下水均衡试验场的改建工程试验场监测资料的推广应用核心问题

来源出版物: 水文地质工程地质 卷: 47 期: 1 页: 46-52 出版年: 2020

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文献类型: Article

作者关键词: vadose medium; sampling number; semi-variance analysis; Kriging method; parameter variability

作者关键词: 包气带介质; 取样数目; 半方差分析; Kriging 法; 参数变异性

摘要: The reconstruction project of groundwater balance experiment site of Zhenzhou was rebuilt by Geo-environmental Monitoring Institute of Henan Province,belongs to one of the national groundwater monitoring projects,which is performed by China of Institute

Geol-Environment Monitoring. In view of the key application problems of extending site-scale equilibrium test data to field production practice, this paper considers the combination of deterministic model (water transport equation) and stochastic model (regional vadose zone parameters). It is proposed to select 24 km² of the alluvial-producing area of the South Yellow River as a field test site to carry out regional variability study of the parameters of the vadose zone. Through limited sampling in the site, the parameter variability characteristics of vadose zone at any point in the site can be calibrated. With the help of regional meteorological data and the result of the established soil water transport mathematical model in the groundwater balance test site, the infiltration recharge of precipitation and the evaporation of phreatic water in the site are calculated, which can provide scientific basis for groundwater resource evaluation, geological environment assessment and groundwater resource sustainable development and utilization. Meanwhile, also lays a foundation for large-scale soil surface pollution assessment.

摘要: 郑州地下水均衡试验场的改建, 是中国地质环境监测院主持的国家地下水监测工程中地下水均衡试验场的改建项目之一, 由河南省地质环境监测院具体负责实施。针对场地尺度均衡试验资料推广至野外生产实践核心问题, 采用确定型模型(水分运移方程)和随机模型(区域性包气带参数)相结合的研究方法。拟选黄河南冲洪积区 24 km² 作为野外试验场地, 通过场地上有限数量的采样, 标定该场地包气带参数变异性特征, 并借助于区域气象资料, 结合地下水均衡试验场所建土壤水分运移数学模型成果, 计算区域降雨入渗补给量与潜水蒸发, 为地下水资源评价、地质环境评价及地下水资源可持续开发利用提供科学依据。同时也为大范围土壤面状污染评价工作奠定基础。

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作者: Qiao Yaqi; Huang Lihui

作者: 乔雅琦; 黄立辉

标题: Characterization of phthalates in residential house dust and their transfer routes

标题: 住宅室内降尘中邻苯二甲酸酯的污染特征及传输途径

来源出版物: 环境化学 卷: 39 期: 6 页: 1523-1529 出版年: 2020

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作者关键词: DEHP; DIBP; DBP; phthalates; house dust; DEHP; DIBP; DBP

作者关键词: 邻苯二甲酸酯; 室内降尘

摘要: House dust samples were collected in the living room and bedroom of forty residences in Beijing in both summer and winter. The concentrations of 7 phthalates in these samples were characterized. The results showed that the major phthalates in house dust were DIBP (39.6 ng·mg⁻¹),geometric mean concentration,thereafter), DBP (38.7 ng·mg⁻¹) and DEHP (418.5 ng·mg⁻¹). The concentrations of dust-borne DIBP,DBP and DEHP were positively associated with temperature,relative humidity and ventilation rate (P<0.005). Elevated temperature and improved ventilation could accelerate the source emission rates of phthalates,resulting in the accumulation of airborne phthalates, and ultimately increase the concentration of dust-borne phthalates through the air-mediated transfer; whereas higher humidity could expedite the mass transfer of phthalates from air to dust,leading to the higher concentration of dust-borne phthalates. Due to the combined effects of above factors,significantly higher concentrations of dust-borne phthalates were found in the summer (P < 0.0001). The results also suggested that phthalates transport from source materials to house dust via two routes: air-mediated indirect transfer and direct transfer from source to dust on source surface. As a result,the concentrations of dust-borne phthalates were closely associated with surface material. The residence time of dust was also found to impact the concentrations of dust-borne phthalates. Therefore,it is necessary to specify the type of dust, collection location and surface material,so that accurate exposure assessment can be conducted using measurement data.

摘要: 本文分别于夏季和冬季在北京市 40 户家庭的客厅和卧室采集降尘样品,研究降尘中邻苯二甲酸酯(PAEs)的污染特征.结果表明,室内降尘中主要的 PAEs(及其浓度)为 DIBP (39.6 ng·mg⁻¹),几何平均浓度,下同)、DBP (38.7 ng·mg⁻¹)和 DEHP (418.5 ng·mg⁻¹). 降尘中 PAEs 的浓度与温度、相对湿度和换气次数均呈显著正相关(P<0.005). 这是由于室温升高和换气次数增高加快 PAEs 的源排放速率,促进室内空气中 PAEs 积累并通过气相媒介传输使得降尘 PAEs 浓度增高;湿度升高促进空气中 PAEs 向降尘的传质,增大降尘中 PAEs 浓度.3 种因素共同影响使得夏季降尘中 3 种 PAEs 的浓度均显著高于冬季(P<0.0001). 研究还发现,源材料中 PAEs 至降尘的传输途径包括以气相为媒介的间接传输和源至降尘的直接转移,因此

降尘 PAEs 浓度与采集平面材料相关;降尘 PAEs 浓度还受降尘在室内的停留时间影响.因此,相关研究需指明降尘的类型、采集位置和平面材料,便于利用测量数据进行准确的暴露评估.
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作者: 刘威; Laoyongxay Huexay; 代伟; 惠肖峰; 赵剑强

标题: Effect of a Small Amount of Organic Carbon on CANON Performance

标题: 少量有机碳对单级自养脱氮工艺性能的影响

来源出版物: 水处理技术 卷: 46 期: 4 页: 66-69,92 出版年: 2020

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作者关键词: CANON; denitrification; C/N ratio; denitrification performance

作者关键词: 单级自养脱氮; 反硝化; 碳氮比; 脱氮性能

摘要: AOB and AnAOB were rapidly enriched in a sequencing batch biofilm reactor (SBBR) after four stages of cultivation and investigated various denitrification performances in different low carbon-nitrogen ratios (C/N). The experimental results showed that the ammonia nitrogen (NH₄⁺-N) and total nitrogen (TN) removal efficiency were about 99% and 90% respectively. Meanwhile, corresponding to C/N=0, 1 and 2, removal efficiency of NH₄⁺-N and TN were 99.59%,99.5%,98.47% and 93.75%,97.22%,98.11% respectively in the reactor effluent. It indicates that the presence of a small amount of COD can influence simultaneous nitrification anammox denitrification and improve nitrogen removal efficiency to a certain extent.

摘要: 采用序批式生物膜反应器(SBBR),经过 4 个阶段的培养,快速富集好氧氨氧化细菌

(AOB)和厌氧氨氧化细菌(AnAOB),并考察不同低碳氮比对工艺脱氮性能的影响。结果表明,NH₄⁺-N 去除率可达到 99%以上,TN 去除率可达到 90%以上。对应 C/N=0、1 和 2 时,反应器出水 NH₄⁺-N 和 TN 去除率分别为 99.59%、99.5%、98.47%和 93.75%、97.22%、98.11%。说明少量 COD 的存在,可实现同步硝化-厌氧氨氧化-反硝化,且在一定程度上提高脱氮效率。

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作者: 汪晶发; 宋慧; 巴利萌; 李光华; 孙智钢

标题: Study on the vehicle emission inventory and spatial distribution characteristics in Xi'an

标题: 西安市机动车污染物排放清单与空间分布特征

来源出版物: 环境污染与防治 卷: 42 期: 6 页: 666-671,677 出版年: 2020

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文献类型: Article

作者关键词: vehicle emission inventory; spatial distribution; MOVES model; Xi'an

作者关键词: 机动车排放清单; 空间分布; MOVES 模型; 西安市

摘要: A vehicle emission inventory with a resolution of 1 km*1 km in Xi'an for the year 2017 was developed based on the motor vehicle emission simulator (MOVES) model and geographic information system (ArcGIS) technique. The results showed that the total emissions of PM_{2.5},PM₁₀,NO_x(NO+NO₂),NO,NO₂,N₂O and volatile organic compounds(VOCs)

were 126.1×10^4 , 138.2×10^4 , 2884.2×10^4 , 2577.8×10^4 , 306.4×10^4 , 27.9×10^4 and 1281.2×10^4 kg, respectively; the main source of $PM_{2.5}$, PM_{10} and NO_x were diesel vehicle with contribution of 80.2%, 79.5% and 75.8%, respectively. Meanwhile, gasoline vehicle contributed the most of the VOCs and N_2O emission, the contribution rate of which were 89.7% and 95.4%, respectively. In addition, the spatial distribution of different pollutants had similar characteristics, which caused by the shape of highway in Xi'an. The emissions of $PM_{2.5}$ and NO_x were mainly concentrated in the central downtown, the expressway and national highway in surrounding counties, while emissions of VOCs were concentrated in the second ring and its inner of central downtown.

摘要: 基于机动车排放因子(MOVES)模型和地理信息系统(ArcGIS)技术,建立了西安市2017年分辨率为 $1 \text{ km} \times 1 \text{ km}$ 的机动车污染物排放清单。结果显示:2017年西安市机动车污染物 $PM_{2.5}$ 、 PM_{10} 、 NO_x ($NO+NO_2$)、 NO 、 NO_2 、 N_2O 和挥发性有机物(VOCs)的年排放总量分别为 126.1×10^4 、 138.2×10^4 、 2884.2×10^4 、 2577.8×10^4 、 306.4×10^4 、 27.9×10^4 、 1281.2×10^4 kg;柴油车是 $PM_{2.5}$ 、 PM_{10} 和 NO_x 排放的主要来源,贡献率分别为 80.2%、79.5% 和 75.8%;VOCs 和 N_2O 则主要来自汽油车,贡献率分别为 74.2%、89.7%;总体看来,研究区域内不同污染物的空间分布规律相似,这与西安市公路分布有关, $PM_{2.5}$ 和 NO_x 的排放主要集中在主城区及周边县区的高速路和国道,而 VOCs 的排放主要集中在主城区二环及环内。

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标题: STUDY ON GROUNDWATER POLLUTION RISK IN PLAIN AREA OF XI'AN CITY

标题: 西安市平原区地下水污染风险研究

来源出版物: 环境工程 卷: 38 期: 5 页: 215-222 出版年: 2020

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文献类型: Article

作者关键词: groundwater pollution risk; vulnerability; pollution source load; water function value; plain area of Xi'an

作者关键词: 地下水污染风险; 脆弱性; 污染源荷载; 水功能价值; 西安市平原区

摘要: Groundwater pollution risk assessment is important for the rational development and utilization of land and groundwater pollution prevention. By analyzing the characteristics of shallow groundwater in the plain area of Xi'an, a conceptual model of groundwater pollution risk assessment including groundwater vulnerability, pollution source load and water function value was established, and the groundwater pollution risk of the plain area of Xi'an was evaluated. The results showed that the high, medium and low risk areas of groundwater pollution in the plain area of Xi'an accounted for 0.2%, 28.8% and 71.1% of the total study area, respectively. The medium and above risk areas of groundwater pollution in the plain area were mainly distributed along the banks of the Weihe River in Zhouzhi County, along the Weihe River in Chang'an District, and along the Weihe River in Lantian County. The high groundwater vulnerability and relatively strong pollution source load were the main reasons for the relatively high pollution risk in the region.

摘要: 地下水污染风险评价对地下水污染防治及土地的合理开发利用具有重要意义。通过分析西安市平原区浅层地下水特征,建立了包含地下水脆弱性、污染源荷载及水功能价值的地下水污染风险评价概念模型,对西安市平原区地下水污染风险进行了评价。结果表明:西安市平原区地下水污染高、中、低风险区分别占研究区总面积的 0.2%、28.8%、71.1%。平原区地下水污染中等以上风险区主要集中分布在周至县的渭河沿岸、长安区的浐河沿岸以及蓝田县的灞河沿岸,地下水脆弱性高、污染源荷载相对较强是造成该地区污染风险相对较高的主要原因。

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作者: 胡海洋; 李金龙; 孔德涛; 王玮

标题: Study on Reasonable Groundwater Exploitation in Loess Area of Zhidan and Jingbian

标题: 志丹靖边黄土区地下水合理开采方式研究

来源出版物: 水文 卷: 40 期: 3 页: 24-28 出版年: 2020

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文献类型: Article

作者关键词: groundwater resources; mining method; linear well array; loess area

作者关键词: 地下水资源; 开采方式; 线状布井; 黄土区

摘要: Groundwater is main water source of Zhidan and Jingbian regions in China. Aiming at resolving its water shortage, this paper used the controlled numerical test, chosen its typical area, designed different schemes to calculate the shape of the falling funnel and maximum drawdown under different means and intensity of groundwater exploitation. The results show that it is superior to build wells by linear well pattern along the valley than that by the average well pattern in the study area. The linear mining intensity should be controlled within $600\sim 800\text{m}^3/\text{d}\cdot\text{km}^{-1}$. This paper could have guiding significance for the rational exploitation of groundwater in Zhijing area.

摘要: 地下水是志丹靖边地区主要的用水来源,针对该地区水资源短缺的问题,通过控制性数值试验的方法,选择志丹靖边地区典型的区域,分别设计不同的方案,建立数值模型,对地下水的不同开采方式和开采强度下的降落漏斗形态和最大水位降深进行计算。结果表明,通过线状布井的方式沿河谷布设开采井优于在研究区内平均布井,并且线状开采强度应控制在 $600\sim 800\text{m}^3/\text{d}\cdot\text{km}^{-1}$ 。对志靖地区地下水的合理开采具有指导意义。

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作者: Li Xinyan; Chen Kai; Ge Jialiang; Wang Wei

作者: 李欣艳; 陈凯; 葛佳亮; 王玮

标题: Groundwater environment change of water source area in Jingbian County

标题: 靖边县水源地区地下水环境变化研究

来源出版物: 水资源与水工程学报 卷: 31 期: 2 页: 36-41 出版年: 2020

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作者关键词: groundwater environment; groundwater level; hydrochemistry; dynamic analysis;
water source area of Jingbian County

作者关键词: 地下水环境; 地下水水位; 水化学; 动态分析; 靖边县水源地区域

摘要: The main drinking water source in Jingbian County is groundwater, and the groundwater environment changes seriously affect the water supply amount. In order to clarify the changes in the groundwater environment in the view of time and space as well as the influencing factors, statistical and hydrogeochemical methods were used to analyze the results of groundwater level investigation and the 90 groundwater samples on the study area. The results showed that the groundwater level in most of the study area decreased significantly from 1995 to 2017, and a large-scale falling funnel has formed in Guojiamiao and other places. The concentration of TDS in groundwater increased significantly. Furthermore, TDS and NO₃~ in some areas have exceeded standard requirements. It is found that the application of nitrogenous fertilizers has led to the

excess of NO₃⁻ in groundwater and the influence scope keeps expanding in the irrigation area. Therefore, reasonable measures should be taken in time to control the amount of groundwater exploitation, new irrigation methods and rational fertilization should be adopted to reduce the continuous decline of local groundwater level and water quality deterioration.

摘要: 靖边县饮用水源多为地下水,地下水环境的变化严重影响着当地供水量。为了进一步厘清研究区地下水环境在时间和空间上的变化情况及其影响因素,利用统计学及水文地球化学方法,对研究区地下水位统测结果和 90 组地下水水样检测结果进行分析。结果表明:1995-2017 年研究区内大部分地区地下水位显著下降,在郭家庙等地已经形成较大规模的降落漏斗;地下水中 TDS 浓度明显增加;部分区域 TDS、NO₃⁻超标,尤其是农灌区常年施用含氮肥料导致地下水中 NO₃⁻浓度超标且范围不断扩大。因此,当地应及时控制地下水开采量,采用新型灌溉、合理施肥等措施来减缓地下水位的持续下降与水质恶化。

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作者: 郑乐; 杨法暄; 钱会; 徐盼盼

标题: Study on the utilization efficiency of industrial water resources in Ningxia based on super-efficiency DEA model

标题: 基于超效率 DEA 模型的宁夏工业水资源利用效率研究

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作者关键词: industrial water resources utilization efficiency; super-efficiency data envelopment analysis(DEA) model; Malmquist index method; technical efficiency; scale efficiency; Ningxia

作者关键词: 工业水资源利用效率; 超效率 DEA 模型; Malmquist 指数法; 技术效率; 规模效率; 宁夏

摘要: Improving the water utilization efficiency(WUE) is the key to solve the problem of water resources shortage.Based on the super-efficiency data envelopment analysis(DEA) model and Malmquist index method,we selected the industrial water consumption,the number of industrial employees and the net value of industrial fixed assets as input indicators,and the industrial total output value and waste water discharge as output indicators to analyze the industrial WUE in Ningxia region from 2006 to 2016 from dynamic and static perspectives.The results showed that the industrial WUE of Ningxia region was good in general,and the technical efficiency was the main factor reducing the industrial WUE of the region.Yinchuan and Shizuishan had reasonable water consumption and rapid growth of total factor productivity in the past five years.Wuzhong and Zhongwei had serious labor redundancy problems,and Guyuan was the most underdeveloped city in technology and scale.This research provides scientific basis for industrial production and resource allocation in Ningxia.

摘要: 提高水资源利用效率是解决水资源短缺问题的关键。利用超效率 DEA 模型和 Malmquist 指数法,选取工业耗水量、工业从业人数和工业固定资产净值为投入指标,工业总产值和废污水排放量为产出指标,对宁夏回族自治区 2006-2016 年的工业水资源利用效率从动态和静态两个角度进行了分析。结果表明:宁夏地区工业用水效率整体良好,技术效率是降低整个自治区工业用水效率的主要因素;银川市和石嘴山市近 5 年用水状况较为合理且全要素生产率增长较快,吴忠和中卫市劳动力冗余严重,固原市技术和规模方面都最为落后。此研究可为全区工业生产以及资源配置提供科学依据。

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标题: Road dust loading in main urban area of Weinan and particulate matters emission released by vehicle fugitive dust

标题: 渭南主城区道路积尘负荷及交通扬尘颗粒物排放

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作者关键词: main urban area of Weinan; vehicle fugitive dust; dust loading; particulate matters

作者关键词: 渭南主城区; 交通扬尘; 积尘负荷; 颗粒物

摘要: Road dust loading was determined in main urban area of Weinan, and particulate matters emission released by vehicle fugitive dust was estimated from different aspects of road types and vehicle types in 2008. Results showed that the dust loading of the branch road was the largest (1.79 g/m²), while that of the expressway was the smallest (0.05 g/m²). Sprinkling was an effective way to decrease dust loading. PM_(2.5) and PM₍₁₀₎ annual emissions released by vehicle fugitive dust in main urban area of Weinan were 1 149.65 and 4 751.88 t, respectively. On urban roads (including main road, secondary main road and branch road), and national and provincial roads (including national road and provincial road), the distribution rates caused by small passenger cars were the highest (59.49% and 41.46%, respectively). But on expressway, the distribution rates caused by heavy trucks was the highest (63.35%). The particulate matters emission released by vehicle fugitive dust had obvious daily variation with two peaks on urban roads, but not on national and provincial roads and expressway.

摘要: 对渭南主城区道路积尘负荷进行了实测,并计算了2018年不同道路类型和不同车型的交通扬尘颗粒物排放量。结果表明:渭南主城区支路积尘负荷最大,为1.79 g/m²,高速积尘负荷最小,为0.05 g/m²,洒水作业能有效降低积尘负荷;渭南主城区道路交通扬尘PM_(2.5)和PM₍₁₀₎的年排放量分别为1 149.65、4 751.88 t;小型客车引起的交通扬尘颗粒物排放在城市

道路(包括主干道、次干道、支路)和国省道(包括国道和省道)上的分担率最高,分别为 59.49%、41.46%,重型货车在高速上的分担率最高,为 63.35%;城市道路交通扬尘颗粒物排放有明显的双峰日变化规律,而国省道和高速不明显。

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标题: Analyses of the spatio-temporal heterogeneity of evapotranspiration in the piedmont of the Manas River Basin

标题: 玛纳斯河流域山前平原区蒸散发时空异质性分析

来源出版物: 水文地质工程地质 卷: 47 期: 2 页: 25-34 出版年: 2020

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文献类型: Article

作者关键词: evaporation; spatiotemporal distribution characteristics; SEBAL; Manas River Basin

作者关键词: 蒸散发; 时空分布特征; SEBAL 模型; 玛纳斯河流域

摘要: In the Manas River Basin the climate is dry and evaporation is strong, and accurate estimation of evapotranspiration is of important guiding significance for groundwater resources evaluation and ecological environmental protection. In the past, the research on evapotranspiration is of a low spatial resolution and the results cannot satisfy the detailed changes in evapotranspiration caused by the evolution of landscape patterns in various hydrogeological zones. In response to the past deficiencies, this study uses the Landsat series of images to estimate the evapotranspiration in the piedmont plain of the Manas Basin in the past 30 years, and further explores the temporal and spatial distribution characteristics and influencing factors of

evapotranspiration in different hydrogeological zones. The results show that the spatial distribution of evapotranspiration is obviously banded according to the hydrogeological division. The total evapotranspiration of each hydrogeological zone is represented by the Gobi belt < desert belt < oasis belt. The total evapotranspiration of the whole area shows an increasing trend on the time scale and the increasing trend gradually slows down. The total amount of evapotranspiration in the oasis belt increases, and the total evapotranspiration in the gobi belt and desert belt decreases first and then increases. The change trend of evapotranspiration in each district is controlled by the variation in evapotranspiration of the major land types in each district. According to the analysis of influencing factors, it can be found that ET increases with the rising temperature, and the daily average evapotranspiration of various places is consistent with the average temperature change trend of the whole region. NDVI and ET show a good positive correlation in the gobi and oasis zones. Groundwater table burial depth is negatively correlated with ET in the oasis zone. When the groundwater table burial depth is greater than 5.5 m, ET tends to stabilize. The analytical ideas can provide reference for hydrogeologists in the data-poor areas.

摘要: 玛纳斯河流域气候干燥、蒸发强烈,准确估算蒸散发量对地下水资源评价及生态环境保护具有重要指导意义。以往蒸散发研究空间分辨率较低,已不能满足各水文地质分区景观格局演变引起的蒸散发细部变化研究,针对以往不足,文章基于 SEBAL 模型利用 Landsat 系列影像估算了近 30 年来玛纳斯河流域山前平原区蒸散发,并进一步探讨不同水文地质分区蒸散发时空分布特征及影响因素。结果表明,蒸散量空间分布按照水文地质分区呈现明显带状性,各水文地质分区日蒸散总量表现为戈壁带<荒漠带<绿洲带,时间尺度上全区蒸散总量呈上升趋势,且增大幅度逐渐变缓,各分区呈现绿洲带蒸散总量递增、戈壁带及荒漠带蒸散总量先减小后增大,各分区蒸散总量变化趋势是由各分区主地物类型蒸散量变化控制;通过对影响因素的分析可知日蒸散发量随气温的升高而升高,各地物日均蒸散发量与全区平均气温变化趋势一致;归一化植被指数与日蒸散发量在戈壁带与绿洲带呈现较好的正相关关系;地下水位埋深与日蒸散发量在绿洲带呈负相关,当地下水位埋深大于 5.5 m 时,日蒸散发量趋于稳定。

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标题: Dynamic Analysis of Groundwater Level in Yinchuan Plain

标题: 银川平原地下水位变化特征及其成因分析

来源出版物: 西北地质 卷: 53 期: 1 页: 195-204 出版年: 2020

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作者关键词: the Yinchuan plain; dynamic type of groundwater level; influencing factors

作者关键词: 银川平原; 地下水位动态类型; 影响因素

摘要: Based on the groundwater monitoring data from 2013 to 2015,SPSS cluster analysis and land-use-type were used to analyze the variation rules and influencing factors of the dynamic change of water level in Yinchuan plain on the time scale and space scale.It is found that the groundwater dynamics in Yinchuan plain are divided into four types:runoff type,irrigation type,rainfall-evaporation type and mining type.The dynamic types of human-influence(irrigation type and mining type)are widely distributed among them,accounting for about 1/2 of the total area

of Yinchuan plain. In terms of time scale, the change trend of the four dynamic types is obviously different because of different influence factors. From the perspective of the dynamic trend of the whole year, the runoff-type shows M-type change. The irrigation-type shows W type change. Rainfall evaporation type shows Lambda type change. The mining type shows Z type change. Through simulation, the optimal annual mining volume is 45%~50% in summer and 15%~20% in winter. On the spatial scale, due to the influence of topographic factors, the groundwater dynamic type changed from west to east as runoff type, mining type and irrigation type. On this basis, a reasonable way of exploiting groundwater resources in Yinchuan plain is discussed, which provides a scientific proof for sustainable exploitation and utilization of groundwater resources.

摘要: 基于2013~2015年地下水的监测资料,通过SPSS聚类分析和土地利用类型,分析银川平原水位动态变化在时间尺度、空间尺度上的变化规律及影响因素。分析发现:银川平原地下水动态分为径流型、灌溉型、降水-蒸发型和开采型4种类型,其中人为影响地下水动态类型(灌溉型、开采型)分布最广,约占银川平原总面积的1/2。在时间尺度上,受不同因素的影响,4种动态类型变化趋势明显不同,从年内动态趋势看,径流型呈M型变化;灌溉型呈W型变化;降水-蒸发型呈Lambda型变化;开采型呈Z型变化,对于开采型,通过模拟,认为夏季开采全年的45%~50%,冬季开采15%~20%是最优开采量。在空间尺度上,受地形因素影响,地下水动态类型自西向东呈径流型开采型灌溉型规律变化。在此基础上,探讨了银川平原地下水资源开采的合理方式,为地下水资源的可持续开发利用提供科学依据。

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标题: Characteristics of VOCs and formation potential of O₃ and SOA in autumn and winter in Baoji, China

标题: 宝鸡市秋冬季大气 VOCs 浓度特征及其 O₃ 和 SOA 生成潜势

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作者关键词: volatile organic compounds; ozone formation potential; secondary organic aerosol; Baoji city

作者关键词: 挥发性有机物;臭氧生成潜势; 二次有机气溶胶; 宝鸡市

摘要: A total of 102 ambient volatile organic compounds (VOCs) were detected during the 29-day online real-time scrutiny conducted in the urban area of Baoji during October and December, 2017. The ozone formation potential (OFPs) and the secondary organic aerosol formation potential (SOAFPs) of VOCs species were estimated using the maximum incremental reactivity (MIR) coefficient and the fractional aerosol coefficient (FAC), respectively, so as to screen out the VOCs species that had the largest contribution to the formation of O₃ and SOA. The results showed that the concentration of TVOC in Baoji in the autumn and winter were $(68.6221.85) \times 10^{-9}$ and $(42.4416.62) \times 10^{-9}$. The total OFPs were 185.49×10^{-9} and 126.00×10^{-9} in the autumn and winter, respectively; the total SOAFPs were 3.26, 0.65 g/m³ in the two seasons, respectively. In the autumn, alkanes (21.83×10^{-9}) and aromatics (13.37×10^{-9}) contributed the highest contents, which accounted for 31.82 % and 19.49 % of TVOC, respectively. In the autumn, ethylene, trans-2-pentene and toluene were the species having the largest contribution to OFPs, whereas toluene, m, p-xylene and ethylbenzene were the largest contributors to SOA production. In the winter, alkane (17.34×10^{-9}) and alkyne (8.81×10^{-9}) were the top two abundant species, which accounted for 40.85% and 20.75% of TVOC, respectively. In the winter, ethylene, propylene and acetylene were the three major components that had the largest contribution to OFPs; whereas toluene, m-p-xylene, and ethylbenzene were the top three VOCs that had the largest contribution to SOA production. To conclude, it is an efficient way to reduce O₃ and SOA pollution in autumn and winter in Baoji through controlling concentrations of alkenes and

aromatics in ambient air.

摘要: 2017 年 10 月、12 月在宝鸡市城区开展了共 29d 的挥发性有机物(VOCs)浓度在线监测,共测出 102 种 VOCs,分别采用最大增量反应活性(MIR)系数法和气溶胶生成系数(FAC)法估算了宝鸡市各 VOCs 组分的臭氧生成潜势(OFPs)和二次有机气溶胶生成潜势(SOAFPs),筛选出生成 O₃ 与 SOA 活性最大的 VOCs 成分.结果表明:宝鸡市秋季和冬季 TVOC 的浓度分别为 $(68.6221.85)*10^{-9}$ 和 $(42.4416.62)*10^{-9}$,总 OFPs 分别为 $185.49*10^{-9}$ 和 $126.00*10^{-9}$,总 SOAFPs 分别为 3.26,0.65g/m³.秋季 VOCs 中含量最多的 2 种组分为烷烃($21.83*10^{-9}$)和芳香烃($13.37*10^{-9}$),分别占 TVOC 的 31.82%和 19.49%,乙烯、反-2-戊烯和甲苯是 OFPs 最大的 3 个成分,甲苯、间/对二甲苯和乙苯是 SOAFPs 最大的 3 个成分.而在冬季,烷烃($17.34*10^{-9}$)和炔烃($8.81*10^{-9}$)是 VOCs 中含量最多的 2 种组分,分别占 TVOC 的 40.85%和 20.75%,乙烯、丙烯、乙炔是 OFPs 最大的 3 个成分,甲苯、间/对二甲苯、乙苯是 SOAFPs 最大的 3 个成分.优先减少烯烃和芳香烃的排放是宝鸡市秋冬季抑制 O₃ 和 SOA 的形成的有效途径.

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作者: 任涛; 贾志峰; 王智; 卢玉东; 刘秀花; 钟哲

标题: Characteristics of soil temperature change under plastic membrane-geotextile cloth mulching in Mu Us Desert land

标题: 毛乌素沙漠地膜-地布覆盖下土壤温度变化特征

来源出版物: 干旱地区农业研究 卷: 38 期: 1 页: 190-199,216 出版年: 2020

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作者关键词: plastic membrane + geotextile ground cover; soil temperature change; Mu Us desert

作者关键词: 地膜+地布覆盖; 土壤温度; 毛乌素沙漠

摘要: In order to study the effect of combined mulching mode using plastic membrane and geotextile cloth on soil temperature in the Mu Us Desert, this experiment selected a site in the east edge of Mu Us Desert sand belt, had three treatments including plastic membrane plus weed-blocking geotextile ground cover (MB), weed-blocking geotextile cover (DB), and bare ground control (CK) in three groups, and carried out a one-year in-situ monitoring of shallow soil temperature, so as to compare the influence of different cover types on soil temperature variation. Results showed that the MB cover resulted in higher average annual temperatures, 0.5°C, 0.6°C, and 0.5°C higher, at 5, 15, and 30 cm of soil depths, respectively, than that under the DB cover, which was 1.0, 0.8, and 1.0°C higher than the CK condition. At the same depth, the length of the freezing-thawing period was longest for CK, intermediate for DB, and shortest for the MB. There was a significant difference in soil temperature between the three treatments at the same depth ($P < 0.05$), and the soil temperature conservation effect was the best under MB; At 5, 15 cm and 30 cm soil depths, the accumulated, no less than 5°C, soil temperature under MB is respectively 4%, 4%, and 3% higher than that of DB, which was respectively 8%, 7%, and 9% higher than that under CK; Before, during, and after a rainfall event, the daily range of soil temperature at the same depth was the largest in MB, followed by DB, and the smallest with CK. The near-surface air temperature and soil temperature were positively correlated. At the same depth, the correlation was greater under mulching conditions than that of the bare surface condition. This experiment showed that there was an obvious heat conservation effect under the plastic membrane and geotextile ground cover conditions, which were suitable for plant growth and provided reference for developing vegetation restoration technologies in this area.

摘要: 为了研究地膜+地布相结合的覆盖方式对毛乌素沙漠地区土壤温度的影响,在毛乌素沙漠东缘风沙滩区选取试验点,设置地膜+防草地布覆盖 (MB)、防草地布覆盖 (DB) 以及裸地 (CK) 3 个处理方式,开展为期 1 a 的浅层土壤温度原位监测试验,对比不同覆盖对温度变化规律的影响。结果表明: MB 覆盖区地表下 5、15、30 cm 土层土壤的年均温度比 DB 覆盖区分别高出 0.5°C、0.6°C 和 0.4°C,比 CK 分别高出 1.0°C、0.8°C 和 1.0°C; 冻融期在同一土层深度处均表现为 CK 最长、DB 次之、MB 最短; 同一土层深度处 3 个处理的土壤温度之间存在显著性差异 ($P < 0.05$), 以 MB 覆盖条件下土壤保温效果最好, CK 最差; MB 覆盖区在 5、15、30 cm 土层土壤深度处 $\geq 5^\circ\text{C}$ 地积温比 DB 覆盖区分别高 4.0%、4.0% 和 3.0%, 比 CK 分别高 8.0%、7.0% 和 9.0%; 降雨前、中、后, 同一土层深度处土壤温度日较差以 MB 覆盖区最大, DB 覆盖区次之, CK 最小; 近地表大气温度与土壤温度呈正相关, 同一土层深度处, 覆盖条件下其相关性较大, 裸地较小。试验表明地膜+地布覆盖处理保温效果明显, 适合植物生长。

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标题: Research on characteristics of water change capability of Kunming Lake (test section) in Xi'an based on the MIKE 21 Model

标题: 基于 MIKE21 的西安昆明池(试验段)换水能力特征研究

来源出版物: 水资源与水工程学报 卷: 31 期: 1 页: 58-63 出版年: 2020

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作者关键词: urban artificial lake; hydraulic retention time; hydrodynamics; MIKE21 model; the test section of Kunming Lake in Xi'an

作者关键词: 城市人工湖; 换水周期; 水动力; MIKE21 模型; 西安昆明池试验段

摘要: Taking Kunming Lake (test section) in Xi'an as the research object, a two-dimensional hydrodynamic-staining agent coupling model was established based on MIKE21 to quantitatively analyze the water exchange capacity. The results showed that the flow field of Kunming Lake (test section) often forms circulations of different sizes due to the influence of artificial islands and lakeshore topography. The flow rate of the lake area is usually between 0.004 m/s and 0.09 m/s, and the relative larger flow rates often occur near the artificial islands and lakeshores. The hydraulic retention time is roughly stepping up along the main direction of the water flow, and the lake is divided into four different areas. The hydraulic retention time in the western lake area is generally longer than that in the eastern lake area, and the water exchange capacity of the whole lake area coexists, the hydraulic retention time of about 10% of the area does not exceed 10 days, 40% of the area does not exceed 17 days, 70% of the area does not exceed 34 days, and less than 10% of the area is longer than 35 days. Improving the water exchange capacity of the western lake area to avoid water quality deterioration is the key to ensuring the healthy and sustainable operation of the water environment system of Kunming Lake (test section).

摘要: 以西安昆明池(试验段)为研究对象, 基于 MIKE21 建立二维水动力-染色剂耦合模型, 对昆明池(试验段)的换水能力进行了定量的研究分析。结果表明: 受人工岛及湖岸地形影响, 昆明池(试验段)流场多形成大小不一的环流, 湖区流速在 0.004 ~ 0.09 m/s 之间, 且较大流速多出现在人工岛及湖岸附近; 换水周期沿水体主流方向大致呈阶梯递增趋势, 其中西部湖区换水周期普遍大于东部湖区; 整个湖区换水能力快慢并存, 约 10% 的水域换水周期不超过 10 d, 40% 的水域换水周期不超过 17 d, 70% 的水域换水周期不超过 34 d, 不足 10% 的水域换水周期在 35 d 以上; 提高西部湖区水体的换水能力, 避免其出现水质恶化问题, 是保障整个昆明池(试验段)水环境系统健康可持续运行的关键所在。

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标题: Vulnerability assessment of urban water resources based on DPSIR model:A case study of Xi'an City

标题: 基于 DPSIR 模型的城市水资源脆弱性评价以西安市为例

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作者关键词: urban water resources; vulnerability; DPSIR model; entropy weight; Xi'an City

作者关键词: 城市水资源; 脆弱性; DPSIR 模型; 熵权法; 西安市

摘要: According to the current situation of water resources in Xi'an,11 indicators were selected from five levels of driving forces,ramely pressure,state,impact and response to construct the urban water resources vulnerability assessment system based on DPSIR model.The entropy weight

method and fuzzy mathematics method were used to evaluate the water resources vulnerability of Xi'an in time and space dimensions, respectively. The results showed that the water resources vulnerability of Xi'an from 2007 to 2017 showed a downward trend and then an upward trend. It decreased significantly from 2007 to 2013, and rose from 2013 to 2017. Except for the non-vulnerable state in 2013, the other years are mild or moderate vulnerable. The water resources evaluation results in 2017 show that the water resources vulnerabilities of different regions is highly differentiated. In contrast, the urban water resources vulnerability is the highest, and Zhouzhi County is the lowest. Optimizing water resources allocation, improving water resources utilization rate and alleviating the contradiction between supply and demand are the key to reducing water resources vulnerability.

摘要: 结合西安市水资源现状,从驱动力、压力、状态、影响和响应 5 个层级选取 11 个指标构建基于 DPSIR 模型的城市水资源脆弱性评价体系,采用熵权法和模糊数学评价方法对西安市分别进行时间和空间维度上的水资源脆弱性评价。结果表明:2007-2017 年西安市水资源脆弱性整体上呈现先下降后上升的趋势,2007-2013 明显下降,2013-2017 升高,除 2013 年不为脆弱状态外,其余年份均为轻度或中度脆弱;2017 年水资源评价结果显示,西安市各地区水资源脆弱性存在明显差异,市区水资源脆弱性最高,周至县最低;优化水资源配置,提高水资源利用率,缓解供需矛盾是降低水资源脆弱性的关键。

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作者: 李傲雯; 李永红; 姚超伟; 苏晓萌; 惠明强; 任超; 杨渊

标题: Several Modes of Geological Disasters Monitoring,Early Warning and Successful Predicting

标题: 几种地质灾害监测预警和成功预报的模式

来源出版物: 灾害学 卷: 35 期: 1 页: 222-229 出版年: 2020

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来源出版物: Journal of Catastrophology 卷: 35 期: 1 页: 222-229 出版年: 2020

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文献类型: Article

作者关键词: successful predicting modes of geological disasters; monitoring and early warning; professional monitoring mode; patrol inspection mode; meteorological early warning mode; public prevention mode

作者关键词: 地质灾害; 成功预报模式; 监测预警; 专业监测型; 巡查排查型; 气象预警型; 群测群防型

摘要: The successful prediction of geological disasters means that through various kinds of monitoring and early warning approaches,before the geological disaster,the authority or individual could be able to accurately predict the time,location,extent or intensity of the geological disaster,and issue warning signal,then the relevant departments could immediately take necessary measures to avoid the loss.Based on the successful forecasting of 553 geological disasters in Shaanxi Province from 2003 to 2018,this study defined the modes of geological disaster monitoring and early warning and successful prediction based on the source of the first forecasting and warning signal,typical cases were demonstrated in this study.Four mode were defined:professional monitoring mode,patrol inspection mode,meteorological early warning mode,public prevention mode,and the successful rates of the four modes have apyramidform from low to high.

摘要: 地质灾害成功预报是指通过多种形式的监测预警手段,在地质灾害临灾前,由单位或个人对地质灾害将要发生的时间、地点、范围或强度等进行准确的预判并发出预报预警信号,相关部门立即采取必要的避险防治措施后,避免了人员伤亡或财产损失的事件过程。该文以2003-2018年陕西省553起地质灾害成功预报为样本,以第一次预报预警信号的来源为依据,界定了地质灾害监测预警和成功预报的模式,辅以具体案例并对每一种模式进行了定义。文章认为地质灾害监测预警和成功预报的模式有:专业监测型、巡查排查型、气象预警型、群

测群防型共四种模式,四种模式的成功预报率由低至高具金字塔型。

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作者: 谢亚平; 陈爱侠; 陈贝; 庞家驹; 王敏

标题: Optimization of congo red adsorption in water by semicoke residuals from sludge pyrolysis based on response surface methodology

标题: 响应曲面法对污泥热解剩余半焦吸附水中刚果红的优化

来源出版物: 环境工程学报 卷: 14 期: 3 页: 622-631 出版年: 2020

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文献类型: Article

作者关键词: semicoke residuals from sludge pyrolysis; adsorption; response surface methodology; congo red

作者关键词: 污泥热解剩余半焦; 吸附; 响应曲面法; 刚果红

摘要: As for the resource utilization of municipal sewage sludge, the semicoke residuals from sludge rapid pyrolysis for hydrogen-rich gas production was used to absorb the Congo red (CR) simulated dye wastewater. Box-Behnken design of response surface methodology was used to explore the effects of adsorbent dosage, initial concentration of CR, temperature and pH on CR removal rate. Furthermore, the CR adsorption mechanism by the semicoke residuals was analyzed. The results showed that the effect order of above factors on CR removal rate was following: the dosage of adsorbent > CR initial concentration > pH > temperature; the CR removal rate under the optimal adsorption conditions reached 98.97%, which was basically consistent with the predicted value of 99.61%. Through the analysis of the response surface interactions, increasing the amount of adsorbent to a certain extent, reducing the initial concentration of CR and the pH could improve the CR removal rate. The characterization results of XRD and FT-IR showed that the main components of semicoke residuals were silicon-containing inorganics, BET results demonstrated that the semicoke residuals had developed pore structure and provided many adsorption sites. No new functional groups were found after CR adsorption, which indicating that physical adsorption dominated CR adsorption on semicoke residuals.

摘要: 为了实现市政脱水污泥的资源化,以污泥快速热解制备富氢燃气剩余半焦作为吸附材料,对刚果红(CR)模拟染料废水进行了吸附研究。采用响应曲面法的 Box-Behnken 实验设计原理探究了吸附剂投加量、CR 初始浓度、温度和溶液 pH 对 CR 去除率的影响,并分析了剩余半焦对 CR 的吸附机理。结果表明:各因素对 CR 去除率的影响顺序为吸附剂投加量>CR 初始浓度>溶液 pH>温度;最佳吸附条件下 CR 的去除率为 98.97%,与预测值(99.61%)基本吻合;由交互作用响应曲面分析结果得出,适当的增加吸附剂投加量,降低 CR 初始浓度和溶液 pH 均有助于提高 CR 的去除率;污泥热解剩余半焦的 XRD 和 FT-IR 表征结果显示,其主要成分为含硅无机物,BET 结果显示孔隙结构发达,可提供较多的吸附位点;吸附 CR 后,没有新的官能团产生,表明剩余半焦对 CR 的吸附主要为物理吸附。

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作者: 霍文博; 王倩; 李春荣

标题: Theoretical study effects of pi bridge on photovoltaic properties of C217 dye

标题: 理论研究 pi 桥对 C217 染料光伏性质的影响

来源出版物: 化学研究与应用 卷: 32 期: 3 页: 351-357 出版年: 2020

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文献类型: Article

作者关键词: C217 dye; Photovoltaic properties; DFT; pi-bridge; Density functional theory

作者关键词: C217 染料; 光伏特性; pi 桥; 密度泛函理论

摘要: In this study, the C217 dye is the parent structure, and then a series of novel dye sensitizers are designed by changing the type, number and connection mode of pi-bridge groups, and using density functional theory (DFT) combined with discontinuous charge jump model to study the electronic structure, optical absorption and photovoltaic properties of the dye. The results showed that the predicted photoelectric conversion efficiency value of C217 is 9.50%, which is close to the experimental value (9.80%). Furthermore, dye 7 presents a high short-circuit current density (21.144 mA·cm⁻²), open circuit voltage (0.760 V), filling factor (0.762) and the photoelectric conversion efficiency is 12.31%, which proves that dye 7 is a potential high-efficiency dye sensitizer and is worthy of further experimental research.

摘要: 本文以 C217 染料为母体结构, 通过改变 pi 桥联基团的种类、数量、连接方式, 设计了一系列结构新颖的染料敏化剂, 利用密度泛函理论方法 (DFT) 结合不连续的电荷跳跃模型研

究了所设计染料的电子结构、光学吸收及光伏性质。理论预测 C217 的光电转化效率达到了 9.50%, 与其实验值比较接近(9.80%)。而染料 7 具有较高的短路电流密度($21.144\text{mA}\cdot\text{cm}^{-2}$)、开路电压(0.760V)、填充因子(0.762)光电转换效率为 12.31%, 证明染料 7 是一种潜在的高效染料敏化剂, 值得进一步实验研究。

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标题: Construction of photo-sensitive Gel/PPy composite system and its controlled release of carbendazim

标题: 明胶/聚吡咯光敏感复合体系的构建及其对多菌灵的控释研究

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作者关键词: gelatin; polypyrrole; carbendazim; photo sensitivity; controlled release

作者关键词: 明胶; 聚吡咯; 多菌灵; 光敏感; 控释

摘要: Gelatin/polypyrrole(Gel/PPy)with photo-sensitive and controlled release properties was prepared by chemical polymerization based on the light absorption characteristics of polypyrrole and the temperature-sensitive spiral-irregular crimp structure of gelatin.The hydrogel was

compounded, and carbendazim was used as a template drug to investigate the controlled release of the gel system. The results showed that polypyrrole could effectively compound with gelatin, and acted as a crosslinking agent to enhance the mechanical strength of the gel. Increasing temperature can promote the release of carbendazim. Under the condition of light for 3 hours, the system could achieve effectively controlled release of carbendazim, and the release rate increased with the decrease of the crosslinker content.

摘要: 基于聚吡咯的光吸收特性以及明胶的温敏性螺旋-无规则卷曲结构变化,以明胶和吡咯为原料,采用化学聚合法制备了具有光敏感控释性能的明胶/聚吡咯(Gel/PPy)复合水凝胶,并使用多菌灵为模板药物考察了该凝胶体系对于药物的控释作用。结果表明:聚吡咯可与明胶有效复合,并起到交联剂的作用,增强凝胶的机械强度。温度的升高能够促进多菌灵的释放。在光照 3h 条件下,该体系可以实现对多菌灵的有效控制释放,且释放率随着交联剂含量的降低而升高。

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作者: 张王超; 郭洪成; 郭冀峰; 李继香

标题: Effect of magnetic microparticles and nanoparticles on the performance of membrane bioreactor

标题: 微纳米磁性粒子对膜生物反应器运行效能的影响

来源出版物: 环境工程学报 卷: 14 期: 10 页: 2719-2727 出版年: 2020

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文献类型: Article

作者关键词: membrane fouling; magnetic materials; magnetic activated sludge; pioneer species

作者关键词: 膜污染; 磁性材料; 磁活性污泥; 先锋物种

摘要: In order to alleviate the problem of membrane fouling in membrane bioreactor (MBR), three MBRs were built to investigate the effects of magnetic microparticles and nanoparticles on their performance, including the pollutants removal, properties of sludge mixed liquor and membrane fouling. High-throughput sequencing was used to deeply analyze the relation between the succession of microbial community and MBR performance. Results showed that the addition of magnetic microparticles or nanoparticles had no adverse impact on pollutants removal in MBRs. The effluent COD and $\text{NH}_4^{+}\text{-N}$ were lower than $50 \text{ mg}\cdot\text{L}^{-1}$ and $5 \text{ mg}\cdot\text{L}^{-1}$, respectively, which could meet the first-class A standard of Chinese sewage discharge standard (GB 18918-2002). The addition of microparticles or nanoparticles can effectively alleviate membrane pollution, and the alleviation effect of magnetic microparticles was more significant. Analysis of membrane fouling components showed that the additions of magnetic materials with different sizes could effectively reduce the concentrations of SMP and LB-EPS components, and effectively reduce the content of macromolecules, but increase the content of small molecules, thereby the membrane fouling rate decreased. Microbial community analysis showed that the addition of microparticles or nanoparticles may inhibit the growth of pioneer species of Alphaproteobacteria inducing membrane fouling, and the membrane fouling was effectively alleviated. Moreover, the magnetic microparticles also presented the better performance than nanoparticles. This study is expected to provide reference for engineering practice of regulating membrane fouling of MBR with magnetic activated sludge process.

摘要: 针对膜生物反应器(MBR)应用中膜污染这一难题,构建了3套MBR系统对比研究了微纳米磁性粒子对MBR运行效能的影响,包括污染物去除效果、污泥混合液特性、膜污染情况等;并基于高通量测序技术,深入分析了微生物群落演替规律与MBR运行效能的关系。结果表明:微纳米磁性粒子的引入均未在污染物去除方面产生负面影响,MBR出水COD浓度低于 $50 \text{ mg}\cdot\text{L}^{-1}$,出水 $\text{NH}_4^{+}\text{-N}$ 维持在 $5 \text{ mg}\cdot\text{L}^{-1}$ 以下,均可达到国家污水排放标准一级A标准(GB 18918-2002);微纳米磁性粒子的引入均有效减缓了膜污染,并且微米尺度材料延缓效果更显著。膜污染组分分析表明:不同粒径磁性材料引入均有效降低了SMP、LB-EPS各组

分浓度;同时有效减少了反应器中大分子物质含量,增加了小分子物质含量,因而降低了膜污染速率。微生物群落分析表明,微纳米磁性粒子的引入可能抑制了反应器中易引起膜污染的先鋒物种 *Alphaproteobacteria* 的生长,有效延缓了膜污染,并且微米粒径材料抑制效果更显著。研究结果可为磁活性污泥法调控 MBR 膜污染的工程应用提供参考。

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作者: Chen Wang; Chen Ying; Zhao Jianqiang; Zhang Yuhao

作者: 陈望; 陈莹; 赵剑强; 张宇浩

标题: Purifying rule and key parameters design of the interception device of rainwater funnel treating initial roof rainwater runoff

标题: 雨水斗截污装置对屋面初期雨水净化规律及关键参数设计

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文献类型: Article

作者关键词: roof runoff; initial rainwater; rainwater funnel; interception device; geotextile; low

impact development (LID)

作者关键词: 屋面径流; 初期雨水; 雨水斗; 截污装置; 土工布; 低影响开发策略(LID)

摘要: A runoff sample point was set up in a roof drainage pipe which located in the cultural and educational area of Xi'an city, Shaanxi province. Runoff samples in 3 storm events from Aug. 2016 to Nov. 2016 were collected by the manual time-interval sampling method, and the pollution indicators of SS, COD, TN, NH₃-N, TP, turbidity, Pb, Zn, Cu, Cd, Ni and Cr of all runoff samples were determined by standard methods. Based on the monitoring results, the initial roof runoff was defined, then a device for intercepting the pollutants in the roof runoff was designed according to the water quality and flow characteristics of initial roof runoff and the structure of rainwater funnel. The experiments were conducted to study the permeability of the interception device, work status, the interception efficiency of pollutants and clean and replacement cycle of the interception device. The results indicated that the initial rainwater runoff could be defined as the first 30~40 minutes of a rainstorm event and the first 40~50 minutes of a heavy rain event or a light rain event. The more the geotextile mass of unit area was, the less the permeability was. Moreover, there was a linear relationship between filtration flux and water head. Under the conditions without overflow, the filtration effluent of the interception device prepared with the geotextile of 500 g·m⁻² treating the initial roof runoff could satisfy the requirement of Quality Standard of Reclaimed Water (GB/T 18920-2002). In order to avoid water accumulation from roof flooding in the case of 5 years-return period storm, the minimum area of the upper overflow orifices and the minimum height of the filtration area of the interception device were 0.015 4 m² and 568 mm, respectively. The study can provide references for release the water shortage of Xi'an city and other arid or semi-arid areas.

摘要: 在西安市某文教区屋面排水立管设径流采样点,雨期采用人工时间间隔采样法采集径流水样,对 2016 年 8 月 2016 年 11 月 3 场屋面径流 SS、COD、TN、NH₃-N、TP、浊度、Pb、Zn、Cu、Cd、Ni、Cr 等污染指标进行监测,界定了初期雨水的概念并根据屋面初期雨水水质、水量特征、雨水斗构造设计屋面雨水截污装置,研究了该截污装置的透水性能、工作状态、截污效果和清洗更换周期。结果表明:将暴雨次降雨前 30~40 min、大雨和小雨次降雨前 40~50 min 雨水定义为初期雨水;土工布单位面积质量越大,透水能力越小,且其过滤通量与过滤水头呈线性关系;在不发生溢流的情况下,500 g·m⁻²的土工布制成的截污装置过滤出水可满足《生活杂用水水质标准》(GB/T 18920-2002)要求;为避免 5 年一遇的暴雨下屋面积水,截污装置上部溢流孔孔口面积至少应为 0.015 4 m²,须至少保证有效过滤区高度为 568 mm。研究为缓解西安等干旱、半干旱地区用水紧张问题提供参考。

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作者: Wang Hao; Duan Lei; Wang Wenke

作者: 王浩; 段磊; 王文科

标题: Dynamic Features of Groundwater Level in Northern Qinling and Its Influence Factors

标题: 秦岭北麓地下水位动态特征与影响因素

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来源出版物: Northwestern Geology 卷: 53 期: 2 页: 280-288 出版年: 2020

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作者关键词: Groundwater level dynamic features; Kriging method; principal component projection clustering model; northern Qinling

作者关键词: 地下水动态; 克里金插值; 主成分投影-聚类; 秦岭北麓

摘要: Groundwater is the main water supply source in the north of Qinling mountains. It is of great significance to study the dynamic variation of groundwater level and its influencing factors for rational development of groundwater resources and protect the ecological environment. This paper chooses the Huxian plain as the regions in the north of Qinling mountains. According to the groundwater depth, meteorological and hydrological data, combined with the hydrogeological conditions in the study area, using the Kriging method and principal component projection clustering coupling model statistical, the temporal and spatial variation process of groundwater level from 1980 to 2019 was studied, the groundwater dynamic types were classified according to the main factors affecting groundwater dynamics, and the dynamic variation characteristics of groundwater level were analyzed. The results show that the groundwater level fluctuates and declines from 1980 to 2019. The interannual variation of alluvial plain and diluvial plain is large while the leading edge of alluvial fan is relatively small. The groundwater dynamic types in the study area can be divided into four types: hydrologic, precipitation-exploration, runoff, and precipitation-hydrologic-exploration

type.Rainfall,river runoff and exploitation are the main external influencing factors of groundwater level change in the study area.

摘要: 地下水是秦岭北麓地区的主要供水水源,研究该区地下水位动态变化特征及其影响因素对地下水资源合理开发及生态环境保护具有重要意义。以秦岭北麓的户县平原区为例,根据地下水埋深、气象、水文资料,结合研究区水文地质条件,运用克里金插值方法、主成分投影-聚类耦合模型,研究 1980~2019 年地下水位时空演变过程,以影响地下水动态的主要因素划分地下水动态类型,分析地下水位动态变化特征。结果表明,1980~2019 年地下水位总体呈波动下降趋势;冲积平原和洪积平原年际变幅较大,而冲洪积扇前缘相对较小;研究区地下水动态类型可划分为水文型、降雨入渗-开采型、径流型、降雨入渗-水文-开采型 4 类;研究区地下水位动态变化的主要外在影响因素为降雨、河流径流、开采。

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标题: Study on adsorption and desorption characteristics of Cu and Fe in burial soil of cultural relics

标题: 文物埋藏土壤中 Cu、Fe 的吸附解吸特征研究

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作者关键词: Cu; Fe; buried soil; Cu; Fe; adsorption; desorption

作者关键词: 埋藏土壤; 吸附; 解吸

摘要: In order to analyze the adsorption and desorption characteristics of Cu and Fe in burial soil, the isothermal adsorption/desorption experiments were carried out. The results showed that the adsorption processes of Cu and Fe both were spontaneous, endothermic and entropy increased. Desorption processes had hysteresis effects. The adsorption capacity of Fe in soil was greater than Cu. While desorption capacity of Cu was higher than Fe. The experimental results revealed the migration of Cu and Fe, which have reference significance for the research on the corrosion mechanism in buried soil.

摘要: 为分析文物埋藏土壤中 Cu、Fe 的吸附解吸特征, 进行了 Cu、Fe 的等温吸附/解吸实验。结果表明, 供试土样吸附 Cu 和 Fe 是一个自发、吸热、熵增的反应, 解吸过程存在滞后现象。土样对铁的吸附能力比铜强, 但铜的解吸能力比铁强。本研究揭示了文物埋藏土壤中 Cu 和 Fe 的迁移规律, 对埋藏土壤中文物腐蚀机理研究具有重要的参考意义。

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标题: Effects of double ridge geotextile mulching on soil moisture in arid and semi-arid regions

标题: 干旱半干旱地区双垄地布覆盖对土壤水分的影响

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作者关键词: geo-textile fabric mulching on the ridge; soil moisture; rain and dew superposition; arid and semi-arid area

作者关键词: 地布覆垄; 土壤水分; 雨露叠加; 干旱半干旱区

摘要: In order to evaluate the feasibility of a substitute material-geotextile weed blocker,a one-year long monitoring experiment was carried out in Anding District, City of Dingxi, Gansu Province. The experimentation included three treatments: weed-blocking geo-textile fabric plus plastic film mulching on the ridge (MB), geo-textile fabric mulching on the ridge (DB), and bare soil ridge (CK) . Soil moisture and water potential sensors were installed to monitor the changes in soil moisture content and water potential at 5 cm and 15 cm below the surface of the furrow. The results showed that: (1) Diurnal variation of moisture in top 5 cm surface soil was wave-like, which was significantly influenced by the ridge cover types and the seasonal climate changes. (2) The annual variation of water content in top 0 ~ 20 cm soil was mainly affected by rainfall, dew, and evaporation rates. It can be characterized as dry in spring and winter, and wet in summer and autumn. From November to February, the net loss of soil water in MB and DB was higher than CK, but during the crop growing season (May-September), the net gain of soil water storage was the highest in DB (36.35 mm), followed closely by MB (30.73 mm) and the lowest in CK (16.30 mm); (3) Ridge mulching under MB and DB obviously accelerated the superposition of rain and dew over the ridge so as to increase soil water storage in the furrow. This effect was weak under CK treatment, and the deep soil infiltration was less responsive to rainfall and dew, showing a lagging effect. But, with the occurrence of continuous rainfall, this lagging was obviously weakened due to higher water storage in the top layer; (4) The diurnal variation of 0~20 cm soil water storage was the largest in summer (average 1.20 mm·d⁻¹), medium in spring (1.03 mm·d⁻¹) and the smallest in autumn (0.79 mm·d⁻¹) . The annual net harvest with different ridge covering measures was the highest with DB (24.9 mm), followed closely by MB (21.5 mm) and the smallest with CK (only 11.4 mm) . Overall, ridge mulching using geotextile fabric alone had the best water harvesting effect. This weed-blocking fabric can be used for multiple years without fragmentation and soil pollution problems associated with plastic film

mulching, but in the no-rain season, because of higher soil moisture in the furrow, its evaporation rate was slightly higher than the bare ridge treatment.

摘要: 为探明一种可替代覆盖材料的可行性,在甘肃省定西市安定区开展了为期 1 a 的监测试验,试验设防草地布加地膜覆垄(MB)、防草地布覆垄(DB)和裸地起垄(CK) 3 种处理,利用土壤水分、水势传感器分别对沟内地表下 5、15 cm 的土壤含水率、水势进行监测,结果表明:(1)表层 5 cm 土壤水分日变化呈复杂波形,受不同覆垄处理和季节性天气变化的影响显著;(2)0~20 cm 土层的水分年变化主要受降雨、露水和蒸发强度的影响,表现为春冬干、夏秋湿的特点,在 11 月至翌年 2 月期间 MB 和 DB 覆垄处理土壤水分净损失量要高于 CK 裸地垄,而在作物生育期内(5-9 月)覆垄处理土壤储水净增量为 DB 最大(36.35 mm)、MB 次之(30.73 mm)、CK 最小(16.30 mm);(3)MB 和 DB 覆垄能明显加快雨露叠加,增加土壤水储存,而 CK 处理下叠加效应弱,且深层土壤对降雨不敏感,具有滞后性,但随着连续降雨的发生,表层土壤储水量加大,这种滞后性明显减弱;(4)0~20 cm 土层土壤储水量日变化幅度为夏季最大(平均 $1.20 \text{ mm} \cdot \text{d}^{-1}$),春季次之($1.03 \text{ mm} \cdot \text{d}^{-1}$),秋季最小($0.79 \text{ mm} \cdot \text{d}^{-1}$),全年水分净收获总量为 DB 最大(24.9 mm)、MB 略低(21.5 mm)、CK 最小(11.4 mm)。整体而言,只用地布覆垄具有最好的集水效果,这种防草地布可多年使用,无地膜碎片化污染问题,但在无降雨时期,垄沟内因土壤水分高,其蒸发强度略高于裸地处理。

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作者: 张剑; 雷娜

标题: Diurnal variation of respiration of reconstructed soil masses and its hydrothermal influence factors

标题: 重构土体土壤呼吸及其水热影响因子日变化特征

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作者关键词: soil respiration; reconstituted soil masses; hydrothermal factor; diurnal variation

作者关键词: 土壤呼吸; 重构土体; 水热因子; 日变化

摘要: Four kinds of reconstructed soil mass in the barren beach were selected as the research objects. The soil carbon flux measurement system (LI-8100) was used to monitor the soil respiration and hydrothermal factors of the reconstructed soil mass in situ, and the seasonal respiration changes of the reconstructed soil mass and its components were analyzed. The results showed that the daily changes of soil respiration for the four reconstructed soil masses showed a single-peak curve, and the patterns of daily changes for soil respiration were basically the same. The lowest value during the observation period appeared at 6 : 00 or 20 : 00, and the highest value appeared at 10 : 00, 12 : 00, or 14 : 00. The soil respiration values of the four reconstituted soil masses reached the maximum and minimum values during the experimental observation period in August and December, respectively, and the daily variation range of the four

reconstituted soil masses during the observation period. Among them, the maximum values of reconstructed soil masses with meteorite, shale, sand, and soft rock were 9.88, 10.47, 14.94, and 12.19 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, respectively, the minimum values were 0.11, 0.08, 0.10, and 0.00 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$. The order was as sand>shale>soft rock>meteorite. The four factors of soil temperature (index model), soil volume water content (quadratic model), soil temperature, and water content (power-index model) can explain the daily variation of soil respiration. However, the explanatory power was different, the explanatory power of the two-factor model was generally higher than 50.0%, and the interpretation ability of temperature in the single factor model was significantly higher than that of water. Under the fitting of three kinds of models, the hydrothermal influence factor of the addition of meteorite to reconstruct the soil mass had the lowest ability to interpret the diurnal variation of soil respiration (77%~97%). Under the exponential model and the power-exponential model, the soil hydrothermal influence factor of the addition of meteorite to reconstruct the soil mass had the lowest ability to interpret the diurnal variation of soil respiration (41%~96% and 77%~97%). Under the quadratic curve model, the soil water content of adding the shale reconstituted soil mass had the highest ability to interpret the diurnal variation of soil respiration (28%~53%).

摘要: 选取荒石滩地 4 种重构土体作为研究对象, 应用土壤碳通量测量系统(LI-8100), 对重构土体土壤呼吸和水热影响因子进行原位监测, 分析了重构土体土壤呼吸的日变化情况。结果表明, 4 种重构土体土壤呼吸在观测期间的日变化均呈现单峰曲线, 最低值出现在 6 : 00 或 20 : 00, 最高值出现在 10 : 00、12 : 00 或 14 : 00。4 种重构土体土壤呼吸值在 8 月份和 12 月份分别达到试验观测期间最大值和最小值, 其中, 添加蛭石、页岩、沙和砒砂岩重构土体的最大值分别为 9.88、10.47、14.94 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ 和 12.19 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, 最小值分别为 0.11、0.08、0.10 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ 和 0.00 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$, 4 种重构土体日变化幅度的排序为添加沙>页岩>砒砂岩>蛭石。4 种重构土体土壤温度(指数模型)、土壤体积含水量(二次曲线模型)单因素以及土壤温度和含水量双因素(幂-指数模型)均能够解释土壤呼吸的日变化, 但是解释能力不同, 双因素模型解释能力一般高于 50.0%, 单因素模型中温度的解释能力显著高于水分; 3 种模型拟合下, 添加蛭石重构土体水热影响因子对土壤呼吸日变化的解释能力最低, 为 77%~97%, 指数模型和幂-指数模型下添加蛭石的重构土体土壤水热影响因子对土壤呼吸日变化的解释能力最低, 分别为 41%~96% 和 77%~97%, 二次曲线模型模拟下添加页岩重构土体土壤体积含水量对土壤呼吸日变化的解释能力最高, 为 28%~53%。

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作者: Chen Yang; Chen Aixia; Chen Bei; Chen Li; Li Jin

作者: 陈阳; 陈爱侠; 陈贝; 陈丽; 李晋

标题: Catalytic pyrolysis characteristics of sewage sludge by mechanochemical pretreatment at different temperatures

标题: 机械化学预处理污泥在不同温度下催化热解特性

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作者关键词: CaO; sewage sludge; catalytic pyrolysis; temperature; mechanochemical pretreatment; CaO

作者关键词: 污泥; 催化热解; 温度; 机械化学预处理

摘要: In order to realize sludge resource utilization and harmless treatment and obtain higher quality gas, this study used mechanical chemical pretreatment to gently inject CaO as a catalyst into the sludge sample, and studied the effect of temperature on catalytic pyrolysis products and mechanism. The results showed that CaO was reacted with hydroxyl groups in the mixture to form Ca(OH)_2 under the action of mechanochemistry which contributes to the improvement of pyrolysis gas yield. The organic components in the mixture decomposed with increasing temperature, the C=O, CO and CH functional groups weakened, the OH functional groups gradually disappeared, and the pyrolysis gas yield reaching a maximum at 900 °C, which was 32.10%. The yield of combustible gas (H_2 , CO, CH_4), rose to 17.22 mol /kg, an obvious increase. As the pyrolysis reaction progresses, the Ca(OH)_2 substance in the mixture absorbs CO_2 to form a large amount of calcite, and the pyrolysis of calcite causes the quality of CO and CO_2 gas to rise. The high temperature helps the decomposition of the mixture to produce more flammable gas through the analysis of the pore structure characteristics of the pyrolysis semi-coke surface.

摘要: 为更好地实现污泥资源化以及无害化处理,得到较高品质燃气,采用机械化学预处理方式将 CaO 作为催化剂温和注入污泥样品,探究在催化热解中反应温度对产物的影响及机理分析。结果表明,在机械化学作用下,混合料中的 CaO 与羟基反应生成 Ca(OH)_2 ,有助于热解气产率的提高。混合物料中有机成分随着温度升高发生分解, C=O、CO 和 CH 官能团减弱, OH 官能团消失,热解气产量增高, 900 °C 时达到最大,为 32.10%,其中可燃气体 (H_2 , CO, CH_4) 产量上升至 17.22 mol /kg,增幅明显;随着热解反应的进行,混合料中 Ca(OH)_2 物质吸收 CO_2 生成大量方解石,方解石高温分解导致热解气中的 CO 和 CO_2 气体质量升高。热解半焦表面孔隙结构特性分析发现,高温有助于混合料分解产生更多的可燃气体。

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标题: Effects of Organic Loading and Temperature on Membrane Fouling in Membrane Bioreactor

标题: 有机负荷和温度对膜生物反应器膜污染的影响

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作者关键词: organic loading; temperature; membrane fouling; pioneer species

作者关键词: 有机负荷; 温度; 膜污染; 先锋物种

摘要: The membrane fouling conditions was studied compared with different organic loadings and temperature, the feasibility of membrane fouling control in MBR by selecting organic loading was investigated. The results showed that, the content of membrane foulants gradually increased with the increase of organic loading at the reasonable range, and the membrane fouling gradually aggravated in the MBR. More importantly, much too low organic loading led to extremely severe membrane fouling on account of sludge decomposition, as sludge decomposition resulted in sharp

decrease of sludge size and significant increase of membrane foulants. Also, the lower the temperature was, the severer the membrane fouling happened. Moreover, it easily induced the polysaccharide membrane fouling at low temperature. Real-time PCR analysis showed that Betaproteobacteria might be the pioneer species of membrane fouling. Consequently, it can be concluded that severe membrane fouling can be avoid by selecting the reasonable organic loading, and it should partly decrease the organic loading at the low temperature. It is expected to provide reference for membrane fouling control in practical MBR projects.

摘要: 通过对比研究不同有机负荷和温度工况下膜污染情况,探讨设定适宜的有机负荷调控 MBR 膜污染的工程可行性。结果表明,适宜有机负荷区间内,反应器内膜污染物质含量随着有机负荷的增加逐渐升高,膜污染随之加重;但是过低的有机负荷会导致污泥解体现象严重,污泥粒径急剧减小,膜污染物质含量异常升高,引发更严重的膜污染;温度越低,膜污染越严重,同时低温更容易诱发多糖型膜污染。Real-time PCR 分析发现 Betaproteobacteria 可能是引起膜污染的先锋物种。因此,控制适宜的有机负荷可以避免严重的膜污染,同时低温工况下应适当降低有机负荷。有望为实际 MBR 工程中膜污染的调控提供参考。

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标题: Preparation of straw/polypyrrole composite and selective removal of acid fuchsin from aqueous solution

标题: 秸秆/聚吡咯复合材料的制备及从水溶液中选择性除去酸性品红

来源出版物: 化工新型材料 卷: 48 期: 5 页: 275-280 出版年: 2020

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文献类型: Article

作者关键词: straw; polypyrrole; lignin; acid fuchsin; adsorption

作者关键词: 秸秆; 聚吡咯; 木质素; 酸性品红; 吸附

摘要: The pyrrole was uniformly dispersed in the straw waste solution and oxidized in situ using potassium persulfate as an oxidant to form STRR/PPy, STRA/PPy, STRA/E/PPy composite materials. Morphological analysis and functional group analysis of obtained three composites were performed by depth-of-field digital microscope and FT-IR. Dye adsorption experiments showed that the three composites had specific adsorption on acid fuchsin. Among three composites, STRR/PPy exhibited higher adsorption efficiency. Furthermore, the factors involved in the adsorption process such as temperature, initial dye concentration were investigated. The results showed that the STRR/PPy composite could reach adsorption equilibrium within 40 min at 28°C in 60 mg/L acid fuchsin solution, and the acid fuchsin removal efficiency was approximately 89%.

摘要: 将吡咯平均分散于不同秸秆废料溶液中, 使用过硫酸钾为氧化剂原位氧化吡咯, 复合形成秸秆原材料/聚吡咯(STRR/PPy)、酸处理的秸秆/聚吡咯(STRA/PPy)、酸酶处理的秸秆/聚吡咯(STRA/E/PPy)复合材料, 并使用超景深显微镜、红外光谱对得到的材料进行形貌分析和官能团分析。染料吸附实验表明: 3种复合材料对酸性品红具有专一性的吸附, 其中 STRR/PPy 吸附效果最好。通过对吸附过程中所涉及的影响因素如温度、染料初始浓度等进行了详细考察, 发现在 28°C, 60 mg/L 的酸性品红溶液中, STRR/PPy 复合材料可在 40 min 内达到吸附平衡, 酸性品红去除率达到 89%。

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标题: Characteristics and Sources of Microbial Aerosols in Urban and Mountainous Areas in Autumn and Winter in Xi'an,China

标题: 西安市秋冬季市区与山区微生物气溶胶组成特征及来源

来源出版物: 环境科学 卷: 41 期: 5 页: 2044-2049 出版年: 2020

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文献类型: Article

作者关键词: fungi; bacteria; community structure; Source Track; bioaerosol

作者关键词: 真菌; 细菌; 群落结构; 来源分析; 生物气溶胶

摘要: To explore the bioaerosol composition characteristics and sources in urban areas and mountains,three sample sites were selected in urban (urban,suburban) and southern mountainous areas in Xi'an,and air,soil,and leaf samples were simultaneously collected. The fungi and bacteria community structures at different sampling sites were analyzed through a high-throughput sequencing method,and their spatio-temporal variations were also examined. Moreover,a source track technique was used to identify the source of microorganisms in the air. The results showed that the fungi and bacteria at different sampling sites were significantly different, indicating that the geographical location has a significant influence on the community structure of microorganisms in the air. In winter, more potential fungal pathogens and bacterial pathogens were detected in urban areas with high relative abundance and diversity. In addition,the results

showed that the main local source of fungi and bacteria was the leaf surface, of which the contribution rate of bacteria in the air fine particles was up to (55 30) %. This study can provide a scientific basis for understanding the characteristics of microbial pollution in the atmosphere, and for air environment quality evaluation and disease prevention in China.

摘要: 为探究城市市区与山区微生物气溶胶组成特征及来源,在西安市市区(城区和郊区)及南郊山区设立 3 个采样点,采集细颗粒物、土壤及叶片样本.通过高通量测序法,解析不同采样点真菌与细菌群落结构,考察其时空变化特征;使用 Source Track 源解析技术对空气中微生物进行来源分析.结果表明,不同采样点真菌、细菌菌属差异较大,说明地理位置对空气中微生物的群落结构影响显著;冬季市区检测出较多的潜在真菌致病菌和细菌致病菌,且具有较高的相对丰度和多样性.通过源解析技术发现,在局部源叶片和土壤中,叶片表面微生物是空气中微生物的主要潜在源,且秋季叶片对空气中微生物的贡献率高于冬季.本研究不仅为空气中生物气溶胶的溯源研究提供了一定基础,也为深入了解大气中微生物污染特性和为我国空气质量评价与疾病预防提供一定的科学依据.

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标题: Characteristics of Precipitation in Wugong Area Under the Background of Climate Change

标题: 气候变化背景下武功地区降水特征

来源出版物: 水土保持研究 卷: 27 期: 2 页: 200-205 出版年: 2020

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作者关键词: climate change; precipitation characteristics; M-K test; wavelet analysis; Wugong area

作者关键词: 气候变化; 降水量特征; M-K 检验; 小波分析; 武功地区

摘要: In order to study the relationship between precipitation and climate change, measured data of monthly precipitation and temperature in Wugong region from 1955 to 2015 were used to examine the climate change of Wugong area through linear trend estimation, Mann-Kendall nonparametric test and Morlet wavelet analysis. The results show that the annual precipitation of Wugong area decreased with a rate of 15.56 mm/decade, with intense diminishing in spring and summer, and mild declining in autumn and winter; the typical mutation of annual and seasonal precipitation series occurred around 1983, indicating the consistency of the annual and seasonal precipitation, and suggesting the mutation of precipitation in Wugong area during the 1990s; the chilling period in Wugong area covered the period from 1955 to 1994, in which the temperature decreasing led to the diminishing of precipitation with a rate of 39.46 mm/decade. However, the warmer duration of Wugong area was the period from 1995 to 2015, during which the increasing rate of precipitation was 98.63 mm/decade; the precipitation in Wugong area was affected by the effects of temperature on evapotranspiration and the water-vapor transfer rate; the increment of precipitation would benefit to the water resources shortage in Wugong area, and would lead to the extreme weather scenario and flood disasters.

摘要: 为了研究降水与气候变化之间的关系,借助武功地区 1955-2015 年逐月降水量和气温实测资料,采用线性倾向估计、Mann-Kendall 非参数检验、Morlet 小波分析等方法,对武功地区近 61 年来气候变化背景下的降水特征进行了研究。结果表明:武功地区年降水量总体上呈 -15.56 mm/10a 的减少趋势,其中春、夏季降水量下降显著,秋、冬季则较为平缓;年和季节降水量的典型突变时间节点在 1983 年附近,表明了年降水量和季节降水量变化趋势的一致性,也印证了 20 世纪 90 年代关中平原西部降水趋势发生了突变;武功地区气候偏冷期主要在 1955-1994 年,气温降低使得年降水量呈 39.46 mm/10a 的减少趋势;气候偏暖期主要在 1995-2015 年,气温升高使得年降水量呈 98.63 mm/10a 的增加趋势;气候冷暖变化通过影响蒸发量、蒸腾量和水汽输送速度,来影响武功地区年降水量;降水量增多有利于解决当地水资源短缺问题,同时也增加了极端天气和洪涝灾害发生的几率。

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标题: An analysis of groundwater resources composition and driving force in Huocheng county

标题: 霍城县地下水资源构成变化及驱动力分析

来源出版物: 水文地质工程地质 卷: 47 期: 2 页: 51-59 出版年: 2020

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作者关键词: groundwater resources; change trend; driving force analysis; Huocheng County

作者关键词: 地下水资源; 变化趋势; 驱动力分析; 霍城县

摘要: The analyses of the composition change and driving force of groundwater resources is of practical significance for the development and utilization of urban water resources, development planning and urban resources management. Previous studies on water resources in Huocheng County in Ili Kazakh Autonomous Prefecture of Xinjiang focused mostly based on the water resources quantity in that year and did not involve the change in water resources composition. A quantitative study of the compositions and driving forces of groundwater resources in Huocheng

County in the past 30 years is conducted. The results show that the total groundwater resources in Huocheng County show a decreasing trend from 1985 to 2014, and a positive equilibrium from 1985 to 1990, and a negative equilibrium from 2000 to 2014. At the same time, the composition of groundwater resources has changed profoundly. The infiltration recharge of the river and canal system obtained with the water balance method has decreased significantly, the infiltration recharge in the field has increased continuously, the spring discharge has decreased by 22.85%, and the artificial exploitation has increased by 15.2%. The analysis method is used to compare water resources composition from 1985 to 2000 with that from 2000 to 2014, showing that the positive and negative correlation between the main components of water resources and the total amount of water resources has changed. The correlation between the spring discharge, river infiltration, reservoir infiltration and total water resources changes from negative to positive, and the field infiltration recharge and artificial mining changed from positive to negative. The results of water balance method and factor analysis method show a high correlation to the analysis of the change in groundwater resources composition. The results also show that human activities have a profound impact on the composition of groundwater resources. It is the main driving force of groundwater resources change in Huocheng County, in which the increasing irrigation area and the improvement of irrigation method increase the utilization coefficient of irrigation water, leading to the slow increase speed of infiltration. The groundwater level decreased continuously due to artificial exploitation, causing the spring water resources to decline in stages and the groundwater level to be redistributed, the irrigation area and the total irrigation volume to increase, making the evaporation volume increase. Therefore, it is of great significance to put forward the corresponding watersaving measures for each driving force to guide the sustainable utilization of local water resources.

摘要: 地下水资源构成变化及驱动力分析研究对于城市水资源的开发利用、发展规划及城市资源的管理具有实际指导意义。前人对新疆伊犁霍城县的研究多为当年水资源量,未涉及水资源构成变化的讨论。文章采用地下水均衡、数理统计及因子分析等方法,对霍城县近30年地下水资源构成变化及驱动力进行了定量研究。结果表明:1985-2014年霍城县地下水资源总体呈下降趋势,1985-1990年间为正均衡,2000-2014年演变为负均衡。同时地下水资源构成发生了深刻变化,从水均衡法得到河道和渠系入渗补给显著减少,田间入渗补给量持续增加,泉水排泄量减少22.85%,人工开采量增加15.2%;从因子分析法对比出1985-2000年较2000-2014年,水资源构成项中的主要成分与水资源总量的正负相关性发生了改变。泉水排泄量、河道入渗量、水库入渗量与水资源总量的相关性由负相关变为正相关,田间入渗补给及人工开采由正相关变为负相关;水均衡法和因子分析法对地下水资源构成变化分析结果呈现较高的相关性,结果表明人类活动对地下水资源构成产生深刻影响,是造成霍城县地下水资源变化的主要驱动力,其中灌溉面积不断增大的同时,改进灌溉方式提升灌溉水利用系数,使得田间入渗量增加速度较为平缓。人工开采使地下水位持续下降,造成泉水资源量呈阶段性衰减,同时研究区地下水位重新分布,灌溉面积及灌水总量增大,使得蒸发量增大。故而针对各驱动力提出相应节水措施对指导当地水资源的可持续利用有着重要意义。

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标题: Adsorption copper ions from aqueous solution onto sodium alginate chemically modified aluminum sludge

标题: 海藻酸钠改性铝污泥功能球吸附 Cu(II)的研究

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作者关键词: Cu(II); aluminum sludge; sodium alginate; SA-AIS function beads; Cu(II)ions; adsorption

作者关键词: 铝污泥; 海藻酸钠; SA-AIS 功能球; 吸附

摘要: SA-AIS functional beads was obtained by the aluminum sludge(AIS)and sodium alginate(SA),which was prepared by sol-gel process.The influence of temperature,pH, initial concentration and adsorption time on the Cu(II)adsorption process was investigated.The results showed that the SA-AIS functional beads had the optimum adsorption pH of 5.5; the adsorption equilibrium time was 24 h; and the adsorption of Cu(II)was spontaneous,exothermic,and entropic increasing process.The adsorption isotherm fitting results show that the adsorption behavior of SA-AIS functional beads to Cu(II)is more in line with the Langmuir, indicating that the adsorption process may was monolayer chemisorptions for Cu(II)ions; Quasi-first-order and quasi-second-order kinetics models show that SA-AIS functional beads to Cu(II)is more in line with the quasi-second-order kinetics models, indicating that the adsorption process may was chemical interactions for Cu(II)ions.The adsorption saturated SA-AIS functional beads can be removed by the EDTA-2Na solution,and the adsorption activity is still better after 5 sorption-removal.

摘要: 以铝污泥(AIS)和海藻酸钠(SA)为主要原材料,经过溶胶-凝胶法制备海藻酸钠改性铝污泥(SA-AIS)功能球,研究了温度、pH、初始浓度、吸附时间对 Cu(II)吸附过程所产生的影响。结果表明,SA-AIS 功能球在 Cu(II)的吸附过程中最佳 pH 为 5.5,吸附平衡时间为 24 h,吸附过程为自发、吸热、熵增的过程,吸附等温线拟合结果表明,SA-AIS 功能球对 Cu(II)的吸附行为更符合 Langmuir 模型,表明该吸附过程主要涉及单层吸附;拟一级和拟二级动力学模型研究表明,该吸附过程与拟二级动力学模型更符合,故 SA-AIS 功能球对 Cu(II)的吸附过程主要由化学吸附控制。吸附饱和的 SA-AIS 功能球可以用 EDTA-2Na 溶液很好地脱附,5 次吸附-脱附后仍保持较好的吸附活性。

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标题: Effects of Meteorological Conditions on the Characteristics of Near-surface Atmospheric Environmental Pollution in Summer and Winter in Xi'an, China

标题: 气象条件对西安市夏季和冬季近地面大气环境污染特征影响

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作者关键词: particulate matters; ozone; air pollution; Xi'an city

作者关键词: 颗粒物; 臭氧; 大气污染; 西安市

摘要: Through the routine analysis of six air pollution indexes

(PM₁₀), PM_{2.5}, O₃, SO₂, NO₂, CO) monitored hourly by 13 national air quality monitoring stations in Xi'an from January to December 2018, and combined with meteorological conditions (temperature, relative humidity, wind direction, wind speed, barometric pressure, solar radiation, ultraviolet radiation, mixed layer height, visibility) and particulate matters sampling campaign, the characteristics of near-surface air pollutants in Xi'an were analyzed. The results showed an obvious seasonal variation on the concentration of atmospheric pollutants in Xi'an. Air pollutants are mainly particulate matters in winter, the mass concentration of PM₁₀ and PM_{2.5} were (154.0492.88) $\mu\text{g}\cdot\text{m}^{-3}$ and (101.8460.11) $\mu\text{g}\cdot\text{m}^{-3}$ respectively. Besides, the value of PM_{2.5}/PM₁₀ was 0.66, while the mass concentration of O₃ reached its peak in summer, which was (89.0720.62) $\mu\text{g}\cdot\text{m}^{-3}$. In addition, the number concentration, area concentration and mass concentration of PM_{2.5} in winter were (51 89014 619) cm^{-3} , (2 882.21939.83) $\mu\text{m}^{-2}\cdot\text{cm}^{-3}$ and (0.320.13) $\text{mg}\cdot\text{m}^{-3}$ respectively, and that for PM₁₀ were (51 89714 618) cm^{-3} , (3 410.501 060.31) $\mu\text{m}^{-2}\cdot\text{cm}^{-3}$ and (0.860.29) $\text{mg}\cdot\text{m}^{-3}$. The diameter range 0.010-0.484 μm , accounted for 99.13% of the total number concentration. The diameter range 0.072-8.136 μm , accounted for 98.32% of the total area concentration. And the particle size range 0.316-8.136 μm accounted for 98.75% of the total mass concentration. Moreover, the three particle sizes which influence the visibility of the atmosphere most were $d_p=0.762\text{ }\mu\text{m}$, $d_p=1.956\text{ }\mu\text{m}$ and $d_p=1.232\text{ }\mu\text{m}$, respectively. The R^2 (goodness of fit) of the three particle sizes and visibility are: 0.840, 0.789 and 0.775. When the ambient near-surface temperature is higher than 30.23 °C, the relative humidity is less than 58.09%, the solar radiation is greater than 107.83 $\text{W}\cdot\text{m}^{-2}$ and the ultraviolet radiation is greater than 324.10 $\mu\text{W}\cdot\text{cm}^{-2}$, it is beneficial to the formation and accumulation of higher mass concentration O₃ ((112.1653.01) $\mu\text{g}\cdot\text{m}^{-3}$) in the near-surface atmosphere in summer (in Xi'an). This study would provide Xi'an and other cities in Fen-wei Plain with data support on atmospheric pollutants reduction and air pollution control strategies.

摘要: 利用 2018 年 112 月西安市 13 个环境空气质量监测点的六项大气污染常规分析指标 (PM₁₀、PM_{2.5}、O₃、SO₂、NO₂ 和 CO) 逐小时监测数据, 结合气象条件 (温度、相对湿度、风向、风速、大气压、光照、紫外辐射、混合层高度及大气能见度) 和颗粒物样品采集, 对西安市近地面大气污染物浓度特征进行分析, 结果表明, 西安市近地面大气污染物浓度呈现明显的季节变化特征, 冬季空气污染物主要为颗粒物 (PM₁₀、PM_{2.5}) 对应质量浓度分别为: (154.0492.88)、(101.8460.11) $\mu\text{g}\cdot\text{m}^{-3}$, PM_{2.5}/PM₁₀ 的值为 0.66, 夏季空气污染物主要为 O₃, 质量浓度为 (89.0720.62) $\mu\text{g}\cdot\text{m}^{-3}$; 西安市冬季 PM_{2.5} 数浓度、表面积浓度、质量浓度分别为 (5189014619) cm^{-3} 、(2882.21939.83) $\mu\text{m}^{-2}\cdot\text{cm}^{-3}$ 、(0.320.13) $\text{mg}\cdot\text{m}^{-3}$, PM₁₀ 数浓度、质量浓度、表面积浓度分别为 (5189714618) cm^{-3} 、(3410.501060.31) $\mu\text{m}^{-2}\cdot\text{cm}^{-3}$ 、(0.860.29) $\text{mg}\cdot\text{m}^{-3}$, 数浓度粒径分布集中在 $0.010\leq d_p\leq 0.484\text{ }\mu\text{m}$, 占总数浓度的 99.13%, 表面积浓度粒径分布集中在 $0.072\leq d_p\leq 8.136\text{ }\mu\text{m}$, 占总表面积浓度的 98.32%, 质量浓度粒径分布集中在 $0.316\leq d_p\leq 8.136\text{ }\mu\text{m}$, 占总质量浓度的 98.75%。颗粒物数浓度对大气能见度影响最大的 3 个粒径段分别为 $d_p=0.762\text{ }\mu\text{m}$ 、 $d_p=1.956\text{ }\mu\text{m}$ 、 $d_p=1.232\text{ }\mu\text{m}$, 3 个粒径段与能见度的 R^2 (拟合优度) 分别为: 0.840、0.789、0.775; 西安市夏季, 在近地面环境温度大于 30.23 °C, 相对湿度小于 58.09%, 光照强度大于 107.83 $\text{W}\cdot\text{m}^{-2}$, 紫外辐射强度大于 324.10 $\mu\text{W}\cdot\text{cm}^{-2}$ 时, 有利于近地大气层中高质量浓度 O₃ ((112.1653.01) $\mu\text{g}\cdot\text{m}^{-3}$) 的生成与累积。研究结果可为西安市及汾渭平原其他城市大气污染物减排、大气污染防治策略的制定提供数据支持。

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标题: PDSI variations recorded by tree rings in the northern Luliang Mountains during the past 175 years

标题: 树轮记录的吕梁山北部过去 175 年来帕尔默干旱指数变化

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作者关键词: 吕梁山北部; 树轮宽度; PDSI 重建; 东亚季风

摘要: Background, aim, and scope Luliang Mountains, range in the west of Shanxi Province, China. Northeast striking, about 400 kilometers from north to south, located between the Yellow River and the Fenhe River. Due to the decrease of available water in recent years and the aggravation of drought, it is necessary to study the drought history of this area. In this paper, tree rings of pines from Luliang Mountains were used to study the dry-wet change in the past and its influencing factors. Materials and methods 42 pine cores were collected from Luliang Mountains, then they were dried, fixed and polished in the laboratory, the width was measured by LINTAB with an accuracy of 0.01 mm. The COFECHA program was then used for cross-dating quality

control to ensure that each tree-ring had an accurate calendar year. Finally, three chronologies were generated with ARSTAN. Results Correlation analysis showed that the palmer drought index (PDSI) had the best correlation with the standard chronology (STD) from May to June, with a correlation coefficient 0.687 ($n = 50$, $p < 0.001$). In addition, the STD chronology retained more low-frequency signals than the RES chronology. So the width standard chronology (STD) were selected to reconstruct the PDSI index changes from May to June during 1829 2003, the variance interpretation of the reconstructed equation was 47.16%. The reconstructed sequences including 9 wet sequences and 10 dry sequences. Discussion The reconstruction sequence reveals the drought in the 20th century and the intensification of drought in the end of the 20th century. Compared with the DWI index sequence in Yang et al (2013), the correlation coefficient is -0.235 ($n = 175$, $p < 0.002$). After 10 years of low-pass filtering, the correlation coefficient is -0.4, indicating that the reconstruction sequence is reliable. Conclusions The east Asian summer monsoon has an important influence on the dry and wet changes in the study area. Multiwindow spectral analysis showed that the reconstructed sequences had periodic changes of 2.7 a, 12 a, 13.6 a, 19.2 a, 21.6 a and 26.1 a, which may be related to ENSO and solar activity. Recommendations and perspectives Further research into the factors affecting drought in the region is needed. At the same time, finding other sources of water available to alleviate water shortages is essential.

摘要: 利用采自吕梁山北部地区的油松样本,建立了过去 175 年来的树轮宽度年表。相关分析表明:标准年表(STD)与当年 5 6 月的帕尔默干旱指数(Palmer drought severity index,PDSI)相关性最好,相关系数为 0.687($n= 50$, $p<0.001$)。因此,采用树轮宽度标准年表(STD)序列重建了 1829 2003 年 5 6 月的 PDSI 序列,重建方程的方差解释量达到 47.16%。重建序列发现 9 个偏湿时段,分别为 1833 1836 年、1845 1851 年、1857 1863 年、1869 1874 年、1882 1887 年、1896 1899 年、1932 1939 年、1949 1965 年、1975 1985 年;10 个偏干时段,分别为 1829 1832 年、1837 1844 年、1852 1856 年、1864 1868 年、1875 1881 年、1888 1895 年、1900 1931 年、1940 1948 年、1966 1974 年、1986 2003 年。同时发现 20 世纪 20 年代的严重干旱事件以及 20 世纪末气候干旱化加重的趋势。空间相关结果显示:重建的 PDSI 代表了周边大范围的干旱变化,同时,与基于历史文献的干湿指数(DWI)显著相关($p < 0.002$),说明无论是空间还是时间尺度上,重建结果都可以代表吕梁山周边大范围的干旱变化。此外,重建序列与不同定义的东亚夏季风指数都显著相关($p < 0.02$),说明东亚夏季风对研究区的干湿变化具有调制作用。多窗谱分析表明重建序列存在 2.7 年、12 年、13.6 年、19.2 年、21.6 年、26.1 年的周期变化,这些周期变化可能与 ENSO、太阳活动有关。

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作者: 周及; 关卫省; 付林涛

标题: Water quality assessment and pollution source analysis of Xian river based on multivariate statistics

标题: 基于多元统计的西安市河流水质评价及污染源解析

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文献类型: Article

作者关键词: multivariate statistical analysis; principal component analysis; factor analysis; water quality assessment; pollution source analysis; Xian City

作者关键词: 多元统计分析; 主成分分析; 因子分析; 水质评价; 污染源解析; 西安市

摘要: Taking the monthly monitoring data of surface river water quality in Xian from 2009 to 2017 as the research object,the comprehensive analysis of water quality is carried out by using multivariate statistical method,the main pollutants in water and their changing trend are explored by factor analysis method,and the sources of pollutants are analyzed.Comprehensive evaluation of water quality at each sampling point is made by principal component analysis.The results show that 24 water quality indicators can be described by 4 to 6 principal components from 2009 to 2017,and the cumulative contribution rate of variance is over 78%.The most influential indexes of Xian river water quality are organic matter and ammonia nitrogen.According to the factor load of the main control indicators,it can be seen that the overall water quality tends to be stable from 2009 to 2012,and the pollution intensifies from 2013 to 2015,but there are different degrees of mitigation in 2016 and 2017.In terms of the geographical location of the sampling points,Zaohe River is the most polluted,while the water quality of Heihe River is good as a whole.

摘要: 以西安市 2009-2017 年地表河流水质的逐月监测数据为研究对象,利用多元统计学方法对水质进行综合分析;通过因子分析法探究水中主要污染物及其变化趋势,并分析污染物来源;利用主成分分析法综合评价各个采样点的水质。结果表明:2009-2017 年间,24 个水质指标可由 4~6 个主成分描述,方差累计贡献率在 78%以上;对西安市河流水质影响最大的指标是有机物和氨氮类;根据主要控制指标的因子载荷,可知 2009-2012 年间水质整体趋于平稳,2013-2015 年间污染加剧,但在 2016-2017 年又有不同程度的缓解;就采样点的地理位置而言,皂河污染最为严重,而黑河水质整体良好。

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标题: Analysis on Sources of Soil Water Absorbed by Oil Peonies of Different Ages Based on Stable Isotopes of Hydrogen and Oxygen Found on Loess Plateau

标题: 基于稳定氢氧同位素的黄土高原不同生长年限油用牡丹水分来源研究

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作者关键词: oil peony; Loess Plateau; water utilization sources; stable hydrogen and oxygen isotope

作者关键词: 油用牡丹; 黄土高原; 水分来源; 稳定氢氧同位素

摘要: [Objective] The sources and use strategies of soil water absorbed by an oil peony were explored in order to provide a basis for the improvement of the survival rates in rational plantations of the plants and the development of the oil peony industry. [Methods] Two kinds of oil peonies of different ages were used as materials. The ratios of stable hydrogen and oxygen isotopes in the plant and soil water were tested to analyze the sources of soil water absorbed by oil peonies in spring and autumn. [Results] ① Mature individuals of oil peonies developed strong root systems and consequently more optimal strategies of water use than young individuals did. In spring (or dry season), oil peonies with two ages mainly absorbed water from surface soil (0-20 cm). However, mature oil peonies used more water (70.7%) from the surface soil than young ones did (61.8%), comparatively. In autumn (or relatively humid season), there was high water content in the surface soil. Mature oil peonies conversely tended to absorb soil water from deeper layers of soil compared with young peonies. ② On the basis of the analysis of soil water content, the contribution rates of different sources of soil water to the growth of peonies, and their relationships, it was found that the soil layers with high contribution rates of water to the growth of oil peonies had low soil water content. [Conclusion] An oil peony tends to absorb water from soil layers with low water content during spring and autumn. This verifies both the tolerance of an oil peony to drought and its intolerance to waterlogging.

摘要: [目的]探究油用牡丹的水分来源与用水策略,为合理种植、推广发展油用牡丹,提高牡丹成活率提供科学依据。[方法]以不同生长年份的2种油用牡丹为研究材料,利用稳定氢氧同位素探究其在春秋2个季节的水分来源。[结果]①由于根系更加发达,成年期油用牡丹的用水策略比幼年期有更强的自主选择性。春(旱)季,2种年龄油用牡丹都主要利用0-20 cm表层土壤水,但成年期(70.7%)比幼年期(61.8%)对水分的利用率更高。秋(雨)季,表层土壤含水量过高,成年期油用牡丹较幼年期则更趋向吸收深层土壤水分;②通过分析土壤含水率、油用牡丹吸收的不同来源水分的贡献率及它们之间的关系,可知贡献率越高的土层含水量越低。[结论]

在黄土高原春秋 2 个季节,油用牡丹均倾向于吸收含水量较低土层水分,证明了其耐旱不耐涝的特性。

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标题: Characteristics and influencing factors of diatom bloom in Lin Hekou Reservoir

标题: 蔺河口水库硅藻水华特征及影响因素研究

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作者关键词: Hanjiang river basin; Lin Hekou Reservoir; dark brown water; diatom blooms; influencing factors

作者关键词: 汉江流域; 蔺河口水库; 水体泛深褐色; 硅藻水华; 影响因素

摘要: In April 2017, there was been an abnormal phenomenon of the dark brown-water in Lin Hekou Reservoir of Lanhe River, a tributary of the Hanjiang river basin, which caused panic within local residents. The water quality and the algae community structure were investigated to explore the mechanism for the dark brown-water in the reservoir. It was shown that the reservoir was eutrophicated and reached a heavy extent of algae bloom, and the dominating species were Bacillariophyta, Cyanophyta and Cryptophyta, of which, Bacillariophyta accounted for 90.4% of the total phytoplankton in terms of density; with respect to biomass, Bacillariophyta, Cryptophyta and Pyrrophyta were the top three phylum, and Bacillariophyta accounted for 92% of the total phytoplankton biomass. The predominant genera of diatom were *Achnanthes exigua* and *Synedra* spp., among which, *Achnanthes exigua* (98.2%) showed the highest abundance of dominance. Being eutrophic state of the Lin Hekou Reservoir, diatom blooms may be the main cause of dark brown water and the diatom blooms are related to the factors of nutrient level, weather and hydrology conditions. With the aim of water safety of Central Line Project of South-to-North Water Diversion, catchment management and reduction of nutrients into reservoir are crucial for decreasing the risk of algae blooms in the channel-reservoir of Hanjiang river basin.

摘要: 2017年4月,汉江流域岚河蔺河口水库突发水体泛深褐色的异常现象,在当地引发恐慌。针对此现象,从水质和藻类群落结构开展调查研究,探讨该水库水色突变的可能原因。结果显示蔺河口水库处于富营养化状态,藻类达到水华水平。藻类细胞密度以硅藻门、蓝藻门和隐藻门为主,其中硅藻门占浮游植物总细胞密度的90.4%;藻类生物量则以硅藻门、隐藻门和甲藻门为主,硅藻门占浮游植物总生物量的92%。硅藻门中,曲壳藻和针杆藻占主导地位,尤其是曲壳藻,平均占硅藻总生物量的98.2%。对于处于富营养状态的蔺河口水库而言,硅藻水华可能是引起水色异常的主要原因,而硅藻水华发生受营养盐浓度、气象和水文条件等因素协同控制。加强流域管理,降低营养盐负荷,有利于减少汉江流域水库硅藻水华发生的风险,保障南水北调中线工程供水水质安全。

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标题: 碳微球表面氨基化技术及应用研究

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作者关键词: 氨基化; 碳微球; 接枝技术; 产物应用

摘要: Surface aminated carbon microspheres are a new type of modified porous carbon material, which has been widely used in many fields due to its special morphological structure and excellent functional group properties. With the deepening of relevant research, the surface amination technology and amination reagent of carbon microspheres are gradually diversified. The performance of grafted products is greatly improved. The application fields are continuously expanded, and the types of related products are increasingly enriched. The modified grafting method of aminated carbon microspheres was outlined. The new progress in the application of aminated carbon microspheres for the fields of adsorbent materials, catalytic materials (biodegradation of catalytic coking wastewater), and detection materials was studied. The future development of applications of such carbon microspheres was expected.

摘要: 表面氨基化碳微球是一种新型的改性多孔碳材料。归因于其特殊的形貌、结构和丰富的官能团特性,表面氨基化碳微球在诸多领域得到广泛应用。近年来,碳微球表面氨基化技术、氨基化试剂逐渐多样化,接枝产物的性能大大提高,应用领域不断拓展,相关产品的种类也日益丰富。据此,概述了氨基化碳微球的改性方法,以及氨基化碳微球在吸附材料、催化材料(催化焦化废水的生物降解)、检测材料等领域应用的新进展,并对氨基化碳微球未来的合成与应用进行了展望。

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信息工程学院

第 1 条, 共 36 条

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标题: Model based on SSA-XGBoost method for predicting precipitation change trends

标题: 基于 SSA-XGBoost 方法的降水变化趋势预测模型

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文献类型: Article

作者关键词: precipitation change trend; prediction; machine learning; XGBoost Model; Singular Spectrum Analysis (SSA)

作者关键词: 降水变化趋势; 预测; 机器学习; XGBoost 模型; 奇异谱分解

摘要: Background, aim, and scope Predicting future climate changes is one of the most important scientific questions in the research field of global change. Precise and reliable prediction results can enable us to plan ahead and minimize the impacts of drought and flood disasters on social and economic developments. However, the establishment of prediction models is both necessary and difficult to achieve. Furthermore, owing to the current unstable climate, the requirement for the

accuracy of such models has increased. Hence, this study addresses the problems that conventional methods cannot effectively predict in long-term time series, which in turn can be significant for the prediction of periodic series. Materials and methods In this study, a model based on the singular spectrum analysis (SSA)-XGBoost method was developed by incorporating the precipitation records over the past 270 years (AD 1773 2004) that were reconstructed on the basis of the stalagmite $\delta^{18}\text{O}$ content in southern Thailand. After detrending the original data, the oscillation components of the past data (AD 1773 1964) were extracted through SSA for determining the optimal harmonic number of the data and for reconstructing accurate periodic signal components. Subsequently, subtracting the periodic signal from the detrended original data produced a random signal, which was predicted by employing the XGBoost framework for obtaining a forecast sequence. The final forecast results (AD 1965 2004) were obtained by superimposing the obtained sequence and the periodic signal extension results. Results The obtained results indicate that the proposed model based on the SSA-XGBoost method performs very well while predicting the test date. The proposed model's mean absolute error (MAE) and root mean squared error (RMSE) values are found to be 0.1334 and 0.1678, respectively. Furthermore, the value of R-square (R^2) is found to be 0.536. Discussion In general, the proposed model has revealed satisfactory performance for the predictions of precipitation. Apart from the machine learning frameworks, XGBoost and LightGBM, conventional models such as ARIMA and SSA-ARIMA were employed for predicting the data to demonstrate the advantages of the proposed model. It is observed that each model provides unique features while predicting the final results. Conclusions Compared to the prediction results of the other four models (XGBoost, ARIMA, SSA-ARIMA, and LightGBM), the prediction result of the proposed model is closest to the real value. Both the MAE and RMSE of the SSA-XGBoost method are lowest in value, and the value of R^2 is closest to 1, which indicates that the proposed model based on the SSA-XGBoost method has relatively higher precision and stability. Recommendations and perspectives This study serves as an important directive for future studies on predicting precipitation changes in southern Thailand and other tropical regions, and it also provides a reference for future research on predicting long-term time series.

摘要: 全球变暖预期下不同区域的未来降水变化,是政府和公众都关心的重要问题,也是全球变化研究的前沿科学问题。预测模型的建立是预测/预估研究的重点和难点,现今不稳定的气候背景对预测模型的精准度提出了更高的要求。为了解决传统方法对长时间序列预测效果欠佳的问题,本文以泰国南部洞穴石笋 $\delta^{18}\text{O}$ 重建的过去 270 多年(公元 1773 2004 年)的降水记录为数据集,提出了 SSAXGBoost 预测模型。对原始数据去趋势预处理后,采用奇异谱分析法(SSA)提取前部分数据(1773 1964 年)的振荡成分以确定数据的最佳谐波个数,并进行准确的周期信号分量分解;之后用去趋势数据减去周期信号得到随机信号,再利用 XGBoost 模型对随机项进行预测;最后将预测的序列、趋势曲线和周期信号延拓结果相叠加得到最终的预测数据(1965 2004 年)。与其他四种模型(XGBoost、ARIMA、SSA-ARIMA、LightGBM)的预测结果相比,SSA-XGBoost 的预测结果与真实值最相近,且 MAE 和 RMSE 均最小, R^2 也更接近 1,说明该模型具有更高的精度和稳定性。该研究对于泰国南部等热带地区未来的降水变化趋势预测具有较好的指导意义,也可为其他长时间序列的预估研究提供借鉴。

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标题: Tracking and Warning Technology of Hazmat Transport Vehicles in Edge Computing Environment

标题: 基于边缘计算的危险品运输车辆跟踪预警方法

来源出版物: 交通信息与安全 卷: 38 期: 5 页: 120-128 出版年: 2020

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作者关键词: traffic safety; hazmat transport vehicles; edge computing; collaborative tracking; anomaly detection

作者关键词: 交通安全; 危险品运输车辆; 边缘计算; 协作跟踪; 异常检测

摘要: As a new distributed computing paradigm, edge computing can improve system response speed and network bandwidth. In this paper, edge computing is applied for tracking and early

warning of hazmat transport vehicles. A collaborative tracking algorithm for edge intelligent roadside units is proposed, which solves the problem of incomplete trajectories caused by GNSS outage and ensures the real-time performance at the same time. For anomaly warning during tracking of hazmat transport vehicles, an early warning algorithm is proposed based on machine learning to fuse vehicle status with multi-source information from the intelligent roadside units. The algorithm that integrates factors such as vehicles, surrounding vehicles, roads and natural environment, can effectively improve the accuracy of anomaly detection. Simulations for tracking algorithm performance are carried out within SUMO traffic simulator. Compared with cloud computing, the results show that edge computing reduces the delay by 90% and bandwidth consumption by 68% on average. Use the connected vehicle pilot open data published by the U.S. Department of Transportation, six anomaly detection models based on SVM, KNN, and Adaboost are created. The results show that multisource information from intelligent roadside units can improve anomaly detection performance compared with models created using only variables of vehicle dynamics. Among the models created with multi-source information, SVM has the best performance, with the accuracy of 0.972, recall of 0.98, and AUC of 0.974.

摘要: 边缘计算作为一种新兴的分布式计算模型,可提升信息系统的响应速度、节省网络带宽资源。将边缘计算应用于危险品运输车辆的跟踪预警,提出一种边缘智能路侧节点的协作式跟踪算法,在保障实时性的前提下解决了 GNSS 失锁导致轨迹缺失问题;针对车辆跟踪时的异常状态预警问题,将智能路侧感知的多源信息与车辆运行状态相结合,基于机器学习提出一种融合自车、周围车辆、道路和自然环境等特征因素的预警算法,有效提升了异常检测精度。使用 SUMO 交通仿真器分析了跟踪算法的性能,结果表明,边缘计算较传统云计算方式时延平均降低了 90%,带宽消耗平均减少了 68%。基于美国交通部网联车开放数据,通过参数调优分别建立了基于 SVM, KNN, Adaboost 的单车动力学变量与多因素变量的 6 种异常检测模型,实验表明,多因素变量检测模型优于单车动力学变量模型。基于 SVM 的多因素变量模型性能最优,其准确率为 0.972,召回率为 0.98, AUC 为 0.974。

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作者: 屈立成; 吕娇; 赵明; 王海飞; 屈艺华

标题: Multi-robot path planning algorithm based on 3D spatiotemporal maps and motion decomposition

标题: 基于三维时空地图和运动分解的多机器人路径规划算法

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文献类型: Article

作者关键词: multi-robot path planning; distributed; 3D spatiotemporal; depth first search; A* algorithm; ant colony algorithm

作者关键词: 多机器人路径规划; 分布式; 三维时空; 深度优先搜索; A*算法; 蚁群算法

摘要: In view of the shortcomings of the current path planning strategies for multiple robots, such as high path coupling, long total path, long waiting time for collision avoidance, and the resulting problems of low system robustness and low robot utilization, a multi-robot path planning algorithm based on 3D spatiotemporal maps and motion decomposition was proposed. Firstly, the dynamic temporary obstacles in time dimension were generated according to the existing path set and the current robots' positions, and were expanded into 3D search space together with the static obstacles. Secondly, in the 3D search space, the total time of path motion was divided into three parameters: motion time, turning time, and in-situ dwell time, and the conditional depth first search strategy was used to calculate the set of all paths from the starting node to the target node that met the parameter requirements. Finally, all paths in the path set were traversed. For each path, the actual total time consumption was calculated. If the difference between the actual total time consumption and the theoretical total time consumption of a path was less than the specified maximum error, the path was considered as the shortest path. Otherwise, the remaining paths were continued to traverse. And if the differences between the actual total time and the theoretical total time of all paths in the set were greater than the maximum error, the parameters needed to be adjusted dynamically, and then the initial steps of algorithm were continued to execute. Experimental results show that, the path planned by the proposed algorithm has the advantages of short total length, less running time, no collision and high robustness, and the proposed algorithm can solve the problem of completing continuous random tasks by multi-robot system.

摘要: 针对当前多机器人路径规划策略中存在的路径耦合性高、总路径长、避碰等待时间长

等缺点,以及由此导致的系统鲁棒性低、机器人利用率低等问题,提出了基于三维时空地图和运动分解的多机器人路径规划算法。首先,根据已有路径集和当前机器人的位置生成时间维度上的动态临时障碍物,将其与静态障碍物一并拓展为三维搜索空间;其次,在三维搜索空间内,将路径运动总时间拆分为运动时间、转向时间和原地停留时间这三个参数,并使用条件深度优先搜索策略计算出从起始节点到达目标节点的所有符合参数要求的路径集合;最后,遍历路径集合中的所有路径,对于每条路径,计算其实际总耗时。如果某一路径的实际总耗时和理论总耗时之间的差距小于规定的最大误差,则可认为该路径为最短路径,否则,继续遍历剩下的其余路径;而如果路径集中所有路径的实际总耗时和理论总耗时之差全都大于最大误差,则需要动态调整参数,然后继续执行算法的初始步骤。实验结果表明,所提算法规划的路径具有总长短、运行时间少、系统无碰撞、鲁棒性高等优点,解决了多机器人系统完成持续随机任务的问题。

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标题: Pavement Sealed Crack Detection Method Based on Improved Faster R-CNN

标题: 基于改进 Faster R-CNN 的路面灌封裂缝检测方法

来源出版物: 华南理工大学学报. 自然科学版 卷: 48 期: 2 页: 84-93 出版年: 2020

文献号: 1000-565X(2020)48:2<84:JYGJFR>2.0.TX;2-S

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作者关键词: Faster R-CNN; YOLOv2; pavement disease; sealed crack; detection method; feature extraction; multiple-scale localization; faster R-CNN; YOLOv2

作者关键词: 路面病害; 灌封裂缝; 检测方法; 特征提取; 多尺度定位

摘要: Pavement sealed cracks have significant impact on service life of pavement. A new method for pavement sealed crack detection based on improved faster R-CNN was proposed, aiming at solving the current lack of sealed crack detection technology. Firstly, the marked sample data set of pavement sealed crack was constructed based on the augmented sealed crack image set. Then they were divided into training set, verification set and test set according to the ratio of 6 : 2 : 2. Next, faster R-CNN model was employed in sealed cracks detection. Given that the faster R-CNN model has the demerits of miss detection and inaccurate positioning of sealed cracks, it was combined the feature extraction layers of VGG16, ZFNet and ResNet 50 networks. The results show that the detection accuracy of the VGG16 and faster R-CNN combination models can reach 0.9031, which is the highest. Then, further improvement was made by increasing the aspect ratio of the anchor of the sealed crack. The improved detection accuracy reaches 0.9073 and the original miss detection target can also be detected. Finally, detection and positioning accuracy between improved faster R-CNN and YOLOv2 model was compared. The result shows that improved faster R-CNN model can significantly enhance both detection and positioning accuracy.

摘要: 路面灌封裂缝对路面使用寿命的影响较为突出,为了解决目前灌封裂缝检测技术匮乏的问题,文中提出了一种基于改进 Faster R-CNN 的路面灌封裂缝检测方法。首先,建立灌封裂缝图像集,对采集到的图像进行增广处理,构建路面灌封裂缝标注样本数据集,并将图像集按 6 : 2 : 2 的比例划分为训练集、验证集和测试集;接着,采用 Faster R-CNN 模型对灌封裂缝进行检测,针对 Faster R-CNN 检测灌封裂缝存在漏检、定位效果不够理想的问题,文中分别将 VGG16、ZFNet 和 Resnet50 网络的特征提取层与 Faster R-CNN 模型进行结合,结果表明,VGG16 和 Faster R-CNN 结合的模型检测精度最高,达到 0.9031;然后,通过增加灌封裂缝候选框宽高比的方法继续改进模型,检测精度达到 0.9073,且原先被漏检的目标能被检测出来;最后,对改进 Faster R-CNN 与 YOLOv2 模型的检测精度及定位效果进行对比,结果表明,文中提出的改进 Faster RCNN 能够明显提高对灌封裂缝的检测准确率和定位精度。

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作者: Hui Fei; Guo Jing; Jia Shuo; Xing Meihua

作者: 惠飞; 郭静; 贾硕; 邢美华

标题: Detection of Abnormal Driving Behavior Based on BiLSTM

标题: 基于双向长短记忆网络的异常驾驶行为检测

来源出版物: 计算机工程与应用 卷: 56 期: 24 页: 116-122 出版年: 2020

文献号: 1002-8331(2020)56:24<116:JYSXCD>2.0.TX;2-V

来源出版物: Computer Engineering and Application 卷: 56 期: 24 页: 116-122 出版年: 2020

文献号: 1002-8331(2020)56:24<116:JYSXCD>2.0.TX;2-V

文献类型: Article

作者关键词: deep learning; driving behavior recognition; Bi-directional Long Short-Term Memory(Bi-LSTM)

作者关键词: 深度学习; 驾驶行为识别; 双向长短记忆网络

摘要: The identification of abnormal driving behavior plays a vital role in traffic safety, and accurate identification of abnormal driving behavior can significantly improve driving safety. At present, the detection and identification of abnormal driving behaviors, such as rapid acceleration, rapid deceleration, sudden left turn or right turn, etc. In the process of vehicle driving mainly adopts video surveillance or clustering method. In these two methods, the actual effect of the former is restricted by the application scene, while the latter cannot identify the driving behavior of specific individual vehicles. In order to solve the above problems, an extended neural network detection model based on Bi-LSTM and FC is proposed. The model can effectively use the characteristics of sudden change of driving data in time series and improve the recognition accuracy of abnormal driving. The neural network model can effectively use the time series characteristics of driving data and accurately identify the abnormal driving behavior of vehicles. The accuracy rate can reach 98.08%.

摘要: 异常驾驶行为的识别对交通安全起着至关重要的作用, 准确识别异常驾驶行为能够显著提高驾驶安全。目前, 针对车辆行驶过程中的异常驾驶行为, 如急加速、急减速、突然左转或右转等的检测识别, 主要采用视频监控或聚类的方法完成。在这两种方法中, 前者的实际效果受到应用场景的制约, 而后者则不能针对具体的单个车辆进行驾驶行为识别。针对以上问题, 使用一种基于双向长短记忆网络(Bi-LSTM)及全连接神经网络(FC)的拓展神经网络检测模型, 该模型能有效利用行车数据在时间序列上发生突变时的特征, 提高异常驾驶行为识别准确率。将车辆行车数据处理后制作数据集并对模型进行训练, 训练完成后的神经网络模型能够有效利用行车数据的时间序列特征, 准确识别车辆的异常驾驶行为, 准确率可达到 98.08%。

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作者: 杨澜; 赵祥模; 吴国垣; 徐志刚; Matthew Barth; 惠飞; 郝鹏; 韩梦杰; 赵周桥; 房山; 景首才

标题: Review on connected and automated vehicles based cooperative eco-driving strategies

标题: 智能网联汽车协同生态驾驶策略综述

来源出版物: 交通运输工程学报 卷: 20 期: 5 页: 58-72 出版年: 2020

文献号: 1671-1637(2020)20:5<58:ZNWLQC>2.0.TX;2-O

来源出版物: Journal of Traffic and Transportation Engineering 卷: 20 期: 5 页: 58-72
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文献号: 1671-1637(2020)20:5<58:ZNWLQC>2.0.TX;2-O

文献类型: Review

作者关键词: connected and automated vehicle; eco-driving; signal intersection; adaptive cruise control; ramp merging; lane changing trajectory planning; eco-routing; review

作者关键词: 智能网联汽车; 生态驾驶; 信号交叉口; 自适应巡航控制; 匝道合流; 换道轨迹规划; 生态路由; 综述

摘要: To track the research progress of connected and automated vehicles(CAV)based cooperative eco-driving strategies in recent years,the influences of four factors,including the vehicle,driver behavior,traffic network and social factor on the energy consumption of CAV were analyzed.The current ecological studies on CAV were classified with vehicle,infrastructure and traveler as objects.The status-quo of 5representative types of cooperative eco-driving scenarios were emphatically analyzed,including the eco-approach and departure at the signalized intersection,eco-cooperative adaptive cruise control,eco-cooperative driving in the ramp merging area,eco-cooperative lane changing trajectory planning and eco-routing.Analysis result shows that compared with the human driving mode,CAVs can save up to 63%fuel consumption at any traffic flow with 100% penetration rate of CAV as well as in the light traffic condition with partial penetration rate of CAV.CAVs with partial automated and connected levels can save at least 7%fuel consumption.Few existing studies consider the trajectory tracking deviation caused by the driver's response delay and automatic controller transmission delay in the case of humanmachine

co-driving. The existing researches assume the vehicle-to-vehicle communication(V2V) and vehicle-to-infrastructure communication(V2I) as the ideal data interaction processes. The impacts of factors such as the communication topology, transmission delay, communication failure and packet loss on the CAV based cooperative eco-driving strategies are ignored. Few existing studies discuss the eco-driving strategies in these traffic scenarios, such as the multilanes, shared lanes for turning and through at intersection, U-turn, as well as the mixed traffic conditions of different automated and connected level CAVs coexisting with human-driven vehicles, pedestrians and bicycles. Limited by the immaturity and imperfection of automatic driving technology and infrastructure, the test and verification work in real traffic scenarios is not carried out. The vehicle control, V2V communication, multi-vehicles collaboration, mixed traffic flow scenario, hardware-in-the-loop simulation test and real traffic scenario test will be the further development direction of CAV based cooperative eco-driving strategies. 2 tabs, 8 figs, 111 refs.

摘要: 为了跟踪近年来智能网联汽车(CAV)协同生态驾驶策略的研究进展, 分析了车辆、驾驶行为、交通网络和社会这4类因素对CAV能耗的影响程度, 以车辆、基础设施和旅行者对象对目前CAV生态研究进行分类, 重点分析了信号交叉口生态驶入与离开、生态协同自适应巡航控制、匝道合流区生态协同驾驶、生态协同换道轨迹规划和生态路由5种典型车辆协同生态驾驶应用场景的研究现状。分析结果表明: 相比人类驾驶方式, 在任何交通流量CAV 100%渗透率的条件下和低交通流量CAV部分渗透率的条件下, CAV油耗节省效果显著, 最高可达63%, 而具有部分智能化和网联化等级的CAV油耗可至少节省7%; 现有研究较少考虑人机共驾情况下, 驾驶人反应延迟和自动控制器传输延迟导致的轨迹跟踪偏离; 现有研究将车车通信/车路通信假定为理想数据交互过程, 未考虑通信拓扑、传输时延、通信失效与基站切换等因素对CAV生态协同驾驶策略的影响; 现有研究较少探讨多车道、交叉口转向-直行共用车道和U型车道等交通场景, 以及不同智能网联等级CAV与人类驾驶汽车、行人、自行车等共存的混合交通条件下的生态驾驶策略; 受限于自动驾驶技术和基础设施尚未成熟和完善, 真实交通场景下的测试验证工作尚未开展; 车辆控制、车车通信、多车协同、混合交通流场景、半实物仿真测试和真实交通场景测试等方面将是CAV协同生态驾驶策略的进一步发展方向。

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作者: Kang Jun; Xu Weiqiang; Duan Zongtao; Huang Shan

作者: 康军; 许卫强; 段宗涛; 黄山

标题: Dynamic time warping algorithm for time zone segmentation

标题: 划时区分段的动态时间规整算法

来源出版物: 计算机应用研究 卷: 37 期: 11 页: 3330-3333 出版年: 2020

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作者关键词: DTW; urban traffic; trajectory clustering; data mining; similarity; DTW

作者关键词: 城市交通; 轨迹聚类; 数据挖掘; 相似度

摘要: Trajectory clustering is one of the key points of urban traffic data mining, whose algorithm divides the trajectory into several clusters according to certain similarity indicators. In the complex road network environment, aiming at the inaccuracy of current similarity calculation methods such as DTW and SDTW, this paper proposed a dynamic time warding algorithm (SDTW +) for time zone segmentation to calculate the similarity. This method took the shape of the trajectory into consideration and could effectively improve the accuracy. The experimental part used different similarity algorithms and combined the hierarchical clustering algorithm to cluster the actual vehicle trajectories. Finally, this paper selected the average contour coefficient and the cluster success rate as the evaluation index to judge the effect of clustering with different similarity

algorithms. The experimental results show that the average contour coefficient of the proposed algorithm is 33.86% and 12.94% higher than that of DTW and SDTW, respectively, meanwhile with the clustering success rate improved.

摘要: 轨迹聚类是城市交通数据挖掘的重点之一,交通轨迹聚类算法是按照一定的相似度指标将轨迹划分成若干个类簇。在复杂的路网环境下,针对目前如 DTW、SDTW 等相似度计算方法准确性不高的问题进行了研究,提出了一种划时区分段的动态时间规整算法(SDTW+)进行相似度计算。该算法充分考虑了轨迹形状因素,能有效提高准确性。实验部分利用不同相似度算法,并结合层次聚类算法对实际车辆轨迹进行聚类,最终以平均轮廓系数和聚类成功率为评价指标,判断不同相似度算法的聚类效果。实验结果表明,采用所提算法相对于采用 DTW、SDTW 的平均轮廓系数分别提高 33.86%、12.94%,同时聚类成功率也得到一定提高。

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作者: 任帅; 苏东旭; 徐振超; 范傲雄; 张弢

标题: Three-dimensional model information hiding algorithm based on distance feature and volume integral invariant

标题: 基于距离特征与体积积分不变量的三维模型信息隐藏算法

来源出版物: 信息安全学报 卷: 5 期: 5 页: 110-120 出版年: 2020

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来源出版物: Journal of Cyber Security 卷: 5 期: 5 页: 110-120 出版年: 2020

文献号: 2096-1146(2020)5:5<110:JYJLTZ>2.0.TX;2-O

文献类型: Article

作者关键词: information hiding; 3D models; distance feature; volume integral invariant

作者关键词: 信息隐藏; 三维模型; 距离特征; 体积积分不变量

摘要: In order to improve the robustness and embedding capacity of 3D model information hiding algorithm, and make 3D model can hide large-capacity secret information, a 3D model information hiding algorithm based on distance feature and volume integral invariant was proposed here. The main idea of the algorithm was as follow. Firstly, the global variable distance feature of 3D model and similarity formula were used to classify several 3D model carriers. Secondly, the volume integral invariants were used to calculate the volume inside and outside the sphere of the 3D model, and the 3D model vertices were classified. Finally, the secret information was hidden into the 3D model by modifying the degree of convexity of the vertices of 3D model, and was sent to the recipient for extraction. The experimental results show that the proposed algorithm has good robustness and invisibility.

摘要: 为了提高三维模型信息隐藏算法的鲁棒性和嵌入容量,使得三维模型可以隐藏大容量的秘密信息,本文提出一种基于距离特征和体积积分不变量的三维模型信息隐藏算法。算法的主要思想是:首先使用距离特征这种三维模型全局变量,利用相似性公式对多个三维模型载体进行分类;其次使用体积积分不变量计算三维模型顶点的球体内外体积,对三维模型顶点进行分类;最后通过修改三维模型顶点的凹凸程度把秘密信息隐藏到三维模型中,发送给接受者进行提取。实验结果表明本文算法具有很好的鲁棒性和不可见性。

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作者: Guo Lanying; Han Ruizhi; Cheng Xin

作者: 郭兰英; 韩睿之; 程鑫

标题: Digital Instrument Identification Method Based on Deformable Convolutional Neural Network

标题: 基于可变形卷积神经网络的数字仪表识别方法

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文献类型: Article

作者关键词: Image processing; Character recognition; Deformable convolutional neural network; Projection histogram

作者关键词: 图像处理; 字符识别; 可变形卷积神经网络; 投影直方图

摘要: At present, traditional image processing methods and machine learning methods are adopted for the identification of digital display instruments, which have disadvantages such as low recognition accuracy for both characters and numbers in complicated scenarios, and difficulty to meet real-time application requirements. Aiming at the problems above, combining traditional image processing technology and deep learning methods, a method of segmentation and recognition of digital display instrument based on deformable convolutional neural network is proposed. This method includes steps such as image preprocessing, character segmentation and image recognition. Firstly, the GrayWorld algorithm is applied to perform brightness equalization on the image to be recognized for the further using of color segmentation to extract the screen area. Secondly, the projected histogram method is implemented to realize the unified segmentation of characters with its corresponding decimal point after performing morphological operation on the image. Finally, a deformable convolutional neural network is proposed and trained for character recognition, which optimizes the endogenous geometry restriction of receptive field in convolutional neural networks. The experimental results indicate that the addition of deformable convolution effectively improves the accuracy of image recognition and the convergence speed of the network, and the accuracy of the overall recognition method reaches 99.45% and the detection speed is 10FPS, which can meet the requirements of practical applications.

摘要: 目前,对于数显仪表的识别,多采用传统的图像处理及机器学习等方法,在复杂多变的应用场景中,其对字符、数字的识别准确率低,难以满足实时应用的要求。针对以上问题,将传统图像处理技术与深度学习方法相结合,提出了一种基于可变形卷积神经网络的数显仪表示数分割与识别方法。该方法包含图像预处理、字符分割与识别等步骤。首先,使用 GrayWorld 算法对待识别图像进行亮度均衡,并通过彩色分割提取屏幕区域;其次,对图像进行形态学操作,以便使用投影直方图法完成字符与对应小数点的整体分割;最后,设计并训练了一种可变形卷积神经网络对字符进行识别,优化了卷积神经网络感受野几何结构固定的内在问题。实验结果表明,加入可变形卷积有效提高了图像的识别准确率和网络的收敛速度;该方法的整体识别准确率达到 99.45%,检测速度为 10FPS,能够满足实际应用需求。

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作者: 刘鑫一; 庞继龙; 赵祥模; 侯俊; 马峻岩

标题: A Selection Strategy for Internet of Vehicle Networks Based on User Satisfaction and Transmission Efficiency

标题: 一种兼顾用户满意度与传输效率的车联网网络选择策略

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文献类型: Article

作者关键词: internet of vehicle; convex optimization; network selection; user satisfaction; utility function

作者关键词: 车联网; 凸优化; 网络选择; 用户满意度; 效用函数

摘要: A network selection strategy for internet of vehicle(IoV)is proposed to solve the optimal scheduling problem of different services of IoV terminals in a heterogeneous network environment,and the strategy takes both user satisfaction and transmission efficiency into account.The strategy firstly analyzes the influence of weight coefficients of different utility functions,transmitting power and sensitivity factor of a experience function on each network satisfaction utility function.It is found that when the weight coefficient is larger,the value of satisfaction utility function is larger;and that in a limited power range,when the transmitting power increases continuously,the value of the satisfaction utility function increases sharply at the beginning,then the increase rate slows down,and finally the value of the function tends to be stable.When the value of the sensitivity factor of the experience function is larger,the slope of the corresponding curve is larger,that is,the sensitivity is higher,and the function value changes faster with the change of the transmitting power.Then,a convex optimization method is used to calculate the maximum value of each network satisfaction utility function.Finally,three representative networks are selected as research objects for simulation experiments.Experimental results and comparisons with the network selection strategy based on transmitting power and the network selection strategy based on transmission rate show that the maximum value of the utility function of the proposed strategy is 1.08times and 6.5times of those of the two strategies,

respectively, which proves that the proposed strategy is an efficient and reliable network selection strategy.

摘要: 针对车联网终端的不同业务在异构网络环境下进行优化调度的问题,提出了一种兼顾用户满意度与传输效率的车联网网络选择策略。首先分析了不同的效用函数权值系数、发射功率及体验函数灵敏度因子对各网络满意度效用函数的影响,发现:当权值系数较大时,获得的满意度效用函数值也越大;在有限功率范围内,当发射功率不断增大时,起初满意度效用函数值相应地随之急剧增大,随后增加速率减缓,最终函数值趋于稳定;当体验函数灵敏度因子的值越大时,对应的曲线斜率越大,也即灵敏度越高,函数值随着发射功率的变化而变化得更快。然后,应用凸优化的方法求解各网络满意度效用函数的最大值。最后,选用3种具有代表性网络作为研究对象,进行仿真实验。实验结果表明,与基于发射功率的网络选择策略和基于传输速率的网络选择策略相比,所提策略的效用函数最大值分别是前两者的1.08倍和6.5倍,证明是一种高效可靠的网络选择策略。

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标题: Improved learning resource recommendation algorithm of deep neural network based on MLP

标题: 基于 MLP 改进型深度神经网络学习资源推荐算法

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作者关键词: word2vec; recommendation of learning resources; deep learning; convolutional neural network; word2vec; multi-layer perceptron(MLP)

作者关键词: 学习资源推荐; 深度学习; 卷积神经网络; 多层感知机

摘要: Aiming at the knowledge overload in the process of online learning and the problems of data sparsity and cold start in the traditional recommendation algorithm, this paper proposed an improved learning resource recommendation algorithm based on MLP. The algorithm used the advantage of MLP in nonlinear data processing, converted the prediction mode of vector multiplication of learner characteristics and learning resource characteristics into the input mode of MLP, and improved the DN-CBR neural network recommendation model. In order to verify the effectiveness of the model, this paper built a dataset with the online learning platform data of iCourse as the sample. Compared with DN-CBR model, the improved model improves the normalized cumulative loss gain and hit rate by 1.2% and 3% respectively on the dataset, which effectively improves the recommendation performance of the model.

摘要: 针对在线学习过程中出现的知识过载及传统推荐算法中存在的稀疏数据和冷启动问题,提出了一种基于多层感知机(MLP)的改进型深度神经网络学习资源推荐算法。该算法利用多层感知机对非线性数据处理的优势,将学习者特征和学习资源特征进行向量相乘的预测方式转换为输入多层感知机的方式,改进了 DN-CBR 神经网络推荐模型。为验证模型的有效性,以爱课程在线学习平台数据为样本构建数据集,通过对比实验表明,在该数据集上,改进后模型相较于 DN-CBR 模型在归一化折损累积增益和命中率指标上分别提升了 1.2% 和 3%,有效地提高了模型的推荐性能。

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标题: HATBED:A Distributed Hardware Assisted Tracing Testbed for IoT

标题: HATBED:分布式硬件辅助追踪物联网测试平台

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作者关键词: IoT; Hardware assisted tracing; Testbed

作者关键词: 物联网; 硬件辅助追踪; 测试平台

摘要: Internet of Things systems,such as wireless sensor networks,usually have the characteristics of the high restriction of the resources and coupling with the physical world,which makes it difficult to debug the equipment after deployed.Therefore,it is especially important to thoroughly test and profile the systems before deploying to the real world.Due to the intrusiveness,traditional debugging methods based on the serial port are incompetent for detailed tracing on resource-constrained devices.This paper studies the application of hardware assisted tracing technology in the embedded network sensor systems' test and evaluation.Then,it designs and realizes a Hardware Assisted Tracing testBed (HATBED).HATBED consists of a controller,observers,and targets.It can provide three services,network-wide remote debugging,flexible software tracing and non-invasive software profiling.HATBED can support non-intrusive tracing and profiling without relying on operating systems and applications.In the experiment,this paper benchmarks time and power consumption,time accuracy,and code coverage under bare-metal and FreeRTOS.Then,it tests the RIOT-OS examples and completes the ping6 command high time accuracy feature profiling and UDP communication function coverage and basic block coverage.With the help of hardware assisted tracing technology,HATBED can evaluate the resource-constrained Internet of Things systems more efficiently and adequately.

摘要: 无线传感器网络等物联网系统通常具有资源高度受限且与物理世界耦合的特性,这使得该类系统部署后的设备通常难以调试。因此,在部署前对整个系统进行充分的测试与评价

显得尤为重要。传统基于串口的网络化测试手段具有较大的侵入性,且无法对资源受限设备的运行情况进行详细的跟踪。文中对硬件辅助追踪技术在物联网测试评价中的应用进行了研究,设计并实现了一种硬件辅助追踪测试平台--HATBED(Hardware Assisted Tracing Testbed)。HATBED 由控制器、观察者以及被测目标组成,可以提供网络级远程调试、灵活的软件追踪以及非侵入式软件分析等主要功能,并在不依赖操作系统与应用的前提下,实现对系统的非侵入式追踪与分析。实验中,首先使用裸机与 FreeRTOS 操作系统下的标准例程,从功耗开销、时间精度以及代码覆盖率 3 个方面对 HATBED 进行了基准性能的测试;然后,以物联网 RIOT-OS 代码库程序为例,通过 HATBED 实现了 ping6 的高精度时间特性分析,及其底层 gnrcc 协议栈 UDP 通信过程函数覆盖与基本块覆盖的评估。实例分析表明,借助硬件辅助追踪技术,HATBED 可以对资源受限的物联网系统开展更加高效、充分的测试与评价。

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标题: Camera calibration and vehicle speed measurement in traffic monitoring scene

标题: 交通监控场景下的相机标定与车辆速度测量

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作者关键词: camera calibration; vehicle speed; vanishing point; marking line; traffic monitoring

作者关键词: 相机标定; 车辆速度; 消失点; 标志线; 交通监控

摘要: Aiming at the demand for vehicle speed measurement in traffic monitoring scenarios, this paper proposed a camera calibration method and vehicle speed measurement scheme. Firstly, this method detected and tracked the vehicle target in the video based on deep learning YOLO detection algorithm and optical flow tracking algorithm. According to the obtained trajectory set, this paper calculated the vanishing points in the road direction by cascade Hough transform, and detected marking lines. Then, according to the vanishing point and marking line, it completed the camera calibration task with the idea of exploratory focal length. Finally, this paper achieved vehicle speed by calculating the average of the instantaneous speeds between the multiple frames. The experimental results of real traffic monitoring scenarios show that the automatic camera calibration method based on vanishing point has good stability and high calibration accuracy, which can meet the needs of vehicle speed measurement and practical engineering applications.

摘要: 针对交通监控场景中对车辆速度测量的需求,提出了一种相机标定方法和车辆速度测量方案。首先,通过深度学习 YOLO 检测算法和光流跟踪算法对图像中的车辆目标进行检测和跟踪,根据获得的轨迹集合使用级联霍夫变换计算出道路方向上的消失点,从而检测出道路上的标志线。之后根据消失点和标志线,使用试探焦距思想完成相机标定任务。最后通过计算多帧之间瞬时速度的平均值来实现车辆速度的测量。通过真实交通监控场景的实验结果表明,这种基于消失点的自动相机标定方法具有较好的稳定性和较高的标定精度,能够满足车辆速度测量和实际工程应用的需求。

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标题: 深度特征的核相关滤波视觉跟踪

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作者关键词: video target tracking; kernel correlation filtering; deep learning; deep feature

作者关键词: 视频目标跟踪; 核相关滤波; 深度学习; 深度特征

摘要: Aiming at the shortcomings of traditional manual features in target tracking algorithm based on kernel correlation filtering, this paper takes target tracking technology based on kernel correlation filtering as the research object, uses deep convolution neural network to automatically extract deep convolution features of target to be tracked to replace traditional manual features. The deep convolution feature extracted from different convolution layers is separately learned by the kernel correlation filter to obtain different feature maps, and the position of the target to be tracked in the video sequence is determined by weighted fusion of multiple feature maps, it improves the robustness of the tracking algorithm in complex interference background.

摘要: 针对核相关滤波目标跟踪算法中传统手工特征的不足,以核相关滤波方法的目标跟踪技术作为研究对象,利用深度卷积神经网络自动提取待跟踪目标的深度卷积特征,来代替传统的手工特征,利用从不同卷积层提取到的深度卷积特征分别经过核相关滤波器学习来得到不同的特征图,然后对多个特征图进行加权融合来确定待跟踪目标在视频序列中的位置,以此来提高跟踪算法在复杂干扰背景下的鲁棒性。

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第 15 条, 共 36 条

作者: Wang Yu; Guo Lanying; Cheng Xin

作者: 王钰; 郭兰英; 程鑫

标题: Short-Term Traffic Flow Prediction Optimization Method Based on Deep Learning

标题: 结合深度学习的短时车流量预测优化方法

来源出版物: 计算机工程与应用 卷: 56 期: 16 页: 211-217 出版年: 2020

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来源出版物: Computer Engineering and Application 卷: 56 期: 16 页: 211-217 出版年: 2020

文献号: 1002-8331(2020)56:16<211:JHSDXX>2.0.TX;2-T

文献类型: Article

作者关键词: Long Short-Term Memory; intelligent transportation system; short-term traffic flow; multivariate analysis; Long Short-Term Memory

作者关键词: 智能交通系统; 短时车流量; 多因素分析

摘要: With the development of traffic flow detection technology, massive traffic flow information can be obtained more easily and efficiently. Aiming at the accuracy requirement of short-term traffic flow prediction, an optimization method of short-term traffic flow prediction based on deep learning is proposed. The Long Short-Term Memory algorithm of neural network is used to process the data with the idea of multi-factor analysis. Through the multi-factor analysis of short-term traffic flow data, such as weather factors, holidays, etc., short-term traffic flow data are divided into multiple data sets according to factors, and different data sets are used as training sets to preview. The traffic flow in the next few days with the same factors as the training set is measured. Through this method, the obtained data are more pure, and the influence of various factors on traffic flow prediction is effectively solved. The results show that the optimization method can better reflect the characteristics of road traffic flow change and overcome the disadvantage that the factors of traffic flow data set are not single.

摘要: 随着交通流检测技术的发展,海量的交通流信息可以更容易高效地获取,针对短时车流量预测的准确性要求,提出了一种结合深度学习的短时车流量预测优化方法,采用神经网络 Long Short-Term Memory 算法,用多因素分析的思想对数据进行处理。通过对短时交通流数据进行多因素分析,如天气因素、节假日等,将短时交通流数据划分为多种数据集,将划分的不同数据集作为训练集去预测与训练集因素相同的未来时刻车流量情况。通过这种方法,使得获取的数据更为纯净,有效解决了多种因素对车流量预测影响问题。结果表明,该优化方法克服了车流量数据集影响因素不单一的缺点,能够更为准确地反映道路交通流的变化特征。

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作者: Wang Xi; Yuan Shaoxin

作者: 王晰; 袁绍欣

标题: Algorithm for Extracting Valid Travel Time from Automatic Number Plate Recognition Data

标题: 从车牌识别数据中提取有效旅行时间算法研究

来源出版物: 计算机工程与应用 卷: 56 期: 16 页: 241-247 出版年: 2020

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文献类型: Article

作者关键词: travel time; noise travel time; mixture model; log-normal distribution; data clustering

作者关键词: 旅行时间; 噪音数据; 混合模型; 对数正态分布; 数据聚类

摘要: Travel time samples collected from a special road for a time period can be obtained from the Automatic Number Plate Recognition(ANPR) data. However, the samples often contain a fair amount of noise travel time that can not represent the usual traffic conditions. Filtering out these noise travel time can derive the valuable valid travel time representing the usual traffic conditions. Hence, an algorithm is presented to fit the distribution of data samples with the log-normal mixture model, and the two criteria of optimal K value of component distribution are given to make a best classification of two types of travel time with respect to the characteristics of right tail portion of distribution of noise travel time, so the noise travel time can be identified and the valid travel time can be extracted. The algorithm also can discern the samples with the weak characteristics of noise travel time, and extract the valid travel time from the samples between the 10th and 90th percentile. The experiments using the algorithm on the actual ANPR data coming from the buses and non-bus vehicles gain a good effect in identifying the noise travel time. The experimental results show that there are obvious differences of mean and standard deviation of travel time for non-bus vehicles and standard deviation for buses before and after filtering the noise travel time. This indicates that the wrong judgment for the running state for the two traffic modes under the normal traffic conditions would be made without filtering out the noise travel time.

摘要: 从车牌识别数据中可以得到车辆在特定道路与特定时间段的旅行时间数据样本,但样本中往往混有不反映通常交通状况的噪音数据,去除这些噪音数据后可得到能够反映通常交通状况的有价值的有效数据。为此提出算法采用对数正态分布混合模型对数据样本进行拟合,并利用噪音数据具有右向尾部的分布特点给出确定最优子分布数量的两个判据,使两类数据具有最佳的聚类效果,从而能识别和提取出有效数据。算法对噪音数据特征不明显的少量数据样本也给出了提取方法,将第 10 百分位和第 90 百分位之间的数据作为有效数据。该算法针对公交车和非公交车两类车型的车牌识别数据进行实验,对噪音数据的识别取得了良好效果。实验结果表明,有效数据提取前后,非公交车通常状况的旅行时间平均值和标准差以及公交车旅行时间标准差具有明显差异,不滤除噪音数据会对两类车通常交通状况下的运行状态产生误判。

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作者: Yang Lu; Song Huansheng; Zhang Zhaoyang

作者: 杨露; 宋焕生; 张朝阳

标题: Highway Vehicle Detection Based on Sparse Trajectory Clustering

标题: 基于轨迹稀疏聚类的高速公路车辆检测

来源出版物: 计算机工程与应用 卷: 56 期: 15 页: 251-258 出版年: 2020

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文献类型: Article

作者关键词: vehicle detection; trajectory clustering; spectral clustering; sparsity

作者关键词: 车辆检测; 轨迹聚类; 谱聚类; 稀疏化

摘要: To solve the real-time vehicle detection problem in expressway, a vehicle detection method based on trajectory sparse spectral clustering is proposed. The main processing adopts ORB algorithm to detect feature points, tracks the trajectory of these feature points by Pyramid LK optical flow algorithm. The next step is inversely projecting trajectory to 3D world coordinate system. At the same time, similarity matrix is constructed with 3D trajectories information and is processed sparsely. After preliminary clustering the feature points, vehicle detection result is obtained by merging classes. Experimental results show that proposed method effectively solves vehicle occlusion problem and vehicle detection accuracy is improved to 93%, which has certain validity and value.

摘要: 针对高速公路中车辆的实时检测问题,提出了一种基于轨迹稀疏谱聚类的高速公路车辆检测方法。使用 ORB 算法检测特征点并利用基于金字塔 LK 光流算法进行跟踪得出特征点轨迹,将轨迹逆投影至三维世界坐标系,利用轨迹三维信息构建轨迹间的相似矩阵并对其进行稀疏化处理,采用谱聚类方法对特征点轨迹进行初步聚类,对谱聚类结果进行类间合并得出车辆检测结果。实验结果表明,方法花费了更少的时间代价,有效地解决了车辆遮挡问题,车辆实时检测精度提高至 93%,具有一定的有效性和价值。

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第 18 条, 共 36 条

作者: Sun Zhaoyun; Ma Zhidan; Li Wei; Hao Xueli; Shen Hao

作者: 孙朝云; 马志丹; 李伟; 郝雪丽; 申浩

标题: Pavement crack identification method based on deep convolutional neural network fusion model

标题: 基于深度卷积神经网络融合模型的路面裂缝识别方法

来源出版物: 长安大学学报. 自然科学版 卷: 40 期: 4 页: 1-13 出版年: 2020

文献号: 1671-8879(2020)40:4<1:JYSDJJ>2.0.TX;2-#

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文献号: 1671-8879(2020)40:4<1:JYSDJJ>2.0.TX;2-#

文献类型: Article

作者关键词: road engineering; pavement crack identification; deep convolutional neural network; multi-target detection model; crack segmentation; model fusion

作者关键词: 道路工程; 路面裂缝识别; 深度卷积神经网络; 多目标检测模型; 裂缝分割; 模型融合

摘要: Aimed at the existing methods of using deep learning technology for road surface crack recognition, most of the methods were still limited to the processing technology based on active feature extraction, and the source of the road image was targeted, resulting in the algorithm didn't have the ability to generalize the identification algorithm of the network still has specific requirements for the equipment, and the problem of the accuracy of the location of the road cracks was not high. A method based on deep convolutional neural network fusion model for pavement crack identification was proposed. Firstly, the multi-target SSD convolutional neural network model was applied to classify and detect pavement cracks. Then the depth residual network was used to improve the feature extraction structure of the SSD model, and the hyper parameters in the model were optimized according to the convergence degree of the loss function, which improves the accuracy of classification and location of pavement cracks. Secondly, the classification of cracks detection model was deviations from the pavement crack location. The U-Net model based pavement crack segmentation method was proposed, and the feature extraction network of the model was improved. The crack segmentation accuracy was improved and the precise crack segmentation was realized. Finally, the crack was obtained. The classification detection model was

merged with the segmentation model,two models were loaded,and the optimal weights obtained by the above training were imported,and the road surface image was judged according to the crack classification network to determine whether there was a crack,and if there was a crack,a specific category and confidence were given,and these were the information and the original crack image were input into the U-Net segmentation network,the length and width of the linear crack and the area of the mesh crack were calculated according to the segmentation result.The results show that the recognition accuracy of the pavement crack identification method for transverse cracks,longitudinal cracks and map cracks are 86.6%,87.2% and 85.3%,respectively.This method can not only give the category information of pavement cracks,but also give accurate positioning and geometric parameter information,and can be directly used for pavement condition evaluation.5 tabs,19 figs,25 refs.

摘要: 现有的路面裂缝识别方法大多仍局限于基于主动特征提取的处理技术,对路面图像来源有专一性要求,算法不具备泛化能力,现有的基于神经网络识别算法对设备有特定要求,且路面裂缝的定位准确性不高。为此,提出基于深度卷积神经网络融合模型的路面裂缝识别方法。首先,应用多目标 SSD 卷积神经网络模型对路面裂缝进行分类检测,然后使用深度残差网络对 SSD 模型的特征提取结构进行改进,并根据损失函数的收敛程度对模型中的超参数进行优化,提高路面裂缝分类和定位的准确率;其次,针对裂缝分类检测模型对路面裂缝定位存在的偏差,提出基于 U-Net 模型的路面裂缝分割方法,并改进模型的特征提取网络,提高裂缝分割精度,实现精确的裂缝分割;最后,将裂缝分类检测模型与分割模型进行融合,加载 2 个模型并导入上述训练得到最优权重,根据裂缝分类网络判断路面图像有无裂缝,若存在裂缝则给出具体类别和置信度,并将这些信息和原始裂缝图像输入 U-Net 分割网络,根据分割结果计算线性裂缝的长度、宽度及网状裂缝的面积。试验结果表明:给出的路面裂缝识别方法对于横向裂缝、纵向裂缝和网状裂缝的识别精度分别为 86.6%、87.2%和 85.3%;该方法不仅能够给出路面裂缝的类别信息,还可以给出路面裂缝的精确定位和几何参数信息,可直接用于路面状况评价。

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作者: Ma Jing; Dai Weijia

作者: 马静; 戴维佳

标题: Evaluating on traffic management during traffic construction of urban rail based on AHP-information entropy

标题: 基于 AHP-信息熵决策的城市轨道建设期交通组织方案评价

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文献类型: Article

作者关键词: traffic engineering; urban rail; traffic management; AHP; information entropy; evaluating index

作者关键词: 交通工程; 城市轨道; 交通组织; 层次分析法; 熵权法; 评价指标

摘要: In order to improve the effectiveness of the ground transportation organization during the period of urban rail transit construction,the evaluation indexes of the transportation organization scheme from the three perspectives of "point,line and area" were analyzed.The evaluation indexes were analyzed by the subjective probability method,and the evaluation system of the ground transportation organization during the period of rail transit construction was constructed.A weighted average synthesis method was presented based on analytic hierarchy process(AHP)and information entropy weight method to evaluate the transportation organization plan during urban rail construction.The method was validated with the selected index system,taking the transportation organization during the construction of Xi'an Rail Line 4 as an example.The results show that the weight value of the proposed AHP-information entropy decision method is relatively high,in the six indexes of road network connectivity,lane area occupied by the fence,vehicle ratio,rationality of non-isolation facilities,availability of traffic intersections' channel and availability of signal lights' timing,and the sum of which accounts for 70% of the total weight value.The importance of indicators affecting road traffic is considered respectively from the three levels of "point,line and plane".To a certain extent,it satisfies the scientific rationality of combining subjective and objective,and it is simple to select the evaluation index system structure,which can comprehensively reflect the importance of each evaluation index and the actual situation of ground transportation organization during the rail construction period,so as to provide theoretical guidance for the rail construction transportation organization.7 tabs,2 figs,25 refs.

摘要: 为提高城市轨道交通建设期地面交通组织的有效性,从"点、线、面"3个角度分析其交通组织方案评价指标并进行筛选,通过主观概率法对评价指标进行分析,构建轨道交通建设期地面的交通组织评价体系。提出基于层次分析法(analytic hierarchy process,AHP)和信息熵权法的加权平均综合多指标属性决策的方法,并采用该方法对城市轨道交通建设期交通组织方案进行评价。以西安市地铁4号线建设期间的交通组织为例,用所选取指标体系对该方法进行了验证。

研究表明:提出的 AHP-信息熵决策法中,路网连通度、围挡占用车道面积、大车率、机非(机动车-非机动车)隔离设施合理性、交通交叉口渠化有效性、信号灯配时有效性 6 个指标所占权重值比较大,且总和占到了总权重值的 70%,说明提出的方法从"点、线、面"3 个层次分别考虑了影响道路交通的指标重要性,在一定程度上满足了主客观结合评价的科学合理性;选取评价指标体系架构简单,能够综合反映各评价指标的重要性和轨道建设期地面交通组织的实际情况,可为轨道建设交通组织提供理论指导。

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作者: 任帅; 王萌; 范傲雄; 高泽; 徐解; KHURRAM Shahzad; 张弢

标题: Zero-high-resolution Information Hiding Algorithm for 3D Mesh Model

标题: 一种零高分辨率 3D 网格模型的信息隐藏算法

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文献类型: Article

作者关键词: Zero-high-resolution information hiding; Half-folded mesh simplification; Concentric spherical segmentation; DCT transform; Anti-analysis ability

作者关键词: 零高分辨率信息隐藏; 半边折叠网格简化; 同心球面分割; DCT 变换; 抗分析性

摘要: Aiming at weak anti-analysis of current information hiding algorithm for 3D mesh model, a zero-high-resolution information hiding algorithm was proposed. Firstly, multi-resolution analysis based on the improved half-fold mesh simplification algorithm is manipulated on mesh model to decompose it into High-layer, Mid-layer, Low-layer. Secondly, the feature vectors are extracted by concentric sphere segmentation in High-layer, and the feature points embedded in information are determined by calculating vertex saliency in Mid-layer. Thirdly, the highest bit of the eigenvalue is obtained circularly from the feature vector and then correlated with the encrypted information scrambled by Chebyshev to form the associated information. Finally, the associated information is

embedded into the DCT transform AC coefficient of the feature point spherical coordinate r value using the piecewise mapping function. The algorithm hides the associated information constructed by feature vector of High-layer and scrambled information into the affine transform invariant of robust feature points in Mid-layer with less than 15% energy, which is beneficial to the invisibility, robustness and anti-analysis of algorithm. The obvious changes of point and surface features are undetected by the first-order Laplacian smoothing steganalysis method, which means that the proposed algorithm is of good anti-analysis ability.

摘要: 针对目前3D网格模型信息隐藏算法抗分析性弱的问题,提出一种零分辨率的信息隐藏算法。首先,利用改进半边折叠网格简化算法对网格模型进行多分辨率分析,将3个分辨率层表示为High-layer, Mid-layer, Low-layer;其次,在High-layer进行同心球面分割,提取特征向量,在Mid-layer计算顶点突出度,确定嵌入信息的特征点;再次,通过将特征向量中特征值的最高位与Chebyshev置乱的加密信息建立联系以形成关联信息;最后,利用分段映射函数将关联信息嵌入到特征点球面坐标 r 值的DCT变换交流系数中。算法将高分辨率层的特征向量与置乱信息所构建的关联信息隐藏于能量小于15%中分辨率层的鲁棒特征点的仿射变换不变量中,有利于算法的不可见性、鲁棒性和抗分析性。采用一阶拉普拉斯平滑的隐写分析方法检测不到点、面特征的明显变化,表明所提算法的抗分析性好。

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作者: 唐心瑶; 宋焕生; 王伟; 张朝阳; 崔华

标题: 3D Vehicle Information Recognition Algorithm of Monocular Camera Based on Self-Calibration in Traffic Scene

标题: 单目交通场景下基于自标定的车辆三维信息识别算法

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文献号: 1003-9775(2020)32:8<1305:SMJTCJ>2.0.TX;2-S

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文献类型: Article

作者关键词: monocular camera; camera calibration; deep learning; 3D information recognition

作者关键词: 单目相机; 摄像机标定; 深度学习; 三维信息识别

摘要: Obtaining 3D information of vehicles as the basis for accurate classification of vehicles has become an increasingly important research direction. However, most of the current traffic monitoring cameras are monocular cameras, which cannot directly obtain 3D information of vehicles like pose and size due to perspective factors. According to the above problem, this paper proposes a 3D vehicle information recognition algorithm of monocular camera based on self-calibration in traffic scene. Firstly, this paper builds up a monocular camera model and a stable single vanishing point calibration model according to the typical traffic scene, and completes camera calibration. Then it uses the YOLO deep learning convolution neural network for 2D vehicle detection. Based on this, it puts forward a diagonal and vanishing point constrained non-linear optimization algorithm, combining with the calibration information to complete 3D vehicle information recognition and the best 3D vehicle detection. Finally, the experiment was carried out on the public dataset called BrnoCompSpeed and in highway traffic scenes, and the results show that the algorithm can effectively complete 3D vehicle information recognition in various traffic scenarios with an average recognition accuracy of more than 90%.

摘要: 获取车辆的三维信息作为车型精确分类的依据,已成为当前越来越重要的研究方向,但交通场景中的监控相机大多为单目相机,由于透视因素无法直接获取车辆位姿、车辆轮廓尺寸等三维信息.针对上述问题,提出单目交通场景下基于自标定的车辆三维信息识别算法,首先根据典型的交通场景,建立单目相机的摄像机模型以及较稳定的单消失点标定模型,完成摄像机标定;接着使用深度学习卷积神经网络中的 YOLO 模型对交通场景中的车辆进行二维目标检测.在此基础上,提出对角线和消失点约束的非线性优化求解算法,结合标定信息完成车辆的三维信息识别及最佳三维目标检测.在公开数据集 BrnoCompSpeed 和实际高速公路场景进行了实验,实验结果表明,该算法在多种交通场景下均能有效识别车辆三维信息,平均识别准确率超过 90%.

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作者: Qu Bayi; Liu Yehao; Zhang Taojing; Liu Wei; Yu Dongsong; Zhou Wei

作者: 屈八一; 刘烨豪; 张桃靖; 刘威; 俞东松; 周渭

标题: Scheme for miniature time difference measurement with a high resolution and a large range

标题: 微型高分辨大量程的时差测量方案

来源出版物: 西安电子科技大学学报 卷: 47 期: 4 页: 24-30 出版年: 2020

文献号: 1001-2400(2020)47:4<24:WXGFBD>2.0.TX;2-I

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文献类型: Article

作者关键词: time interval measurement; time-to-voltage; field programmable gate array; high precision; measurement range

作者关键词: 时间间隔测量; 时间电压转换; 可编程逻辑器件; 分辨率; 量程

摘要: This paper presents some solutions to the problems in the precise time interval measuring instrument such as the contradiction between high resolution and wide measurement range, the high temperature sensitivity, the low reliability and the big volume and power consumption. The reference signal is used to generate calibration signals to automatically calibrate the analog circuits which are greatly affected by the temperature. The calibration data are used to amend the conversion coefficient between voltage and time interval and the temperature sensitivity of the instrument is greatly reduced. To avoid the gross error in the measurement result caused by the false trigger of the counter, the double counter synchronous measurement technique is adopted and the logic algorithm is used for analyzing and correcting the measured results. Electronic counting method and time-to-voltage converter method are combined together to meet the requirements of the measurement range and resolution of the instrument. The circuit board's area of the prototype is only 10cm². The prototype's effective resolution is above 10ps and the standard deviation of multiple measurement results is below 15ps, the measurement range is wider than 20, 000 seconds, and its measurement results are highly reliable.

摘要: 针对高精度时间间隔测量仪的高分辨和大量程矛盾、精度受温度的影响较大、可靠性不高以及体积和功耗较大等问题,利用参考信号生成校准信号来对受温度影响较大的模拟电路进行自动校准,大大降低了温度对仪器精度的影响;采用了双计数器同步测量技术并利用逻辑算法来分析和修正得到的测量结果,解决了由于计数器部分的误触发而导致测量结果存在粗大误差的问题;采用了电子计数法和时间电压转换法相结合的设计方案来兼顾仪器的测量范围和测量分辨率。实现的样机的电路板面积只有 10cm²,其有效分辨率优于 10ps,均方差小于 15ps,量程大于 20000s,且测量结果具有很高的可靠性。

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作者: 马素刚; 赵祥模; 侯志强; 王忠民; 孙韩林

标题: A Visual Object Tracking Algorithm Based on Features Extracted by Deep Residual Network

标题: 一种基于 ResNet 网络特征的视觉目标跟踪算法

来源出版物: 北京邮电大学学报 卷: 43 期: 2 页: 129-134 出版年: 2020

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文献类型: Article

作者关键词: visual object tracking; deep residual network; kernelized correlation filter; deep learning; scale estimation

作者关键词: 视觉目标跟踪; 深度残差网络; 核相关滤波; 深度学习; 尺度估计

摘要: Because the objects are easy to be lost in complex scenes, a scale adaptive visual object tracking algorithm based on deep residual network (ResNet) features is proposed. Firstly, the ResNet is used to extract the multi-layer deep features of the image region of interest. Considering the restraining effect of rectified linear units (ReLU) activation function on target features, only the convolutional layers before ReLU function are selected. Secondly, the translation filters based on kernelized correlation filter are constructed in the extracted multi-layer features, and then the weighted fusion of the multiple response maps is carried out to obtain the target position with the largest response value. After the target location is determined, the target is sampled at multiple scales, and the felzenszwalb histogram of oriented gradients (fHOG) features of different scale images are extracted separately. On this basis, a scale correlation filter is constructed to estimate the target scale accurately. Comparing with six related algorithms in OTB100, an experiment is carried. It is shown that the proposed algorithm achieves high tracking success rate and accuracy, and can adapt to scale variation, background clutter and other complex scenes.

摘要: 针对复杂场景下目标容易丢失的问题,提出了一种基于深度残差网络(ResNet)特征的尺度自适应视觉目标跟踪算法.首先,通过 ResNet 提取图像感兴趣区域的多层深度特征,考虑到修正线性单元(ReLU)激活函数对目标特征的抑制作用,在 ReLU 函数之前选取用于提取目标特征的卷积层;然后,在提取的多层特征上分别构建基于核相关滤波的位置滤波器,并对得到的多个响应图进行加权融合,选取响应值最大的点即为目标中心位置.目标位置确定后,对目标进行多个尺度采样,分别提取不同尺度图像的方向梯度直方图(fHOG)特征,在此基础上构建尺度相关滤波器,从而实现目标尺度的准确估计.在视频集 OTB100 中与其他 6 种相关算法进行了比较,实验结果表明,所提算法取得了较高的跟踪成功率和精确度,能够较好地适应目标的尺度变化、背景干扰等复杂场景.

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作者: Wang Weixing; Zhao Heng

作者: 王卫星; 赵恒

标题: Haze traffic image enhancement based on improved retinex and adaptive fractional differential

标题: 结合改进 Retinex 及自适应分数阶微分的雾霾公路交通图像增强

来源出版物: 光学精密工程 卷: 28 期: 8 页: 1820-1834 出版年: 2020

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文献号: 1004-924X(2020)28:8<1820:JHGJRJ>2.0.TX;2-H

文献类型: Article

作者关键词: Retinex; fast guided filtering; Retinex; adaptive fractional differentiation; image enhancement

作者关键词: 快速引导滤波; 自适应分数阶微分; 图像增强

摘要: To improve the contrast, clarity, and color fidelity of the traffic image in haze weather and reduce the negative impact of image degradation, a haze traffic image enhancement algorithm based on fast-guided filtering smoothing constraint for Retinex and adaptive fractional differential was proposed herein. First, an original image was converted from RGB space to YCbCr space, and the brightness component Y was extracted to construct the initial image. Second, a variational model was constructed, and the fast-guided filter was used to construct the smoothing constraints of the objective function to accurately estimate the initial irradiation component. Then, the Retinex model was used to obtain the initial reflection component, and the adaptive fractional differential mask was applied to enhance in order to obtain, which was the enhancement result of the Y component. The method showed good performance in terms of image noise suppression and detail enhancement. Finally, the reflection component was converted from YCbCr to RGB space by combining with the color difference information of Cb and Cr, to obtain the final enhanced image. In this study, the contrast experiments of different haze traffic images were tested. The experimental results indicate that the standard deviation and average gradient of the new method are at least 1.12 times and 4 times higher than those of the original image, and the information entropy is at least 4.76% higher. The comprehensive performance of the proposed method is better than that of other comparison algorithms. Thus, the method is satisfactory for image enhancement and detail retention. It effectively improves the color fidelity, intensity contrast, and texture clarity for road traffic images in haze weather. Moreover, it makes the image more visible, and the color more natural.

摘要: 为了提高雾霾天气条件下交通图像的对比度,清晰度和颜色保真度,减少图像退化所带来的负面影响,提出了一种采用快速引导滤波平滑约束的 Retinex 及自适应分数阶微分的雾霾天气交通图像增强算法。首先,该方法将原图像从 RGB 转换到 YCbCr 颜色空间,提取亮度分量构建初始图像;其次,构建变分模型,借助快速引导滤波构造目标函数的平滑约束项来准确估计初始照射分量;然后,使用 Retinex 模型获得初始反射分量,再采用自适应分数阶微分掩膜对初始反射分量进行增强得到亮度分量的增强结果,该方法在图像噪声抑制和细节增强方面性能良好;最后,将处理后的反射分量结合 Cb,Cr 色差信息从 YCbCr 转换到 RGB 颜色空间即得到最终增强图像。本文对不同的雾霾交通图像进行了对比实验,实验结果表明,新方法的标准差(STD)和平均梯度(AG)较原图至少提高 1.12 倍和 4 倍以上,信息熵(E)至少提高 4.76% 以上,综合性能优于其他的对比算法。新方法在图像增强和细节保持方面得到了很好地改进,有效地提高了雾霾天气条件下公路交通图像的颜色保真度、对比度和细节清晰度等,使得增强后的图像视觉效果和可视度明显改善,更加真实自然。

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作者: Liu Youquan; Pei Xue; Li Wan; Liu Zhengxiong

作者: 柳有权; 裴雪; 李婉; 刘正雄

标题: Visual Tracking and Localization Based on Confidence Evaluation of Adjacent Targets

标题: 基于邻近目标置信度评估的视觉目标跟踪与定位

来源出版物: 系统仿真学报 卷: 32 期: 7 页: 1294-1300 出版年: 2020

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来源出版物: Journal of System Simulation 卷: 32 期: 7 页: 1294-1300 出版年: 2020

文献号: 1004-731X(2020)32:7<1294:JYLJMB>2.0.TX;2-U

文献类型: Article

作者关键词: target tracking and localization; proximity marking; confidence evaluation; Hamming distance

作者关键词: 目标跟踪与定位; 邻近标记; 置信度评估; 汉明距离

摘要: In visual target tracking and localization, the target could not be located due to the lack of features or the severe occlusion. Aiming at this, an algorithm based on confidence evaluation of neighboring targets is designed. In the tracking process, by detecting and extracting the marker

features of neighboring targets, and combining the Hamming distance of each feature marker and the normalized result with respect to other markers as well as the probability of occurrence of each marker, the final confidence of each marker is obtained. The marker with the maximum confidence is used to determine the target location. Experimental results show that the algorithm can greatly improve the robustness and accuracy of tracking during occlusion or target features missing.

摘要: 针对视觉目标跟踪与定位中,目标因为无特征或被严重遮挡导致无法定位的问题,设计了一种基于邻近目标置信度评估的视觉目标跟踪与定位算法。在跟踪过程中,通过检测提取邻近目标的标记特征,然后结合每个特征标记的汉明距离和相对其他标记的归一化结果以及每个标记发生的概率,得到每个标记最终置信度,选择置信度最大的邻近标记来确定目标位置。实验结果表明,该算法在对目标存在遮挡或目标没有特征的情况可以大大提高跟踪的鲁棒性和准确性。

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作者: 陈颖; 荆树旭; 石剑; 陈彦云; 柳有权; 张彩荣

标题: Layered Oil Painting Stylization with Multi-Scale Brushes

标题: 基于多尺度笔刷的分层油画风格化

来源出版物: 计算机辅助设计与图形学学报 卷: 32 期: 4 页: 575-581 出版年: 2020

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文献类型: Article

作者关键词: non-photorealistic rendering; oil painting stylization; tangential orientation field; brush stroke

作者关键词: 非真实感渲染; 油画风格化; 切线方向场; 笔刷流线

摘要: Image based oil painting stylization is a popular research topic in the domain of non-photorealistic rendering. In this paper, we propose a novel layered oil painting stylization

algorithm which applies multi- scale brushes to improve the quality of oil painting stylization. Considering the real painting procedure of artists, we adopt multi-scale brushes to obtain oil painting effects by successively combining layers where brushes of large scales to small ones are employed. In each layer, we use incremental Voronoi sequence and image tangent orientation field to create brush lines. Stylized oil painting brush strokes are synthesized by texture mapping according to brush shape and brush height field. Our method can simulate the painting procedure of artists. Compared with existing methods, better oil painting results are achieved where both structures from input images and details from synthesized brushes are exhibited.

摘要: 基于图像的油画风格化绘制是计算机图形学领域非真实感绘制研究的热点之一.为了进一步提高图像油画风格化的质量,提出了一种基于多尺度笔刷的分层图像油画风格化绘制算法.该算法模拟艺术家的油画绘制过程,采用不同尺度的笔刷按照从粗到细的顺序逐层绘制.在每层笔刷绘制中,首先使用增量 Voronoi 序列采样点和图像切线方向场确定笔刷流线,然后结合笔刷形状与笔刷高度场进行纹理贴图,得到最终的图像油画风格化绘制结果.通过与现有算法比较,文中算法不仅能模拟真实的油画绘制过程,而且生成的油画效果层次感更强,充分体现了图像的结构特征和油画细节.

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作者: Wu Huayue; Zhao Xiangmo

作者: 吴骅跃; 赵祥模

标题: Multi-interference Lane Recognition Based on IPM and Edge Image Filtering

标题: 基于 IPM 和边缘图像过滤的多干扰车道线检测

来源出版物: 中国公路学报 卷: 33 期: 5 页: 153-164 出版年: 2020

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来源出版物: China Journal of Highway and Transport 卷: 33 期: 5 页: 153-164 出版年: 2020

文献号: 1001-7372(2020)33:5<153:JYIHB>2.0.TX;2-J

文献类型: Article

作者关键词: traffic engineering; multi-interference lane recognition; adaptive lane edge extraction; filtering of non-lane interference

作者关键词: 交通工程; 多干扰车道线检测; 自适应车道线边缘提取; 非车道线干扰过滤

摘要: In visual-based environment perception for autopilots, shadows, stains, water, and reflected light could interfere with lane recognition and navigation. In this paper, an improved lane recognition algorithm based on inverse perspective mapping (IPM) and edge image filtering was proposed to solve this issue. An aerial image of the original road scene could be obtained through IPM, which would significantly enhance the visual characteristics of the lane and reduce interference. An iterative clustering segmentation method was proposed to analyze the gray values of the IPM gray image, and the gray points closest to the color and morphological features of the lane were retained as the lane edge in the IPM image. Subsequently, a method that could search and determine the statistic of continuous edge regions was developed to segment the edge image. Filtering the interference factors was achieved by analyzing the edge points and retaining the longest regions. In comparison with other commonly used lane detection algorithms, the result indicates that our method can more effectively filter all kinds of interference factors on the road and enhance the ability to detect fuzzy, real, virtual, and curved lanes under an environment with interference. This significantly improves the ability to keep to a lane under an autopilot environment. Because of this, lane recognition speed is greatly improved, which can meet the real-time requirements autopilots.

摘要: 在基于视觉的自动驾驶环境感知中,路面阴影、雨水、污渍和反光会对车道线识别和车辆导航造成干扰,针对此问题提出了一种基于逆投影映射(IPM)和边缘图像过滤的改进车道线识别方法。通过逆投影方法可以得到原始道路图像的鸟瞰图像,很大程度上增强了车道线的视觉特性并减少了干扰。同时提出迭代聚类分割方法对 IPM 图像中的灰度值进行分析,并保留与车道线颜色和形态特征最为接近的灰度点作为车道线边缘。随后提出一种搜索统计边缘图像中连续边缘区域的方法,通过分析边缘点并保留最长区域实现过滤道路干扰因素的目的。最后将该算法与其他常用车道线检测算法进行对比。研究结果表明:该方法可以更好地过滤路面各种干扰因素,有效增强干扰环境下识别模糊车道线、实车道线、虚车道线、弯车道线的能力,大幅提高了自动驾驶环境中的车道保持能力,并且由于该方法相比其他方法能够更加有效地去除路面干扰区域,因此识别车道线的速度得到大幅提高,可以满足自动驾驶对于实时性的要求。

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作者: 裴莉莉; 孙朝云; 户媛姣; 李伟; 高尧; 郝雪丽

标题: Neural Network Model for Road Aggregate Size Calculation Based on Multiple Features

标题: 基于多特征因子的路用集料粒径计算神经网络模型

来源出版物: 华南理工大学学报. 自然科学版 卷: 48 期: 6 页: 77-86 出版年: 2020

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文献类型: Article

作者关键词: aggregate size; multiple feature factor; geometric feature; correlation analysis; virtual screening; multi-layer perceptron neural network

作者关键词: 集料粒径; 多特征因子; 几何特征; 相关性分析; 虚拟筛分; 多层感知机神经网络

摘要: In the process of road construction and maintenance, the efficient and accurate measurement of aggregate gradation in asphalt mixture is an important factor to ensure the stability of mixture skeleton structure and construction quality. Considering the methods based on a single geometric model can not meet the requirements of particle size calculation accuracy in construction practice, a neural network model for road aggregate size calculation based on multiple features was proposed. Firstly, geometric features were extracted from the collected aggregate particle images, and the extracted feature data were cleaned and normalized to establish the sample data set. Secondly, the characteristic factors with strong correlation with aggregate particle size were extracted by correlation analysis. Finally, multi-layer perceptron (MLP) neural network was constructed to train the data set, and the important characteristics weight representing aggregate particle size was obtained by the sensitivity analysis. Thus the particle size of coarse aggregate can be accurately calculated. The results show that the aggregate particle size calculation method proposed in this paper has a higher fitting accuracy ($R^2=0.91$) than the results measured by the traditional geometric models such as secondary moment and equivalent ellipse. It not only improves the accuracy obviously, but also realizes fast virtual screening and significantly improves the subsequent screening efficiency.

摘要: 在道路施工及养护过程中, 高效、准确地测量沥青混合料中的集料级配是保证混合料骨架结构稳定及施工质量的重要环节。针对基于单一几何模型应用在粗集料颗粒分档时, 存在

粒径计算不准确、无法满足施工要求的问题,文中提出一种基于多特征因子的路用集料粒径计算神经网络模型,实现对集料颗粒粒径的准确计算。首先,对采集到的集料颗粒图像进行几何特征提取,并对提取到的特征数据进行数据清洗和归一化等处理,建立样本数据集;然后通过相关性分析,提取出与集料粒径相关性较强的特征因子;最后,构建多层感知机(MLP)神经网络模型对数据集进行训练,并采用敏感性分析得到用于表征集料粒径的重要特征权重,实现对集料粒径的准确计算。结果表明,文中提出的集料粒径计算方法与卡尺法测量的结果拟合精度较高(相关系数 $R^2 = 0.91$),与二阶矩、等效椭圆等传统几何模型方法相比不仅明显提高了精度,而且可以实现快速虚拟筛分,显著提升后续的筛分效率。

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标题: Survey of Vehicle Recognition Methods Based on 3d Object Detection in Monocular Scene

标题: 单目视觉下基于三维目标检测的车型识别方法综述

来源出版物: 小型微型计算机系统 卷: 41 期: 6 页: 1274-1280 出版年: 2020

文献号: 1000-1220(2020)41:6<1274:SMSJXJ>2.0.TX;2-Q

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文献类型: Review

作者关键词: intelligent transportation; vehicle type recognition; coarse-grained recognition; fine-grained recognition; 3d object detection; monocular camera

作者关键词: 智能交通; 车型识别; 粗粒度识别; 细粒度识别; 三维目标检测; 单目相机

摘要: In recent years, vehicle type recognition has received extensive attention in the field of driverless and intelligent transportation. As vehicle recognition methods based on 3d object detection in monocular scene are not systematic enough, the research status and specific methods of the vehicle recognition problem based on 3d object detection are summarized and discussed. First of all, the vehicle recognition problem based on 3d object detection can be divided into two major categories: coarse-grained recognition and fine-grained recognition. Then, the development process of each type of problem according to the different categories are reviewed respectively, focusing on the core idea of the algorithms in each type of problems and the advantages and disadvantages of these algorithms. Some of the frequently-used public datasets and their characteristics are introduced. Finally, the existing problems and possible development prospects in the future of the vehicle recognition based on 3d object detection are discussed.

摘要: 近年来, 车辆三维检测在无人驾驶及智能交通等领域得到了广泛的关注. 但当前基于单目视觉的车辆三维检测车型识别方法并没有完善的总结, 因此本文对该类方法进行了综述探讨. 首先, 将基于三维目标检测的车型识别问题分为粗粒度识别和细粒度识别两大类, 接着根据不同的类别分别回顾了每类问题的发展历程, 重点阐述了每类问题中代表性算法的核心思想及优缺点, 然后介绍了两类问题中一些常用的公开数据集并且对它们的特点进行了对比, 最后讨论了基于三维目标检测的车型识别目前还存在的一些问题和未来的发展前景.

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标题: Texture Depth Measured Method of Pavement Based on Static and Dynamic Anti-Sliding Characteristics

标题: 基于静态抗滑特性的路面构造深度测量算法

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作者关键词: asphalt pavement; laser vision; B-spline; friction coefficient; texture depth

作者关键词: 沥青路面; 激光视觉; B 样条; 摩擦系数; 构造深度

摘要: The slippery surface of asphalt pavement is one of the leading major causes of traffic accidents. The mean texture depth (MTD) reflects the performance of skid resistance using a static texture of the pavement, while the friction coefficient reflects it through dynamic friction motion. Aimed to eliminate the difference between aforementioned two factors, a novel measurement method was proposed for effective texture depth. The point cloud data obtained by laser vision technology was studied. Firstly, B-spline was employed to interpolate the break-point of cloud data. Secondly, the concave points were removed according to the geometrical construction and anti-sliding mechanism of contact friction between the tire and road surface. Finally, the correlation between the MTD estimated by cross section method and data measured by the friction coefficient tester was analyzed. The results show that both the transverse and longitudinal MTD based on the proposed model could achieve stronger correlations with friction coefficient, compared with the traditional sand patch test. Their correlation values are 0.896 and 0.887, respectively, which are better than 0.504 of the sand patch test. The proposed method can implicitly reflect the dynamic friction coefficient through the static texture depth, and take full advantage of the high efficiency of the laser vision measurement and the objectivity of the friction coefficient, thereby achieve the desired balance of accuracy and efficiency.

摘要: 路面湿滑是诱发交通事故的重要因素,为了解决构造深度和摩擦系数分别从路面静态纹理和动态摩擦运动角度方面反映路面抗滑性时存在的 inconsistency 问题,基于激光视觉测量方法得到沥青路面点云数据,提出一种有效构造深度测量算法;首先利用 B 样条对点云数据进行断点插值,在研究轮胎和路面接触摩擦的几何结构和抗滑机理的基础上,修正路表凹陷点数据;采用断面法估算构造深度,并和摩擦系数测试仪所得的数据进行相关性分析.研究表明:本算法得到的横向和纵向平均构造深度与摩擦系数的相关系数分别为 0.896 和 0.887,优于铺砂法的 0.504;该方法能通过静态的构造深度隐性地反映动态的摩擦系数,兼具激光视觉测量方法的高效率和摩擦系数刻画抗滑性能的客观性,达到效率和精度的统一.

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标题: Information hiding algorithm based on redundant map of 3D model

标题: 一种基于三维模型冗余贴图的信息隐藏技术

来源出版物: 计算机应用研究 卷: 37 期: 2 页: 510-513,525 出版年: 2020

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文献类型: Article

作者关键词: information hiding; quaternion wavelet transform; secret OBJ model; MTL file

作者关键词: 信息隐藏; 四元数小波变换; 含密 OBJ 模型; MTL 文件

摘要: Aiming at the shortcomings of the traditional 3D model information hiding technology, this paper proposed a novel algorithm based on OBJ 3D model redundant texture. First, it verified the feasibility of the texture mapping rule of the orthogonal projection to perform the patch map. Second, it constructed the model quaternion wavelet transform space with surface color attributes, and selected the key information to be transmitted for encryption. Last, it embedded the secret message into the robust transform space to generate the secret OBJ model, and saved the texture and state information into MTL. Additionally, it performed the encrypted model file encryption process by RSA programming means. Simulation experiments show that the proposed algorithm has strong anti-attack capability in special rendering environment compared with 3D model watermarking and steganography without surface mapping properties.

摘要: 针对传统三维模型信息隐藏技术鲁棒性不强的缺点,提出了一种基于三维模型冗余贴图的信息隐藏算法。首先,对正交投影纹理映射规则进行面片贴图的可行性进行验证;其次,构造带有表面颜色属性的四元数小波变换空间并选取传输的关键信息进行加密;最后,将隐秘消息嵌入鲁棒空间后生成含密 OBJ 模型,贴图纹理与状态信息保存至 MTL 文件中,以 RSA 编程手段进行含密模型文件加密处理。仿真实验表明,与不含表面贴图属性的三维模型水印以及隐写方法相比,该算法在特殊渲染环境下具备较强的抗攻击能力。

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标题: End-to-end Autonomous Driving-behavior Decision Model Based on MM-STConv

标题: 基于 MM-STConv 的端到端自动驾驶行为决策模型

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文献类型: Article

作者关键词: traffic engineering; autonomous driving model; behavior decision; spatial-temporal convolution; multitask; multimodal

作者关键词: 交通工程; 自动驾驶模型; 行为决策; 时空卷积; 多任务; 多模态

摘要: Prediction inaccuracy is caused by the single-input data type of the existing end-to-end autonomous driving model. To solve this problem, RGB images, depth images, and vehicle historical continuous motion state sequences were selected as multi-modal inputs, and semantic information

was utilized simultaneously to construct a multimodal multitask of spatial-temporal convolution (MM-STConv) end-to-end behavior decision model based on spatial-temporal convolution. This model obtained the multi-task prediction parameters of speed and steering. First, the spatial features of the scene were extracted through convolutional neural networks with different complexities, and the spatial feature extraction sub-network was constructed to accurately analyze the scene target spatial features and semantic information. Second, an LSTM encoder-decoder architecture was used to capture the temporal context features of the scene, and the temporal feature extraction sub-network was constructed to understand and memorize the scene temporal series information. Finally, a multi-task prediction sub-network was constructed with the hard-parameter sharing method, which outputs predicted values of speed and steering angle to predict vehicle behavior. In this study, virtual scene data were collected based on the AirSim autonomous driving simulation platform, and images of 98,200 virtual frames and the corresponding vehicle speed and steering angle labels were used as training sets. After 10,000 training cycles and 6 h of training time, a real driving-scene data set (BDD100K) was employed for testing and validation of the proposed model. The experimental results show that the training error of the MM-STConv model is 0.130 5, the prediction accuracy reaches 83.6%, and the prediction effect is better in a variety of real driving scenarios. Compared with other state-of-the-art existing models, the proposed model integrates scene spatial information and temporal series information, and has obvious advantages in predicting vehicle speed and steering angle, which can improve the prediction accuracy, stability, and generalization ability of the model.

摘要: 针对现有端到端自动驾驶模型输入数据类型单一导致预测精确度低的问题,选取 RGB 图像、深度图像和车辆历史连续运动状态序列作为多模态输入,并利用语义信息构建一种基于时空卷积的多模态多任务 (Multimodal Multitask of Spatial-temporal Convolution, MM-STConv) 端到端自动驾驶行为决策模型,得到速度和转向多任务预测参量。首先,通过不同复杂度的卷积神经网络提取场景空间位置特征,构建空间特征提取子网络,准确解析场景目标空间特征及语义信息;其次,通过长短期记忆网络 (LSTM) 编码-解码结构捕捉场景时间上、下文特征,构建时间特征提取子网络,理解并记忆场景时间序列信息;最后,采用硬参数共享方式构建多任务预测子网络,输出速度和转向角的预测值,实现对车辆的行为预测。基于 AirSim 自动驾驶仿真平台采集虚拟场景数据,以 98 200 帧虚拟图像及对应的车辆速度和转向角标签作为训练集,历经 10 000 次训练周期、6 h 训练时长后,利用真实驾驶场景数据集 BDD100K 进行模型的测试与验证工作。研究表明:MM-STConv 模型的训练误差为 0.130 5,预测精确度达到 83.6%,在多种真实驾驶场景中预测效果较好;与现有其他主流模型相比,该模型综合场景空间信息与时间序列信息,在预测车辆速度和转向角方面具有明显的优势,可提升模型的预测精度、稳定性和泛化能力。

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作者: 孔方方; 宋蓓蓓

标题: Improved YOLOv3 Panoramic Traffic Monitoring Target Detection

标题: 改进 YOLOv3 的全景交通监控目标检测

来源出版物: 计算机工程与应用 卷: 56 期: 8 页: 20-25 出版年: 2020

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作者关键词: K-means; target detection; panoramic traffic monitoring; K-means; feature fusion; convolutional neural network

作者关键词: 目标检测; 全景交通监控; 特征融合; 卷积神经网络

摘要: Aiming at the complex traffic scenes, vehicles and pedestrians, and the large scale changes, an improved YOLOv3 panoramic traffic monitoring multi-target detection method is proposed. Firstly, based on the YOLOv3 network, four detection scales are designed with consideration of the size and scale target characteristics, and multi-scale feature fusion processing is performed. Then K-means clustering method is used to cluster the labeling target box in the dataset, and the width and height of optimized clustering anchor box are selected as the initial candidate box. The panoramic traffic monitoring targets include five categories: large vehicle, small vehicle, motorcycles, bicycles and pedestrians. The average accuracy and recall rate of target detection on the test set reaches 84.49% and 97.18%, respectively, which is 7.76% and 4.89% higher than the original YOLOv3. The processing speed can meet the real-time detection requirements in traffic scenarios.

摘要: 针对城市交通场景复杂、车辆及行人等目标多且尺度变化大等特点, 提出一种改进的 YOLOv3 全景交通监控多目标检测方法。以 YOLOv3 网络为基础, 兼顾大小尺度目标特性设计 4 个检测尺度, 并进行多尺度特征融合处理。利用 K-means 聚类方法对数据集中的标注目标框进行聚类分析, 选取优化的聚类锚点框宽高维度作为改进 YOLOv3 网络的初始候选框。全景交通监控检测目标包括大型汽车、小型汽车、骑行摩托车、骑行自行车和行人 5 类。在

测试集上目标检测平均精度和召回率分别达到 84.49%和 97.18%,较原始 YOLOv3 分别提高了 7.76%和 4.89%,处理速度可满足交通场景下实时性检测要求。

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作者: 李俊彦; 宋焕生; 张朝阳; 侯景严; 武非凡

标题: Multi-Object Vehicle Tracking and Trajectory Optimization Based on Video

标题: 基于视频的多目标车辆跟踪及轨迹优化

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文献类型: Article

作者关键词: multi-object tracking; object association; trajectory optimization; Savitzky-Golay filter

作者关键词: 多目标跟踪; 目标关联; 轨迹优化; Savitzky-Golay 滤波器

摘要: In order to obtain the movement trajectory of the vehicle in the traffic video and provide the dynamic traffic information of the road, a long-term multi-object vehicle tracking algorithm based on the combination of Yolo3 object detection and KCF object prediction, associated historical trajectory prediction results and detection results is proposed. For the non-smooth phenomenon of vehicle trajectory acquired by machine vision, the original vehicle trajectory is smoothed and optimized by Savitzky-Golay filter. Before and after optimization of vehicle trajectory in the test scenes, the optimized trajectory improves the trajectory smoothness under the premise of retaining original vehicle motion characteristics, and the dynamic traffic information provided can better reflect real motion condition of vehicle.

摘要: 为了获取交通视频中车辆的运动轨迹, 提供道路动态交通信息, 提出一种基于 Yolo3 目标检测和 KCF 目标预测相结合, 关联历史轨迹预测结果和检测结果的长时间多目标车辆跟踪算法; 对采用机器视觉获取的车辆轨迹非平滑现象, 提出通过 Savitzky-Golay 滤波器对原始的车辆轨迹进行平滑优化。对比测试场景中车辆轨迹优化前后, 优化后的轨迹在保留原有车辆

运动特征的前提下,改善了轨迹平滑性,提供的动态交通信息更能反映车辆真实运动状况。

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作者: 陈卫卫; 王卫星; 李润青; 蔡晓琰; 郑思凡

标题: Linear object extraction based on hydrodynamics, fractional differential and Steger algorithm

标题: 基于水动力学、分数阶微分及 Steger 算法的线状目标提取

来源出版物: 中国图象图形学报 卷: 25 期: 7 页: 1436-1446 出版年: 2020

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作者关键词: Steger; linear object; crack; fractional differential; Steger; hydrodynamics

作者关键词: 线状目标; 裂缝; 分数阶微分; 水动力学

摘要: Objective In all the 2D image segmentation, the objects in an image can be generally classified into area objects and linear objects. The two kinds of object extraction or detection are different, comparing to area object extraction, since the linear object is more elongated, discontinuous based algorithms may be more suitable to use, but vague or tiny edges can be easily lost, which will make the under-segmentation problem. The linear target detection has a

very wide range of applications, such as lane line detection in transportation, road extraction in aerial images and remote sensing images, rock fracture analysis in rock engineering, and cement cracks and asphalt cracks in building and road construction applications. In all the linear object extraction or identification applications, the crack detection in an image is one of the most difficult linear object detection. In order to avoid having the difficulty for extracting linear objects directly and accurately, and to solve the problem of crack image segmentation, a new image segmentation algorithm for tracking crack central line is proposed. Method The new algorithm includes three aspects, namely, 1) After image smoothing using a Gaussian filter, an improved fractional differential function is applied to enhance small and vague cracks. This function has nonzero coefficient compared with traditional Tiansi template, indicating that every neighboring pixel of the testing pixel is used for the central feature point detection; 2) Based on that a crack can be regarded as a river /creep, the crack is of a V shape, and the central line in a crack or river is the deep water line, hence, we try to detect the central lines of cracks. The pixels in the central line are called the feature points in this paper. The feature point extraction of crack central lines is based on Steger algorithm and crack image characteristics, where a 1D curve is extended to a 2D ridge or valley line. Then these structures are modeled using a 1D curve, and the feature point is in the direction when it is a curve feature point: the first derivative is zero, the second derivative takes the extreme value, and the feature points are extracted; 3) Considering the distance between the feature points, short gaps between the neighboring segments or points are connected by a line, and long gaps are filled in an optimal routine based on the basis of the gap length and segment angles. We consider that the extraction of cracks in an image is equivalent that a blind man go to find out rivers /creeks on a silt, he will be first step by step to check if there is a deep water point in his current local area, then mark these points and judge which points belong to the same river /creek, finally makes point connection. We assume that a rough and slender crack in a pavement image is a creek or river filled by water, and the boundary of the crack is the side wall. When the feature points of the crack are obtained, the remaining tasks are to connect adjacent feature points and fill crack central line gaps using the idea of water flow-hydrodynamic theory. Result We selected 300 pavement crack and 300 other linear object images in the experiments. Compared with the other four similar traditional algorithms, such as distance transformation, maximum entropy, Otsu, Canny and valley edge detection image segmentation algorithms, the proposed algorithm produces less gaps on the central lines of linear objects or cracks and has less over-segmentation and under-segmentation problems. Conclusion The proposed algorithm can be used in complex linear object and rough pavement crack images because it can rapidly and accurately extract the central line and overcome the existing image segmentation problems for linear object images.

摘要: 目的线状目标的检测具有非常广泛的应用领域,如车道线、道路及裂缝的检测等,而裂缝是其中最难检测的线状目标。为避免直接提取线状目标时图像分割难的问题,以裂缝和车道线为例,提出了一种新的跟踪线状目标中线的算法。方法对图像进行高斯平滑,用一种新的分数阶微分模板增强图像中的模糊及微细线状目标;基于 Steger 算法提出一种提取线状目标中心线特征点的算法,避免了提取整体目标的困难;根据水动力学思想将裂隙看成溪流,通过最大熵阈值处理后,先进行特征点的连接,再基于线段之间的距离及夹角进行线段之间的连接(溪流之间的融合)。结果对 300 幅裂缝图像及 4 种类别的其他线状目标图像进行试验,并与距离变换、最大熵阈值法+细线化 Otsu 阈值分割+细线化、谷底边界检测等类似算法进行比较分析,本文算法检测出的线状目标的连续性好、漏检(大间隙少)和误检(毛刺及多余线段少)率

均较低。结论本文算法能够在复杂的线状目标图像中准确快速地提取目标的中心线,一定程度上改善了复杂线状目标图像分割难的问题。

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第 36 条, 共 36 条

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标题: Research on Performance Test of DSRC and LTE-V in Closed Test Field

标题: 基于封闭测试场的 DSRC 与 LTE-V 通信性能测试研究

来源出版物: 汽车技术 期: 9 页: 14-20 出版年: 2020

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作 者 关 键 词 : LTE-V; IOVs; Communication performance; DSRC; LTE-V; Testing and assessment

作者关键词: 车联网; 通信性能; 专用短程通信技术; 测试评价

摘 要 : According to the performance test requirements of DSRC and LTE-V technology, 5 scenarios under static and dynamic conditions are set up in the closed test field. A modular test platform is constructed for intelligent and connected transportation, a system and method is designed to test the communication performance. The impacts of communication distance, shield and driving speed on the performance of DSRC and LTE-V are compared and analyzed in the test, with packet delivery rate and delay as evaluation criteria. It is found that the communication

distance and shelter are important factors affecting communication performance of DSRC and LTE-V, and LTE-V has a wider communication range and more reliable performance in the same range than DSRC; vehicle speed has less impact on the communication performance, LTE-V experiences a sudden increase in time delay when 2 vehicles are close in distance and DSRC performs better in the high-speed scenario.

摘要: 针对专用短程通信(DSRC)和 LTE-V 技术的性能测试需求,在封闭测试场搭建了静态、动态条件下的 5 种场景,构建了面向智能网联交通应用的模块化测试平台,并设计了一种通信性能测试系统及方法,以数据包投递率和时延为评价指标,通过测试对比分析了通信距离、遮蔽物、车速等因素对 DSRC 和 LTE-V 通信性能的影响。结果表明:通信距离和遮蔽物是影响 DSRC 与 LTE-V 通信性能的重要因素,但 LTE-V 较 DSRC 有更广的通信范围,在同一范围内有更可靠的性能;车速对二者通信性能影响较小,但在高速场景下,两车距离较近时,LTE-V 出现时延突增现象,DSRC 较 LTE-V 有更佳的性能。

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电子与控制工程学院

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标题: Design of a Global-Value Perceptual Neuron Based on Memristor

标题: 一种基于忆阻器的全域值感知神经元设计

来源出版物: 传感技术学报 卷: 33 期: 9 页: 1299-1304 出版年: 2020

文献号: 1004-1699(2020)33:9<1299:YZJYYZ>2.0.TX;2-6

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文献类型: Article

作者关键词: perceptual neuron; global value; memristor; bridge structure

作者关键词: 感知神经元; 全域值; 忆阻器; 桥式结构

摘要: Based on the resistance variability and non-volatility of the memristor, a design scheme for perceptual neuron with weights that can be adjusted within global value is proposed. The perceptual neuron is composed of a global-value memristive weight module, an input weighting module, an information fusion module, a mapping output module and a feedback control module. By controlling the input voltage of the memristive bridge structure in the global-value memristive weight module, the weight voltage signal changes linearly or remains unchanged, so as to meet the requirements of perceptual neuron training and testing. Through a specific global-value perceptual neuron based on memristor, it is verified that the neuron can realize adjustment of weight within global value. The logic OR operation experiment further verified the function of the global-value perceptual neuron based on the memristor.

摘要: 基于忆阻器的阻值可变性和非易失性,提出了一种基于忆阻器的全域值感知神经元设计方案。该全域值感知神经元由全域值忆阻权重模块、输入加权模块、信息融合模块、映射输出模块和反馈控制模块构成。控制全域值忆阻权重模块中忆阻桥式结构的输入电压,权值电压信号线性变化或保持不变,进而能够满足感知神经元训练、测试等的要求。通过一个具体的基于忆阻器的全域值感知神经元,验证了感知神经元可以实现权值的全域值调节。通过逻辑或运算实验,进一步验证了基于忆阻器的全域值感知神经元的功能。

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标题: Traffic Flow Data Imputation Method Based on Symmetrical Residual U-Net

标题: 基于对称残差 U 型网络的路网交通流量数据修复

来源出版物: 交通运输系统工程与信息 卷: 20 期: 5 页: 93-99 出版年: 2020

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作者关键词: intelligent transportation; traffic data recovery; residual U-Net; large-scale road network; residual learning

作者关键词: 智能交通; 交通数据修复; 残差 U 型网络; 大规模路网; 残差学习

摘要: A large-scale road network traffic flow data imputation method based on the symmetrical Residual UNet(RU-Net)model is proposed for the traffic flow data missing caused by the scarcity or failure of traffic data collectors in the process of road network traffic data collection.By gridding the traffic flow data and channelizing the timing,then forming the tensor data format for convolution operation,this method uses the coding and decoding ability of RU-Net to encode the traffic flow data,and keeps the distortion small in the decoding process,to learn the internal multi-factor coupling characteristics of the traffic flow data.Residual learning can improve the signal-to-noise ratio of traffic flow data after coding,reduce the compression rate,and further improve the repair accuracy.Experimental results show that the RU-Net model can effectively repair the large-scale network traffic flow data under different data missing rates and different missing patterns by mapping relationship between the traffic flow characteristics learning history,non-fault collectors' data,and the data to be repaired.

摘要: 针对路网交通数据采集过程中,采集设备稀缺或故障等原因造成路网交通流量数据缺失问题,提出基于对称残差 U 型网络(Residual U-Net,RU-Net)模型的大规模路网交通流量数据修复方法.通过将路网交通流量数据网格化和时序通道化操作,构成可供卷积操作的张量数据格式;利用 RU-Net 编码解码能力,对交通流量数据进行编码;在解码过程中保持失真度较小,使模型学习到交通流量数据内部多因素耦合特性.通过残差学习使交通流量数据编码后的信噪比提升,压缩率降低,提升模型修复精度.实验结果表明,RU-Net 模型能够利用交通流量特性学习历史和非故障采集点数据与待修复数据的映射关系,在不同数据缺失率,不同缺失模式下,高效地完成对大规模路网交通流量数据的修复.

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标题: Hybrid Iterative K-Means Clustering with Improved Moth-Flame Optimization

标题: 引入改进飞蛾扑火的 K 均值交叉迭代聚类算法

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文献类型: Article

作者关键词: moth-flame optimization; cluster center; K-means clustering; average distance category; maximum and minimum distance product

作者关键词: 飞蛾扑火算法; 聚类中心; K 均值聚类; 类内平均距离; 最大最小距离积法

摘要: A new K-means clustering algorithm with improved moth-flame optimization is proposed to solve the problem that the current K-means clustering(KMC)algorithm has great randomness in selecting the initial clustering center,poor global search ability and low clustering accuracy.The maximum and minimum distance function is adopted to initialize the clustering center to avoid the problem that KMC algorithm is sensitive to the random initial clustering center.Then the moth-flame optimization is improved by spline interpolation to heighten the convergence rate and optimization accuracy.The average distance category is taken as the fitness function to guide interpolation moth-flame optimization to optimize the clustering center in the process of KMC iteration so as to improve the clustering accuracy.Compared with KMC algorithm,K-means++ algorithm and fuzzy c-means clustering algorithm on the international standard data sets Iris,Wine and Seeds,the experimental results show that the IMFO-KMC algorithm achieves the most significant improvement on the Iris data set.Compared with the other algorithms,the accuracy of IMFO-KMC algorithm is improved by 0.67%-4.18%,and the normalized mutual information is improved by 1.5%-4.01%.

摘要: 针对现有 K 均值聚类(KMC)算法在选取初始聚类中心时随机性较大、全局搜索能力差、聚类精度低等问题,提出了一种引入改进飞蛾扑火的 K 均值交叉迭代聚类(IMFO-KMC)算法。利用最大最小距离积法初始化聚类中心,避免了 KMC 算法对随机初始聚类中心较为敏感的问题;利用样条插值预测的思想改进飞蛾扑火算法,提高了算法的收敛速度及寻优精度;以类内平均距离为适应度函数,引导插值扑火算法优化 KMC 迭代过程中的聚类中心,提高了聚类精度。将 IMFOKMC 与 KMC、K-means++算法、模糊 c 均值聚类算法在国际标准数据

集 Iris、Wine 和 Seeds 上进行了实验对比,结果表明:IMFO-KMC 算法在 Iris 数据集上的性能提升最为明显,相比其他算法准确率提高了 0.67%~4.18%,标准化互信息提高了 1.5%~4.01%。

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作者: 李刚; 张宇博; 孙姜燕; 申丹

标题: Improved convolutional network target tracking algorithm

标题: 改进的卷积网络目标跟踪算法

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文献类型: Article

作者关键词: target tracking; convolution network; deep learning

作者关键词: 目标跟踪; 卷积网络; 深度学习

摘要: Deep networks have been successfully applied to visual tracking by training large numbers of images offline. However, the offline training is time-consuming and the learned vast representation may be less discriminative for tracking specific objects. In this article, although without training deal auxiliary data, simple two-layer convolutional networks can be powerful enough to learn robust representation for visual tracking. In the first frame, this algorithm extracted

a set of normalized patches from the target region as fixed filters, which integrated a series of adaptive filters surrounding the target to define a set of feature maps by extracting the normalized samples of the subsequent frames of convolution operation. Furthermore, all the maps together form a global representation, via which the inner geometric layout of the target was also preserved. A simple soft shrinkage method that suppresses noisy values below an adaptive threshold is employed to de-noise the global representation. The convolution networks have a lightweight structure that is good for methods on the recent tracking benchmark data set with multiple videos.

摘要: 在目标跟踪算法中深度网络可以对大量图像进行训练和表示,但是对于特定的跟踪对象,离线训练不仅费时,而且在对大量图像进行学习时,其表示和识别能力效果不佳。基于以上问题提出有模板更新的卷积网络跟踪算法,可以在没有离线训练的大量数据时,也能够利用实现强大的目标跟踪能力。在目标跟踪中,从目标周围区域提取一组归一化的局部小区块作为新的滤波器,围绕目标定义下一帧中的一组特征映射来提取自适应滤波器周围目标,对随后帧提取的归一化样本进行卷积操作生成一组特征图;利用这些特征图获取每个滤波器和目标的局部强度衍射图样之间的相似性,然后对其局部结构信息进行编码;最后,使用来自全局表示的特征图保存该目标的内部几何设计,再通过软收缩方法去噪抑制噪声值,使其低于自适应阈值,生成目标的稀疏表示。有模板更新改进的 CNT 算法能稳定地跟踪目标,不会发生严重漂移,具有优于传统 CNT 的良好跟踪效果。

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第 5 条, 共 20 条

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作者: 梁华刚; 王亚茹; 张志伟

标题: Facial Expression Recognition Based on Res-Bi-LSTM

标题: 基于 Res-Bi-LSTM 的人脸表情识别

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文献类型: Article

作者关键词: Res-Bi-LSTM; facial expression recognition; Inception-w model; Res-Bi-LSTM; spatio-temporal features

作者关键词: 表情识别; Inception-w 模型; 时空特征

摘要: Facial expression recognition has widely application prospects in human-computer interaction, such as clinical medicine, safe driving. To solve the problem of low accuracy due to the inability of the LSTM network to effectively extract correlative information prior and post frames, the framework is proposed based on Bi-LSTM, while the theory of identity mapping residual is used to effectively prevent the gradient disappearance caused by network depth. Because the Inception-V3 network has too many parameters and easy over-fitting, proposed to add two Reduction modules to reduce the parameters, and then get the more generalized model of Inception-w. Finally, the designed model has been evaluated on two datasets, CK+ and Oulu-CASIA, and compared with state-of-the-art methods. The highest accuracy reaches 99.6%, which indicates that the proposed method has better recognition accuracy within a certain range.

摘要: 人脸表情识别在人机交互、临床医学、安全驾驶等方面有着广泛的应用前景。针对传统 LSTM 网络只能根据单向传播信息学习表情时序特征的局限,提出在双向传播的 Bi-LSTM 网络基础上,采用恒等映射残差理论有效防止易受网络深度引起的梯度消失问题。又因为提取空间特征的 Inception-V3 网络存在参数过多,容易过拟合等问题,提出添加两个 Reduction 模块减少参数,进而得到泛化性更好的 Inception-w 模型。最后对设计的模型在 CK+ 和 Oulu-CASIA 两个数据集上进行实验,并与现有方法进行对比。实验可得最高识别率为 99.6%,表明该方法在一定范围内具有较好的识别准确率。

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作者: Lei Xu; Li Li; Li Guangze; Wang Guiping

作者: 雷旭; 李立; 李光泽; 汪贵平

标题: Review of multilane traffic flow theory and application

标题: 多车道交通流理论与应用研究综述

来源出版物: 长安大学学报. 自然科学版 卷: 40 期: 4 页: 78-90 出版年: 2020

文献号: 1671-8879(2020)40:4<78:DCDJTL>2.0.TX;2-9

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文献类型: Review

作者关键词: traffic engineering; multi-lane traffic flow; review; theory and application; traffic capacity; traffic flow model; traffic control

作者关键词: 交通工程; 多车道交通流; 综述; 理论与应用; 通行能力; 交通流模型; 交通控制

摘要: In order to deeply understand the influence of multi-lane traffic flow characteristics on the efficient, safe and stable operation of road facilities, the theory and application of multi-lane traffic flow in recent years were reviewed, from the perspectives of theoretical research, technical development and engineering application. The quantitative indicators and their influence factors were introduced to measure the longitudinal passage capacity and transverse distribution of multi-lane traffic flow. The relationships between the indicators and the traffic flow characteristics were also revealed. The modeling methods and typical researches were summarized on microscopic, mesoscopic, and macroscopic multi-lane traffic flow. Moreover, the traditional and novel traffic control methods of multi-lane traffic flow were introduced, according to their intelligence levels. Based on the analysis and discussion of previous studies, future improvement directions were pointed out which cover the aspects of multi-lane traffic flow monitoring, modeling, and control. The results show that the research of this field will be carried out from the following aspects, study the multi-source driven traffic flow monitoring method, the traffic design should be proposed which can reduce traffic flow distribution unbalance, lane changing model should be improved by balancing its generality and specificity, the macroscopic traffic flow model should be able to model the influence of lane changing flow or random movements of individual vehicles in higher accuracy, the modeling methods of macroscopic, mesoscopic, and microscopic traffic flow should mutually share their merits, the research and application of traditional multi-lane traffic control methods, such as lane-scale traffic signal control and dynamic lane grouping, and the intelligent and networking technologies should be introduced in multi-lane traffic control to extend the study domain of this topic. 68 refs.

摘要: 为了深入了解多车道交通流特性对道路设施高效安全稳定运行的影响,从理论研究、技术发展和工程应用等角度回顾了近年来多车道交通流理论和应用研究。介绍衡量多车道交通流纵向通过能力和横向分布状况的量化指标及其影响因素,说明其与宏微观交通流特性的关系;从微观、中观和宏观 3 个层次阐述了多车道交通流建模方法和代表性研究;按照智能化等级分类,介绍了传统和新型多车道交通流控制技术。基于对现有研究的分析和讨论,从多车道交通流状态监测、模拟和控制等方面提出了此领域的未来发展方向。研究表明:该领域应从以下几方面开展研究,研究多源数据驱动的多车道交通流状态监测技术;提出减少交通分布不均衡的交通设计方法;合理平衡换道模型的通用性和个性化;提升考虑换道车流及个体车辆

随机运动的宏观交通流模型性能;开展微观、中观、宏观建模方法的借鉴和融合;加强车道级交通信号控制、动态车道分组等传统多车道交通控制技术的研究和应用;拓展智能网联背景下的多车道交通流控制理论和技术的研究范畴等。

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作者: Li Gang; Wang Chao; Han Depeng; Liu Qiangwei; Li Ying

作者: 李刚; 王超; 韩德鹏; 刘强伟; 李莹

标题: Study on Multimodal Image Genetic Data Based on Deep Principal Correlated Auto-encoders

标题: 基于深度主成分相关自编码器的多模态影像遗传数据研究

来源出版物: 计算机科学 卷: 47 期: 4 页: 60-66 出版年: 2020

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文献类型: Article

作者关键词: Image genomics; Deep principal correlated auto-encoders; Belief networks; Optimization algorithms; Correlation analysis

作者关键词: 影像基因组学; 深度主成分相关自编码器; 信念网络; 优化算法; 关联分析

摘要: Brain imaging phenotype and genetic mutation has become the important factors that affect complex diseases such as schizophrenia, researchers based on previous work in the pathogenesis of in-depth research have proposed many models based on deep neural network or regularization, typically involving either some form of norm or auto-encoders with a reconstruction objective, but the multi-modal data of those models tend to have the number of feature dimensions which more than that of samples. In order to solve the difficulties of high-dimensional data

analysis and overcome the limitations of deep canonical correlation analysis,a competent optimization algorithm is exploited to solve deep canonical correlation analysis (DCCA) with principal component analysis (PCA) on the multi-modal linear features learning and multi-layer belief network based on restricted Boltzmann machine (RBM) on multi-modal nonlinear features learning.The model,together with previous advanced model,has been applied to test and analyze the actual multi-modal data.Experiments show that the deep principal component correlation auto-encoders model has higher correlation and better classification performance than those previous model.In terms of classification accuracy,the classification accuracy of the two types of modal data is more than 90%.Compared with the CCA-based model with an average accuracy of about 65% and the DNN-based model with an average accuracy of about 80%,the classification effect of this model is significantly improved.In the experiment of clustering performance evaluation,the model further verified the significant classification effect of the model with average normalized mutual information of 93.75% and average classification error rate of 3.8%.In terms of maximum correlation analysis,on the premise that the output dimensions of top-level nodes are consistent,this model outperforms other advanced models with the maximum correlation of 0.926,showing excellent performance in high-dimensional data analysis.

摘要: 脑成像表型和基因变异已成为影响精神分裂症等复杂疾病的重要因素。研究人员根据以往在致病机理方面的深入研究,已经提出了很多基于深度神经网络或正则化的模型,这些模型通常包含某种形式的惩罚项或具有重建目标的自编码器结构,但其所使用的多模态数据的特征维数往往大于样本个数。为了应对高维数据分析的困难并突破深度典型关联分析的局限性,文中提出了一种由多模态线性特征学习的主成分分析和基于限制玻尔兹曼机的多模态非线性特征学习的多层信念网络组成的有效模型。该模型和先前的先进模型一起被应用在实际的多模态数据集上进行测试和分析。实验发现,与已有模型相比,深度主成分相关自编码器模型学习的特征具有更高的分类性能和更强的关联性。在分类精度方面,两类模态数据的分类精度均超过了 90%,相比平均精度在 65%左右的基于 CCA 的模型和平均精度在 80%左右的基于 DNN 的模型,该模型分类效果有了显著提高。在聚类性能评估的实验中,该模型以 93.75%的平均归一化互信息指标和 3.8%的平均分类错误率指标进一步验证了其优越的分类性能。在最大关联性分析方面,当顶层节点输出维度一致时,该模型以 0.926 的最大关联性胜于其他先进模型,在高维数据分析方面表现出了优异的性能。

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标题: Classification of schizophrenia based on deep canonically correlated sparse autoencoder

标题: 基于典型相关稀疏自编码器的精神分裂症的分类

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文献类型: Article

作者关键词: schizophrenia; single nucleotide polymorphism; functional magnetic resonance imaging; deep canonically correlated sparse autoencoder

作者关键词: 精神分裂症; 单核苷酸多态性; 功能性核磁共振成像; 典型相关稀疏自编码器

摘要: Imaging genetics has been widely used to aid the diagnosis and treatment of mental illnesses (e.g. schizophrenia), by combining magnetic resonance imaging of the brain and genomic information for a comprehensive and systematic analysis. Herein the joint analysis of single nucleotide polymorphism data and functional magnetic resonance imaging data is carried out for the comprehensive study on schizophrenia. Deep canonically correlated sparse autoencoder is proposed to explore the nonlinear relationships between two types of data and reduce dimensions, and then classify schizophrenia patients from healthy controls. The experimental results reveal that compared with other conventional models, deep canonically correlated sparse autoencoder model can achieve a higher classification accuracy.

摘要: 通过结合大脑核磁共振成像和基因组信息进行全面系统的分析,影像遗传学已被广泛用于帮助诊断和治疗精神疾病(例如精神分裂症)。本文采用单核苷酸多态性数据和功能性磁共振成像数据联合分析,提出深度典型相关稀疏自编码器模型,探索两类数据之间的非线性关联并进行降维,对精神分裂症患者和健康对照进行分类。最后,实验结果表明,使用深度典型相关稀疏自编码器模型比其他传统模型具有更高的分类准确性。

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作者: 李刚; 刘强伟; 万健; 马彪; 李莹

标题: A Novel Pavement Crack Detection Algorithm Using Interlaced Low-Rank Group Convolution Hybrid Deep Network Under a Complex Background

标题: 复杂背景下交错低秩组卷积混合深度网络的路面裂缝检测算法研究

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文献类型: Article

作者关键词: image processing; crack detection; low-rank group convolution; global average pooling; adaptive threshold; maximum crack width

作者关键词: 图像处理; 裂缝检测; 低秩组卷积; 全局平均池化; 自适应阈值; 裂缝最大宽度

摘要: Accurately extracting the crack characteristics using the traditional crack detection algorithm is challenging owing to the uneven light intensity, complex background, and significant noise interference of concrete pavement. Herein, to improve crack detection accuracy and reduce computational redundancy, a pavement crack detection algorithm was proposed that used an interlaced low-rank group convolution hybrid deep network combined with low-rank kernel and group convolution. First, crack image datasets were established using the overlapping sliding window clipping method. A robust classifier was generated on the training set to classify crack and no-crack images. Then, the adaptive threshold method was used to obtain a crack binary image with clear edge contours. Moreover, the central axis method was used to achieve the maximum width of the crack. The performance of the model was verified on the testing set. Experimental results show that the detection accuracy is 0.9726, thus showing an improvement over the traditional crack detection algorithm. Compared with the convolutional neural network and its variants, the proposed model involved a significantly reduced set of parameters. Images were processed at 14 frames per second, and good detection results were achieved on three public datasets. For crack widths greater than 2.5 mm, the relative error of the calculation is less than 0.02, which complies with practical engineering requirements.

摘要: 由于混凝土路面光照强度不均匀、背景复杂、噪声干扰大,传统的裂缝检测算法难以准

确提取其裂缝特征。为了在提高裂缝检测准确性的同时减少计算冗余,提出了一种将低秩核和组卷积结合的交错低秩组卷积混合深度网络的路面裂缝检测算法。首先利用重叠滑动窗口裁剪方法建立裂缝图像数据集,在训练集上生成一个具有较好鲁棒性的分类器,对裂缝及非裂缝图像进行分类,然后采用自适应阈值法得到边缘轮廓清晰的裂缝二值化图像,最后采用中轴线法求取裂缝最大宽度。在测试集上验证模型的性能,实验结果表明测试精度为 0.9726,效果优于经典的裂缝检测算法,而且相对于卷积神经网络及其变体大幅减少了模型参数,处理图像的速度达到了每秒 14 张,并且在三个公开数据集上都达到了较好的检测效果。在 2.5 mm 以上的裂缝宽度上,计算相对误差小于 0.02,较好地达到了工程实际要求。

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作者: 徐先峰; 张丽; 郎彬; 夏振

标题: Research on Inception Module Incorporated Siamese Convolutional Neural Networks to Realize Face Recognition

标题: 引入感知模型的改进孪生卷积神经网络实现人脸识别算法研究

来源出版物: 电子学报 卷: 48 期: 4 页: 643-647 出版年: 2020

文献号: 0372-2112(2020)48:4<643:YRGZMX>2.0.TX;2-A

来源出版物: Acta Electronica Sinica 卷: 48 期: 4 页: 643-647 出版年: 2020

文献号: 0372-2112(2020)48:4<643:YRGZMX>2.0.TX;2-A

文献类型: Article

作者关键词: face recognition; siamese convolutional neural networks; inception module; cyclical learning rate

作者关键词: 人脸识别; 孪生卷积神经网络; 感知模型; 循环学习率

摘要: To solve the problem of face recognition under unlimited conditions, a simple network structure named Inception Module Incorporated Siamese Convolutional Neural Networks(IMISCNN) was designed, which was suitable for small-scale data sets. On the basis of making full use of the Siamese structure to effectively reduce external interference and avoid over-fitting, inception module was incorporated to the Siamese network to extract richer features. Furthermore, a cyclical learning rate strategy was adopted to accelerate the convergence of the model. Simulation results on the CASIA-webface and Extended Yale B standard face database showed that the recognition accuracy of IMISCNN was significantly improved compared with other face recognition algorithms.

摘要: 针对非限定性条件下人脸识别困难问题, 设计了一种引入感知模型的改进孪生卷积神经网络结构(Inception Module Incorporated Siamese Convolutional Neural Networks, IMISCNN), 在充分利用孪生结构有效减少外界干扰并避免过拟合等优点的基础上, 为其增加感知模型实现更丰富特征的提取. 为寻找最优学习率引入了循环学习率策略, 加速模型收敛. 在 CASIA-webface 和 Extended Yale B 标准人脸数据库上的仿真实验表明, 所提 IMISCNN 算法提升了人脸识别精度.

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标题: Reference voltage vector adaptive correction strategy for multilevel converters

标题: 多电平变换器的一种参考电压矢量自校正策略

来源出版物: 电机与控制学报 卷: 24 期: 6 页: 72-80 出版年: 2020

文献号: 1007-449X(2020)24:6<72:DDPBHQ>2.0.TX;2-5

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文献号: 1007-449X(2020)24:6<72:DDPBHQ>2.0.TX;2-5

文献类型: Article

作者关键词: multilevel converters; T-type three-level; four-level; T-type five-level; PWM modulation; adaptive correction

作者关键词: 多电平变换器; T 型三电平; 四电平; T 型五电平; PWM 调制; 自校正

摘要: For multi-level converters, the usual circuit topologies include diode-clamped, flying capacitor, cascade H-bridge and t-type, etc. These topologies have many switching states, control objectives and nonlinear problems, causing deviation of the PWM modulation reference voltage vector instruction. Firstly, based on the T type three-level converters, in the vector space, according to the amplitude and position of the corresponding voltage vector, the paper summarized deviation calculation rules of the dead time voltage vector, and proposed an adaptive correction method of reference voltage vector instructions. Secondly, the four-level diode clamp topology and T-type five-level topology were taken as examples to analyze the application and effectiveness of this method in more level converters. The switch dead time effect was suppressed, and the pulse loss or saturation problems of the traditional PWM pulse shaping was solved. Further, by setting the relation function of voltage error, switching state and load current direction, the general correction formula of the method was obtained in this paper. The reference voltage vector instruction is improved and experimental results verify the effectiveness of the algorithm.

摘要: 对于多电平变换器而言, 常见的电路拓扑结构有二极管箝位型、飞跨电容型、级联 H 桥型和 T 型等, 这些拓扑都有着较多的开关状态、控制目标和非线性问题, 使得 PWM 调制的参考电压矢量指令出现偏差。本文首先从 T 型三电平变换器开始, 在矢量空间中, 总结死区时电压矢量偏差的计算规律, 根据相应电压矢量的位置和幅值, 得出了一种参考电压矢量指令的自适应校正方法。接着以四电平二极管箝位拓扑和 T 型五电平拓扑为例, 对这一方法的应用进行分析。该方法可抑制器件的死区效应, 并解决传统 PWM 脉冲整形时所出现的脉冲损失或饱和问题。本文通过设定电压误差与开关状态的关系函数, 进一步得出这一方法的广义校正通式, 实现了参考电压矢量指令的改良。实验结果验证了算法的有效性。

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作者: Li Guanghui; Duan Chendong; Wu Shan

作者: 李光辉; 段晨东; 武珊

标题: Fault Diagnosis of PV Array Based on Semi-supervised Machine Learning

标题: 基于半监督机器学习法的光伏阵列故障诊断

来源出版物: 电网技术 卷: 44 期: 5 页: 1908-1913 出版年: 2020

文献号: 1000-3673(2020)44:5<1908:JYBJDJ>2.0.TX;2-C

来源出版物: Power System Technology 卷: 44 期: 5 页: 1908-1913 出版年: 2020

文献号: 1000-3673(2020)44:5<1908:JYBJDJ>2.0.TX;2-C

文献类型: Article

作者关键词: photovoltaic array; fault detection; fault classification; SSML algorithm

作者关键词: 光伏阵列; 故障检测; 故障分类; 半监督机器学习算法

摘要: Because of PV's nonlinear characteristics, a variety of faults may be difficult to detect with conventional protection devices, leading to safety issues and fire hazards in PV fields. To fill this protection gap, a fault diagnosis model based on semi-supervised machine learning(SSML)algorithm is proposed. The model uses reference PV module to normalize PV array voltage and current. The SSML algorithm is used to analyze the state of the PV array operating point, thereby detecting the fault and identifying fault type. The fault diagnosis model requires only a small amount of label data easy to measure and is highly adaptable to environmental changes. Simulation and experimental results show effectiveness of the fault diagnosis model.

摘要: 由于光伏组件的非线性输出特性,传统故障保护装置难以检测到所有故障,从而导致光伏阵列出现安全问题和火灾危险。针对传统故障保护装置存在的缺陷问题,提出一种基于半监督机器学习(semi-supervised machine learning,SSML)算法的光伏阵列故障诊断模型,模型利用参考光伏组件将光伏阵列电压与电流归一化,通过半监督机器学习算法分析光伏阵列工作点状态,进而检测故障和识别故障类型。该故障诊断模型仅需要少量容易测量的标签数据,且对环境变化有较强适应能力。最后,通过仿真和实验,验证该故障诊断模型的有效性。

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作者: Zhao Zhongjie; Wang Tiantian; Chen Liye

作者: 赵忠杰; 王甜甜; 陈立业

标题: Trace and examination of the ventilation environment of the highway tunnel fire based on the software known as FDS

标题: 基于 FDS 的公路隧道火灾通风环境研究

来源出版物: 安全与环境学报 卷: 20 期: 2 页: 495-503 出版年: 2020

文献号: 1009-6094(2020)20:2<495:JYFDGL>2.0.TX;2-Y

来源出版物: Journal of Safety and Environment 卷: 20 期: 2 页: 495-503 出版年: 2020

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文献类型: Article

作者关键词: FDS; safety engineering; highway tunnel; fire ventilation; critical wind velocity; FDS

作者关键词: 安全工程; 公路隧道; 火灾通风; 临界风速

摘要: In this paper, a numerical simulation method has been adopted based on Zhongnanshan Tunnel of Qinling (upstream line), Shaanxi, in its relation to the temperature field, the smoke distribution need and the fire spreading regularity in the tunnel. When the tunnel is supposed on fire, it would be of great need to study and clarify the smoke spread characteristic features in the tunnel, choose an appropriate longitudinal wind speed and determine the best available ventilation and smoke control scheme to work out proper measures for fire control, personnel and vehicle evacuation. For the above said purpose, we have established a local tunnel model for the 5 possible fire reducing and control conditions in the tunnel. The research results we have worked out can be stated as follows: The longitudinal wind of different strengths should be set up to observe and trace the diffusion situations of the smoke movement in the tunnel with the critical wind velocity of the fire being 3.6 m/s by using the well-known FDS software and the maximum heat or thermos releasing rate of the simulated fire being 30 MW under the above said 5 working conditions. For instance, under the condition with no longitudinal wind, or minor longitudinal wind and critical wind velocity, it may be suggested that, in the early evacuation stage, ventilation is supposed to be done with smaller longitudinal wind and then followed with the variation law to take the critical wind speed after evacuation so as to affect the temperature and smoke field. Analyzing the smoke exhaust effect of the ventilation shaft exhaust duct under the different exhaust velocities, the optimized exhaust velocity should not be set over or beyond 4.6 m/s. At this juncture, if the jet fan is turned on for 90 s, the dynamic change of the natural wind velocity and direction in the tunnel should have little effect on the fire size. Therefore, it is recommended to apply a critical wind velocity in correspondence with from big scale fire to small scale one. And, then, careful analysis of such parameters as temperature and smoke visibility in the simulation results may help to ensure the feasibility and authenticity of the numerical simulation method. Thus, it can be seen that the research results we have worked out should be in a position to provide a reference to formulating emergency plans for the fire prevention and disaster relief of Qinling Zhongnanshan

Tunnel in the fire ventilation construction of the same type of tunnels.

摘要: 隧道发生火灾时,研究隧道内的烟气蔓延特性,选择合适的纵向风速,确定最佳的通风控烟方案,具有重要的研究价值。利用计算流体力学数值模拟技术,选用 FDS 软件以秦岭I号隧道(上行线)为对象建立局部隧道模型,模拟最大热释放率为 30 MW 的火灾,设计 4 种不同工况进行模拟计算。模拟了不同纵向风状态下的隧道火灾,观测烟气扩散规律,确定临界风速为 3.6 m/s;在无纵向风、较小纵向风和临界风速状态下,分析了隧道内温度场和烟气场的变化规律,得出其对人员疏散和火灾救援的影响;在通风井通风排烟模式下,模拟了排风道在不同风速状态下的排烟效果,确定最佳排烟风速为 4.6 m/s;射流风机开启前,隧道内风速的大小和方向对隧道内火灾温度场和烟气场的影响很小。给出了适用于秦岭I号隧道(上行线)各工况的通风控制策略,也可为同类型特长隧道的火灾通风设计提供参考。

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作者: 张弢; 柳雨农; 任帅; 张德刚

标题: Differential histogram shift lossless information hiding algorithm based on LBP face texture features

标题: 基于 LBP 人脸纹理特征的差分直方图移位无损信息隐藏算法

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作者关键词: lossless information hiding; multi-carrier; local binary pattern; difference matrix; histogram shift

作者关键词: 无损信息隐藏; 多载体; 局部二值模式; 差分矩阵; 直方图移位

摘要: Aiming at the contradiction between improving the embedded quantity and enhancing the

robustness in the information hiding algorithm, this paper proposed a multi-carrier information hiding algorithm. The algorithm used multiple facial expression images as vectors, and applied local binary pattern (LBP) texture features to recognize facial expression regions to embed encrypted information. It calculated the adjacent pixel difference matrix of the carrier region, and constructed the embedded space by shifting the histogram of the corresponding element of the difference matrix, in order to realize the reversible concealment of the encrypted information and the lossless recovery of the carrier images. Algorithm analysis proves that it has greater embedding capacity and maintains higher robustness than existing algorithms. Its largest embedded capacity reaches 0.561, at the same time the peak signal to noise ratio (PSNR) is 38.421 dB. And the value of embedded region PSNR reaches 46.286. The robustness experiments show that the proposed algorithm may have a similarity greater than 99% to the original information image for the filtering attack. In the face of shear and translation attacks, the minimum image normalization coefficient is 0.743 and 0.728, which is much larger than other algorithms. From the comparison experimental results with other algorithms, the proposed algorithm is effective.

摘要: 针对信息隐藏算法中提高嵌入量与增强鲁棒性之间的矛盾问题, 提出一种多载体信息隐藏算法。使用多幅人脸表情图像作为载体, 采用局部二值模式(LBP)纹理特征识别人脸表情区域来嵌入加密信息; 计算出载体区域的相邻像素差值矩阵, 通过对差值矩阵的对应元素直方图进行移位构造出嵌入空间来实现加密信息的可逆隐藏与载体图像的无损恢复。分析证明了该算法比现有算法具有更大的嵌入容量并保持较高的鲁棒性的优势, 在最大嵌入容量达到 0.561 时具有 38.421 dB 的信噪比(PSNR), 且在识别的嵌入区域 PSNR 值达到 46.286。鲁棒性实验表明, 该算法对于滤波攻击可以与原始信息图像的相似度大于 99%; 面对剪切、平移攻击时, 秘密图像归一化系数 NC 最小为 0.743 和 0.728, 远大于其他算法。从与其他算法的对比实验结果看, 该算法是有效的。

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作者: Li Gang; Gao Zhenyang; Zhang Xinchun; Zhao Huaixin; Liu Zhuo

作者: 李刚; 高振阳; 张新春; 赵怀鑫; 刘卓

标题: Improved Global Convolutional Network for Pavement Crack Detection

标题: 改进的全局卷积网络在路面裂缝检测中的应用

来源出版物: 激光与光电子学进展 卷: 57 期: 8 出版年: 2020

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文献类型: Article

作者关键词: image processing; semantic segmentation; large convolution kernel; global convolution network; mean intersection over union; skeleton extraction

作者关键词: 图像处理; 语义分割; 大卷积核; 全局卷积网络; 平均交并比; 骨架提取

摘要: To address the inability of traditional crack image segmentation methods to inaccurately extract the crack on the concrete surface, an improved lightweight global convolutional network crack image segmentation model is proposed in this study. Based on the principle of deep convolution network, the large convolution kernel is used to classify and locate crack images. For the characteristics of cracks, a lightweight semantic segmentation model MobileNetv2-GCN is constructed. Experimental results show that the MobileNetv2-GCN model delivers superior performance in three open crack datasets. The central axis skeleton algorithm is used to extract the crack skeleton subsequent to semantic segmentation, and the physical value of the average width of the crack is calculated. The proposed model has high accuracy and can provide reliable data support for road quality detection.

摘要: 针对传统裂缝图像分割方法不能准确提取混凝土表面裂缝的难题,提出了一种改进的轻量级全局卷积网络的路面裂缝图像分割模型。根据深度卷积网络原理,使用大卷积核对裂缝图像进行分类和定位,针对裂缝特征构建轻量级的语义分割 MobileNetv2-GCN 模型。实验对比结果表明,该模型在三个公开裂缝数据集上都表现出优越的性能。采用中轴骨架算法提取语义分割后的裂缝骨架,计算裂缝平均宽度的物理值,其实验结果具有较高的准确性,可为公路健康检测提供可靠的数据支持。

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作者: 梁华刚; 张志伟; 王亚茹

标题: Expression Recognition Method for Adaptive Gabor Convolution Kernel Coding Network

标题: 自适应 Gabor 卷积核编码网络的表情识别方法

来源出版物: 计算机工程与应用 卷: 56 期: 10 页: 149-156 出版年: 2020

文献号: 1002-8331(2020)56:10<149:ZSYGJJ>2.0.TX;2-B

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文献号: 1002-8331(2020)56:10<149:ZSYGJJ>2.0.TX;2-B

文献类型: Article

作者关键词: expression recognition; Gabor kernel; convolutional neural network; automatic encoder; genetic algorithm; Support Vector Machine(SVM); parameter optimization

作者关键词: 表情识别; Gabor 核; 卷积神经网络; 自动编码器; 遗传算法; 支持向量机(SVM); 参数优化

摘要: Facial expression recognition is one of the hotspots in the field of computer vision. Aiming at the problems that the extracted high-dimensional features recognition rate of facial expression images is poor and the generalization is almost unsatisfactory, combined with the advantages of convolutional neural network to learn local features, this paper proposes a method of multi-channel, image segmentation and optimization of Gabor convolution kernel parameters to realize image convolution, and analyzes the extracted expression adaptive features. Automatic encoder theory is used to realize high dimensional feature dimension reduction and multi-channel feature fusion. Because the traditional SVM(Support Vector Machine) is not sensitive to multi-classification tasks, the genetic algorithm is used to optimize the maximum interval classification surface and obtain fitter classifier parameters. Finally, the designed GaAeS-net(Gabor Autoencoder Support Vector Machine Convolution Network) is tested on CK+, JAFFE, FER2013, CHD2018 and other databases, and compared with the existing models. The highest recognition rate reaches 99.34% by GaAeS-net, which proves that the model has a good recognition rate and generalization.

摘要: 人脸表情识别是计算机视觉领域研究的热点之一。针对传统 Gabor 网络提取表情图像高维特征识别率不高、泛化性不强的问题,结合卷积神经网络学习局部特征的优点,提出多通道、图像分块、优化 Gabor 卷积核参数的方法实现表情图像卷积,对提取的表情自适应特征进行分析,首先进行通道内降维,然后采用自动编码器理论解决高维特征降维和多通道特征融合的问题。因为传统支持向量机(Support Vector Machine,SVM)对多分类问题不敏感,所以采用遗传算法优化出最大间隔分类面,进而得到适应度较高的分类器参数。对设计的 GaAeS-net(Gabor Autoencoder Support Vector Machine Convolution Network)网络分别在 CK+、JAFFE、FER2013、CHD2018 等数据库上进行实验,并与现有模型进行对比,最高识别率可达到 99.34%,从而证明 GaAeS-net 模型具备良好的识别率和泛化性。

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作者: Dai Liang; Zhai Yiming; Wang Guiping

作者: 代亮; 翟一鸣; 汪贵平

标题: Packet scheduling scheme for energy-delay tradeoff in self-powered roadside units

标题: 自供电路侧单元能量-时延均衡分组调度策略

来源出版物: 交通运输工程学报 卷: 20 期: 2 页: 161-171 出版年: 2020

文献号: 1671-1637(2020)20:2<161:ZGDLCD>2.0.TX;2-6

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文献号: 1671-1637(2020)20:2<161:ZGDLCD>2.0.TX;2-6

文献类型: Article

作者关键词: cooperative vehicle infrastructure system; roadside unit; packet scheduling; constrained Markov decision; energy-delay tradeoff

作者关键词: 车路协同系统; 路侧单元; 分组调度; 带约束的马尔科夫决策; 能量-时延均衡

摘要: Considering the randomness of energy harvesting, vehicle arrival and vehicle speed in the process of self-powered roadside units' packet transmission, the packet scheduling system was modeled as a constrained Markov decision model to analyze the average packet transmission delay and energy consumption. The optimization problem of the minimum packet average transmission delay under the constraint of energy queue was analyzed, and packets scheduling scheme for energy-delay tradeoff in self-powered roadside units was proposed. The performance of the optimal packet scheduling scheme was analyzed by simulation experiments, and compared with the greedy bundle relaying scheme and Q-learning method. Simulation result shows that the packet scheduling scheme has a dual-threshold structure. The decision variables were determined by the energy queue state of the self-powered roadside units and the speed state of the arriving vehicles, so that the system can reduce the average transmission delay of the monitoring data on the premise of considering the energy utilization efficiency, and ensure non-overflow of the self-powered roadside units' energy storage to minimize the average packet transmission delay. In

the single packet transmission model,the average transmission delay of the proposed packet scheduling scheme is 15.7%lower than that of greedy bundle relaying scheme,and 13.5%lower than that of Q-learning method.In the batch packet transmission model,the average transmission delay of the proposed packet scheduling scheme is 20.4%lower than that of greedy forwarding scheme,and 11.5%lower than that of Q-learning method.1tab,8figs,30refs.

摘要: 考虑了自供电路侧单元在分组传输过程中能量收集、车辆到达与车速的随机性,基于受限马尔科夫决策模型建立分组调度系统模型,研究了分组平均传输时延与能量消耗;分析了在能量队列约束下最小分组平均传输时延的优化问题,提出了自供电路侧单元能量-时延均衡分组调度策略,通过仿真试验分析了最优分组调度策略性能,并与贪婪中继方案和 Q-learning 算法进行对比。仿真结果表明:该分组调度策略具有双门限结构,系统通过自供电路侧单元的能量队列状态以及到达车辆的车速状态确定决策变量,使系统可以在考虑能量利用效率的前提下降低监测数据分组的平均传输时延,保证自供电路侧单元在能量存储不溢出不耗尽的同时,最小化系统分组平均传输时延;在单分组发送模型中,提出的分组调度策略的平均传输时延相比贪婪中继方案降低了 15.7%,相比 Q-learning 算法降低了 13.5%;在批量分组发送模型中,其分组平均传输时延相比贪婪中继方案降低了 20.4%,相比 Q-learning 算法降低了 11.5%。

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作者: Li Kunlun; Wei Zefa; Song Huansheng

作者: 李坤伦; 魏泽发; 宋焕生

标题: Vehicle color recognition based on SqueezeNet

标题: 基于 SqueezeNet 卷积神经网络的车辆颜色识别

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文献类型: Article

作者关键词: SqueezeNet; traffic engineering; convolutional neural network; intelligent transportation; vehicle color recognition; SqueezeNet

作者关键词: 交通工程; 卷积神经网络; 智能交通; 车辆颜色识别

摘要: In order to accurate identification of vehicle colors which can assist existing license plate recognition system and enable accurate identification of vehicles in intelligent transportation system,existing solutions were analyzed,and the problems of the practical applications of convolutional neural network(CNN)were explored.A method of realizing vehicle color recognition by using light weight convolutional neural network(LCNN)was proposed.The parameter quantity of SqueezeNet is one fiftieth of that of AlexNet network structure,and it can also ensure the accuracy,which avoids the large-scale calculation and high computer hardware requirements caused by the complex network structure and large parameter quantity,and therefore improves the portability of the model.The vehicle color recognition data set was selected as the research basis,and the data set was expanded and enhanced.Based on SqueezeNet,the impact of feature fusion on classification results was explored.The output feature map of fire7/concat and the output feature map of fire9/concat were fused.The results show that SqueezeNet has a training accuracy of 96.28% on the basis of guaranteed model size of 2.9 M and a single sheet test time of 15 ms,while that of AlexNet is 227 M,24 ms and 96.18%.It can be seen that,under the premise of achieving the same accuracy,the model trained by the lightweight convolutional neural network SqueezeNet is more suitable to be transplanted to the development board such as field-programmable aate array(FPGA),and the processing speed on the server is faster.Therefore,the lightweight convolutional neural network SqueezeNet,which is used to identify vehicle colors,can be better applied in the intelligent transportation system and solve,to a certain extent,current problems and drawbacks.3 tabs,7 figs,23 refs.

摘要: 为实现车辆颜色的精准识别,辅助现有车牌识别方法在智能交通系统中完成对车辆身份的精确认证,通过分析现有解决方案和探究卷积神经网络在实际应用中的问题,提出基于轻量级卷积神经网络 SqueezeNet 实现对车辆颜色识别的方法。轻量级卷积神经网络 SqueezeNet 的参数量是 AlexNet 网络结构的 1/50,同时还能保证精度,避免由于网络结构复杂、参数量大造成的大规模计算和较高的计算机硬件需求,提升了模型的可移植性。选取车辆颜色识别 (Vehicle_Color_Recognition)数据集作为研究基础,针对数据集进行了扩充和增强处理。以 SqueezeNet 为基准探究了特征融合对分类结果的影响,通过对比试验确定将 fire7/concat 输出特征图和 fire9/concat 输出特征图相融合。研究结果表明:轻量级卷积神经网络 SqueezeNet 在保证模型大小 2.9 M、单张测试时间 15 ms 的基础上,训练精度为 96.28%,而 AlexNet 的模型大小为 227 M、单张测试时间 24 ms、训练精度为 96.18%;在实现同等精度的前提下,轻量级卷积神经网络 SqueezeNet 训练得到的模型更适合移植到如现场可编程门阵列(FPGA)这种开发板上,同时在服务器上的处理速度也更快;融合后的模型最终的分类结果提升为 96.48%。利用轻量级卷积神经网络 SqueezeNet 进行车辆颜色识别可以较好地应用在智能交通系统中,并在一定程度上解决目前车牌识别的难点。

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作者: Li Kunlun; Zhang Lu; Xu Hongke; Song Huansheng

作者: 李坤伦; 张鲁; 许宏科; 宋焕生

标题: Waveletdomain dilated network for fast low-dose CT image reconstruction

标题: 小波域扩张网络用于低剂量 CT 图像快速重建

来源出版物: 西安电子科技大学学报 卷: 47 期: 4 页: 86-93 出版年: 2020

文献号: 1001-2400(2020)47:4<86:XBYKZW>2.0.TX;2-N

来源出版物: Journal of Xidian University 卷: 47 期: 4 页: 86-93 出版年: 2020

文献号: 1001-2400(2020)47:4<86:XBYKZW>2.0.TX;2-N

文献类型: Article

作者关键词: image reconstruction; computed tomography; wavelet transforms; convolutional neural networks

作者关键词: 图像重建; 计算机断层扫描; 小波变换; 卷积神经网络

摘要: Low-dose CT has the advantages of low radiation and high efficiency, but the noise and artifacts with low-dose CT images reduce the reliability of diagnosis. In order to improve the quality of low-dose CT images, this paper attempts to enhance the visuals of reconstructed CT images in the wavelet domain, and improve the running speed by combining the multi-dilated convolution and subpixel, so that the model can be better deployed to the CT equipment. The data set of "2016 AAPM Low Dose CT image Challenge" is used to evaluate the proposed method. Experimental results show that the visuals of reconstructed CT images are better. Compared with RED-CNN, the average PSNR of the proposed method is improved by 0.1428dB(1mm)/ 0.0939dB(3mm), and the running speed on the CPU and GPU is increased by more than 55% and 50%, respectively.

摘要: 低剂量计算机断层扫描技术具有低辐射和高效的优点,但低剂量图像伴随的噪声和伪影降低了诊断的可靠性。为了有效地改善低剂量图像的质量,通过借助小波域的优势来增强重建图像的细节纹理,结合改进的扩张卷积和亚像素技术来提高运算速度,使模型更好地部署到断层扫描设备。使用"2016 AAPM 低剂量图像挑战赛"数据集对提出的方法进行评估。实验结果表明,该方法重建图像的视觉效果提升明显,平均峰值信噪比比 RED-CNN 约高 0.1428dB(1mm)、0.0939dB(3mm),在中央处理器和图形处理器上的运算速度分别提升约 55%、50%以上。

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第 20 条, 共 20 条

作者: Xu Juan; Yao Rugui; Gao Yan; Zhu Liya

作者: 徐娟; 姚如贵; 高岩; 朱礼亚

标题: Statistic Characteristics for Upper Bound of Rate Loss with Bounded Channel Estimation Error

标题: 信道估计误差有界时速率损失上界统计特性

来源出版物: 计算机工程与应用 卷: 56 期: 20 页: 82-86 出版年: 2020

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文献类型: Article

作者关键词: channel estimation error; rate; upper bound; interference leakage

作者关键词: 信道估计误差; 速率; 上界; 干扰泄漏

摘要: In practical applications, estimation error, quantization error and feedback delay bring out imperfect perfect Channel State Information(CSI). Particularly for a Vandermonde-subspace Frequency Division Multiplexing(VFDM)based two-tiered spectrum sharing system, a performance degradation evaluation of the macrocell is proposed based on the upper bound of rate loss when bounded channel estimation error is considered. It first derives the upper bound of interference leakage generated by the bounded error. Then, with the relationship between interference leakage and achievable system rate, it obtains the upper bound of rate loss. Finally, numerical results are presented to verify the correctness of the derivation and the upper bound of rate loss can better describe the system degradation with bounded channel estimation error.

摘要: 考虑采用 VFDM 技术的二层频谱共享网络,针对实际应用中由于信道估计误差、量化误差、反馈时延等因素带来的非理想信道状态信息,提出了一种基于速率损失上界的信道估计误差有界时宏小区性能评估方案。推导了信道估计误差有界时干扰泄漏的上界,建立干扰泄漏与宏小区可达速率之间的关系,进而得到宏小区系统速率损失上界。给出了仿真结果验证推导的正确性,该上界很好地描述了范德蒙子空间频分复用系统在信道估计误差有界时的性能损失统计特性。

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汽车学院

第 1 条, 共 39 条

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作者: 李晓虎; 麦乐; 任杰; 刘浩学; 朱彤

标题: A Trajectory Optimization Method of Automatic Vehicles at Freeway Work Zone

标题: 高速公路施工区自动车辆行驶轨迹优化方法

来源出版物: 交通信息与安全 卷: 38 期: 3 页: 40-47 出版年: 2020

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作者关键词: traffic engineering; work zone; connected and autonomous vehicle; lane change control algorithm; trajectory optimization

作者关键词: 交通工程; 施工区; 网联自动车辆; 换道控制策略; 轨迹优化

摘要: To optimize driving status of vehicles at freeway work zone, a lane-changing control strategy that integrates optimized lane-changing ratio and variable headway is established. The objective functions of traffic operation efficiency and conflict risk are introduced and solved

online, so as to optimize the trajectory of vehicles at work zone, and then the ride comfort of vehicle is improved. Under the environment of connected and autonomous vehicle, the average speed at upstream of the work zone is selected as the objective function, and the genetic algorithm is used to solve lane change ratio by traversing the traffic flow state to adjust the distribution of vehicles at the upstream of the work zone. The vehicle traffic efficiency and conflict risk of the merging area are regarded as the objective function of the variable headway model. Besides, the CPLEX/Matlab solver is called to solve the variable headway at merging area. To calculate and visualize, the simulation platform of Matlab/Vissim_COM is established. The Matlab programming technology is used to extract vehicle information of Vissim in a single-step simulation. The CPLEX solver and Vissim packaging environment are combined with the genetic algorithm in the form of function calls to optimize the vehicle information and feedback. When the total number of simulations reaches 400, the effects of model control is optimal. The results of the optimal control show that when the simulation time reaches 800 s, the traffic input of each lane reaches 700 veh/h, at this time the optimization effect is obvious. Compared with the cases where lane change control is not implemented, the number of "exposures" of the global vehicles at the merging area is reduced which contributes to the "smoothness" of vehicles' driving trajectory, and the global vehicle speed is increased by 48%. The variation range of the speed standard deviation is reduced, and the speed dispersion of the global vehicle is improved. The number of conflicts reduces by 39% using post encroachment time as the index. With this method, the vehicle operating conditions is improved at freeway work zone.

摘要: 为改善高速公路施工区路段车辆运行状态,建立了一种集合优化换道比例和可变跟车时距的换道控制策略。通过引入交通运行效率和冲突风险目标函数并进行在线求解,从而对施工区车辆行驶轨迹进行优化,提高了车辆的平顺性。在网联自动驾驶环境下,以施工区上游路段车辆平均速度为目标函数,借助遗传算法遍历交通流状态集合,求解换道比例,以此调整施工区上游车辆分布。以施工区汇入路段车辆交通效率和冲突风险为可变跟车时距模型的目标函数,调用 CPLEX/Matlab 求解器得到汇入路段可变跟车时距。为了在线计算和可视化建立了 Matlab/Vissim_COM 的仿真平台,通过 Matlab 编程技术以单步仿真的方式提取 Vissim 车辆信息,将 CPLEX 求解器和 Vissim 的封装环境以函数调用的方式与遗传算法结合,对车辆信息进行优化计算和参数反馈。在总仿真次数达到 400 次时,模型控制得到最优。结果表明,与未实施控制相比,在最优控制中,当仿真时长达到 800 s 时,每条车道交通量输入达到 700 veh/h,优化效果较为明显,即全局车辆在汇入路段曝光次数减少,车辆行驶轨迹变的平滑,全局运行速度提高了 48%,速度标准差的变化幅度降低,全局车辆的速度离散性得到改善,以后侵入时间表征冲突风险,冲突次数降低了 39%,高速公路施工区车辆运行状态得到了改善。

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作者: Shen Xiaoyan; Wei Shanshan; Feng Yuqing

作者: 沈小燕; 魏珊珊; 冯煜清

标题: Machine Learning-Based Analysis of Factors Influencing Dangerous Goods Road Transport Accidents

标题: 基于机器学习的危险货物道路运输事故影响因素分析

来源出版物: 交通信息与安全 卷: 38 期: 5 页: 113-119,128 出版年: 2020

文献号: 1674-4861(2020)38:5<113:JYJQXX>2.0.TX;2-R

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文献号: 1674-4861(2020)38:5<113:JYJQXX>2.0.TX;2-R

文献类型: Article

作者关键词: dangerous goods; road transport accidents; severities; influencing factors; machine learning

作者关键词: 危险货物; 道路运输事故; 严重程度; 影响因素; 机器学习

摘要: In order to study the factors influencing the severity of dangerous goods road transport accidents, the analytical performance of decision tree C5.0, support vector machine and multilayer perceptron are compared with the data of the accidents of dangerous goods road transport based on 1267 cases of dangerous goods road transport accidents that occurred in China from 2015 to 2019. The best-performing model is selected to analyze main factors influencing the occurrence of accidents of three different severity levels. The results show that Decision Tree C5.0 has the best overall performance. Factors influencing the occurrence of accidents of property damage only are direct accident form (scrapes, leaks, fire, etc.), indirect accident form (leaks), and segment type (station area). Factors that influence the occurrence of accidents with injury are direct accident form (rollover, hitting a fixed object, rear-ending two vehicles, colliding two vehicles, running off the road, and crashing), indirect accident form (spills and rollovers), segment type (general road, bridges, tunnels, and entrances), road type (provincial and national roads), and time of day (07:00-12:00). The factors influencing the occurrence of fatalities are direct accident form (multi-vehicle collisions, multi-vehicle rear-ends, and explosions), hazardous materials (oxidizing substances, gases, and flammable solids), indirect accident form (fires and explosions), and road alignment (long downhill slopes and sharp curves).

摘要: 为研究危险货物道路运输事故严重程度的影响因素,以 2015-2019 年发生在我国的 1267 起危险货物道路运输事故案例为基础,比较决策树 C5.0、支持向量机和多层感知器对危险货物道路运输事故数据的分析性能,并选用表现最佳的模型探索影响 3 种不同严重程度的事故发生的主要因素。结果表明,决策树 C5.0 整体表现最佳。影响仅财产损失事故发生的主要因素依次为直接事故形态(刮擦、泄漏、火灾和其他),间接事故形态(泄漏)和路段类型(站区);

影响受伤事故的发生的主要因素依次为直接事故形态(侧翻、撞固定物、2车追尾、2车相撞、冲出路面和坠车),间接事故形态(泄漏和侧翻),路段类型(普通路段、桥梁、隧道和出入口),道路类型(省道和国道)和时间(07:0012:00);影响死亡事故发生的主要因素依次为直接事故形态(多车相撞、多车追尾和爆炸),危化品类别(氧化性物质、气体和易燃固体),间接事故形态(火灾和爆炸)和道路线形(长下坡和急弯)。

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作者: Yan Shengyu; Xiao Runmou; Yang Ming

作者: 闫晟煜; 肖润谋; 杨铭

标题: Statistical approach for the region-oriented volume of freight transport on highway

标题: 在地公路货物运输量统计方法

来源出版物: 交通运输工程学报 卷: 20 期: 6 页: 210-217 出版年: 2020

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文献号: 1671-1637(2020)20:6<210:ZDGLHW>2.0.TX;2-Z

文献类型: Article

作者关键词: transportation economy; region-oriented freight volume; statistics method; commercial truck; city of vehicle registration; network toll collection data

作者关键词: 交通运输经济; 在地货物运输量; 统计方法; 营运货车; 车辆注册地; 联网收费数据

摘要: The concept of region-oriented freight transportation volume was proposed. Non-commercial trucks and nonlocal trucks were included in the statistics category of the region-oriented freight transportation volume, and the basic data sets were summarized. The factors of the registration place, usage, level of the highway network, and traffic flow direction of the vehicles were analyzed. Statistical thoughts and splitting logic of the freight transportation volume, and statistical models of freight volume and freight turnover volume were developed. Based on the freight volume of registered local commercial trucks, a scale index of region-oriented freight volume was created and used to evaluate the relative offset degree and involvement of nonlocal trucks. Analysis results show that when the limit error is controlled within

10%,the region-oriented freight volume can be evaluated exactly by five basic data sets:special survey data on freight transport,expressway network toll collection data,sample survey data of highway,traffic volume survey data of highway,and truck data in the register of vehicle management. For the studied city,the proposed statistical model embodies a 0.45% relative deviation rate of the freight turnover to create GDP per ten thousand yuan with the national average level,which is consistent.The scale index of region-oriented freight volume is 2.47,which indicates that nonlocal trucks involved in local freight transportation to a high degree in cities with developed real economy.The freight transportation volume of commercial trucks registered at the local government office is not sufficient to support economic planning.However,a lack of registered trucks does not indicate an insufficient transportation capacity.The commercial trucks registered locally mainly undertake shortdistance freight transportation,which accounts for 66.28%of the total in-city freight volume.Nonlocal trucks mainly undertake inter-city and inter-provincial goods,which accounts for 79.16% of the total volume.In the near future,when trucks are charged by vehicle type,the average load of each vehicle type and the rate of each loaded truck in total will be key parameters for the evaluation of the regionoriented freight transportation volume.In addition,inter-provincial disequilibrium existed in the traffic volume of trucks with 3axles or more.5tabs,1fig,30refs.

摘要: 提出了在地公路货物运输量的概念,将非营运货车和外地货车纳入了在地货物运输量的统计范畴,归纳了基础数据集;通过分析车辆注册地、使用性质、路网等级和车流流向等因素,提出了在地货物运输量的统计思路和拆分逻辑,建立了在地公路货运量和货物周转量统计模型;基于本市籍营运货车产生的货运量,提出了在地货运量规模指数用以评估在地货运量的相对偏移程度和外地货车的参与程度。研究表明:控制极限误差在 10%以下时,5 种基础数据集,即货运专项调查数据、高速公路联网收费数据、普通公路抽样调查数据、普通公路交通量调查数据和车辆管理所在册货车数据可完成在地货物运输量的精细化推算;提出的统计模型使所研究城市创造每万元 GDP 的货物周转量与全国平均水平的相对偏差率为 0.45%,具有一致性;所研究城市的在地货运量规模指数为 2.47,说明实体经济发达的城市中外地货车在当地参与运输的程度偏高;本市籍营运货车货物运输量不足以支撑当地经济规划;本市籍在册营运货车少并不能代表本市运力不足,所研究城市的本市籍营运货车主要承担短途运输,在总市内货运量中占 66.28%,而外地货车主要承担市际与省际间的货物交流,在总跨市货运量中占 79.16%;货车按车型计费后,每种货车车型的平均载货质量与按车流划分的重车比将是在地货物运输量统计的关键参数;省际间 3 轴及以上货车车流量存在着不均衡性。

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作者: 李耀华; 刘洋; 冯乾隆; 南友飞; 何杰; 范吉康

标题: Path tracking control for an intelligent commercial vehicle based on optimal preview and model predictive

标题: 基于最优预瞄和模型预测的智能商用车路径跟踪控制

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文献类型: Article

作者关键词: intelligent commercial vehicles; path tracking; road adhesion factors; optimal preview control; model predictive control

作者关键词: 智能商用车; 路径跟踪; 路面附着因数; 最优预瞄控制; 模型预测控制

摘要: An optimal preview control strategy was adopted to solved path tracking problem of intelligent commercial vehicles. According to the relationship between the heading angle and the curvature of the path, the heading angle deviation feedback control was introduced. According to the relationship between the speed and the preview distance, a multi-point preview distance determination method with variable weight coefficient was proposed. In order to ensure the stability of path tracking, the model predictive control was used to restrict the wheel sideslip angle. Through co-simulation of TruckSim and Simulink, the lateral deviations, the yaw rates and the front wheel slip angles were compared. The results show that the optimal preview control has good adaptability to the speed, but when the road adhesion factor is low, the vehicle will lose stability; The model predictive control has better adaptability to speeds and road adhesion factors, and has better driving stability, and has more accurate path tracking effect than the optimal preview control.

摘要: 为解决智能商用车路径跟踪问题,采用一种最优预瞄控制策略。根据商用车航向角与路径曲率的关系,引入航向角偏差反馈控制;根据车速与预瞄距离的关系,提出了变权重因数的多点预瞄距离确定方法。为了保证商用车路径跟踪的稳定性,采用模型预测控制策略,对车轮侧偏角进行约束。通过 TruckSim 与 Simulink 联合仿真,对比分析了侧向偏差、横摆角速度和前轮侧偏角变化情况。结果表明:最优预瞄控制策略对车速变化具有较好的适应性,但当路面附着因数较低时,车辆会失去稳定性;模型预测控制策略对车速和路面附着因数变化都具有较好的适应性,行驶稳定性更好,且比最优预瞄控制策略具有更精确的路径跟踪效果。

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作者: Wang Shu; Zhao Xuan; Yu Qiang

作者: 王姝; 赵轩; 余强

标题: Estimation of Vehicle Centroid Sideslip Angle Based on ASVD-UKF Algorithm

标题: 基于自适应奇异值分解无迹卡尔曼滤波算法的车辆质心侧偏角估计

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文献类型: Article

作者关键词: automobile engineering; sideslip angle estimation; adaptive singular value decomposition(ASVD); unscented Kalman filtering(UKF)

作者关键词: 汽车工程; 侧偏角估计; 自适应奇异值分解; 无迹卡尔曼滤波

摘要: As the key evaluation indicator of vehicle handling stability and the control target of vehicle stability, accurate estimation of sideslip angle of vehicle centroid directly affects the driving safety of the vehicle. To this end, a vehicle centroid sideslip angle estimation method based on ASVD UKF algorithm is proposed to improve the reduction or even divergent of the state estimation accuracy of the UKF when the system is strongly nonlinear or the state model is inaccurate. The sigma point is constructed by using ASVD method, and the singular matrix is modified by using adaptive factor during the time update process which improved the iterative stability of the state covariance matrix in UKF and the robustness of the estimator. The centroid sideslip angle estimation methods based on UKF and ASVD-UKF algorithm are comparatively verified by using the semi-physical simulation platform of the distributed drive electric vehicle under the working conditions of double-line shifting, single-line shifting and steering wheel angle step respectively. The result shows that the ASVD-UKF estimator improved the accuracy of UKF estimator and verified the effectiveness of the algorithm.

摘要: 作为车辆操纵稳定性的关键评价指标及车辆稳定性控制目标, 准确估计车辆的质心侧偏角直接影响车辆的行驶安全性, 为此提出了一种基于自适应奇异值分解无迹卡尔曼滤波算法的车辆质心侧偏角估计方法, 以改善无迹卡尔曼滤波(Unscented Kalman Filter, UKF)在系统强非线性或状态模型不精确的情况下状态估计精度降低甚至发散的问题。利用自适应奇异值分解方法(Singular Value Decomposition, SVD)构建 sigma 点, 并在时间更新过程中利用自适应

因子对奇异矩阵进行修正,改进了 UKF 中状态协方差矩阵的迭代稳定性及估计器的鲁棒性。利用分布式驱动电动汽车半实物仿真平台分别在双移线工况、单移线工况及方向盘转角阶跃工况下对基于无迹卡尔曼滤波和 ASVDUKF 算法的质心侧偏角估计方法进行了对比验证。结果表明,ASVD-UKF 估计器改善了无迹卡尔曼滤波估计器的精度,验证了算法的有效性。

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第 6 条, 共 39 条

作者: Hu Dawei; Liu Chengqing; Hu Hui; Gao Yang; Cai Rong

作者: 胡大伟; 刘成清; 胡卉; 高扬; 蔡榕

标题: The two-echelon open location routing problem based on low carbon perspective Fuel vehicles vs. electric vehicles

标题: 基于低碳视角的两阶段开放式选址路径问题燃油车与电动车对比

来源出版物: 系统工程理论与实践 卷: 40 期: 12 页: 3230-3242 出版年: 2020

文献号: 1000-6788(2020)40:12<3230:JYDTSJ>2.0.TX;2-4

来源出版物: Systems Engineering-Theory & Practice 卷: 40 期: 12 页: 3230-3242 出版年: 2020

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文献类型: Article

作者关键词: transportation planning; location-routing problem; open routing problem; simulated annealing algorithm; carbon emission

作者关键词: 交通运输规划; 选址-路径问题; 开放式路径问题; 模拟退火算法; CO₂ 排放

摘要: For the traditional two-echelon open location-routing problem (2E-OLRP), considering the impact of speed and load on energy consumption and CO₂ emissions, the two-echelon open location routing problem models for fuel and electric vehicles were established based on the driving and emission characteristics of fuel and electric vehicles respectively. An improved simulated annealing algorithm was proposed to solve the two models. In order to verify the validity and practicability of the models and algorithm, three comparative analyses were conducted: The comparison between the two models and the traditional 2E-OLRP model; The comparison between the algorithm solution results and the exact solution of the two models; The comparison of the two models on economic costs and emission costs. The results indicate that the two models have obvious advantages compared with the traditional 2E-OLRP model; The

proposed algorithm can solve such models quickly and efficiently; In terms of transportation activities, electric vehicles can save 3.44% of total cost and reduce 74.03% of CO₂ emissions compared with fuel vehicles. The research results above can provide decisions support for logistics enterprises to save energy and reduce emissions in transportation and distribution.

摘要: 针对传统两阶段开放式选址-路径问题(2E-OLRP),考虑速度和负载对能量消耗和CO₂排放的影响,基于燃油车和电动车的行驶与排放特性,分别建立了燃油车和电动车的两阶段开放式选址路径问题模型,并提出一种改进的模拟退火算法对两种模型进行求解.为验证本文模型与算法的有效性和实用性,进行了3种对比分析:两种模型与传统2E-OLRP模型的对比;两种模型的算法求解结果与精确解的对比;两种模型经济成本与排放成本的对比.结果表明:两种模型与传统2E-OLRP模型相比,均具有明显优势;所提出的算法能快速有效的求解此类模型;就运输活动而言,与燃油车相比,电动车能节约3.44%的总成本、减少74.03%的CO₂排放量.以上研究结果可为物流企业在运输配送中的节能减排提供决策支持.

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作者: Zhang Ruibin; Guo Yingshi; Chen Yuanhua; Li Tianming; Liu Xiaogang

作者: 张瑞宾; 郭应时; 陈元华; 李天明; 刘晓刚

标题: Target recognition technology for urban intersection based on roadside LiDAR

标题: 基于路侧激光雷达的城市交叉口目标识别技术

来源出版物: 传感器与微系统 卷: 39 期: 12 页: 32-35 出版年: 2020

文献号: 2096-2436(2020)39:12<32:JYLCJG>2.0.TX;2-Z

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文献类型: Article

作者关键词: intersection; 3D point cloud; viewpoint feature histogram; support vector machine (SVM); classification identification

作者关键词: 交叉口; 三维点云; 视点特征直方图; 支持向量机; 分类识别

摘要: Aiming at the problem that the traffic infrastructure cant accurately detect the road users in urban intersection environment,a point cloud feature extraction and classification method based on viewpoint feature histogram and support vector machine(VFH-SVM) is proposed. According to the perception requirements of the target in the complex environment of the intersection, the point cloud information obtained by roadside 3D LiDAR is preprocessed by straight through data filtering, the scene point cloud data is segmented by the conditional Euclidean clustering algorithm, the 3D point cloud features of different targets are extracted based on the viewpoint feature histogram, and viewpoint feature histogram(VFH) features of different traffic participants and facilities are established. Support vector machine(SVM) algorithm of linear kernel function is used to classify and recognize the point cloud data in traffic scene. The experimental results show that the accuracy of classification and recognition of typical objects in urban intersection environment is higher than 90 %.

摘要: 针对城市交叉口环境下交通基础设施无法精确检测道路使用者的问题,提出了一种基于视点特征直方图与支持向量机(VFH-SVM)的点云特征提取与分类方法。根据交叉口复杂环境下目标物的感知需求,对路侧三维激光雷达获取的点云信息采用直通数据滤波预处理;利用条件欧氏聚类算法对场景点云数据进行分割;基于视点特征直方图对分割后不同目标物的三维点云特征进行提取;建立了不同交通参与者及设施的视点特征直方图(VFH)特征数据集;采用线性核函数的支持向量机(SVM)算法对交通场景内的点云数据进行分类识别实验。实验结果表明:所提方法对城市交叉口环境下典型目标物体的分类识别准确率均大于 90 %以上。

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作者: 兰海潮; 马宗钰; 李学博; 阙海霞

标题: The long downhill combined braking control strategy of electric commercial vehicles based on dynamic programming

标题: 基于动态规划的电动商用车长下坡联合制动控制策略

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作者关键词: electric commercial vehicles; eddy current retarder; genetic algorithm; fuzzy control; dynamic programming

作者关键词: 电动商用车; 电涡流缓速器; 遗传算法; 模糊控制; 动态规划法

摘要: Electric commercial vehicles need to have a certain amount of continuous braking force to maintain a constant speed when they are running on long downhill sections. However, as the slope length increases, brake friction heats up, which makes the brake efficiency decline and causes the problem of brake thermal fade, causing huge safety risks. Aiming at solving this problem, this paper puts forward a study on motor braking, mechanical braking and continuous braking control strategy for electric commercial vehicles equipped with eddy current retarder, and makes a secondary distribution of braking power for total demand. A fuzzy controller optimized by genetic algorithm is used to determine the braking force provided by the motor, and then a combined braking strategy is proposed based on dynamic programming to allocate the braking torque of eddy current retarder and the mechanical braking torque, aiming at the lowest brake temperature rise. At last, the simulation experiment of fixed slope and variable slope was carried out on Matlab /Simulink platform. The results show that the control strategy can effectively prolong the working time of the retarder and reduce the temperature rise of the brake.

摘要: 电动商用车在长大下坡路段行驶时,需要有一定的持续制动力来维持匀速下坡,然而随着坡长的增加,制动器摩擦升温,使制动效能高速下降,出现制动器热衰退现象,造成巨大的安全隐患。针对上述问题,该文针对装有电涡流缓速器的电动商用车进行制动策略研究,对总需求制动力进行二次分配。首先,利用遗传算法优化的模糊控制器确定电机所提供的制动力;再以制动器温升最低为目标,基于动态规划法提出联合制动策略,对电涡流缓速器制动力矩和制动器制动力矩进行分配;最后,在 Matlab /Simulink 平台进行了定坡度和变坡度道路仿真实验。结果表明,该文所提的控制策略可以有效地延长缓速器的工作时间,从而降低制动器温升。

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作者: Wang Tong

作者: 王童

标题: A Membrane Element Model with Bending Modification and Improvement to One-Step Algorithm for Rollover Collision

标题: 一种弯曲修正膜单元及对侧翻一步碰撞算法的改进

来源出版物: 同济大学学报. 自然科学版 卷: 48 期: 11 页: 1649-1656 出版年: 2020

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作者关键词: four-node membrane element; equilibrium principle; bending modification; bus rollover; one-step collision algorithm

作者关键词: 四节点膜单元; 平衡原理; 弯曲修正; 客车侧翻; 一步碰撞算法

摘要: In view of the defect that traditional four-node membrane element cannot bend, a novel four-node membrane element model with bending modification was proposed based on the equilibrium principle of element internal forces and bending moments. The new element is applied in the one-step algorithm for bus rollover collision to improve the initial algorithm. A case study on the rollover of a typical bus body section is conducted using the improved algorithm. The validity of the proposed improved element is examined by comparing the computational results of the improved algorithm with that of the original algorithm, LS-DYNA, and the rollover test on the side of computational efficiency and precision.

摘要: 针对传统四节点膜单元无法进行弯曲的缺陷, 基于单元内力和弯矩的平衡原理, 提出一种可进行弯曲修正的新型四节点膜单元模型, 将其应用于客车侧翻一步碰撞算法, 对初始算法进行改进。通过对典型车身段模型进行模拟, 并与客车侧翻一步碰撞初始算法、LS-DYNA 仿真及侧翻试验结果在计算精度和计算效率方面分别进行对比, 检验了所提新型单元模型的有效性和实际工程应用价值。

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第 10 条, 共 39 条

作者: Li Yaohua; Yang Qidong; Liu Yang; Ren Jiayue

作者: 李耀华; 杨启东; 刘洋; 任佳越

标题: Candidate voltage vectors set in MP-DTC of surface PMSM

标题: 表面式永磁同步电机模型预测直接转矩控制备选电压矢量集合研究

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文献类型: Article

作者关键词: surface permanent magnet synchronous motor; direct torque control; model predictive control; candidate voltage vectors set; switching table; calculation burden

作者关键词: 表面式永磁同步电机; 直接转矩控制; 模型预测控制; 备选电压矢量集合; 开关表; 计算负担

摘要: In order to solve high calculation burden of conventional model predictive direct torque control(MP-DTC) for permanent magnet synchronous motor (PMSM),candidate voltage vectors sets were studied.Conventional MP-DTC was carried on rotor flux coordinate system,and coordination rotating transformation was required.And all voltage vectors generated by voltage source inverter (VSI) were used as candidate voltage vectors in conventional MP-DTC,which results in high calculation burden.The MP-DTC of surface PMSM in stator flux coordinate system was established.According to the information of voltage vector sector and the increase or decrease in stator flux and torque,candidate voltage vectors sets were proposed.Control performances of the MP-DTC for surface PMSM using different candidate voltage vectors sets were compared.And time consuming of the MP-DTC of surface PMSM using different candidate voltage vectors were calculated based on STC89C51chip.Considering control performances and calculation burden synthetically,the ideal candidate voltage vector set was proposed for MP-DTC of surface PMSM.

摘要: 针对传统永磁同步电机模型预测直接转矩控制在转子旋转坐标系计算电流和磁链,需要转子坐标旋转变换,且以逆变器生成的全部电压矢量作为备选电压矢量集合,计算负担影响较大,提出了定子磁链坐标系下的表面式永磁同步电机模型预测控制直接转矩预测,通过定子磁链扇区及磁链和转矩增减控制判断,精简备选电压矢量集合。仿真对比不同备选电压矢量集合控制下,表面式永磁同步电机模型预测控制直接转矩预测的控制性能,并基于 STC89C51 单片机平台,实验对比不同备选电压矢量集合下模型预测控制的运算时间。综合考虑不同备选电压矢量集合下表面式永磁同步电机模型预测控制直接转矩预测系统的控制性能和计算负担,给出了一种较为理想的备选电压矢量集合。

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第 11 条, 共 39 条

作者: Ling Guoqing; Lu Chao; Han Longfei; Wang Ruixi

作者: 林国庆; 逯超; 韩龙飞; 王睿希

标题: Test and evaluation method of pedestrian automatic emergency braking system

标题: 汽车自动紧急制动系统行人测试与评价方法

来源出版物: 汽车安全与节能学报 卷: 11 期: 3 页: 296-304 出版年: 2020

文献号: 1674-8484(2020)11:3<296:QCZDJJ>2.0.TX;2-O

来源出版物: Journal of Automotive Safety and Energy 卷: 11 期: 3 页: 296-304 出版年: 2020

文献号: 1674-8484(2020)11:3<296:QCZDJJ>2.0.TX;2-O

文献类型: Article

作者关键词: vehicle active safety; pedestrians collision avoidance system (AEB-P); testing and evaluation; analytic hierarchy process (AHP); virtual testing

作者关键词: 汽车主动安全; 行人自动紧急制动系统(AEB-P); 测试与评价; 层次分析法(AHP); 虚拟测试

摘要: A variety of pedestrians autonomous emergency braking system (AEB-P) test conditions was formulated to establish a complete test and evaluation method of autonomous emergency braking system (AEB) in line with China's traffic conditions and driver's driving behavior by using China in-depth accident study (CIDAS) passenger car accident data, drawing lessons from domestic and foreign research results and referring to AEB pedestrian test method in China new car assessment programme (C-NCAP). The AEB-P hierarchical model was established with introducing the analytic hierarchy process. And the weight coefficients was built up, which was suitable for testing and evaluating AEB-P test scenarios and the corresponding scenarios. The results show that the proposed AEB-P test and evaluation method are verified to be reasonable.

摘要: 为了建立符合中国交通状况和驾驶员驾驶行为的汽车自动紧急制动系统(AEB)完整的测试与评价方法,本文利用中国交通事故深入研究(CIDAS)乘用车事故数据,借鉴国内外研究成果,参考中国新车评价规程(C-NCAP)中的 AEB 行人测试方法,制定出符合中国国情的汽车自动紧急制动多种不同行人(AEB-P)测试工况。引入层次分析法(AHP)搭建 AEB-P 层次模型,确定了适用于测试和评价 AEB-P 测试场景及各场景对应的权重系数,利用自动驾驶仿真软件 PreScan 对所提测试场景进行建模。结果表明:通过引入碰撞时间(TTC)、相对距离和速度减少量作为 AEB-P 的评价指标并给予不同的权重,在 PreScan 中对提出的测试场景建模,提出的 AEB-P 测试与评价方法的合理性和实用性得到了验证。

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作者: Li Yaohua; Liu Yang; Meng Xiangzhen

作者: 李耀华; 刘洋; 孟祥臻

标题: Finite control set model predictive direct torque control of surface permanent magnet synchronous motor

标题: 一种表面式永磁同步电机有限状态集模型预测直接转矩控制

来源出版物: 电机与控制学报 卷: 24 期: 8 页: 33-43 出版年: 2020

文献号: 1007-449X(2020)24:8<33:YZBMSY>2.0.TX;2-H

来源出版物: Electric Machines and Control 卷: 24 期: 8 页: 33-43 出版年: 2020

文献号: 1007-449X(2020)24:8<33:YZBMSY>2.0.TX;2-H

文献类型: Article

作者关键词: surface permanent magnet synchronous motor; direct torque control; model predictive control; candidate voltage vectors; predictive model; calculation burden

作者关键词: 表面式永磁同步电机; 直接转矩控制; 模型预测控制; 备选电压矢量; 预测模型; 运算负担

摘要: Aiming at the problem of weight factor design of cost function in model predictive direct torque control (MP-DTC), cost function without weight factor is proposed. The control of stator flux and torque was converted to the control of stator flux and error rates. Based on MP-DTC model of surface permanent magnet synchronous motor (SPMSM), 7 basic voltage vectors of inverter were used as candidate vectors. Simulation results testify the effectiveness of the proposed strategy. Simulation results show that, due to limitation of candidate vectors, stator flux has high ripples at dynamic state. Based on effects of voltage vectors on stator flux and torque, candidate voltage vectors set was given to satisfy the control of stator flux and torque at the same time. Simulation results show the proposed candidate vectors set can suppress stator flux ripple. In order to improve real-time performance of MP-DTC system, candidate vectors set and predictive model were simplified. And MP-DTC using different candidate voltage vectors sets and predictive models were carried out using STC89C51 chip. Simulation and experimental results show the simplified candidate voltage vectors sets and predictive models can decrease calculation burden and has equivalent control performance.

摘要: 针对常规有限状态集模型预测直接转矩控制成本函数需要设计磁链和转矩控制权重系数的问题, 设计了将磁链和转矩控制转换为相对误差率控制的成本函数, 从而消除了权重系

数。建立了基于定子磁链坐标系的表面式永磁同步电机预测模型,并以逆变器生成的 7 个基本电压矢量作为备选电压矢量,仿真验证了提出成本函数的可行性。仿真发现:由于受备选电压矢量自身限制,转矩动态变化下,磁链会出现较大的波动。基于电压矢量作用规律,给出了可同时满足转矩和磁链控制要求的备选电压矢量集合。仿真结果表明:该电压矢量集合可有效抑制动态下的磁链波动。为了提高模型预测控制的实时性,对备选电压矢量数目和预测控制模型进行了简化,并基于 STC89C51 单片机平台,实验对比了不同备选电压矢量集合和预测模型预测控制的运算时间和运算结果。仿真和实验结果表明了采用精简的备选电压矢量集合和简化模型可在控制性能基本不变的前提下,有效减小运算负担,提高系统实时性。

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第 13 条, 共 39 条

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作者: 李彬; 肖润谋; 闫晟煜; 马健

标题: Transportation trend of Chinese expressway

标题: 中国高速公路运输态势

来源出版物: 交通运输工程学报 卷: 20 期: 4 页: 184-193 出版年: 2020

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文献类型: Article

作者关键词: expressway transportation; Chinese expressway; transportation structure; data mining; Gini coefficient; freight vehicle; passenger vehicle

作者关键词: 公路运输; 中国高速公路; 运输结构; 数据挖掘; 基尼系数; 货运车辆; 客运车辆

摘要: The historical data of traffic volume, vehicle structure, vehicle speed, traffic density, empty driving and truck overload of Chinese expressway in 13 years were mined, and the transportation situations of passenger vehicle and freight vehicle on expressway were analyzed. Analysis result shows that the expressway vehicle driving capacity in 2018 was 7.32×10^{11} veh·km, in which the truck driving capacity was 2.21×10^{11} veh·km and the bus driving capacity was 5.11×10^{11} veh·km. The correlation coefficient of expressway vehicle driving capacity and lane mileage was as high as 0.99. In 2018, the passenger turnover volume of expressway was 1.77×10^{12} people·km, which was three times the value of in 2006 and 1.25 times of railway

passenger turnover volume in the same year,respectively.With an increasing number of private car ownership,the total number and proportion of passenger vehicle trips with less than 7 seats increased substantially and continually,from 29.75% of the total passenger turnover of expressway in 2006 to 71.74%in 2018.The freight turnover volume of expressway was 2.99×10^{12} t·km in 2018,with a year-on-year growth of about 4.25% compared with 2017.The expressway freight turnover volume accounted for 42.00%of the total commercial truck turnover volume in whole society,and its fluctuation basically synchronized with the economic cycle.The passenger and truck transportation of expressway in each province were relatively reasonable. The Gini coefficients of passenger and freight transportation density in each province were 0.36 and 0.30 in 2018,respectively,both within the relatively reasonable range.With a further optimization of expressway freight vehicle structure,the excess freight decreased 1.63%and the empty-truck increased 4.28%in 2018 compared with 2017.

摘要: 挖掘了中国高速公路 13 年的客货车运输量、车辆结构、运行速度、运输密度、货车空驶和货车超载等历史数据,分析了高速公路上客货车运输态势。分析结果表明:2018 年高速公路行驶量为 7.32×10^{11} veh·km,其中货车行驶量为 2.21×10^{11} veh·km,客车行驶量为 5.11×10^{11} veh·km,高速公路行驶量与车道里程相关系数高达 0.99;2018 年高速公路旅客周转量达到 1.77×10^{12} 人次·km,相当于 2006 年高速公路旅客周转量的 3 倍,相当于同年铁路旅客周转量的 1.25 倍;随着私家车保有量的增加,7 座以下客车出行总量和比例均持续大幅增长,已从 2006 年占高速公路总旅客周转量的 29.75%,增长至 2018 年的 71.74%;2018 年中国高速公路货物周转量为 2.99×10^{12} t·km,较 2017 年同比增长约 4.25%;2018 年高速公路货物周转量占全社会营业性货车货物周转量的 42.00%,且高速公路运输量波动与经济周期基本同步;中国各省高速公路客货车运输较为合理;2018 年各省旅客和货物运输密度的基尼系数分别为 0.36 和 0.30,均处于相对合理区间;2018 年高速公路货运车辆结构进一步优化,与 2017 年相比超载现象降低了 1.63%,货车空驶现象增加了 4.28%。

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作者: Gao Yang; Liu Jiang; Li Kunpeng

作者: 高扬; 刘江; 李鹏鹏

标题: Evaluation of Localizability for Path Planning

标题: 路径规划的可定位性研究

来源出版物: 计算机工程与应用 卷: 56 期: 18 页: 58-62 出版年: 2020

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文献类型: Article

作者关键词: path planning; localizability; mobile robot; evaluation function

作者关键词: 路径规划; 可定位估计; 移动机器人; 评价函数

摘要: A new path evaluation function is proposed to solve the shortcomings of traditional path planning which doesn't consider the localizability of each point on the path. According to the characteristics of location error transfer in common location algorithms, the location variance can be represented by the location result in [X]-[Y] plane and the estimated variance of the orientation angle and then considering the path safety and length performance, the new path evaluation function is formed. The experimental results show that the evaluation function proposed in this paper can make the path planning obtain an overall optimal path in three aspects of localizability, safety and length.

摘要: 针对传统路径规划中没有将路径上各点的可定位性考虑进来,导致机器人在跟踪路径时由于定位误差过大导致跟踪失败,提出了一种新的路径评价函数将路径上各点可定位性进行考虑。分析常用定位算法中定位误差传递特性,采用将定位方差分别以[X]-[Y]平面定位结果的分布范围与朝向角的估计方差代表的方法,综合考虑路径安全性与长度性能,形成新的路径评价函数。实验结果表明,新的评价函数可以使得路径规划获得一条在可定位性、安全性、长度三方面总体最优的路径。

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作者: Ma Xiaolong; Yu Qiang; Liu Jianbei; Ma Yuanyuan

作者: 马小龙; 余强; 刘建蓓; 马媛媛

标题: Analysis of Lane Change Behavior of Passenger Cars on the Freeway Using UAVs

标题: 基于无人机视频拍摄的高速公路小型车换道行为特性

来源出版物: 中国公路学报 卷: 33 期: 6 页: 95-105 出版年: 2020

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作者关键词: traffic engineering; lane-changing parameter; statistical analysis; lane change behavior; UAV and high precision map; freeway

作者关键词: 交通工程; 换道行为特性; 统计分析; 换道行为; 无人机与高精度地图; 高速公路

摘要: To study the discretionary lane change behavior of passenger cars on the freeway, two UAVs (Unmanned Aerial Vehicle) were used to simultaneously shoot videos at a height of 200 m. Also a high-precision map was constructed. The two videos were spliced and the accurate running states of vehicles at each frame were obtained, including 8 key indicators, such as lane position, speed, and ID of the vehicle. A total of 1 520 lane change behaviors were extracted and 942 discretionary lane change behaviors were obtained after screening. Determination of the start and end of lane-changing was based on whether the trajectory of the vehicle continued to deviate. On this basis, 16 characteristic parameters, such as the length of lane-changing time, length of space, mutual state with surrounding vehicles, and safety of lane change behavior, were analyzed. It is concluded that the average length of lane-changing time is 6.09 s and the average space distance of lane-changing is 148.08 m. A lognormal distribution provides the best fit to the time and space length of lane-changing. The average distance between the lane-changing vehicle and the following vehicle in the target lane is found to be the shortest (34.29 m). The relative distance within 10 m is found to be 28.24%. To speed up driving, drivers make the lane-changing decision when the relative distance between the lane-changing vehicle and the following vehicle in the target lane is small. The relative velocity difference between the subject vehicle and the preceding vehicle in the original lane is the largest, at an average of 10.2 km·h⁻¹. Moreover, in 83% of cases, the speed of lane change car is faster than that of the front car in the original lane. It is fully explained that the free lane change of vehicles is caused by the slow speed of the vehicles ahead. TTC (time to collision) and MTC (margin to collision) were used to analyze the safety state at the beginning of lane change. The safety state can be divided into four types: serious-urgent state, serious-non-urgent state, non-serious-urgent state, and non-serious-non-urgent state. The two states serious-non-urgent, non-serious-non-urgent account for the highest proportion. The results of this research provide a certain reference for understanding the characteristics of the lane change behavior of drivers on freeway in China. The research results also have certain reference values that can be used in the establishment of a lane change behavior model suitable for the actual traffic environment in China.

摘要: 为了研究高速公路小型车的换道行为特性,采用2台无人机同时在200 m的高空对交通流进行拍摄,获取交通流运行状态。构建拍摄路段的高精度地图,获取每一时刻车辆的精确运行状态数据,在此基础上对2个视频进行拼接,最终获得车道位置、速度、车辆编号等8项关键指标,共提取换道行为1 520条,筛选后得到完整的自由换道数据942条。采用车辆轨迹是否持续偏移作为判断换道行为起终点的依据,在此基础上分析换道的时间长度、空间长度、与周边车辆的相互状态以及换道行为的安全性等16个特征参数。得出平均换道时间长度为6.09 s,平均换道空间距离为148.08 m,换道时间与空间长度均符合对数正态分布。换道车辆与

目标车道后方车辆的平均距离最小(34.29 m),其相对距离在 10 m 以内的占 28.24%,驾驶人为了加快行驶,在与目标车道后方车辆相对距离较小的情况下,依然采取换道措施。与正前方车辆的相对速度差最大,平均值为 10.2 km·h⁻¹,并且在 83%的情况下,本车的速度大于前车,说明车辆自由换道是由于前方车辆行驶速度较慢所引起。采用 TTC,MTC 分别对换道起始时刻的安全性进行分析,并将安全状态划分为 4 种类型:严重-紧急状态、严重-非紧急状态、非严重-紧急状态、非严重-非紧急状态。其中严重-非紧急,非严重-非紧急这 2 种状态占比最高。该研究成果对了解中国驾驶人在高速公路上的换道行为特性,以及对建立适用于中国实际交通环境特征的换道行为模型具有一定参考意义。

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作者: Zhao Jianyou; Han Wanli; Zheng Wenjie; Zhao Yang

作者: 赵建有; 韩万里; 郑文捷; 赵阳

标题: Distribution of emergency medical supplies in cities under major public health emergency

标题: 重大突发公共卫生事件下城市应急医疗物资配送

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文献类型: Article

作者关键词: emergency logistics; major public health emergency; medical supply; demand urgency; genetic algorithm; distribution path

作者关键词: 应急物流; 重大突发公共卫生事件; 医疗物资; 需求紧迫度; 遗传算法; 配送路径

摘要: To improve the emergency rescue efficiency of medical supplies and reduce the casualties and economic losses in cities under the major public health emergency, based on the characteristics analyses of major public health emergencies and emergency logistics, the demand urgency was taken as the influencing factor of distribution. The evaluation index system for medical supplies demand points was proposed with the evaluation indexes of population within jurisdictions, confirmed and suspected cases of infection, scale of medical supplies demand point, number of medical staff and gap rate of medical supplies. According to the characteristics of emergency logistics of medical supplies, the time window parameters of medical supplies distribution were adjusted. The total distribution cost function composed of driving cost, penalty cost of distribution delay and subsidy without distribution delay was established. Considering the constraints of vehicle load, distribution time window, and demand urgency of medical supplies, a dual objective of priority distribution for demand points with the minimum total distribution cost and high demand urgency was constructed to optimize the distribution path of medical supplies. Relying on the software platforms of SPSS, Yaahp and MATLAB, and combining with examples, the analytic hierarchy process and genetic algorithm were used to solve the optimization models of emergency logistics distribution path of medical supplies with and without the consideration of demand urgency. Research result shows that under the major public health emergency, the optimal distribution path considering the demand urgency not only gives priority to the medical supplies demand points with higher demand urgency, but also reduces the total distribution cost by 5.8%, comparing with the distribution path without the consideration of demand urgency. The introduction of demand urgency can greatly reduce the blindness of scheduling. The dual objective optimization model restrained by the conditions of vehicle load, distribution time window and demand urgency of medical supplies can effectively improve the emergency rescue efficiency and reduce unnecessary scheduling costs.

摘要: 为了在发生重大突发公共卫生事件时提高城市医疗物资的应急救援效率,减少人员伤亡与经济损失,在分析重大突发公共卫生事件特点与应急物流特征的基础上,将需求紧迫度作为配送影响因素,提出以辖区人口、感染确诊及疑似病例、医疗物资需求点规模、医护人员数量和医疗物资缺口率为评价指标的医疗物资需求点需求紧迫度评价指标体系;针对医疗物资应急物流的特点,调整医疗物资配送时间窗参数,建立由车辆行驶成本、配送延误惩罚成本和无配送延误补贴费用组成的总配送费用函数,并考虑配送车辆载重、配送时间窗、医疗物资需求紧迫度等约束条件,构建使总配送费用最少与需求紧迫度高的需求点优先配送的双重目标,优化了医疗物资的配送路径;依托 SPSS、Yaahp 和 MATLAB 软件平台,结合算例,利用层次分析法与遗传算法求解考虑与不考虑需求紧迫度的医疗物资应急物流配送路径优化模型。研究结果表明:重大突发公共卫生事件下,相对于不考虑需求紧迫度的配送路径,考虑需求紧迫度的最优配送路径不仅对需求紧迫度较高的医疗物资需求点进行优先配送,同时还使总配送费用减少了 5.8%;需求紧迫度的引入能极大地改善调度的盲目性,基于配送车辆载重、配送时间窗、医疗物资需求紧迫度等约束条件所构建的双目标优化模型能够有效地提高应急救援效率和减少不必要的调度成本。

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作者: Zhang Hailun; Fu Rui

作者: 张海伦; 付锐

标题: Driving Behavior Recognition and Intention Prediction of Adjacent Preceding Vehicle in Highway Scene

标题: 高速场景相邻前车驾驶行为识别及意图预测

来源出版物: 交通运输系统工程与信息 卷: 20 期: 1 页: 40-46 出版年: 2020

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文献号: 1009-6744(2020)20:1<40:GSCJXL>2.0.TX;2-P

文献类型: Article

作者关键词: traffic engineering; behavior recognition; intention prediction; CHMM; Bi-LSTM

作者关键词: 交通工程; 行为识别; 意图预测; 连续隐马尔可夫模型; 双向长短时记忆网络

摘要: The driving behavior of the adjacent preceding vehicle in highway scene will have an impact on the vehicles behind. Advanced driver assistance systems (ADAS) should be equipped with the ability to recognize the lane changing behavior of the adjacent preceding vehicle. In this paper, the lane change behavior of adjacent preceding vehicle in highway scene was studied, the behavior recognition model and intention prediction model based on the two-layer continuous Hidden Markov Model-Bayesian generation classifier (CHMM-BGC) and the Bi-directional long short time memory network (Bi-LSTM) were proposed, respectively. The validity of the models was tested and verified using a natural driving data set. Experimental analysis shows that the average recognition rate of the behavior recognition model based on Bi-LSTM is 11.24% higher than that of two layers CHMM-BGC. Both behavioral recognition models can recognize lane change behavior of the adjacent preceding vehicle in the early stages of lane change process. Considering the interaction between the adjacent preceding vehicle and surrounding vehicles, the model can be predictive. Both intention prediction models can predict the driver's lane change intention before the lane change moment of the vehicle. The model simulation time satisfies the real-time requirement of the system. It can reserve the reaction time for the driver and provide support for the prediction of the surrounding vehicle trajectory research.

摘要: 相邻前车的驾驶行为会影响后车,因此先进的辅助驾驶系统需具备识别前车驾驶行为的能力.对高速场景下相邻前车换道行为进行研究,分别提出双层连续隐马尔可夫模型贝叶斯

生成分类器(CHMM-BGC),以及基于双向长短时记忆网络(Bi-LSTM)的行为识别模型和意图预测模型.采用自然驾驶数据集对模型的有效性进行测试验证.实验分析表明:基于 Bi-LSTM 的行为识别模型相较于双层 CHMM-BGC 在平均识别率上提升了 11.24%,两种行为识别模型均可在相邻前车换道过程的早期阶段识别换道行为;考虑相邻前车与周围环境车辆的交互作用,可使模型具有预测性,两种意图预测模型均可在车辆换道时刻前预测到驾驶人换道意图.模型仿真计算时间可满足系统的实时性需求,为本车驾驶人预留出反应时间,为预测周围车辆行驶轨迹研究提供支持.

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作者: Xu Ting; Wen Changlei; Zhang Xiang; Li Baowen; Wang Jian; Zhang Yakun

作者: 徐婷; 温常磊; 张香; 李宝文; 王健; 张亚坤

标题: Lane Changing Behavior Identification of Urban Road Based on GMM-CHMM

标题: 基于 GMM-CHMM 的城市道路换道行为识别

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文献类型: Article

作者关键词: GMM; CHMM; intelligent transportation; lane changing identification; Gaussian mixture model; continuous hidden Markov model; driving behavior; active safety system

作者关键词: 智能交通; 换道识别; 驾驶行为; 主动安全系统

摘要: Advanced driver assistance system (ADAS) is one of the active safety systems to improve the safety of occupants in vehicles. In this paper, an urban road lane changing behavior identification model that can be applied to ADAS was proposed by combining vehicle parameters and vehicle position parameters. The experiment was carried out in the urban road environment of Xi'an, where 9 on-board real-time parameters data of 18 drivers as well as the relative speed, relative distance and relative angle between the front and rear vehicles were collected. 412 lane changing behavior units and 824 lane keeping behavior units were extracted, with a total of 88 992 data. The analysis of mathematical statistics shows that there is significant difference between steering wheel angle, steering angle velocity and relative safe distance ratio between lane changing behavior and lane keeping behavior. An identification model is established on the basis

of these 3 features parameters and identification model is a mixture of Gaussian mixed model (GMM) and Continuous Hidden Markov Model (CHMM). Some samples are used to evaluate the effectiveness of identification model. The results show that the identification accuracy of the hybrid model is 93.6%, which has a good effect and can be applied to ADAS well.

摘要: 高级驾驶辅助系统(ADAS)是提高车内乘员安全性的主动安全系统之一,将车载参数和车辆位置参数相结合,提出一种能够应用到 ADAS 的城市道路换道行为识别模型.在西安城市道路环境中进行实验,采集 18 位驾驶员的 9 个车载实时参数数据,以及前后车辆间的相对速度、相对距离、相对角度,提取 412 个换道行为单元和 824 个车道保持行为单元,共 88 992 条数据.运用数理统计方法分析表明,方向盘转角、转向角速度、相对安全距离比在换道行为和车道保持行为之间有显著性差异,在这 3 个特征参数的基础上,建立混合了高斯混合模型 (GMM)和连续型隐马尔可夫模型(CHMM)的识别模型,用部分样本对模型效能评价.结果表明,混合模型对换道行为的识别精度为 93.6%,具有良好的识别效果,可以很好地应用到 ADAS.

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作者: Xu Fan; Chen Zhaoyang; Li Zhao; Li Qianqian

作者: 许凡; 陈朝阳; 李昭; 李倩倩

标题: Prediction on the Laminar Burning Velocity of Dimethyl Ether/Air Mixtures Using Machine Learning

标题: 采用机器学习的二甲醚层流燃烧速度预测研究

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文献类型: Article

作者关键词: laminar burning velocity; dimethyl ether; model prediction; machine learning; multivariate regression

作者关键词: 层流燃烧速度; 二甲醚; 模型预测; 机器学习; 多变量回归

摘要: To determine the relationship between laminar burning velocity of dimethyl ether (DME)/air mixture and the initial conditions(temperature,pressure,equivalence ratio),the calculation of laminar burning velocity of dimethyl ether/air mixture was formulated using the multivariate regression algorithm of machine learning based on the experimental and simulated results.By comparing with the results of literatures and numerical simulation,it is found that the formula can accurately predict the laminar burning velocity of dimethyl ether/air mixtures under the conditions with equivalence ratio range of 0.8-1.4,initial pressure range of 0.1-1.0MPa and initial temperature range of 298-373 K.The laminar burning velocity of DME has negative exponent relationship with initial pressure but positive exponent relationship with initial temperature,which indicates a decrease of laminar burning velocity of DME with the increase of initial pressure but an increase with the initial temperature.The absolute value of the pressure or temperature index is smaller in the stoichiometric condition,and the value increases as the mixture becomes richer or leaner,indicating a higher sensitivity of laminar burning velocity of DME to the initial pressure or initial temperature change in this condition.This study may provide simple and accurate input data of laminar burning velocity for the numerical simulation of DME engines to save research costs and calculation time.

摘要: 为了明确二甲醚层流燃烧速度与混合气初始条件(温度、压力、当量比)之间的关系,基于大量的实验及数值模拟数据,利用机器学习多变量回归算法,建立了二甲醚/空气预混层流燃烧速度随初始条件的拟合关系式。通过与文献及数值模拟结果的对比,发现所建立的函数关系式能够在 0.8~1.4 当量比、298~373K 初始温度和 0.1~1.0MPa 初始压力范围内得到准确的二甲醚层流燃烧速度预测结果。二甲醚层流燃烧速度随初始压力呈负指数关系,随初始温度呈正指数关系,化学当量比时,压力和温度指数的绝对值较小,混合气较浓或较稀时,压力和温度指数的绝对值增大,表明二甲醚层流燃烧速度随初始压力的增大而减小,随初始温度的升高而增大,且在较浓或者较稀的混合气条件下,层流燃烧速度随初始压力和温度的变化更为敏感。研究结果可以为二甲醚发动机数值模拟提供简单准确的层流燃烧速度输入数据,从而节约研究成本和计算时间。

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作者: 张一西; 马建; 赵轩; 张凯; 刘晓东

标题: Unscented Kalman Filter Estimator of Vehicle States and Parameters Based on Ant Lion Optimization Algorithm

标题: 基于蚁狮算法的 UKF 车辆状态参数估计器

来源出版物: 中国公路学报 卷: 33 期: 5 页: 165-177 出版年: 2020

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文献类型: Article

作者关键词: automotive engineering; parameter estimation; unscented Kalman filter; distributed drive electric vehicle; ant lion optimization algorithm

作者关键词: 汽车工程; 参数估计; 无迹卡尔曼滤波; 分布式驱动电动汽车; 蚁狮算法

摘要: To accurately acquire the states and parameters of distributed drive electric vehicles and meet the requirements of vehicle stability control systems, a state parameter estimator was proposed based on the ant lion optimization (ALO) and unscented Kalman filter (UKF) algorithms with a consideration of the uncertain noise covariance in the process of UKF. The ALO algorithm was used to find the optimal noise covariance and the singular value decomposition (SVD) was implemented to always maintain the noise covariance matrix in positive definiteness. In addition, tire cornering stiffness as the estimator input was identified by the exponential weighted least square algorithm. The parameter estimation model for distributed drive electric vehicles was established based on a MATLAB/Simulink and CarSim co-simulation platform; the co-simulation was conducted under the double lane change and sinusoidal hysteresis maneuver and a vehicle test under the double lane change was also carried out with A&D 5435 rapid prototyping platform. The simulation and test results indicate that, compared to the estimation results of the SVDUKF estimator, under the double lane change simulation condition, the root mean square error of side slip angle and yaw rate are reduced by 55.7% and 30.7% respectively. Under the sinusoidal hysteresis simulation condition, the root mean square error of the side slip angle and yaw rate are reduced by 58.1% and 85.1% respectively. Furthermore, the estimator can maintain an adequate performance despite vehicle instability. Under the double lane change test condition, the root mean square error of the yaw rate is only $0.9384 (^{\circ})\cdot s^{-1}$. Therefore, the proposed ALO-SVDUKF estimator of distributed drive electric vehicles can effectively improve the estimation accuracy of the side slip angle and yaw rate, providing accurate state information for vehicle stability control.

摘要: 为了准确获取分布式驱动电动汽车状态参数信息,满足车辆稳定性控制系统的需求,提出一种基于蚁狮算法的无迹卡尔曼滤波状态参数估计器。针对无迹卡尔曼滤波(UKF)过程中噪声协方差矩阵的不确定性,采用蚁狮优化算法(ALO)对其进行寻优,并引入奇异值分解(SVD)的方法来维持噪声协方差矩阵的正定性,此外,基于指数加权最小二乘法对车辆侧偏刚度进行辨识并将其作为状态参数估计器输入。基于 MATLAB/Simulink 和 CarSim 联合仿真

平台,建立分布式驱动电动汽车参数估计模型,分别进行双移线工况和正弦迟滞工况仿真,并基于 A&D5435 快速原型开发平台进行双移线工况实车试验。仿真与试验结果表明:相比于 SVDUKF 算法估计结果,双移线仿真工况下,基于 ALO-SVDUKF 算法估计得到的质心侧偏角和横摆角速度的均方根误差分别降低了 55.7%、30.7%,正弦迟滞仿真工况下,均方根误差分别降低了 58.1%、85.1%,且在车辆处于极限失稳状态时仍能维持较好的估计效果;双移线试验工况下,横摆角速度的估计值与实际测量值之间的均方根误差仅为 $0.9384 (^{\circ})\cdot s^{-1}$;提出的基于 ALO-SVDUKF 算法的分布式驱动电动汽车状态参数估计器能够有效提高质心侧偏角和横摆角速度的估计精度,可为车辆稳定性控制提供精确的状态信息。

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作者: Zhang Shuo; Yu Qiang; Wang Yibo

作者: 张硕; 余强; 王一博

标题: Passengers'immediate escape decision model for the motor-coach accidents

标题: 大型客车事故人员逃生决策模型研究

来源出版物: 安全与环境学报 卷: 20 期: 2 页: 624-631 出版年: 2020

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文献类型: Article

作者关键词: public safety; decision; emergency evacuation; naive Bayesian; analytic hierarchy process

作者关键词: 公共安全; 决策; 紧急疏散; 朴素贝叶斯; 层次分析法

摘要: The present paper has chosen 110 sampling members to confirm the distributive situation of the gender and age difference in China to conduct a questionnaire survey to trace and identify the characteristic features of the emergency decisionmaking psychology and the behaviors of

passengers' escape on account of bus accident happening. By means of the significance analysis method of contingency table, the paper has done an analysis of the personal factors that may influence the decision-making behaviors of the passengers on account of the different categories of gender, personality, riding frequency and traffic accident experience. According to the report of over 200 typical cases of passenger traffic accidents, such as by the accident tracing in accordance with the on-spot scenario photos taken by the accident monitoring video recordings, the accident inquiry transcripts, the accident casualty accounting identification and vehicle attacking accident inspection reports, we have managed to obtain the decision-making escape behaviors of the traffic supervisors of the real accident scenarios. According to the questionnaire response and the results of the accident analysis, we have managed to divide the passengers' escape decision-making behaviors into 4 types: the leadership type, the follow-up type, the tension type and the in-situ waiting type. According to the naive Bayesian theory, the above factors can be trained to simulate the subconscious escape decision-making of the personnel under study. Based on the environmental factors, the judgment matrix can be built up as a result of tracing the analytic hierarchical process, and the decision-making model of the passenger escape when a bus accident is hit by. Combining the 2 kinds of escape decision-making models, it would be possible to predict the type of the escape decision-making of the occupant as a result of the accident by using the personnel characteristic variables. And, finally, the imitated bus accident escape experiment can be laid out, with the experimental results being in nice agreement with the model predicted results. The tracing observation and the actual in-situ research results show that the emergency decision-making psychology of the passengers following the bus accidents can largely be affected by the individual congenital features and the experience gained. Among them, gender and temperament type ought to have a greater impact on the emergency escape decision-making after the bus accidents, which can be manifested in the fact that men are more active than women in the escaping process, and among them those with mucous and depressive personality tend to behave obviously calmer enthusiastically. And, in front of the unexpected hit by the accidents and evacuation, men are more active than women prove to have a positive impact on their final emergency decision-making.

摘要: 为研究客车事故后人员应急决策心理及逃生行为特征, 选取 110 名符合我国性别、年龄分布的样本成员进行问卷调查, 通过显著性分析得到影响人员决策行为的个人因素。根据朴素贝叶斯理论对上述影响因素进行学习、训练, 模拟人员的潜意识逃生决策。结合环境因素由层次分析法构造判断矩阵, 构建客车事故后人员逃生决策模型。进行客车事故逃生试验, 试验结果与模型预测结果具有较好的一致性。研究表明, 客车事故后人员的应急决策心理在很大程度上受个体先天特征及后天经验的影响。

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作者: Jiang Jinke; Liu Zhao; Peng Xianlong

作者: 蒋进科; 刘钊; 彭先龙

标题: Optimization Design of Vibration Reduction for Hypoid Gears with Ease-Off Flank Modification

标题: Ease-Off 修形准双曲面齿轮减振优化设计

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文献类型: Article

作者关键词: hypoid gear; ease-off modification; vibration; meshing stiffness; loaded transmission error; loaded tooth contact analysis

作者关键词: 准双曲面齿轮; Ease-off 修形; 振动; 啮合刚度; 承载传动误差; 承载接触分析

摘要: An optimization design method of vibration reduction for ease-off modification based hypoid gears was proposed to improve dynamic performances of automobile drive pinion axle. The modified pinion were represented by a sum of two vector functions determining the tooth of conjugate and the pinion normal ease-off deviations, which were expressed by both predesigned transmission error function and tooth profile modification curves. Meshing stiffness was obtained with tooth contact analysis (TCA) and loaded tooth contact analysis (LTCA) . Based on force analysis of the meshing position,the bending-torsional-axial coupling dynamic lumped mass model for hypoid gears was established,and the vibration response of the system was obtained by solving the differential equation of motion with numerical method. The best ease-off deviations were determined by a optimizing minimal mean square value of normal vibration. Besides,influences of stiffness curve shape and amplitude caused by modification on the dynamic performance of the system were explored. A numerical example shows that excessive modification leads to decrease of meshing stiffness,which are responsible for the increase of normal vibration. In case of a little differences in value of average meshing stiffness for the modified tooth surfaces,the shape is more sensitive to vibration than the amplitude for stiffness curve. After the optimal ease-off modification,the vibration of system is obviously reduced. Besides,the average meshing stiffness decreases a little and main frequency in the stiffness curve is meshing frequency,and there is no frequency doubling component. When the amplitude of load transmission error (ALTE) decreases and the high frequency component in the curve increases,the vibration may not be reduced,and ALTE can basically reflect the variation tendency of vibration with loads.

摘要: 为了改善汽车驱动桥动态性能,提出基于 Ease-off 修形准双曲面齿轮齿面减振优化设计方法。该方法通过预置传动误差参数及抛物线修形参数设计小轮法向 Ease-off 曲面,小轮修形齿面表示为与大轮共轲的小轮齿面叠加 Ease-off 曲面。结合齿面接触分析(TCA)、齿面承载接触分析(LTCA)方法获得齿轮啮合刚度。以啮合位置受力分析为基础,应用集中质量法建立准双曲面齿轮弯-扭-轴耦合动力学模型,采用数值方法求解运动微分方程得到系统的振动响应。以法向振动加速度均方根最小为优化目标获得最佳修形齿面,并分析修形导致的刚度波形及幅值变化对系统动态性能的影响。算例表明:当修形量过大时导致刚度下降较多,引起法向振动增加;修形齿面的平均啮合刚度相差不大情况下,刚度曲线的形状较幅值对振动的影响更为敏感;最优 Ease-off 修形后系统振动明显降低,齿轮副的平均啮合刚度下降较少且刚度曲线中主要为啮合频率,基本无倍频成分;修形齿面承载传动误差幅值(ALTE)降低且曲线中的高频成分增加时,未必能减小振动;多载荷 ALTE 曲线基本可以反映振动随载荷的变化趋势。

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作者: Jiang Jinke; Liu Zhao; Liu Hongmei

作者: 蒋进科; 刘钊; 刘红梅

标题: Design and Analysis for Straight Bevel Gears with Ease-Off Flank Modification Based on Minimal Wear

标题: 齿面磨损最小直齿锥齿轮 Ease-off 修形设计与分析

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文献类型: Article

作者关键词: straight bevel gear; Ease-off modified; tooth wear; loaded tooth contact analysis

作者关键词: 直齿锥齿轮; Ease-off 修形; 齿面磨损; 承载接触分析

摘要: An approach of ease-off flank modification for straight bevel gears is proposed to improve meshing performances and reliability. By means of technology of milling straight bevel gear with plate cutters on a cradle generator, the modified pinion is represented by a sum of two vector functions determining the conjugate gear tooth, and normal ease-off deviations expressed by both predesigned transmission error function and tooth profile modification curves. Then a numerical method of loaded wear tooth contact analysis considering wear is introduced according to tooth contact analysis, loaded tooth contact analysis and Archard formula of wear, which combines tooth surface geometry analysis with mechanical analysis and fully considers the coupling of alignment error, tooth surface modification and wear. So the wear depth of tooth profile reconstituted is obtained accurately and quickly. The best ease-off modification is determined by optimizing with minimal amplitude of loaded transmission error (ALTE) and maximal wear times as the objectives, and the influences of wear on ALTE are explored. The results show that the wear times with the same depths gradually decrease and tend to equal as increasing loads. The increasing wear times lead to increasing initial contact clearances from meshing zone of two pairs, which is mainly responsible for increasing meshing deformations. Under multi-load conditions, minimum ALTE and the corresponding load increase gradually with increasing wear times; mild wear facilitates reducing ALTE for conjugate tooth.

摘要: 为了改善齿轮传动性能和可靠性,提出了直齿锥齿轮齿面抗磨设计与分析方法。该方法结合碟型刀具在摇台型机床切制直齿锥齿轮方法获得大轮齿面;通过预置传动误差及抛物线修形参数设计小轮法向 Ease-off 曲面,并叠加于大轮的共轭齿面表达修形齿面。结合齿面接触分析、承载接触分析、Archard 磨损公式,提出考虑磨损深度影响的齿面承载接触分析数值方法,将齿面几何分析与力学分析融为一体,且充分考虑了安装误差、齿面修形和磨损的耦合性,可准确快速获得齿形重构后的齿面磨损量;以无磨损时承载传动误差幅值(ALTE)最小、齿面磨损次数最多进行修形优化设计,获得最优 Ease-off 曲面,并分析磨损对 ALTE 的影响。结果表明:相同磨损量下,随载荷的增加磨损次数逐渐减少且趋于相等;随齿形重构次数增加,主要是双齿啮合区的齿面初始间隙增加,导致承载变形增大;多载荷工况下,随磨损次数增加最小 ALTE 及其对应的载荷逐渐增大;共轭齿面轻度磨损后 ALTE 有所改善。

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作者: Li Meng; Tian Guibin; Liu Yi; Liu Heng; Qi Shemiao; Song Haitao; Ji Chuanyi

作者: 李猛; 田桂斌; 刘意; 刘恒; 戚社苗; 宋海涛; 姬传义

标题: Ultrasonic measurement of oil film thickness in cylindrical roller bearings under mixed lubrication

标题: 圆柱滚子轴承混合润滑状态下的超声法膜厚测量

来源出版物: 振动与冲击 卷: 39 期: 10 页: 279-284 出版年: 2020

文献号: 1000-3835(2020)39:10<279:YZGZZC>2.0.TX;2-V

来源出版物: Journal of Vibration and Shock 卷: 39 期: 10 页: 279-284 出版年: 2020

文献号: 1000-3835(2020)39:10<279:YZGZZC>2.0.TX;2-V

文献类型: Article

作者关键词: cylindrical roller bearing; mixed lubrication; ultrasonic measurement; contact coefficient; oil film thickness

作者关键词: 圆柱滚子轴承; 混合润滑; 超声测量; 接触系数; 油膜厚度

摘要: Cylindrical roller bearings are widely used in various types of large equipment under low speed and heavy load conditions due to their linear contact characteristics. Their operating performance and stability are closely related to the contact lubrication state between rollers and the inner or outer rings. The ultrasonic method based on equivalent stiffness can be used to measure the thickness of elastohydrodynamic lubrication film of roller bearings under actual working conditions. But it cannot be directly applied to the measurement of oil film thickness in mixed lubrication state under low speed and heavy load conditions. Therefore, an ultrasonic measurement method under mixed lubrication was proposed in this paper, and the parallel model of interface oil film stiffness and rough body contact stiffness was established. By introducing the contact coefficient and combining with the empirical formula, the total interface stiffness measured by ultrasonic method was decomposed to get the oil film stiffness under mixed lubrication state. Then a more accurate oil film thickness was obtained. Finally, through comparing the experimental and theoretical results, the feasibility and validity of the proposed model were verified.

摘要: 圆柱滚子轴承由于其线接触特点被广泛应用于各类低速重载工况下的大型设备中, 其运行性能和稳定性与滚子和内外圈间的接触润滑状态密切相关; 基于等效刚度的超声法可用于实际工况的滚子轴承弹流润滑油膜厚度测量, 但无法直接适用于低速重载工况下流体润滑和粗糙峰接触共存的混合润滑状态膜厚测量。为此, 提出了一种混合润滑状态下的超声测量方法, 建立了界面油膜刚度和粗糙体接触刚度的并联模型, 通过引入接触系数并结合经验公式对超声法所测界面总刚度进行分解, 获取混合润滑状态下的油膜刚度, 进而得到更加准确的油膜厚度。将实验结果和理论结果的对比分析, 验证了该模型的可行性和有效性。

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标 题 : Simplified predictive control for direct torque control of surface permanent magnet synchronous motor

标题: 表面式永磁同步电机直接转矩控制系统简化预测控制策略

来源出版物: 电机与控制学报 卷: 24 期: 4 页: 96-103 出版年: 2020

文献号: 1007-449X(2020)24:4<96:BMSYCT>2.0.TX;2-B

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文献类型: Article

作者关键词: surface permanent magnet synchronous motor; direct torque control; predictive control; torque ripple; flux ripple

作者关键词: 表面式永磁同步电机; 直接转矩控制; 预测控制; 转矩脉动; 磁链脉动

摘要: In order to suppress high torque ripple in the surface permanent magnet synchronous motor (PMSM) direct torque control based on switching table,predictive control with the angle of applied voltage vector as control variable is proposed. The amplitude of stator flux and torque at next sampling period were calculated. Furthermore,cost function about stator flux and torque's

errors were obtained. The angle corresponding to the minimum cost function was selected as the angle of applied voltage vector. But the calculation of stator flux and torque were complicated and time-consuming. Therefore, simplified expressions to calculate stator flux and torque were given. Errors between simplified expressions and conventional expressions show simplified expressions can be used instead of conventional expressions. Simulation results of surface permanent magnet synchronous motor direct torque control using conventional and simplified predictive control show two control schemes can control stator flux and torque with good performance. Time consuming and calculation results of conventional and simplified predictive control expressions of stator flux and torque were carried out using MK60DN512ZVLQ10 chip. Experimental results show that, compared with conventional predictive control, simplified predictive control can decrease time consuming with the same calculation results.

摘要: 针对基于开关表控制的表面式永磁同步电机(PMSM)直接转矩控制系统转矩脉动大的缺陷,建立电压矢量相角为控制变量的预测控制。该方法通过计算下一时刻的定子磁链幅值和转矩得到关于磁链和转矩误差的成本函数,并选择令成本函数最小的电压矢量作为施加电压矢量,但其对定子磁链幅值和转矩的预测计算较为复杂,运算负担大,运算耗时长。提出一种简化的定子磁链幅值和转矩预测计算方法,计算简化方法与传统计算方法的相对误差率,证明了简化方法的可行性。仿真结果表明:传统预测控制和简化预测控制均可实现表面式永磁同步电机直接转矩控制系统对磁链和转矩的控制,控制效果良好,两者控制效果相当。基于MK60DN512ZVLQ10 单片机平台对传统及简化计算公式进行计算耗时和计算精度实验,实验结果表明简化计算公式可明显减少计算用时,且计算精度保持不变。

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作者: Li Xuan; Shen Pengju; Zhao Junwei; Liu Yongtao; Wang Peng

作者: 李旋; 沈鹏举; 赵俊玮; 刘永涛; 王鹏

标题: Analysis and Prediction of Passenger Injury Severity Based on Multiple Injury Components

标题: 基于多致伤部件的乘员损伤严重程度分析与预测

来源出版物: 汽车技术 期: 8 页: 28-33 出版年: 2020

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文献类型: Article

作者关键词: AdaBoost; Injury components; Passenger injury; Severity; Analysis and prediction;

Binary logistic regression; AdaBoost; SVM

作者关键词: 致伤部件; 乘员损伤; 严重程度; 分析与预测; 二元逻辑回归; 支持向量机

摘要: In order to determine the impact of injured components in collision on the severity of occupant injury, data of 400 injury-causing accidents are screened from China In-Depth Accident Study (CIDAS) database for analysis. The binary logistic regression model is established to analyze the factors of passenger injury location, direct injury components and indirect injury components in the accident process, the results shows that the body area of the occupants and the front and rear position of the injured part have significant influence on the severity of the injuries. Among them, the Odds Ratio (OR value) of BD region (car top) in the directly injured parts reaches 1.549 and that of environmental parts in the indirectly injured parts reaches 1.489, which have the most significant influence on the severity of injury. Finally, AdaBoost-SVM model is used to predict the severity of occupant injury, and the accuracy of the prediction results reaches 80.36%.

摘要: 为确定碰撞事故中致伤部件对乘员损伤严重程度的影响, 从中国交通事故深入研究 (CIDAS) 数据库中筛选 400 例致伤事故的数据进行分析。建立二元逻辑回归模型, 对事故过程中乘员损伤部位、直接致伤部件和间接致伤部件等因素进行分析, 结果表明: 乘员损伤身体区域、损伤部位的前后位置等对乘员损伤严重程度有显著影响; 其中直接致伤部件中 BD 区域 (车顶部) 的比值比 (OR 值) 达到 1.549, 间接致伤部件中环境部件的比值比达到 1.489, 对损伤严重程度影响最为显著。最后, 通过 AdaBoost-SVM 模型对乘员损伤严重程度进行预测, 预测结果准确率可达到 80.36%。

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标题: Car-following Warning Rules Considering Driving Styles

标题: 考虑驾驶人风格的跟车预警规则研究

来源出版物: 中国公路学报 卷: 33 期: 2 页: 170-180 出版年: 2020

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作者关键词: automotive engineering; car-following warning rule; Gaussian mixture modeling; driving style; driver; advanced driving assistance system

作者关键词: 汽车工程; 跟车预警规则; 高斯混合模型; 驾驶风格; 驾驶人; 高级驾驶辅助系统

摘要: The research of early warning and control strategy considering driving style is a hotspot in the field of automatic driving.To study driver's car-following characteristics and explore whether the warning rules can be applied for different driving styles and further develop active safety warning systems for self-driving vehicles to meet the needs of different users,50 participants were recruited to carry out a real road test.The characterization parameters for the analysis of car-following behaviors were collected and the extraction rules of the car-following events were determined based on radar data.The Gaussian mixture model method with the inputs of the K-means algorithm was used for clustering and drivers were classified into three types of driving styles (aggressive drivers,calm drivers,and conservative drivers) on the basis of two-dimensional variables:average time gap and average time gap when braking.By analyzing the car-following data and braking characteristics of the three groups of drivers,combined with the real warning data and the warning rate of time gap when braking in different percentiles,the time gap when braking in the percentile format was suggested as the warning threshold afterward.Accordingly,the warning rules were adjusted to meet the needs of different types of drivers.The results show that there is a significant difference between the time gap and time gap when braking for three groups of drivers.Aggressive drivers tend to keep a smaller time gap or time gap when braking,while conservative drivers usually choose a larger value.The number of early warnings from three groups of drivers is 215,the number of times when the brake pedal is pushed by a driver while the system failed to give a warning was 329,the overall warning rate of the existing system is 21.9%,and the missed alarms account for 87.5%.Warning rules are unreasonable and should be reset considering driving styles after analyzing the information entropy.The result is satisfying when using a 10% percentile of time gap when braking as the warning threshold,and the new warning rules can adapt to different types of drivers to a certain extent.

摘要: 为研究驾驶人的跟车特性及探究可适用于不同风格驾驶人的跟车预警规则,为自动驾驶车辆开发可满足不同用户驾驶需求和驾乘体验的主动安全预警系统,选取 50 名被试驾驶人开展实车试验,采集驾驶人跟车行为表征参数并基于雷达数据确定跟车事件提取规则。选取平均跟车时距和平均制动时距为二维向量,使用基于 K-means 聚类结果的高斯混合模型将驾驶人聚类为 3 种风格类型(冒进型、平稳型、保守型)。通过分析 3 组驾驶人的跟车及制动数据,将不同类型驾驶人的制动时距分位数作为跟车预警阈值,结合实际预警数据及不同制动时距分位数对应的预警正确率,对现有跟车预警规则进行调整,以适应不同类型驾驶人的驾驶需求。研究表明:3 组驾驶人的平均跟车时距和平均制动时距差异显著,冒进型驾驶人倾向于选择较小的跟车时距和制动时距,保守型驾驶人的跟车时距和制动时距则普遍较大;3 组驾驶人的实际跟车预警次数为 215 次,驾驶人采取制动操作而系统未予以预警的次数为 329 次,系统整体预警正确率为 21.9%,漏警率为 87.5%,通过分析信息熵等判定当前预警规则并不合理;将每类驾驶人制动时距的 10%分位数作为阈值时的预警效果较好,调整后的跟车预警规则能在一定程度上适应不同的驾驶人类型。

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作者: 邓雷; 朱彤; 王晓勇; 孙智诚; 谢培

标题: Analysis of Shaanxi's road network based on space syntax

标题: 基于空间句法的陕西省路网结构分析

来源出版物: 测绘工程 卷: 29 期: 2 页: 52-59 出版年: 2020

文献号: 1006-7949(2020)29:2<52:JYKJQF>2.0.TX;2-4

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文献号: 1006-7949(2020)29:2<52:JYKJQF>2.0.TX;2-4

文献类型: Article

作者关键词: transportation economy; spatial syntax; accessibility; coordination

作者关键词: 交通运输经济; 空间句法; 通达性; 协调性

摘要: In order to evaluate the coordination between the development level of road traffic network and the economic development of the provincial-level administrative scale in Shaanxi Province, and based on the spatial syntactic theory and ArcGIS, the road traffic network and the gross national product of each prefecture-level administrative region are analyzed. The result shows that the road traffic network is spreading out with Xi'an, and the development of each region is quite different. There is a positive correlation between the development level of transportation network and economic development. The cities which the development level of transportation

network is behind the economic lower development and the development level of the road network is also located in the northern of Shaanxi. Those cities should be paid attention to in the future optimization and upgrading of Shaanxi's transportation network.

摘要: 对陕西省地级行政尺度道路网络发展水平与经济协调性进行评价。以空间句法理论为基础,结合 ArcGIS 对各个地级行政区的道路网络与国民生产总值进行分析。结果显示:道路网络呈现以西安市为枢纽中心向外扩散,且各区域发展差异较大;交通网络发展水平与经济发展之间具有强的正相关性;交通网络发展水平滞后于经济发展的城市多位于陕北地区且路网发展水平也较低,是未来陕西省交通网络优化升级关注的重点区域。

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标题: Driving Condition of City Bus in Xi'an Based on Clustering and VSP Distribution

标题: 基于聚类 and 比功率分布的西安城市公交行驶工况研究

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 4 页: 23-30 出版年: 2020

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文献类型: Article

作者关键词: vehicle engineering; specific power distribution; driving condition; clustering; city bus

作者关键词: 车辆工程; 比功率分布; 行驶工况; 聚类; 城市公交

摘要: Vehicle driving condition is the important test basis for evaluating performance indexes, such as vehicle fuel consumption and emission. The actual operation data of the selected Xi'an city bus lines were collected, and the total original data samples of Xi'an city bus line construction

were established, according to the station strength and line strength as the data distribution basis. Clustering method was used to classify the samples into three types: congestion, general and unobstructed. Three types of driving conditions were constructed respectively based on vehicle specific power, and the comprehensive driving condition of Xi'an urban buses was constructed by the time proportion of three kinds of data. The comprehensive driving condition was verified from the aspects of vehicle specific power distribution and eigenvalue, and was compared with ECE condition and CCBC condition. The results show that the error of vehicle specific power distribution between the proposed comprehensive condition and the sample data is 0.0033, and the average error of eigenvalue is 0.083. Both two errors are far less than the errors between ECE condition, CCBC condition and sample data, which can accurately reflect the actual operation and emission characteristics of city bus in Xi'an.

摘要: 车辆行驶工况是评价车辆油耗、排放等各项性能指标的重要测试依据。采集所选西安城市公交线路实际运行数据,以站点强度和线路强度为数据分配依据,建立了西安城市公交线路工况构建的原始数据总样本。采用聚类法将样本数据分为拥堵、一般、通畅这3类,基于比功率分布构建出3类工况,并以3类数据的时间比例构建出西安城市公交行驶综合工况;从比功率分布和特征值两个角度对综合工况进行验证,并将其与ECE工况和CCBC工况进行了对比分析。结果表明:所建综合工况与样本数据的比功率分布误差为0.0033,特征值平均误差为0.083,均远小于ECE工况和CCBC工况与样本数据的误差,能准确地反映西安市公交车实际运行状况和排放特征。

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标题: Safety Analysis of Different Vehicle Types in Urban-Rural Binding Regions Based on Logit Model

标题: 基于 Logit 模型的城乡结合部不同车型安全性分析

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 1 页: 28-33 出版年: 2020

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文献类型: Article

作者关键词: traffic engineering; Logit model; urban-rural binding regions; vehicle type safety

作者关键词: 交通工程; Logit 模型; 城乡结合地区; 车型安全性

摘要: Compared with urban areas,urban-rural binding regions have the characteristics of frequent accidents and high severity. Although the effort has been made in many ways,the effect is limited. The urban-rural binding region has become a key bottleneck area that affects China's traffic safety. The accident data of the urban-rural binding regions of a city in the past three years were collected,and the vehicle CWI(crash worthiness index) and CAI(crash aggressivity index) were introduced as the vehicle type safety indexes.Based on the polytomous ordered Logit model,the safety analysis method of different vehicle types in the urban-rural binding area was designed,and the safety of each vehicle type was determined.The influence of various factors on vehicle safety was analyzed in depth,and the relevant improvement suggestions were put forward.

摘要: 与城市地区相比,城乡结合地区交通具有事故频发、严重程度高等特点,虽经多方努力但效果有限,已成为影响我国交通安全的重点瓶颈地区。采集某城市城乡结合地区近 3 年来的事故数据,引入车辆保护性和攻击性指标作为车型安全性指标,基于多分类有序 Logit 模型设计了城乡结合地区不同车型安全性分析方法,确定了各车型安全性,深入分析了各因素对车型安全性影响,并提出相关改善建议。

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标题: Dynamical Force Characteristics for Helical Planetary Gear Considering Loaded Tooth Contact of Multi-gears

标题: 考虑多体承载啮合斜齿行星齿轮动载特性分析

来源出版物: 工程科学与技术 卷: 52 期: 1 页: 161-167 出版年: 2020

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文献类型: Article

作者关键词: helical planetary gear; dynamical force; loaded tooth contact analysis; corner meshing impact; meshing stiffness; load sharing coefficient

作者关键词: 斜行星齿轮; 动载荷; 承载接触分析; 啮合冲击; 啮合刚度; 均载系数

摘要: With the wide use of helical planetary gears in the case of high-speed and heavy loads, the study of dynamic loads characteristics become great significance for reduction vibration and noises. Firstly, correctly describing meshing stiffness and meshing error of planetary gear was the top priority of dynamic analysis, so an approach of loaded tooth contact analysis for planetary gears (PLTCA) combining gear geometry analysis and mechanical analysis of tooth was proposed to calculate meshing stiffness of gears and corner meshing impact, which was prepared for further analysis of planetary gear dynamics. Secondly, considering time-varying meshing stiffness and corner meshing impact excitation, a lumped-parameter planetary gear model was established and forces responses were got by solving the dynamic equations with numerical method. The results showed that the dynamical meshing forces increase remarkably with the speed increase except resonance speed. Besides, installation error, especially the center distance error, is responsible for the difference in value of meshing stiffness, and lead to the more resonance speeds, furthermore. With floating planetary gear, the dynamic forces are reduced at the resonant speeds, and the dynamic meshing force of some gears are obviously reduced with increasing speeds due to the differences in value of meshing stiffness.

摘要: 斜齿行星传动在高速重载场合中应用越来越广泛,其动载特性研究对减振降噪具有重要意义。正确地描述行星齿轮系统的啮合刚度和啮合误差是进行动力学分析的前提。为此,紧密结合齿轮几何分析与力学分析,提出行星齿轮承载接触分析技术,获得各齿轮副的耦合时变啮合刚度,并计算其啮合冲击力,为行星齿轮动力学深入分析奠定基础;其次,应用集中参数法建立考虑齿轮副安装误差、刚度激励及啮合冲击激励的斜齿行星传动啮合型弯-扭-轴动力学模型,采用数值法求解系统的动载特性。结果表明:考虑啮合冲击激励时,随转速的增加动载荷增加更为明显;共振转速附近,啮合冲击对动态啮合力的影响较小;安装误差特别是中心距误差是引起各齿轮副啮合刚度不同的主要原因,其进一步导致了系统的共振转速变多;行星轮浮动可以明显降低共振转速处的动载荷,由于各外(内)齿轮副刚度的不同,随转速的增加行星轮浮动使得部分齿轮副的动态啮合力明显降低。

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标题: Application of the enhancement test technology in the vehicle reliability test

标题: 强化试验技术在车辆可靠性试验中的应用

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作者关键词: vehicle reliability test; enhancement test technology; vehicle road test; bench simulation test; virtual proving test

作者关键词: 车辆可靠性试验; 强化试验技术; 整车道路试验; 台架可靠性试验; 虚拟仿真试验

摘要: The traditional vehicle reliability test which requires a large amount of statistic information on the vehicles has a certain hysteresis in the verification of vehicle reliability, which is not conducive to the vehicle reliability test as well as the development and optimization of vehicles. Thus, the enhancement test technology is widely used in the automobile design and finalization. In order to optimize the vehicle reliability test, this article summarizes the application of the enhancement test technology in the vehicle reliability test from three aspects: vehicle road test, bench reliability test, and virtual proving test, according to the characteristics of both the enhancement test technology and the vehicle fault model. Suggestions are made on the future trend of the enhancement test technology in the vehicle reliability test, based on summarizing the status quo and deficiencies of the vehicle reliability test, which provides reference for improving the automobile reliability, optimizing the automobile design and accelerating the vehicle reliability test.

摘要: 由于传统车辆可靠性试验需要统计大量的车辆使用信息, 在车辆可靠性验证上具有一定的滞后性, 不利于车辆可靠性试验的发展和汽车的开发优化研究, 因此强化试验技术在汽车产品设计和定型过程中得到了更广泛的关注。为了进一步推进车辆可靠性试验研究的发展, 根据强化试验技术和车辆故障模式的特点, 从整车道路试验、实验室台架可靠性试验及虚拟仿真试验 3 个方面对强化试验技术在车辆可靠性试验中的应用进行综述。在总结现有车辆可

靠性强化试验的研究现状和不足的基础上,指出车辆可靠性强化试验技术的发展趋势,为提升汽车可靠性、优化汽车设计和促进汽车可靠性试验的发展提供参考。

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作者: 张新锋; 姚蒙蒙; 王钟毅; 饶勇翔

标题: Lithium-ion battery capacity decline prediction based on ant colony optimization BP neural network algorithm

标题: 基于 ACO-BP 神经网络的锂离子电池容量衰退预测

来源出版物: 储能科学与技术 卷: 9 期: 1 页: 138-144 出版年: 2020

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作者关键词: lithium-ion battery; capacity decline; wavelet analysis; ant colony algorithm; BP neural network

作者关键词: 锂离子电池; 容量衰退; 小波分析; 蚁群算法; BP 神经网络

摘要: Accurately predicting the declining trend with respect to the capacity of a battery is important for strengthening the management and maintenance of the battery system. Lithium-ion batteries are the research object; the battery capacity decline trend is predicted based on a source data set analysis published by NASA Laboratories. The data for a full-cycle charge-discharge test of a battery, obtained at room temperature and constant current, are denoised and optimized by a compact set orthogonal wavelet analysis to obtain a more stable and regular battery capacity decay process. The ant colony optimization (ACO) algorithm is subsequently used to optimize the initial weight of the BP neural network. And threshold, based on the ACO-BP neural network model to

predict the capacity decline of lithium-ion batteries, and compared with BP neural network alone. The results denote that the ACO-BP neural network generates better prediction results when compared with that generated by the BP neural network alone; with more training samples, it contains more information on battery capacity degradation, and the prediction accuracy is significantly improved. The predicted average error is 1.46% when 80 charge and discharge cycles are used as training samples. If the training samples are further expanded, the prediction effect will improve. This study helps to strengthen the management of the battery systems and provides a technical reference for efficiently predicting the degradation trajectory of the lithium-ion batteries.

摘要: 准确预测电池的容量衰退趋势对加强电池系统的管理和维护具有重要意义。本工作选择以锂离子电池为研究对象,根据 NASA 实验室公开的源数据集分析、预测锂离子电池的容量衰退趋势。在室温、恒流工况下对锂离子电池进行满充满放的循环充放电试验,得到各循环周期下电池的实际额定容量值,采用紧支集正交小波分析对获得的电池监测数据进行去噪优化处理,得到更加平稳规律的电池容量衰退过程,然后利用蚁群算法(Ant colony optimization,ACO)优化 BP 神经网络的初始权值和阈值,基于 ACO-BP 神经网络模型完成对锂离子电池容量衰退的预测,并与单独使用 BP 神经网络进行对比。结果表明,采用 ACO-BP 神经网络比单独使用 BP 神经网络具有更好的预测效果,且随着训练样本的增加,包含更多的电池容量退化信息,预测精度明显提高,当以前 80 个循环充放电周期作为训练样本时,预测的平均误差为 1.46%,若继续扩大训练样本,预测效果将会更好。本研究有助于加强电池系统的健康管理,为高效预测锂离子电池的劣化轨迹提供技术参考。

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第 34 条, 共 39 条

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作者: 徐宇; 郑珣; 李雪; 刘浩学

标题: Quantitative Study on the Discomfort Glare of the Road Tunnel Sunshades

标题: 隧道遮光棚不舒适眩光定量评价方法研究

来源出版物: 现代隧道技术 卷: 57 期: 1 页: 120-124 出版年: 2020

文献号: 1009-6582(2020)57:1<120:SDZGPB>2.0.TX;2-K

来源出版物: Modern Tunnelling Technology 卷: 57 期: 1 页: 120-124 出版年: 2020

文献号: 1009-6582(2020)57:1<120:SDZGPB>2.0.TX;2-K

文献类型: Article

作者关键词: Tunnel; Sunshade; Light spot; UGR; Discomfort glare; Quantitative evaluation method

作者关键词: 隧道; 遮光棚; 投影光斑; 统一眩光值; 不舒适眩光; 定量评价方法

摘要: In order to evaluate the discomfort glare of the light spot which is caused by the tunnel sunshade,the glare influence of the projected sunshade light spot is analyzed,a quantitative method for evaluating the glare comfort of tunnel sunshades is established,the UGR of the projected light spot of sunshades with equal grilling distance is calculated,the relationship among light spot width,luminance and UGR are analyzed using UGR which is to evaluate the glare degree in lighting places.The results show that at the tunnel access zone,the smaller the luminance,the width of the bright area of the sunshade light spot and the UGR,the better the comfort,and vice versa;if the luminance and the width are more than a certain value and UGR is larger than 22,the discomfort glare is large and it affects the driving comfort.Finally a proposal for the design of sunshades is proposed.

摘要: 为了评价隧道遮光棚投影光斑的眩光舒适性,文章利用评价照明场所眩光程度的统一眩光值(UGR),通过分析遮光棚投影光斑的眩光影响,建立了隧道遮光棚眩光舒适度的定量评价方法,计算了等间距遮光棚投影光斑的统一眩光值,分析了不同光斑宽度、亮度与统一眩光值的关系。研究结果表明:在洞口遮光段的明亮环境下,遮光棚投影光斑明区域的亮度和宽度越小,UGR 值越小,舒适度越好;遮光棚投影光斑明区域的亮度和宽度越大,UGR 值越大,舒适度越差;亮度和宽度比值达到一定时,UGR 值大于 22,不舒适眩光较大,影响驾驶员的行车舒适性。最后提出了隧道遮光棚的设计建议。

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第 35 条, 共 39 条

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作者: 魏洪贵; 贺伊琳; 卫龙龙; 张大禹; 叶毅铭

标题: Strategy of multi-objective adaptive cruise control system with variable weight based on naive Bayesian algorithm

标题: 基于朴素贝叶斯算法的变权重多目标自适应巡航控制策略

来源出版物: 西北大学学报. 自然科学版 卷: 50 期: 1 页: 23-30 出版年: 2020

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文献类型: Article

作者关键词: adaptive cruise control; model predictive control; multi-objective; forward vehicle prediction

作者关键词: 自适应巡航控制; 模型预测控制; 多目标; 前车预测

摘要: Aiming at the widely used adaptive cruise control system based on model predictive control, a hierarchical control structure is proposed, which is divided into upper controller and lower controller. A model predictive controller with variable weight is designed as the upper controller. In order to obtain the best acceleration, the expected distance of the driver, the physical limitation of the vehicle itself, the influence of the acceleration of the vehicle in front and other factors are taken into comprehensive consideration. The weight changes according to the future lane changing behavior of vehicles in front of ego vehicle predicted by Gaussian naive Bayesian algorithm. Finally, the fixed weight parameters and variable weight parameters are simulated by Matlab/Simulink and Carsim respectively. The simulation results show that with the change of road conditions, the variable weight parameter can improve the performance of the vehicle adaptive cruise system, significantly reduce the system speed and distance deviation of the fixed weight strategy and effectively improve the control precision and adaptability of the system is improved effectively.

摘要: 针对目前使用较为广泛的基于模型预测控制的自适应巡航系统, 该文提出一种分层控制结构, 设计一种变权重的模型预测控制器作为上位控制器。为了获得最佳加速度, 综合考虑驾驶员期望车距, 车辆自身物理限制, 前车加速度影响等因素。使用高斯朴素贝叶斯算法预测前方车辆未来行为, 从而采取不同的权重参数策略。通过 Matlab/Simulink 与 Carsim 对固定权重参数和可变权重参数分别进行联合仿真, 结果表明, 随着道路条件的变化, 可变权重参数可以提高车辆自适应巡航系统的表现效果, 显著降低固定权重策略的系统速度和距离偏差量, 有效提高了系统的控制精度与适应性。

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作者: 肖梅; 徐福博; 边浩毅; 颜建强

标题: Estimation of Waiting Time Value Based on Multi-Logit Model

标题: 基于多项 Logit 模型的候车时间价值估计

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 10 页: 24-30 出版年: 2020

文献号: 1674-0696(2020)39:10<24:JYDXLM>2.0.TX;2-I

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文献号: 1674-0696(2020)39:10<24:JYDXLM>2.0.TX;2-I

文献类型: Article

作者关键词: traffic engineering; urban public transportation; multi-Logit models; SP survey; waiting time value; curve fitting

作者关键词: 交通工程; 城市公共交通; 多项 Logit 模型; SP 调查; 候车时间价值; 曲线拟合

摘要: Waiting time is one of the important factors affecting the attractiveness of public transportation. Waiting time value as the medium of conversion between waiting time and travel cost often has a greater impact on the organizational optimization results of public transportation. The data of willingness to pay (WTP) for travelers to reduce waiting time under different conditions was obtained through research interviews and SP survey methods. Based on the theory of disaggregation, a prediction model of payment behavior based on multinomial Logit model was established. Based on the travelers willingness to pay, the value of waiting time under different conditions was calculated by using the prediction results, and the difference of waiting time value under different conditions and its variation rule changing with waiting time length were studied. The results show that the waiting time value is significantly affected by the waiting time length, income level, travel purpose and weather conditions, and it is positively related to waiting time length and income level. The waiting time value of working trip is higher than that of entertainment trip, meanwhile, the waiting time value in bad weather is higher than that in fine

weather. In addition, the relationship between the waiting time value and the waiting time length can be well analyzed by Logistic curve, and the fitting coefficient is close to 1.

摘要: 候车时间是影响公共交通吸引力的重要因素之一, 候车时间价值作为候车时间与出行成本间的转化媒介往往对公共交通组织优化结果产生较大影响。通过调研访问及 SP 调查法获取出行者在不同条件下为减少候车时间的支付意愿数据, 应用非集计理论建立基于多项 Logit 模型的支付行为预测模型; 基于出行者支付意愿, 利用预测结果测算出行者在不同条件下的候车时间价值; 研究候车时间价值在不同条件下的差异及随候车时长变化的规律。结果表明: 候车时间价值受候车时长、收入水平、出行目的及天气条件影响显著, 且与候车时长和收入水平均呈正相关; 工作出行的候车时间价值要高于娱乐出行, 恶劣天气条件下的候车时间价值要高于舒适天气; Logistic 曲线能够较好地解析候车时间价值与候车时长的关系, 拟合决定系数接近于 1。

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作者: 王润民; 刘丁贝; 胡锦超; 朱宇; 徐志刚

标题: Traffic congestion detection method based on IoV and fuzzy logic

标题: 车联网环境下基于模糊逻辑的交通拥堵检测方法

来源出版物: 计算机应用研究 卷: 37 期: 6 页: 1830-1834 出版年: 2020

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文献号: 1001-3695(2020)37:6<1830:CLWHJX>2.0.TX;2-C

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作者关键词: Internet of Vehicles(IoV); vehicle communication; congestion detection; speed;

traffic density; fuzzy logic

作者关键词: 车联网; 车车通信; 拥堵检测; 速度; 车流密度; 模糊逻辑

摘要: Because of the drawback of existing method, the paper proposed a traffic congestion detection method based on Internet of Vehicles and fuzzy logic. Firstly, this method constructed a neighbor table of vehicle based on the obtained real-time information of neighbor vehicles. Secondly, it created a fuzzy controller according to the speed, traffic density and traffic congestion rating system, and evaluated the local traffic congestion level. Thirdly, it realized the inquiry of traffic congestion status of neighbor vehicles based on real-time communication between neighbor vehicles, and verified the local traffic congestion level based on large sub-sample hypothesis test, then completed the detection of regional traffic congestion level. Finally, it built a simulated test scenario based on Veins platform, then it compared the accuracy of detecting traffic congestion, and calculated the backoff slots and received broadcast packets of vehicle nodes in the simulated test scenario. The results show that the accuracy of traffic congestion detection of the proposed method is increased by 5.5% and 7.5% compared with no trigger method and CoTEC method, respectively. The proposed method reduces the network congestion of vehicle communication by 90.8% compared with CoTEC method, and the communication load of communication nodes significantly decreases when there is no traffic congestion.

摘要: 针对现有的道路交通拥堵检测方法的不足,提出了一种基于 V2V 的道路交通拥堵检测方法。首先基于 V2V 的方式实时获取邻居车辆状态信息,建立车辆邻居表;其次依据车辆行驶速度、车流密度、交通拥堵评级体系构建模糊控制器,完成本地交通拥堵水平的估计;然后通过车车通信进行邻居车辆交通拥堵状况的查询,并根据大子样假设检验验证本地交通拥堵水平值,完成所在区域交通拥堵水平的检测;最后基于 Veins 平台搭建仿真测试场景,仿真对比了拥堵检测结果的准确率,同时测试车辆节点的退避时槽数量和接收广播数据包的数量。实验结果表明,提出的道路交通拥堵检测方法实现的拥堵检测准确率分别比线圈法和 CoTEC 法提高了 5.5% 和 7.5%;提出的道路交通拥堵检测方法实现的车车通信网络拥塞比 CoTEC 法降低了 90.8%,并且在未发生交通拥堵时通信节点的通信负载显著降低。

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作者: Niu Shifeng; Li Guiqiang; Zhang Shiwei

作者: 牛世峰; 李贵强; 张士伟

标题: Driving Risk Assessment Model of Commercial Drivers Based on Satellite-positioning Data

标题: 卫星定位数据驱动的营运车辆驾驶人驾驶风险评估模型

来源出版物: 中国公路学报 卷: 33 期: 6 页: 202-211 出版年: 2020

文献号: 1001-7372(2020)33:6<202:WXDWSJ>2.0.TX;2-B

来源出版物: China Journal of Highway and Transport 卷: 33 期: 6 页: 202-211 出版年: 2020

文献号: 1001-7372(2020)33:6<202:WXDWSJ>2.0.TX;2-B

文献类型: Article

作者关键词: traffic engineering; traffic safety; integrated weighting method; commercial driver; driving risk assessment

作者关键词: 交通工程; 交通安全; 集成赋权法; 营运车辆驾驶人; 驾驶风险评估

摘要: To improve the safety of commercial drivers, assess the driving risk level of drivers, and reduce the accident rate of high-risk drivers. Subsequently, 26 driving behavior characteristic parameters were designed based on the satellite-positioning data and correlation between driving behavior and driving risk. Considering that the influence of the driving behavior on driving risk is different between high-speed and low-speed driving, we used real-time data of 23 commercial drivers on an on-road driving test to screen driving risk assessment indicators and developed the driving risk assessment indicator system of commercial drivers. Then, the integrated weighting method was established based on the entropy weight, independent weight coefficient, and Spearman correlation coefficient methods to determine the weight of each indicator. Finally, real vehicle verification tests were performed with 40 commercial drivers to verify the rationality of the proposed model. The results show that the driving behavior in terms of speed and acceleration can assess the accident risk, and the effect is good. The risk assessment score of the assessment model is positively correlated with the actual number of traffic conflicts. The established model can assess the driving risk level of commercial drivers with an accuracy rate of 77.5%. The accuracy of the model varies based on locations, but the model exhibits better robustness within a specified range.

摘要: 为了提高营运车辆驾驶人安全管理的精细化水平,合理地评估驾驶人驾驶风险程度,有的放矢地降低高风险驾驶人的事故率,基于卫星定位数据特点及驾驶行为与驾驶风险的相关关系设计 26 个驾驶行为特征参数。考虑到高速和非高速行驶时相同驾驶行为对驾驶风险的影响区别较大,根据 23 名营运车辆驾驶人的实测数据有针对性地筛选高速和非高速路段驾驶人风险评估指标,构建营运车辆驾驶人驾驶风险评估指标体系。然后,基于熵权法、独立性权系数法和 Spearman 相关系数法建立集成赋权法,确定各评估指标的权重。最后,雇佣 40 名营运车辆驾驶人进行实车试验以验证模型的合理性。结果表明:车辆速度和加速度方面的驾驶

行为特征可以用于评估驾驶人的驾驶风险且评估效果较好,驾驶风险评估得分与实际交通冲突次数呈正相关关系,所建立模型可以较为准确地评估营运车辆驾驶人驾驶风险的高低,准确率达到 77.50%,该模型在不同地区使用时,准确率存在一定的差异,但在容许范围之内,方法具有较好的鲁棒性。

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标题: Simulation Research on Adjustable Rearview Mirror for Driving Simulator

标题: 驾驶模拟器可调节后视镜仿真方法研究

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文献类型: Article

作者关键词: Driving simulator; MFC; Rearview mirror; Serial communication; Off- screen rendering

作者关键词: 驾驶模拟器; 微软基础类库; 后视镜; 串口通信; 离屏渲染

摘要: In order to improve the visual field comfort of the driving simulator rearview mirror simulation, an MFCbased adjustable rearview mirror method is proposed. The method is based on MFCs multi-threaded framework to design the rearview mirror adjustment model. The visual field is adjusted by changing the field of view. The Arduino design rearview mirror adjustment button is used to realize the data interaction between the MFC program and the Arduino. Finally, the off-screen rendering technology is used to display the rearview mirror in the virtual view. Using the driving simulator to verify the rearview mirror imaging effect. The results show that the adjustable rearview mirror designed in this paper meets the driver's rear vision requirements under different driving conditions, while ensuring the real- time performance of the rearview mirror imaging, achieving virtual driving simulation requirements.

摘要: 为提升驾驶模拟器后视镜仿真的视野舒适度,提出了一种基于微软基础类库(MFC)的可调后视镜仿真方法。该方法基于 MFC 的多线程框架设计后视镜调节模型,通过改变视野范围的方式调后视镜可视区域,结合 Arduino 设计后视镜调节按钮,利用串口通信实现 MFC 程序与 Arduino 的数据交互,最终采用离屏渲染技术将后视镜显示在虚拟视景中。使用驾驶模拟器对后视镜成像效果进行了验证,结果表明,所提出的可调后视镜仿真方法满足驾驶员在不同驾驶工况下的后方视野需求,同时保证了后视镜成像的实时性,达到虚拟驾驶仿真的要求。

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标题: Research on Denoising and Filtering Method based on Wavelet Packet Optimal Base Decomposition Tree

标题: 小波包最优基分解树的降噪滤波方法研究

来源出版物: 机械科学与技术 卷: 39 期: 1 页: 28-34 出版年: 2020

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文献类型: Article

作者关键词: optimal base decomposition tree; wavelet packet transforms; depressing and filtering noise; wavelet analysis; loader transmission system

作者关键词: 最优基分解树; 小波包变换; 降噪滤波; 小波分析; 装载机传动系统

摘要: Signals of loader's transmission system collected by sensors are always disturbed because of the harsh environment, which is not conducive to data analysis. Therefore, the signal should first be denoised and filtered when studying its working condition. Taking a front axle torque signal of a

5t loader as the research object,the wavelet packet transform method was used to decompose the db9-6 scale after eliminating the trend,and then the reconstructed signal was obtained by the wavelet packet optimal decomposition tree. Compared with the Butterworth denoising and wavelet denoising methods,it is concluded that Butterworth filtering method has phase deviation compared with the original signal,and the signal-to-noise ratio and root mean square error of optimal base decomposition tree of wavelet packet after de-noising are 16.38 and 74.71 respectively,which are similar to the wavelet transform denoising results and more suitable for the fields of working condition identification and artificial intelligence algorithms,etc. The research results could provide a method basis for data signal processing of other similar construction machinery.

摘要: 装载机的传动系统工作时传感器所采集到的信号受环境干扰大,不利于数据分析,因此在研究其工作状态时需对数据信号进行降噪滤波。本文以 5t 装载机的前轴扭矩信号为研究对象,剥离其趋势项后采用小波包变换法进行 db9-6 尺度分解,进而通过小波包最优分解树得到重构信号。通过与巴特沃斯去噪、小波变换去噪法对比后得出:巴特沃斯滤波处理法相较于原始信号存在相位偏移;小波包最优基分解树去噪后的信噪比、均方根误差分别为 16.38 与 74.71,与小波变换去噪法相比结果近似,更适用于工况识别、人工智能算法等领域。研究结果可为其他同类型工程机械数据信号处理提供方法依据。

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标题: Quaternion Interpolation Path Planning Method for Dual-robot Collaborative Rotation

标题: 双机器人协同旋转过程中的四元数插补路径规划

来源出版物: 机械科学与技术 卷: 39 期: 10 页: 1547-1554 出版年: 2020

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文献类型: Article

作者关键词: dual-robot; collaborative rotation; quaternion; path planning; inverse kinematics;
path arc trajectory; homogeneous transformation matrix; experiment

作者关键词: 双机器人; 协同旋转; 四元数; 路径规划

摘要: A dexterous attitude transformation of workpiece in space can be realized by co-rotating two robots around the center point. A quaternion path arc interpolation method is proposed, and applied to coordinate rotation and coordinate position interpolation of path control points. Firstly, the initial control points of the path arc are expressed as four-dimensional homogeneous transformation matrix, and the three-dimensional rotation matrix and coordinate vector are extracted. Then, the rotation matrix is transformed into quaternion for coordinate rotation interpolation, and the coordinate vector of the control point is interpolated to solve the general solution of the homogeneous transformation matrix of the proposed method. Finally, the joint coordinate system of the interpolation control point is obtained by inverse kinematics, then imported into the robot instructor, and the co-rotation of the two robots is experimented. Analysis and experimental show that the interpolation control points of the path arc trajectory can be calculated by the proposed method. The interpolation path is smooth, the joint angle limitation is fulfilled, and the roundness error is controlled within 1.1 mm. This proposed method can realize the coordinated movement of workpiece by two robots in space with multi-angle rotation to the center, and has good performance of universal applicability.

摘要: 双机器人绕中心点协同旋转可实现工件在空间中的灵巧姿态变换, 本文提出一种基于四元数路径圆弧插补方法, 应用于路径控制点的坐标旋转与坐标位置插补。首先, 将路径圆弧初始控制点表示为四维齐次变换矩阵, 提取三维旋转矩阵与坐标向量两个部分。然后, 把旋转矩阵转换为四元数进行坐标旋转插补, 对控制点坐标向量进行位置插补, 以求解该方法的齐次变换矩阵通解; 最后, 由逆运动学得出插补控制点的关节坐标系, 导入机器人示教器, 以对双机器人协同旋转进行实验验证。实验结果表明: 该方法能计算出路径圆弧轨迹的插补控制点, 插补路径平滑, 符合关节角限制, 圆度误差控制在 1.1 mm 以内。可实现双机器人协调搬运工件在空间中的多角度对中心旋转, 具有普遍适用性。

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标题: Force/Position Master-slave Cooperative Control for Dual Robots Based on Fuzzy and Optimized Bacterial Foraging Algorithms

标题: 基于模糊自适应和优化阻抗的双机器人力/位主从协同控制方法

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文献类型: Article

作者关键词: dual robots; cooperative handling; position control; damping control; fuzzy adaptive; bacterial foraging algorithm(BFA)

作者关键词: 双机器人; 协同搬运; 位置控制; 阻尼控制; 模糊自适应; 细菌觅食算法(BFA)

摘要: Multi-robot cooperation is widely used in cooperative handling, stamping, welding and other fields, with higher precision and more flexibility. The interpolation algorithm and the force/position control performance determine the smoothness of the trajectories and the stability of the cooperative operation, and also directly affect the bearing capacity and the operation quality. In this paper, the force/position control technology in the process of two robots cooperative handling was studied. First, the clamping characteristics and stress state of two robots cooperative handling were analyzed, and the ideal mathematical model of cooperative handling system was established. Next, according to the mathematical model of the second-order damping system of the master-slave robot, the master-slave cooperative control mode was adopted to design the force/position control strategies respectively. The optimized fuzzy self-tuning position control based on the ideal position was presented for the master robot, and the damping control with the optimized bacterial foraging algorithm based on the force optimization of position deviation of the

master robot was presented for the slave robot, and the design of the controller was carried out. Then, the main body of the algorithm and its cost function were programmed in MATLAB, and the control system was established in Simulink. Finally, the whole controller was simulated. The simulation results were as follows. The maximum position error of the master was 1.53 mm, and the maximum force error of the slave was 0.038 N. The position error of tracking down between the slave and the master was within 0.18 mm, and the slave could quickly correct the master-slave speed deviation within 0.2 s. The simulation results showed that compared with the conventional PD control method, the proposed controller could reduce the maximum tracking error by 40% and effectively eliminate the zero-crossing oscillations of the force tracking. This method could significantly improve the dynamic performance of the system.

摘要: 多机器人协同作业广泛用于多机协同搬运、冲压、焊接等领域,具有更高的精度,更灵活的工况执行能力。协同系统的插补算法与力/位控制性能共同决定了协同作业的轨迹平滑性和稳定性,也直接影响着系统的承载性能与作业质量。作者针对双机器人协同搬运过程中的力/位控制技术展开了研究。首先,分析了双机器人协同搬运工况的夹持特征和受力状态,建立了协同搬运系统的理想数学模型。接着,依据主从机器人 2 阶阻尼系统的数学模型,采用双机器人主从协同控制模式,分别设计力/位控制策略;提出主机器人采用基于理想位置的优化模糊自整定位置控制,从机器人采用基于主机器人位置偏差的优化细菌觅食算法的阻尼控制,进行控制模块的设计工作。然后,在 MATLAB 中编译了细菌觅食算法主体及其代价函数,在 Simulink 中搭建控制系统。最后,对整个控制器模块进行联合仿真,仿真结果如下:主机器人的最大位置误差缩小到 1.53 mm,从机器人的最大力误差缩小到 0.038 N。从机器人追踪主机器人的位置误差控制在 0.18 mm 内,且从机器人可在 0.2 s 内快速修正主从速度偏差。仿真结果表明:相比常规 PD 控制,本文所述控制方法可减少约 40% 的最大追踪误差,且有效消除了力追踪过程中的过零振荡现象,提高了系统的实时追踪动态性能。

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标题: Metal type identification method based on convolutional neural network and eddy current

标题: 一种基于卷积神经网络的电涡流金属辨识方法

来源出版物: 电子测量与仪器学报 卷: 34 期: 4 页: 172-179 出版年: 2020

文献号: 1000-7105(2020)34:4<172:YZJYJJ>2.0.TX;2-4

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文献类型: Article

作者关键词: eddy currents; CNN; metal identification; ferrite; pearlite

作者关键词: 涡流; 卷积神经网络; 金属辨识; 铁素体; 珠光体

摘要: In order to identify three types of carbon structural steels whose metallographic structures are ferrite and pearlite. This paper proposes a metal identification method based on convolutional neural network. Convolutional neural networks can efficiently implement classification with complex environmental information, ambiguous inference rules, and flawed samples. The metal identification platform was built based on eddy current non-destructive testing technology and convolutional neural network. First, 8 high-frequency points are randomly selected from the bandwidth of the eddy current sensor, and the metal information that under each frequency point is separately collected by this eddy current sensor. Then, this information is imaged through data processing such as Fourier transform and coordinate transformation. Finally, the identification model is obtained by convolutional neural network. The results show that the proposed scheme can identify metals without damaging the metal compared to the traditional method. The accuracy of the CNN model for all three metals increased to 92.33%, which is superior to the BP neural network (86.20%).

摘要: 为实现对主要金相组织同为铁素体和珠光体的 3 种碳素结构钢的辨识, 提出一种基于卷积神经网络的金属辨识方法。卷积神经网络可以很好地处理环境信息复杂、推理规则不明确和样品本身有缺陷情况下的分类, 利用涡流无损检测技术和卷积神经网络算法搭建了该金属辨识平台, 首先在涡流传感器的工作频率范围内随机选取 8 个高频点, 并通过该传感器分别采集各个频点下金属的信息; 然后通过傅里叶变换、坐标变换等数据处理使得每种金属的信息图像化; 最终通过卷积神经网络训练来获得辨识模型。结果表明, 该方案对比传统方式可在不损伤金属的情况下识别金属; 对比现有的 BP 神经网络算法(86.20%), 对 3 种金属的正确识别率都达到了 92.33%。

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第 5 条, 共 32 条

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作者: 栾飞; 蔡宗琰; 吴书强; 马军; 李富康; 杨嘉

标题: Improved Whale Optimization Algorithm of Scheduling Problem for Low Carbon Workshop

标题: 求解低碳车间调度问题的改进鲸鱼算法

来源出版物: 机械科学与技术 卷: 39 期: 5 页: 721-728 出版年: 2020

文献号: 1003-8728(2020)39:5<721:QXDTCJ>2.0.TX;2-N

来源出版物: Mechanical Science and Technology for Aerospace Engineering 卷: 39 期: 5
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文献类型: Article

作者关键词: flexible job-shop scheduling problem; carbon emissions; whale optimization algorithm, whale individual position vector

作者关键词: 柔性作业车间调度问题; 碳排放量; 鲸鱼优化算法; 个体位置向量

摘要: Owing to the traditional flexible job shop scheduling problem (FJSP) has the limitations which only consider completion time,equipment utilization,and completion cost et al as the criterion,a low carbon FJSP model with the criterion of minimizing the weighted sum of carbon consumption cost and completion-time cost has been established,and an improved whale optimization algorithm (IWOA) has been proposed. Firstly,a twosegment string is used to describe the FJSP,and a conversion method based on the ranked-order-value (ROV) rule has been introduced to implement the conversion between the whale individual position vector and the scheduling solution. Secondly,a hybrid population initialization strategy based on a certain proportion of global search,local search and random search is used to generate the initial population with certain quality,and then,a nonlinear convergence factor (NFC) and an adaptive weight (AW) are introduced to coordinate the abilities of exploitation and exploration of the algorithm. Thirdly,an adaptive adjustment search strategy is employed to enhance the ability of exploitation of the algorithm. Finally,the experimental data have verified the effectiveness of the improved whale algorithm in solving the low-carbon FJSP.

摘要: 针对传统柔性作业车间调度问题只考虑完工时间,设备利用率,完工成本等因素的局限,构建了以碳排放成本和完工时间成本加权和最小为目标的低碳柔性作业车间调度问题模型,

并设计了一种改进的鲸鱼优化算法对其进行求解。首先,采用等长的两段式编码方式来表示柔性作业车间调度问题,引入基于 ROV 规则的转换机制,实现鲸鱼个体位置向量与调度解之间的相互转换。其次,采用基于一定比例的全局搜索、局部搜索和随机搜索的混合式种群初始化方法,生成一定质量的初始种群,同时设计了非线性收敛因子和自适应惯性权重系数来加强算法协调全局搜索和局部寻优的能力。再次,引入自适应调整搜索策略以提高算法跳出局部最优的能力。最后,通过实验数据验证了改进鲸鱼算法在求解低碳柔性作业车间调度问题方面的有效性。

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作者: Feng Shuo; Zheng Baojuan; Chen Wenxing; Zhang Tingyu

作者: 封硕; 郑宝娟; 陈文兴; 张婷宇

标题: RNSGA-II Algorithm Supporting Reinforcement Learning and Its Application in UAV Path Planning

标题: 支持强化学习 RNSGA-II 算法在航迹规划中应用

来源出版物: 计算机工程与应用 卷: 56 期: 3 页: 246-251 出版年: 2020

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版年: 2020

文献号: 1002-8331(2020)56:3<246:ZCQHXX>2.0.TX;2-4

文献类型: Article

作者关键词: NSGA-II; double populations; migration; NSGA-II; path planning; reinforcement learning

作者关键词: 双种群; 迁徙; 航迹规划; 强化学习

摘要: In view of the limitation of traditional NSGA-II in solving multi-objective UAV 3d path planning, such as the problem of premature convergence and insufficient diversity, an RNSGA-II algorithm supporting reinforcement learning is proposed. Two single populations are set to search optimization with the NSGA-II algorithm respectively and every certain generation migrate between two populations, then each population performs optimization evolution, according to the change of population diversity using reinforcement learning algorithm to dynamically optimize the proportion of migration among the population of parameters, so that the evolutionary process to keep the population diversity, to some extent, the contradiction between the convergence speed and global convergence is solved. Simulation results show that the RNSGA-II algorithm not only has higher convergence accuracy than single NSGA-II algorithm but also the solution set has better distribution and diversity.

摘要: 针对传统第二代非支配排序遗传算法(NSGA-II)求解无人机多目标三维航迹规划早熟收敛及多样性不足的局限性,提出了支持强化学习 RNSGA-II 算法。设置两个独立种群分别用 NSGA-II 算法独立演化,隔代在两种族之间迁徙,接着各种群进行寻优进化,根据种群多样性的变化运用强化学习算法动态地优化各种群间"迁徙"的比例参数,从而使进化过程保持种群多样性,一定程度上解决了收敛速度和全局收敛性之间的矛盾。仿真结果表明,RNSGA-II 算法较单一 NSGA-II 收敛精度更高,解集具有更好的分布性和多样性。

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作者: Wang Chikai; Wang Guoqing; Wang Yanan; Shao Yanming

作者: 王驰凯; 王国庆; 王艳安; 邵严明

标题: Research on special controller of compact mounter based on multi-core heterogeneous mode

标题: 基于多核异构模式的紧凑型贴片机专用控制器的研究

来源出版物: 制造业自动化 卷: 42 期: 2 页: 32-35 出版年: 2020

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文献号: 1009-0134(2020)42:2<32:JYDHYG>2.0.TX;2-1

文献类型: Article

作者关键词: 贴片机; 多核异构; 专用控制器; 增强型总线

摘要: 针对目前紧凑型贴片机缺少专用的低成本控制器的现状,提出了一种基于多核异构模式的专用控制器。并完成了控制器总体设计和上位机软件的开发。该专用控制器包括三个功能模块和 Android 控制平台。功能模块分别是运动控制模块、I/O 模块和数据采集模块。三个模块间采用增强型总线通讯,实现主从机交互。Android 控制平台作为控制器核心,进行数据的调度与处理,并承担视觉系统的中枢。最终经过软件测试和样机测试,实现了设计目标,证明该控制平台具有可行性,可以良好地应用于紧凑型贴片机。

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第 8 条, 共 32 条

作者: Sun Kunxiao; Feng Shuo; Pan Ye

作者: 孙坤霄; 封硕; 潘野

标题: Structural analysis and lightweight design of turret body

标题: 炮塔塔体结构分析与轻量化设计

来源出版物: 制造业自动化 卷: 42 期: 4 页: 120-124 出版年: 2020

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来源出版物: Manufacturing Automation 卷: 42 期: 4 页: 120-124 出版年: 2020

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文献类型: Article

作者关键词: 炮塔; 瞬态分析; 尺寸优化; 拓扑优化

摘要: 针对炮塔塔体,提出一种尺寸优化与拓扑优化相结合的方法对其进行轻量化设计。首先,对自主设计的炮塔塔体两种关键射击角度进行瞬态动力学分析,得出关键部位应力分布图,结

果显示塔体结构的中后部区域基本处于低应力状态。参照分析结果建立炮塔塔体优化模型,对护板部分进行尺寸优化,对耳轴架部分进行拓扑优化。结果表明,在满足结构强度和刚度条件下,炮塔塔体的质量减轻了 9.5%。对优化后的炮塔塔体再次进行瞬态动力学分析及模态分析,结果表明优化前后刚度变化不大,并且在一定程度上改善了塔体振动性能。

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作者: 栾飞; 吴书强; 李富康; 杨嘉; 蔡宗琰

标题: A Whale Swarm Optimization Algorithm for Solving Flexible Job Shop Scheduling Problem

标题: 一种求解柔性作业车间调度问题的鲸鱼群优化算法

来源出版物: 机械科学与技术 卷: 39 期: 2 页: 241-246 出版年: 2020

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文献类型: Article

作者关键词: flexible job shop scheduling problem; whale swarm algorithm; individual position vector; scheduling solution

作者关键词: 柔性作业车间调度问题; 鲸鱼群算法; 个体位置向量; 调度解

摘要: A new meta-heuristic algorithm, whale swarm algorithm (WSA) is proposed for solving the flexible job shop scheduling problem (FJSP) with the objective to minimize the makespan. In the WSA, whale individual position vector can be updated by using the guidance of its better and most recent whale, the range of whale individual movements can be controlled by the ultrasonic intensity, because of this iteration method, it shows superiority in global searching ability and maintaining population diversity when solving various standard functions. Firstly, a two-segment string is used to describe the FJSP as two sub-problems, machine assignment and operation sequence. Secondly, the conversion method between the whale individual position vector and the scheduling solution is applied, and then the population can be updated and searched for optimization via WSA. Finally, the experimental data show that the present WSA is effective for solving the FJSP.

摘要: 针对最小化最大完工时间的柔性作业车间调度问题 (Flexible job shop scheduling

problem, FJSP),提出了一种新型元启发式算法,鲸鱼群算法(Whale swarm optimization algorithm,WSA),该算法以较优且最近的鲸鱼引导和利用超声波强度来控制鲸鱼个体移动范围的迭代方式,在求解各类标准函数时显示出了其在全局搜索能力和维持种群多样性方面的优越性。采用两段式编码方法将 FJSP 描述为机器选择和工序排序两个子问题;引入转换机制实现 FJSP 的离散调度解与连续的鲸鱼个体位置向量之间的相互转换,然后利用 WSA 完成种群的迭代更新和寻优。最后,通过实验数据验证了 WSA 在求解 FJSP 方面的有效性。

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标题: Influence of heating distance and wind speed on coupling heating asphalt pavement

标题: 加热距离与风速对协同加热沥青路面的影响

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文献类型: Article

作者关键词: hot in-place recycling; coupling heating method; asphalt pavement; simulation

analysis; heating distance; hot wind speed

作者关键词: 就地热再生; 协同加热方法; 沥青路面; 仿真分析; 加热距离; 热风风速

摘要: To improve the heating homogenization and efficiency of asphalt pavement in hot in-place recycling, a coupling heating method was proposed considering the characteristics of infrared radiation heating and hot air cycle heating, and the physical and mathematical model of asphalt pavement by coupling heating method were established. The computational fluid dynamics (CFD) simulation software was used to analyze the influence of heating distance and wind speed on the heating homogenization and efficiency of asphalt pavement and find the best heating scheme. Results show that the coupling heating method has the advantages that single heating method cannot have, whether it is heated by hot air circulation or by infrared radiation alone. The coupling heating method can not only avoid the overheating and aging of pavement surface when heated by infrared radiation, but also have higher heating efficiency than that when heated by hot air, so it can obtain higher heating homogenization and efficiency. Moreover, it is not only conducive to the deep heating of the road surface, but also helps to reduce the rise of the surface temperature of the road surface, which solves the problem of the decline of the quality of the road regeneration caused by the fire on the road surface during the construction of the geothermal regeneration. The increase of heating distance of heating plate and the increase of wind speed of hot air are not conducive to the absorption of heat energy on the road surface, and the influence of wind speed on heating efficiency of asphalt pavement will decrease with the increase of heating distance. The heating distance plays a leading role in heating efficiency, while the final heating homogenization and efficiency of asphalt pavement is closely related to the matching of wind speed and heating distance.

摘要: 为了提高沥青路面就地热再生时的加热均匀性与效率,提出一种红外辐射与热风循环协同加热方法,建立协同加热沥青路面的物理模型与数学模型.借助计算流体动力学(CFD)仿真软件进行仿真分析,寻找协同加热沥青路面时加热距离与风速对沥青路面加热均匀性与效率的影响规律和最佳加热方案.结果表明:采用协同加热法具有热风循环与红外辐射单独加热不具备的优点,既能避免红外辐射加热时路面表层过热老化,又比热风加热有更高的加热效率,从而获得更高的加热均匀性与效率;有利于路面深层的加热和降低路面表层温度的上升,解决了在就地热再生施工中由于路表起火而导致的路面再生质量下降;加热板加热距离增大和热风风速增加都不利于路面对热能的吸收,风速对沥青路面加热效率的影响会随着加热距离的增加而减弱;加热距离对加热效率起主导作用,加热均匀性与效率同风速与加热板的距离匹配密切相关.

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标题: Influence of Tunnel Boring Machine Scraper Bucket Structure on the Mucking Performance

标题: 全断面隧道掘进机刀盘刮碴铲斗结构对出碴性能的影响

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文献类型: Article

作者关键词: tunnel boring machine; muck transfer; scraper bucket; particle-based discrete element method

作者关键词: 全断面隧道掘进机; 出碴; 刮碴铲斗; 颗粒离散元

摘要: In view of the problems existing in the TBM (tunnel boring machine) cutterhead muck transfer simulation research that the grading and shape parameters of rock chips are not considered comprehensively, and the influence of the scraper bucket structure is not clearly revealed, a numerical model of the mucking process including chip falling, shoveling and sliding was built considering the grading and shape of rock chips by using the clump strategy of a particle-based discrete element method, and the numerical model was verified by scaled mucking tests. Numerical simulations were carried out to study the influence of disc cutters, bucket structure, bucket height and bucket width on the cutterhead's mucking performance considering the average mucking speed and passing rate. The simulation results show that the influence of the disc cutters on the mucking process can be ignored. The triangle section type is a more reasonable bucket structure. The recommended value of bucket height is approximately 30-50mm smaller than the disc cutter height. The recommended value of bucket width is 50% of the width of the chip discharging chute. The numerical model built in this paper provides an effective approach for the study of mucking process of TBM cutterhead, and the conclusions can be used as theoretical basis for the design of scraper buckets.

摘要: 针对现有全断面隧道掘进机(TBM)刀盘出碴模拟研究所存在的岩碴级配和形状参数考虑不全面、刮碴铲斗结构影响规律揭示不明晰的问题,采用颗粒离散元方法构建考虑了岩碴级配和形状的刀盘落碴、铲碴、溜碴过程的数值模型,并进行缩比出碴试验验证了数值模型的可靠性。进行数值模拟研究了刀盘有无滚刀、铲斗结构形式、铲斗高度、铲斗宽度等因素对以平均出碴速度和出碴率为评价指标的刀盘出碴性能的影响规律。仿真结果表明:滚刀群对出碴过程影响可以忽略不计;三角截面式是较为合理的铲斗结构形式;铲斗高度的建议取值为滚刀高度减去 30~50mm;铲斗宽度的建议取值为出碴口宽度的 50%。该模型为 TBM 刀盘出碴性能研究提供了有效手段,为 TBM 刀盘出碴结构的设计提供了理论依据。

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作者: 高康平; 展梓荃; 焦生杰; 魏孟; 徐信芯

标题: Design and Stability Analysis of Flexible Joint of Rescue Robot

标题: 救援机器人柔性关节的设计与稳定性分析

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文献类型: Article

作者关键词: rescue robot; series elastic actuator(SEA); flexible joint; stability analysis; dynamic model

作者关键词: 救援机器人; 串联弹性驱动器(SEA); 柔性关节; 稳定性分析; 动力学模型

摘要: In order to improve the adaptability of rescue robots in unstructured environment,the concept of equivalent mass of the transmission mechanism is introduced,and the influence of the internal damping of the motor on the dynamic model of the elastic actuator is considered,and the dynamic model of the series elastic actuator based on the force source drive is established.Using PID unit negative feedback control method,the open-loop transfer function and closed-loop transfer function of the flexible joint system are obtained by Laplace transform,and the stability of the system is analyzed using Nyquist criterion and Bode diagram.Through simulation experiments,the system's step signal tracking response is obtained.By comparing the simulation results with the analysis results of the frequency domain characteristics,the rationality and stability

of the flexible joint structure design of the rescue robot are further verified.

摘要: 为了提高救援机器人在非结构环境中的顺应能力,引入传动机构等效质量的概念,考虑电机内部阻尼对弹性驱动器动力学模型的影响,建立了基于力源驱动的串联弹性驱动器动力学模型。采用 PID 单位负反馈的控制方式,通过 Laplace 变换得到系统的开环传递函数与闭环传递函数,运用 Nyquist 判据与 Bode 图分析了系统的稳定性。通过仿真实验,得到了系统的阶跃信号跟踪响应。仿真结果与频域特性分析结果对比,验证了救援机器人柔性关节结构设计的合理性与稳定性。

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标题: Study on the Change Law of Oil Density Characteristics Based onDeep Sea Environment Model

标题: 深海环境下油液密度特性变化规律研究

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文献类型: Article

作者关键词: deep sea environment; hydraulic medium; equivalent density; gas content

作者关键词: 深海环境; 液压介质; 等效密度; 含气量

摘要: Aimed at the problem of oil density changing with depth in deep sea environment, the deep sea environment pressure and temperature model was established. Considering the influence of gas content, a pure oil density model and a gas-liquid two-phase equivalent density model were established respectively. The error analysis of the models was carried out with experimental data of VG32 and VG64 hydraulic oil. The maximum error of the models is 0.32% and 0.11%, verifying the feasibility of the models. Based on the above model, the equivalent density models with water depth as the variable were established, and the change law of hydraulic medium density in deep sea environment was studied. The results show that the change of the equivalent density of gas-liquid two-phase oil equivalent density model is lagged behind that of pure hydraulic oil density model with the increase of water depth. However, the difference of the density between the two models is very small when the sea water depth is more than 3 000 m, and the density of pure hydraulic oil can be used to replace the density of the two-phase medium. With the increase of water depth, the equivalent density shows a growth law from fast to slow. The specific performance is: in the shallow sea layer (<460 m), the seawater temperature plays a dominant role in the density change, and the equivalent density is increased sharply with the increase of water depth; in the middle sea layer (460~1 300 m), the temperature dominant effect is weakened, and the equivalent density is increased slowly; in the deep sea layer (>1 300 m), seawater pressure instead of temperature becomes the main factor affecting density, and density growth tends to be stable.

摘要: 针对深海环境下油液密度随下潜深度变化的问题,建立深海环境压力和温度模型,考虑含气率的影响分别建立纯油液密度模型和气-液两相等效密度模型,以 VG32 和 VG64 液压油实验数据对模型进行误差分析,得到其最大误差分别为 0.32%、0.11%,验证了模型的可行性。综合上述模型,建立以水深为变量的等效密度模型,研究深海环境下液压介质密度的变化规律。结果表明:随水深的增加,气-液两相油液模型的等效密度较纯液压油模型的变化相对滞后,但进入深海 3 000 m 以下后,两者相差很小,可以用纯液压油密度近似替代两相介质的密度;深海环境下随水深增加,油液等效密度呈现迅速增加、缓慢过渡、平稳增长的变化规律。具体表现为:在浅海层(<460 m),海水温度对密度变化起主导作用,等效密度随水深增加急剧增长;在中海层(460~1300 m),温度主导作用减弱,等效密度增幅变缓;在深海层(>1 300 m),海水压力取代温度成为影响密度的主要因素,密度增长趋于平稳。

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标题: State of charge estimation of Li-ion battery based on adaptive extended Kalman filter

标题: 基于自适应扩展卡尔曼滤波的锂离子电池荷电状态估计

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作者关键词: BMS; SOC; lithium-ion battery; BMS; SOC; extended Kalman filter

作者关键词: 锂离子电池; 扩展卡尔曼滤波

摘要: The state of charge (SOC) of the Li-ion battery is an important parameter associated with a battery management system. However, when estimating the SOC, external factors, such as the accuracy of the measuring equipment and noise, can interfere and reduce the SOC estimation accuracy. In this study, an adaptive extended Kalman filter (EKF) is proposed to improve the estimation accuracy and stability of SOC. Compared with traditional EKF, the estimation error of our method can be controlled within 3%, demonstrating the validity of the proposed model.

摘要: 锂离子电池荷电状态(SOC)是电池管理系统(BMS)重要的参数之一,准确估计可以提高电池的使用寿命。然而在 SOC 估计过程中,会受到如测量设备的精度、噪声等外界因素的干扰,降低 SOC 的估计精度。为了提高 SOC 的估计精度,针对扩展卡尔曼滤波(EKF)算法易受噪声干扰,提出了以新息自适应扩展卡尔曼滤波来提高 SOC 的估计精度和稳定性。通过实验工况采集的数据,并与传统的 EKF 进行对比,估计误差可以控制在 3%以内,验证了该模型的有效性。

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作者: 李嘉波; 魏孟; 李忠玉; 叶敏; 焦生杰; 徐信芯

标题: An improved battery state estimation based on support vector machine regression

标题: 一种改进的支持向量机回归的电池状态估计

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作者关键词: SOC; LSSVM; lithium ion battery; SOC; LSSVM; feedback

作者关键词: 锂离子电池; 反馈

摘要: The state-of-charge (SOC) estimation of a lithium-ion battery is very important with respect to a battery management system (BMS). It is difficult to ensure SOC estimation accuracy because it cannot be measured directly. To improve the SOC estimation accuracy, a least squares support vector machine (LSSVM) is used to establish a relation among voltage, current, and SOC. Further, an improved LSSVM method for SOC estimation is proposed to reduce the SOC estimation accuracy because of the changing voltage and current. The voltage measurement, current measurement, and SOC estimation values of the previous time are considered to be the feedback quantities of the model, and the voltage and current values of the present time are considered to be the input quantities that can be used to estimate the current SOC. The experimental results show that the error of the proposed method is less than 1% when compared with LSSVM, verifying the effectiveness of the proposed method.

摘要: 锂离子电池荷电状态(SOC)估计在电池管理系统(BMS)尤为重要,由于 SOC 不可直接测量,因此估计精度很难保证。为提高电池荷电状态估计精度,采用通过最小二乘支持向量机(LSSVM)建立电压、电流和 SOC 之间的关系。不同的是,为了减小电压和电流因变化造成 SOC 估计精度低,提出了一种改进的 LSSVM 的锂离子电池 SOC 在线估计方法。将上一时刻的电压测量值、电流测量值以及上一时刻 SOC 的估计值,作为模型的反馈量,并和当前时刻的电压

值和电流值,共同作为模型的输入量,来估计当前时刻的 SOC。实验结果表明,与 LSSVM 相比,所提方法误差控制在 1%以内,验证了所提方法的有效性。

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作者: 魏孟; 李嘉波; 李忠玉; 叶敏; 徐信芯

标题: SOC estimation of Li-ion batteries based on Gaussian process regression and UKF

标题: 基于高斯过程回归的 UKF 锂离子电池 SOC 估计

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文献类型: Article

作者关键词: UKF; power battery; state of charge; Gaussian process regression; UKF

作者关键词: 动力电池; 荷电状态; 高斯过程回归

摘要: The high-precision state-of-charge (SOC) estimation of battery power capacity is the key technology associated with a battery management system, and its estimation accuracy directly

influences the energy management efficiency and endurance mileage of electric vehicles. The traditional filter estimation method uses an estimation model and does not consider the accuracy model of a Li-ion battery. To solve this problem, an unscented Kalman filter (UKF) estimation method based on Gaussian process regression (GPR) is presented. GPR can be used to establish a measurement equation for an equivalent circuit model with limited training data, resulting in the connection of UKF and GPR. The proposed model optimally uses the data obtained via the tests and the current to estimate the SOC. The experimental results and comparative analysis of the UKF estimation method based on Gaussian process regression demonstrate the high prediction accuracy of the proposed algorithm during SOC estimation.

摘要: 高精度的电池荷电状态估计是电动汽车电池管理系统的关键技术之一,其估计精度直接影响能量管理效率和汽车的续航里程。传统的滤波方法基于模型来估计电池 SOC,但难以建立锂离子电池精确的数学模型。针对此问题,提出一种基于高斯过程回归的无迹卡尔曼滤波(UKF)锂离子电池 SOC 估计方法,使用高斯过程回归在有限的训练数据下建立等效电路模型的测量方程,在 UKF 和高斯过程回归之间建立关联。该模型能够充分联合利用现有实验数据和被预测实时状态数据,实现 SOC 估计。结果表明,与传统 UKF 相比,基于高斯过程回归的 UKF 算法具有较高精确性。

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作者: 李嘉波; 李忠玉; 焦生杰; 叶敏; 徐信芯

标题: Lithium-ion state estimation based on feedback least square support vector machine

标题: 基于反馈最小二乘支持向量机锂离子状态估计

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文献类型: Article

作者关键词: SOC; lithium-ion battery; SOC; least squares support vector machine (LSSVM)

作者关键词: 锂离子电池; 最小二乘支持向量机(LSSVM)

摘要: To ensure the safe operation of electric vehicles, the accurate estimation of the state of charge (SOC) of the lithium-ion battery installed in the vehicle is required. SOC is also an important parameter of battery management systems. However, SOC estimation is influenced by the accuracy of the measuring equipment, applied load, and various other factors. Accordingly, to improve the accuracy of SOC estimation, this study proposes a new SOC estimation model for lithium-ion batteries based on least-squares support vector machine (LSSVM) machine learning. The LSSVM model is trained on the measured current, voltage, and temperature of the lithium ion battery, which are input in vector form, and outputs the SOC vector. To improve the accuracy of SOC estimation, the SOC value estimated at the previous time is added as a feedback vector to the input vector before estimating the SOC at the current time. In an experimental evaluation, the proposed method achieved higher SOC estimation accuracy than the LSSVM, SVM, and neural network models. Moreover, the estimation error was controlled within 1%, establishing the validity of the model.

摘要: 锂离子电池荷电状态(SOC)的准确估计,直接影响电动汽车的安全运行,也是电池管理系统(BMS)重要的参数之一。然而在 SOC 估计过程中,会受到如测量设备的精度、荷载等因素的干扰。为了提高 SOC 的估计精度,本工作提出了一种新的基于最小二乘支持向量机(LSSVM)机器学习的锂离子电池 SOC 估计模型。将测量的锂离子电池的电流、电压和温度作为模型的输入向量,SOC 作为模型的输出向量,来训练 LSSVM 模型。不同的是,为提高 SOC 的估计精度,将上一时刻估计的 SOC 值作为反馈向量,加入到输入向量中,用来估计当前时刻的 SOC。通过实验工况采集的数据,并与传统的 LSSVM、支持向量机(SVM)、神经网络(NN)比较,实验结果表明,该模型可以提高 SOC 的估计精度,估计误差可以控制在 2%以内,验证了该模型的有效性。

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作者: 魏孟; 李嘉波; 叶敏; 高康平; 徐信芯

标题: SOC estimation of Li-ion battery based on gaussian mixture regression

标题: 基于高斯混合回归的锂离子电池 SOC 估计

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文献类型: Article

作者关键词: power battery; state of charge; Gaussian process regression; Gaussian mixture regression

作者关键词: 动力电池; 荷电状态; 高斯过程回归; 高斯混合回归

摘要: The state of charge (SOC) of a power battery must be accurately estimated as it determines the endurance mileage and is the basic premise for the energy management of electric vehicles. However, SOC estimation of battery systems is degraded by nonlinearity, instability, and other factors. Accordingly, the characteristic state data of a lithium battery contain nonlinearities, fluctuations, and external interference. This study proposes an SOC prediction method based on Gaussian mixture regression (GMR), which resolves the problems of abnormal values embedded in the state data and noise in the traditional Gaussian process model (GPM). The hyper-parameters of the Gaussian mixture model are sequentially optimized by k-means clustering and an EM algorithm. The GMR predicts the SOC output. In an experimental validation and a comparative analysis of GMR and GPM, the GMR algorithm achieved superior prediction accuracy and effectiveness in SOC estimation.

摘要: 动力电池剩余电量的准确估算是电动汽车续航里程的重要依据和能量管理的基本前提,为降低电池系统因非线性、不平稳因素对荷电状态估计的不利影响。针对锂电池的状态数据采集存在非线性、不平稳以及外界干扰等问题,提出了基于高斯混合回归对荷电状态进行预测,以解决传统高斯过程模型含有异常数据和噪声的问题。利用 K-means 聚类算法与 EM 算法对高斯混合模型的超参数进行求解,然后采用高斯混合回归对输出的荷电状态进行预测。最后通过实验验证,并与高斯过程回归进行对比分析,验证了高斯混合回归算法在荷电状态估计过程中具有高精度和有效性。

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作者: 马登成; 刘康

标题: Modeling and simulation of mixing uniformity of double drum regenerative mixing equipment

标题: 双滚筒再生搅拌设备搅拌均匀性建模与仿真

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作者关键词: double drum regenerative mixing equipment; structural parameters; working parameters; mixing process; mixing uniformity; EDEM simulation

作者关键词: 双滚筒再生搅拌设备; 结构参数; 工作参数; 搅拌过程; 搅拌均匀性; EDEM 仿真

摘要: To improve the mixing uniformity of the double drum regenerative mixing equipment, the inner cylinder rotation speed, the blade installation angle and the stirring arm phase angle of the double drum were designed and calculated. The double drum mixing model was established by discrete element method (EDEM) software, and the stirring process was simulated by discrete

element simulation. The simulation results show that the increase of the rotational speed and the reduction of the axial installation angle of the blade can improve the uniformity of the three aggregates. When the feed rate is constant, the phase angle of the stirring arm is too large, which is not conducive to the mixing of the mixture. The influence of the arm phase angle on the uniformity of the coarse aggregate is very significant, and the dispersion coefficient can be quickly reduced by reducing the phase angle.

摘要: 为提高双滚筒再生搅拌设备的搅拌均匀性,对内筒转速、叶片安装角和搅拌臂相位角进行了设计,利用基于离散元方法(EDM)的仿真软件建立了双滚筒再生搅拌设备模型,对搅拌过程进行了离散元仿真模拟.仿真结果表明:在设计范围内提高转速、减小叶片轴向安装角可以提高双滚筒再生搅拌设备的搅拌均匀性;在供料速率一定的情况下,搅拌臂相位角过大不利于混合料的搅拌;搅拌臂相位角对粗集料均匀性的影响程度非常显著,通过减小相位角可以快速降低其离散系数,提高搅拌均匀性.

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标题: SOC estimation of lithium-ion batteries based on Gauss process regression

标题: 基于高斯过程回归的锂离子电池 SOC 估计

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作者关键词: SOC; SOC; Gauss process regression; lithium-ion battery

作者关键词: 高斯过程回归; 锂离子电池

摘要: Battery state estimation (state of charge, SOC) is particularly important in a battery management system (BMS). It is difficult to ensure its accuracy because SOC estimation is vulnerable to temperature, load, charging and discharging efficiency, and other external factors. Currently, many scholars use machine learning algorithms to estimate the SOC. However, the estimation accuracy of a neural network (NN) is dependent on the number of samples. The support

vector machine (SVM) falls into a local optimum in parameter optimization. An online estimation method is proposed based on Gaussian process regression (GPR) for lithium-ion batteries to improve the estimation accuracy of the SOC. Based on the battery measurement parameters, including current, voltage, and temperature, as input to the GPR model and the SOC as an output of the model, the model is trained, and the parameters are optimized using the gradient descent method. The validity of the model is verified by simulation and data collected from the constant current charging and discharging experiments. Compared with the SVM, LSSVM, and NN, the validity and feasibility of the model are verified.

摘要: 电池状态估计(SOC)在电池管理系统(BMS)尤为重要,由于 SOC 估计易受温度、荷载、充放电效率等外界因素的影响,因此估计精度很难保证。目前,有很多国内外学者利用机器学习算法进行 SOC 估计,然而神经网络(NN)的估计精度依赖于样本个数,支持向量机(SVM)在参数寻优时已陷入局部最优。因此为了提高 SOC 的估计精度,提出了基于高斯过程回归(GPR)的锂离子电池在线的估计方法,根据电池的测量参数,包括电流、电压、温度作为 GPR 模型的输入,SOC 作为模型的输出,进行模型训练,并利用梯度下降法进行参数寻优。通过仿真和恒流充放电实验采集的数据来验证模型的有效性,并与 SVM、LSSVM 和 NN 相比,验证了模型的有效性和高精度性。

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作者: 马兵; 张璐凡; 聂福全; 周强; 李虎

标题: Analysis on vibration energy of the super-accelerating macro-micro motion platform

标题: 超高加速宏微运动平台振动能量分析

来源出版物: 机械设计 卷: 37 期: 11 页: 27-32 出版年: 2020

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作者关键词: floating stator; super acceleration; macro-micro motion platform; vibration energy; energy attenuation

作者关键词: 浮动定子结构; 超高加速; 宏微运动平台; 振动能量; 能量衰减率

摘要: It is difficult to improve the acceleration of macro-micro motion platform. Thus, in this article, based on the series of ideas, the super-accelerating macro-micro motion platform with the floating stator is set up, which is driven by more macro single micro-more macro. The structure of this platform is explored and the whole dynamic model is worked out. Then, the energy attenuation of this platform is identified by means of different drive modes and floating-stator modes. The analysis is conducted on the changing law of energy attenuation by the level number n of different voice coil motors. The super-accelerating macro-micro motion platform with $n=1$ is selected for the experiment. The results show that the energy-attenuation rate of the system β_{11} is about 89.32% under the double floating-stator mode and the energy-attenuation rate of the system β_{21} is about 82.6% under the single floating and single-fixed mode; the analytical error is about 3.75% and 9.03% respectively. Therefore, the super-accelerating macro-micro motion platform under the multi-level floating-stator mode has desirable vibration suppression.

摘要: 针对宏微运动平台加速度难以提升的问题,采用串联思想,构建了一种以多宏+单微+多宏驱动的浮动定子式的超高加速宏微运动平台。首先介绍了超高加速宏微运动平台的结构组成并搭建了其整体动力学模型。其次,从振动能量角度出发,选取不同驱动方式和浮动定子模式,并通过改变不同音圈电机的级数 n ,探究了平台系统振动能量衰减率的变化规律。最后,通过选取 $n=1$ 的超高加速宏微运动平台作为试验对象,试验结果表明:当分别采取双浮动定子模式和单浮动-单固定模式时,系统振动能量衰减率 β_{11} 和 β_{21} 分别约为 89.32% 和 82.6%,与仿真分析结果误差分别约为 3.75% 和 9.03%。因此,采用多级浮动定子模式的超高加速宏微运动平台具有较好的振动抑制效果。

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标题: RESEARCH ON PLATFORM FATIGUE TEST ATTITUDE AND LOADING MODE OF EXCAVATOR WORKING DEVICE BASED ON MEASURED SPECTRUM

标题: 基于实测谱的挖机工作装置台架疲劳试验姿态及加载方式研究

来源出版物: 机械强度 卷: 42 期: 6 页: 1453-1458 出版年: 2020

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来源出版物: Journal of Mechanical Strength 卷: 42 期: 6 页: 1453-1458 出版年: 2020

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文献类型: Article

作者关键词: Working device; Durability; Bench; Test posture

作者关键词: 工作装置; 耐久性; 台架; 试验姿态

摘要: Taking the working device of a certain type of excavator as the research object,,through the method of market research and the simulation analysis of the validated FEM by static calibration experiment to determine the dangerous position of working device,basing on the experimental data (cylinder displacement,stress etc.),first take the maximum digging force posture for fatigue test of stress response assensitiveposture and loading in the middle of the bucket tip and the level of positive response at-13 DEG direction " sensitive" as direction,solving the multi degree of freedom system actual attitude multiplicity the real danger caused deviation of the object of any other fixed posture and loading direction of the problem.Secondly,the load of the dangerous point spectrum as the driving load spectrum of tip loading force equivalent,finally through the damage consistency test results show that the experimental method is reasonable,which can effectively solve the problem of posture and loading under the laboratory environment working device,to provide reference for similar and Taiwan fatigue experiment of multi degree of freedom system.

摘要: 以某型挖掘机工作装置为研究对象,采用数值仿真分析方法对 7 种不同受载状态的应力响应进行求解,选取了动臂及斗杆的 7 个较大应力点作为有效测点。在试验数据(油缸位移,应力等)分析的基础上,确定了以工作装置发挥的最大挖掘力的姿态为疲劳试验应力响应的敏感姿态和等效加载在中间斗齿某一响应敏感方向,仿真及试验数据分析结果表明:当动臂、斗杆及铲斗油缸长度分别为: 2 463 mm,2 935 mm,2 229 mm 时的工作装置姿态发挥最大挖掘力的试验姿态;中间斗齿等效加载力与水平正向成-13°的加载方向为应力响应因子 K 值的最大方向。由此解决了在台架试验中,由于多自由度系统工作姿态多样性所造成在随意固定姿态和加载方向下疲劳失效位置与实际位置不一致问题。该方法能够有效解决实验室环境下工

作装置的姿态及加载方向的问题,并为类似多自由度系统的台疲劳试验姿态确定问题提供参考。

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作者: Zhao Wu; Yue Chao; Shen Weiwei

作者: 赵悟; 岳超; 沈威威

标 题 : FINITE ELEMENT SIMULATION AND STRUCTURE OPTIMIZATION OF THE AGITATING MECHANISM OF DOUBLE SHAFT VIBRATING MIXER

标题: 双立轴振动搅拌机搅拌机构有限元分析与结构优化

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文献类型: Article

作者关键词: Vibratory agitating; Agitating mechanism; Finite element simulation; Modal shape; Structure optimization

作者关键词: 振动搅拌; 搅拌结构; 有限元模拟; 模态分析; 结构优化

摘 要 : Analyze the force of the agitating mechanism of double shaft vibrating mixer under different working conditions. Combined with the finite element software analysis, the stress, strain and modal shape of the agitating mechanism is obtained. At the same time, the strain pattern is compared with the actual deformation zone to verify the rationality of the finite element analysis. An optimization scheme is proposed aiming at improving the stiffness. After the simulation analysis, the stiffness of the optimized agitating mechanism is obviously enhanced to meet the work requirements. Meanwhile, the strength and natural frequency of the mechanism have

also improved.It has an important significance for reducing safety incidents.At the same time, it also lays a theoretical foundation for vertical shaft vibration mixing technology.

摘要: 分析双立轴振动搅拌机搅拌机构在不同工况下的受力情况。结合有限元软件分析,得到了搅拌机构的应力应变图以及振型图。针对现有的搅拌机构存在刚度不足的问题,将应变图的变形量与实际变形区的变形量进行了比较,验证了有限元分析的合理性。同时,提出了一种提高搅拌机构刚度的优化方案。经过仿真分析发现,新型搅拌机构在工作时的刚度得到了明显的改善。同时,强度满足工作要求,固有频率与激振器的工作频率也不同,避免了共振现象。这对于减少安全事故的发生有着重要意义,同时也为立轴振动搅拌技术奠定理论基础。

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作者: Zhao Xiaoyun; Song Xuding

作者: 赵晓运; 宋绪丁

标题: An inverse computation control vertex method for the quartic NURBS curve and its application

标题: 一种四次 NURBS 曲线反求控制顶点方法及应用

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文献类型: Article

作者关键词: control vertex inverse computation; NURBS curve interpolation; recursive algorithm; vane surface reconstruction

作者关键词: 控制顶点反求; NURBS 曲线插值; 递推算法; 叶片曲面重构

摘要: The complex freeform curve and surface can be smoothly and efficiently reconstructed by raising the order of equation. In this study, the general algorithm expressions for inverse computation of control vertex for NURBS curve interpolation are proposed, which is based on the

property and correlation of stepwise linear recursion of B-spline method and Bezier method. One kind of matrix equation and subordinate algorithm formulae are exactly acquired for inverse computation of control vertex for quartic NURBS curve under certain boundary conditions. The bi-quartic NURBS surface of turbo impeller vane is reversely reconstructed. Compared with the cubic construction line, the curvature of the quartic construction line is decreased by 36.20%. Compared with the constructed cubic surface, the maximum Gaussian curvature of the constructed quartic surface is decreased by 2.04%, and the minimum Gaussian curvature is decreased by 99.55%. The fairness of the bi-quartic NURBS surface is improved clearly with the data comparison and contrast to the bi-cubic NURBS surface. Experimental results indicate the practicability and correctness of the matrix equation and formulae. The conclusion may provide support and reference to the digital manufacturing and reverse reconstruction of complex freeform curve and surface in practice.

摘要: 用提高方程阶次的方法, 可以光顺和高效地反求复杂的自由型曲线曲面。基于 B 样条方法和贝齐尔方法逐步线性递推的性质和联系, 推出了 NURBS 曲线插值控制顶点反求的一般算法表达式。结合边界条件, 详细给出了一种四次 NURBS 曲线插值控制顶点反求的矩阵方程和配套算法公式。通过对涡轮增压器叶轮叶片双四次 NURBS 曲面的逆向重构, 并将该构造曲面与双三次的构造曲面进行数据对比分析, 四次构造曲线的曲率比对应的三次构造曲线的曲率, 减少了 36.20%; 四次构造曲面高斯曲率的最大值比三次的减少了 2.04%, 最小值减少了 99.55%, 曲面的光顺性得到明显提高。研究结果证实了该矩阵方程和配套算法公式的可行性和正确性。研究结论可为工程实践中, 对复杂的自由型曲线曲面的逆向重构和数字化制造, 提供有效的支持和借鉴。

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作者: 张晨光; 谢立扬; 高岱乐; 顾海荣

标题: Comparative study of parallel-flow and counter-flow heating process in rotary dryer for asphalt recycling plant

标题: 厂拌热再生滚筒顺流与逆流加热工艺对比研究

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文献类型: Article

作者关键词: asphalt recycling plant; recycling rotary dryer; parallel-flow heating; counter-flow heating; heat transfer model; heating process

作者关键词: 厂拌热再生设备; 再生滚筒; 顺流加热; 逆流加热; 传热模型; 加热工艺

摘要: To improve the reclaimed asphalt pavement (RAP) heating efficiency for the rotary dryer of asphalt recycling plant and analyze the technical feasibility of RAP counter-flow heating progress, based on the coupling effect of heat convection, radiation and contact transfer processes between RAP, flue fluid and drum wall, one-dimension steady heat transfer model was established for 2000 series recycling rotary dryer. The parallel-flow and counter-flow models were solved respectively by numerical algorithm, and the variation trends of the RAP and flue fluid temperature along the dryer axial direction were described quantitatively. The thermal efficiencies of the parallel-flow and counter-flow rotary dryers were calculated and compared via the RAP heating tests to verify the numerical simulation results. Results show that compared with the parallel-flow heating process, the counter-flow method can enhanced the RAP heating effect. The measured thermal efficiency of counter-flow rotary dryer is 80.8%, which is 5.4% higher than that of counter-flow dryer, so the counter-flow rotary dryer has better energy utilization. Reasonable control of the flue fluid initial temperature is the critical technology to implement the RAP counter-flow heating process in asphalt recycling plants.

摘要: 为了提高厂拌热再生滚筒对沥青路面回收材料(RAP)的加热效率,并分析 RAP 逆流加热工艺的技术可行性,基于 RAP、热气流及滚筒筒体之间的对流、辐射、接触多种方式耦合传热机理,建立了 2000 型再生滚筒一维稳态传热模型,采用数值算法分别对顺流和逆流加热方式进行了模型求解,定量描述了 RAP 及热气流温度沿滚筒轴向的变化趋势.进行了顺流式和逆流式再生滚筒 RAP 加热试验,以验证数值模拟结果,并对比计算了滚筒热效率.结果表明:相对于顺流加热方式,逆流式再生滚筒对于 RAP 的加热能力更强;实测逆流式再生滚筒的热效率为 80.8%,比顺流式高 5.4%,能量利用率更高;对进入再生滚筒的热气流初始温度进行合理控制是厂拌热再生设备实施 RAP 逆流加热工艺的技术关键.

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第 26 条, 共 32 条

作者: Lyu Jingxiang; Tang Renzhong; Zheng Jun

作者: 吕景祥; 唐任仲; 郑军

标题: Data-driven methodology for energy consumption prediction of turning and drilling processes

标题: 数据驱动的车削和钻削加工能耗预测

来源出版物: 计算机集成制造系统 卷: 26 期: 8 页: 2073-2082 出版年: 2020

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作者关键词: data-driven; turning; drilling; feature selection; machining; energy consumption prediction

作者关键词: 数据驱动; 车削; 钻削; 特征选择; 机械加工; 能耗预测

摘要: To accurately and quickly predict the energy consumption of turning and drilling processes, a data-driven methodology to predict energy consumption of machining apart was proposed, which included four key technologies that were manufacturing data acquisition and preprocessing, preprocessing of feature attribute, algorithm for feature selection and energy consumption prediction. The feature selection was achieved by combining sample classification and RReliefF algorithm. The energy consumption was predicted using three algorithms that were neural network, support vector regression and random forest, and the prediction accuracy was improved by adjusting the parameters of the algorithms. Experiments were conducted to validate the proposed method. The energy consumption of cylindrical turning and drilling processes of parts was predicted using the proposed methodology and compared with the measured energy. Results showed that the proposed method could be used to identify the main factors influencing the machining energy consumption. The average prediction errors range from 4.94% to 9.94% and decreased as the number of training samples increasing. The neural network algorithm could achieve the lowest prediction error, which was lower than those obtained using existing method. The proposed methodology had a big potential for industrial applications.

摘要: 为准确快捷地预测零件车削和钻削加工工艺过程的电能消耗, 提出一种基于数据驱动的能耗预测方法, 包括能耗数据采集和预处理、特征属性预处理、特征选择算法和能耗预测算法 4 个关键技术。将样本分类和 RReliefF 算法结合进行特征选择, 采用神经网络、支持向量回归、随机森林 3 种算法预测能耗, 并通过对算法进行调参提高预测精度。在此基础上进行了实验研究, 应用所提方法预测零件外圆车削和钻削加工能耗, 并同实测能耗进行比较。案

例分析结果表明,所提方法能够分析得出零件加工能耗的主要影响因素,3 种算法的平均预测误差在 4.94%~9.94%之间,误差随着训练样本的增加逐步下降,其中神经网络算法的预测误差最小,低于现有方法,具有很大的应用潜力。

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作者: Si Guimao; Zhan Ziquan; Zhi Jingjing; Shi Yu

作者: 司癸卯; 展梓荃; 支静静; 师毓

标题: Design of FOC-based control system of electric crawler type remote controlled hedge trimmer

标题: 基于 FOC 的纯电动履带式遥控绿篱机控制系统设计

来源出版物: 长安大学学报. 自然科学版 卷: 40 期: 5 页: 117-126 出版年: 2020

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作者关键词: mechanical engineering; electric crawler type remote controlled hedge trimmer; field oriented control; control system; ADRC

作者关键词: 机械工程; 纯电动遥控绿篱机; 磁场定向控制; 控制系统; 自抗扰技术

摘要: To solve the problem of the excessive yaw angle when the electric crawler type remote controlled hedge trimmer worked by the remote control, which resulted in the frequent manual adjustment because of the unbalanced load exerting into the different side of tracks, the causes were analyzed and a type of the control system was introduced. The theoretical load and velocity were researched according to the vehicle's dynamic theory in typical working condition, including the straight ground, 30 degree of the longitudinal slope and 30 degree of the cross slope. The high voltage bus, the low voltage bus and the communication bus were set in the system to enable the

controller,sensors and motors to work and communicate.Two field oriented control(FOC) simulation,the one was controlled by traditional PI algorithm and the other was controlled by active disturbances rejection control(ADRC)technique were built in MATLAB/Simulink to compare their robustness by analyzing their fluctuations of velocity and torque figures when the load was changed suddenly.The results show that the design of control system could support the trimmer's work in remote control and the new type algorithm is obviously beneficial to the system robustness,which leads to about 5times increase of the steady state time without overshoot in system and about 40%of improvement of torque fluctuation and the steady time.1tab,6figs, 28refs.

摘要: 针对在作业过程中两侧履带经常受到大小不同的载荷而造成纯电动履带式遥控绿篱机作业偏航频繁,需要人工不断调整的问题,提出了一种纯电动履带式绿篱机的控制系统,并研究不平衡载荷对其工作状态的影响。首先通过分析绿篱机作业过程的 3 种典型工况,根据履带车辆地面力学理论,研究绿篱机在直线行驶、30°横坡行驶和 30°纵坡行驶典型工况下所需驱动力矩大小,进行绿篱机行驶力学分析;其次通过设置高压总线、低压总线和通信总线的方式实现绿篱机控制器、传感器、驱动电机等的工作和通信,进而完成绿篱机控制系统硬件的方案设计;最后基于 MATLAB/ Simulink 软件平台搭建纯电动履带式遥控绿篱机行驶驱动系统的仿真模型,研究该绿篱机的双侧履带在受到不同载荷的情况下,其驱动电机分别采用比例积分控制(PI)算法和自抗扰技术(ADRC)控制算法时的磁场定向控制(FOC)的转矩和转速的变化情况。研究结果表明:以上述方法设计得到的纯电动履带式遥控绿篱机能够以遥控方式实现绿篱作业;相比于原有的 PI 算法,采用 ADRC 控制算法的 FOC 控制方法对于协调转速与转矩,以及提升系统鲁棒性有明显优势,系统转速的稳态时间提升约 5 倍,系统转速无超调,系统转矩的稳态速度和稳态误差均改善约 40%,解决了绿篱机在遥控工作状态下偏航严重,人工干预频繁的问题。

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作者: Zhao Xiaoyun; Song Xuding

作者: 赵晓运; 宋绪丁

标题: Reverse reconstruction and analysis of the vane's quartic NURBS surface based on MATLAB

标题: 基于 MATLAB 的叶片四次 NURBS 曲面反求重构及分析

来源出版物: 机械设计 卷: 37 期: 7 页: 59-67 出版年: 2020

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文献类型: Article

作者关键词: reverse reconstruction of quartic NURBS surface; NURBS modeling method; analysis on error and smoothness; design of vane surface

作者关键词: 四次 NURBS 曲面反求重构; NURBS 造型方法; 误差与光顺分析; 叶片曲面设计

摘要: In order to improve the accuracy and smoothness of reverse reconstruction for the turbo impeller vane surface, the bi-quartic NURBS surface model is reconstructed based on the quartic NURBS theory and the surface data, by means of programming and ample calculation in MATLAB. The results are compared with those based on the bi-cubic NURBS surface model, with the aid of error analysis and graph comparison. The results show that the quartic NURBS surface, compared with the cubic NURBS surface, has less error and fluctuation; the reverse design of the quartic NURBS surface with one more order has higher accuracy and better smoothness. It is of great significance to reverse reconstruction of complex and free surfaces, and ensures a higher standard of data accuracy and shape smoothness.

摘要: 为了提高涡轮增压器叶片曲面反求设计的精度和光顺性,在 MATLAB 环境下,基于曲面型值数据,利用双四次 NURBS 理论与方法,通过编程和大量计算等,重构了叶片曲面模型。经过与双三次 NURBS 叶片曲面模型误差的数据分析和图形对比,结果表明:四次 NURBS 曲线的误差和波动要小于三次的误差和波动;升高一次的四次 NURBS 曲线曲面反求设计具有更高的造型精度和光滑度。研究结论有助于在工程实践中,对复杂的自由型曲线曲面逆向工程的高效数据计算,为更精准、更光滑造型等提供支持和借鉴。

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作者: Suo Xuefeng; Jiao Shengjie; Wang Gangfeng

作者: 索雪峰; 焦生杰; 王刚锋

标题: Experimental Study on Vibration and Impact Characteristics of the Hydro-pneumatic Suspension of a Mine Dump Truck

标题: 矿用自卸车油气悬架振动冲击特性实验研究

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作者关键词: vibration and wave; mine dump truck; hydro-pneumatic suspension; vibration shock; overshoot amount; oscillation time

作者关键词: 振动与波; 矿用自卸车; 油气悬架; 振动冲击; 超调量; 振荡时间

摘要: Mining dump trucks bear a huge impact when being loaded. This impact will cause damage to the body or suspension of the trucks. In order to raise the lifespan of the vehicle and improve the vibration absorption feature of the suspension, the TLD110 mining dump truck developed by Shaanxi Tonly Heavy Industries Co. Ltd. is taken as the research object. The research is highlighted on the vibration and energy absorption characteristics of the hydro-pneumatic suspension during loading. Through experiments, the changes of the pressure of the hydro-pneumatic suspension with the shock loading and without the shock loading are compared. The results show that there is a linear relationship between the spring pressure and the loading mass when there is no impact loading. The experimental and theoretical values are basically consistent each other with the maximum difference of 5.2 %. The shock loading causes the hydro-pneumatic suspension pressure to reach the peak rapidly and then the pressure oscillation reduces. And then it tends to a stable value. The maximum deviation is 0.32 MPa. The maximum overshoot is 21.6 %. The oscillation attenuation time is concentrated in 4.7 s- 6.0 s. Increasing the diameter of the accumulator can reduce the maximum deviation of the loading impingement hydro-pneumatic suspension pressure, which can well protect the body and the suspension.

摘要: 矿用自卸车装载时会产生巨大冲击, 严重时会造成车身或悬架破坏。为了提高车辆寿命, 改善悬架减振吸能特性, 以陕西同力重工最新研发的 TLD110 矿用自卸车为研究对象, 重点研究车辆装载过程中油气悬架的减振吸能特性, 通过实验对比无冲击加载和有冲击加载两个过程中油气悬架压力的变化情况。结果表明: 无冲击加载时油气悬架压力和装载质量成线性关系, 实验值和理论值基本一致, 最大误差为 5.2 %; 有冲击加载会造成油气悬架压力迅速达到峰值, 然后衰减振荡, 最后趋于稳定值, 最大偏差为 0.32 Mpa, 最大超调量为 21.6 %, 衰减振荡时间集中在 4.7 s~6.0 s 之间; 增大蓄能器直径能减小小装载冲击油气悬架压力的最大偏差, 对车身和悬架起到更好保护作用。

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作者: Wan Yipin; Song Xuding; Yuan Zhengwen

作者: 万一品; 宋绪丁; 员征文

标题: Fatigue Test and Fatigue Reliability Evaluation of Loader Working Device

标题: 装载机工作装置的疲劳试验及疲劳可靠性评估

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作者关键词: loader; working device; load spectrum; fatigue test; reliability

作者关键词: 装载机; 工作装置; 载荷谱; 疲劳试验; 可靠度

摘要: In order to design an anti-fatigue loader working device and evaluate its fatigue reliability, two dimensional load spectrum of the fixed attitude equivalent external load of the ZL50G loader was obtained. Loading spectrum of accelerated fatigue test and the fatigue reliability evaluation of very small samples were carried out. The results show that 35.88 h of acceleration loading spectrum can be equivalent to 495.67 h of continuous operation of loader, and the purpose of fast fatigue test of working device is realized. The average actual fatigue life of the working device is 9132.20 h. The main cause of fatigue fracture is the weld toe crack near the boom plate. Based on the fatigue reliability evaluation of very small samples with given working life and fatigue life test results, the cubic polynomial of the mathematical relationship between the life and reliability of the working device was obtained.

摘要: 为了对装载机工作装置进行抗疲劳设计和疲劳可靠性评估, 在获得 ZL50G 装载机工作装置固定姿态当量外载荷二维载荷谱的基础上, 对载荷谱进行了等寿命加速处理, 设计疲劳试验台进行加速加载疲劳试验研究, 并对工作装置进行了极小子样疲劳可靠性评估。结果表明: 利用加速加载谱加载 35.88 h 可以等效装载机连续作业 495.67 h, 实现了工作装置快速疲劳试

验的目的;工作装置试件的实际疲劳寿命的平均值为 9132.20 h,疲劳破坏起始于销轴衬套与动臂焊接处,靠近动臂板处的焊趾裂纹源是造成疲劳断裂的主要因素;基于给定工作寿命和疲劳寿命试验结果的极小子样疲劳可靠性评估,获得了工作装置寿命与可靠度为 3 次多项式的数学关系。

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标题: Surface Texture of Cement Concrete Pavement: a Review

标题: 水泥混凝土路面纹理的研究进展

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文献类型: Review

作者关键词: road engineering; cement concrete pavement; wearing of surface texture; diamond grinding; next generation concrete surface (NGCS)

作者关键词: 道路工程; 水泥混凝土路面; 纹理磨损; 金刚石研磨; 新一代混凝土路面纹理

摘要: China is the country with the longest miles of Portland cement concrete (PCC) pavement in the world. PCC pavement is widely applied in rural areas and tunnels of high-grade highway. The surface textures of PCC pavement in long tunnel are easy to be worn to be a mirror. So its surface friction declines rapidly to cause more traffic accidents. Surface textures of PCC pavement are the main parts to provide anti-skidding performance and make noise. The surface textures of PCC pavement are mainly made up of macrotexture and microtexture. Macrotexture is formed by construction, which allows water to escape beneath a vehicle's tires to prevent hydroplaning. Microtexture is the fine-scale roughness contributed by the fine aggregate in the concrete mortar

to provide surface friction on sunny days. According to the construction time, the textures of PCC pavement can be classified as fresh and harden concrete. Textures for fresh concrete are done between the placement and curing of concrete. The forms include burlap dragging, transverse brooming, transverse or longitudinal tining. Transverse tining is the most common texturing technique used by state highway agencies. Textures for harden concrete are done after the formation of its strength. The forms include diamond grinding, diamond grooving and next generation concrete surface (NGCS). They are also available for restoring surface friction or lowering tire-pavement noise on existing PCC pavement. Because of aggregate and concrete strength, diamond grinding has some defects on land area. The next generation concrete surface is the most recent new concrete texture introduced in the past 20 years. It synthesizes diamond grinding and grooving techniques to make a different texture which are more consistent and durable. The main problems of PCC concrete are tire-pavement noise and wearing of textures. On-Board Sound Intensity (OBSI) is applied to evaluate the noise of textures. Transverse tining makes the loudest noise of all of the textures. NGCS and conventional diamond grinding (CDG) seem to be the quietest pavements. Exposed aggregate makes louder noise itself, but with combination of NGCS or CDG, it can be quiet a lot. The ASTM E274 locked-wheel skid method is used to measure friction. The loss of friction is attributed to the wearing of textures. NGCS has stable friction because of wider land area. Transverse grooving is widely used in China. There are less researches about PCC textures on mainland. Most of them are focused on the construction parameters of transverse grooving. There are less applications for other forms of textures. For the exposed aggregate, there are more researches than applications. Diamond grinding is still confined to the research stage. It is the first time for the NGCS that is introduced to China. This review offers the research progress of PCC textures. The types, construction parameters, application and problem were emphasized. Textures have great impact on tire-pavement noise and friction. New textures introduced by this paper could provide reference for the future application of PCC with lower noise and stable friction.

摘要: 我国是世界上水泥混凝土路面里程最长的国家,水泥路面在我国主要分布于农村公路和高等级公路长隧道中。高速公路长隧道内水泥路面易被磨光呈镜面,路面抗滑性能下降较快,交通事故频发。水泥路面的纹理构造是提供抗滑性能及产生噪音的主要部分。水泥路面的纹理主要由宏观构造和细观构造组成,宏观构造由施工而成,提供雨天排水通道,防止雨天打滑;细观构造主要来自于水泥砂浆的粗糙度,提供晴天抗滑性能。水泥路面的纹理按施工时机分为新拌混凝土的纹理和硬化混凝土的纹理。新拌混凝土的纹理主要是在摊铺后养生前完成,形式包括:麻袋拉毛纹理、刷毛法纹理、纵向和横向拉槽。横向拉槽是美国新建水泥混凝土路面最常采用的纹理形式,然而也是轮胎-路面噪音最大的纹理形式。硬化混凝土的纹理是在混凝土强度形成后施工,形式主要包括:金刚石刻槽、金刚石研磨、新一代混凝土路面纹理,同时也可作为水泥路面抗滑性能恢复养护措施。金刚石研磨由于集料或者混凝土强度问题,在施工过程中存在缺损,纹理形貌存在突变。新一代混凝土路面纹理是最近 20 年新发展起来的混凝土路面纹理形式,将研磨与刻槽技术相结合,由槽提供宏观纹理,脊提供微观纹理,且由于面积更大而更稳定。水泥路面纹理使用过程中的主要问题是噪音和磨损。采用车载声强法评价纹理形式对水泥路面噪音的影响,结果发现,横向拉槽纹理的噪音较大,新一代混凝土路面纹理和金刚石研磨的噪音较小,而露石混凝土路面的噪音较大,将其与金刚石研磨和新一代混凝土路面纹理结合,可显著降低噪音。采用锁轮法评价路面抗滑性能及其衰变,水泥路面抗滑性能的损失主要是宏观构造的磨损造成,新一代混凝土路面纹理随时间的衰变较慢,具有较稳定的抗滑性能。我国对水泥路面纹理形式的研究较少,主要集中于横向刻槽的施工参数研

究,实体工程也主要采用横向刻槽施工工艺。对露石混凝土路面的研究较多,但应用较少。金刚石研磨纹理仍处于室内研究阶段,而新一代混凝土路面纹理尚未引进。本文归纳了水泥路面纹理的主要形式、施工参数、应用和存在的问题,分析了纹理对噪音的影响、纹理对抗滑性能的影响及使用过程中纹理的磨损。期待新的水泥路面纹理形式可以提供噪音较低、纹理更耐久的路面,以解决长隧道水泥路面的镜面问题。

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标题: Remote Control and Measurement System of Spiral Pipeline Inspection Robot Based on WLAN

标题: 基于 WLAN 的螺旋式管道检测机器人远程测控系统

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作者关键词: WLAN; pipeline defection; WLAN; pipeline robot; remote monitoring; DNT

作者关键词: 管道缺陷; 管道机器人; 远程控制; 无损检测

摘要: To solve the problem of difficult detection of internal defects in pipelines,taking Phi100 ~ Phi120mm pipeline as the object,inductance sensor and vision as defect detection sensor,based on master-slave control method,the front and back driven spiral pipeline inspection robot was designed.Aiming at the problem of robot remote control and data transmission,a remote

communication scheme and protocol based on wireless network bridge and WLAN were proposed. The C/S architecture was adopted to design the remote measurement and control system of the robot, and the function test was carried out on the prototype. The prototype functional tests show that the scheme can realize the pipeline detection control function based on WLAN, and the application of vision and inductance sensors can effectively detect the coating defects. The positive and negative deviation of the coating thickness is less than 3.2%, which meets the requirement of less than 5% of the common anticorrosion grade deviation. This research provides a new method for the remote inspection of pipeline robot.

摘要: 针对管道内部缺陷检测困难的问题,以 $\Phi 100\sim\Phi 120$ mm 管道为对象、电感传感器和视觉传感器为管内涂层缺陷检测传感器,基于主从控制方式设计了前后驱动的螺旋式管道检测机器人。针对机器人远程操控和数据传送的问题,提出了基于无线网桥和 WLAN 的远程通信方案和通信协议,采用 C/S 架构设计了机器人的远程测控系统,并在样机上进行功能试验。结果表明基于 WLAN 的方案可实现管道检测机器人的远程测控功能,采用视觉和电感传感器可有效检测涂层缺陷,涂层厚度检测偏差小于 3.2%,符合普通防腐等级偏差小于 5% 的要求。该研究为管道机器人的远程防腐检测提供一种新方法。

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标题: Mineralogical Study of Pyrites in the Miaoliang Gold Deposit, Shanyang County, Shaanxi Province and its Metallogenic Significance

标题: 陕西山阳庙梁金矿床黄铁矿矿物学研究及其成因意义

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作者关键词: pyrite; mineralogy; S、Pb isotopes; Miaoliang gold deposit; southern Qinling

作者关键词: 黄铁矿; 矿物学; S、Pb 同位素; 庙梁金矿; 南秦岭

摘要: In order to find out the source of metallogenic materials, genesis, and metallogenic mechanism of the Miaoliang gold deposit, detailed petrographic observation, electron probe component analysis, and S and Pb isotopes of the main gold-bearing pyrites in the deposit have been carried out in this paper. The electron probe analytical results of pyrites in different types of ores and granites indicate that the S/Fe ratios, δFe and δS values, Co/Ni ratios, Au/Ag values, and the Co-Ni and Co-Ni-As diagrams of pyrites in the Miaoliang gold deposit are characterized with those of the magmatic hydrothermal origin. Most Fe/(S+As) values of pyrites are greater than 0.863, indicating that pyrites could be located in the middle and shallow parts of the orebody. The sulfur in pyrite was mainly sourced from the mantle sulfur in depth with minor from the sulfur in crust. The lead was mainly from the orogenic belt formed by the crust and mantle activities as it is characterized with the crust-mantle mixed source. Based on the tectonic setting, geological characteristics, ore-controlling factors, diagenetic age, and mineralogical, isotopic, and other characteristics of the deposit, it is considered that Miaoliang gold deposit belongs to a structure-controlled medium-shallow deep magmatic hydrothermal gold deposit.

摘要: 为查明陕西山阳庙梁金矿床的成矿物质来源、矿床成因与成矿机制, 对该矿床的主要载金矿物黄铁矿进行了岩相学观察、电子探针成分分析及 S、Pb 同位素分析。不同类型矿石及花岗岩体中黄铁矿的电子探针分析显示, 黄铁矿的 S/Fe、 δFe 和 δS 、Co/Ni、Au/Ag、Co-Ni 及 Co-Ni-As 图解均表明庙梁金矿中的黄铁矿为岩浆热液成因; 其 Fe/(S+As) 绝大多数值大于 0.863, 指示黄铁矿形成于中浅部。黄铁矿中的硫为深部幔源硫混染了部分地壳硫; 铅来自地壳与地幔活动形成的造山带中, 具有壳幔混源的特征。对矿床的构造背景、地质特征、控矿因素、成岩时代、矿物学、同位素等特征的综合研究表明, 庙梁金矿为受构造控制的中浅成岩浆热液型金矿床。

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作者关键词: 银多金属矿; 成矿过程; 银的赋存形式; 西山湾羊场; 内蒙古

摘要: The Xishanwanyangchang silver polymetallic deposit is located in the mid-western segment of the northern margin of North China Craton. There are large-area outcrops of Paleozoic adamellite and tonalite in the ore district. The Early Cretaceous Bainyangpan Formation acidic volcanic rocks, erupting along the near-N-E-trending tensile fractures in the contact zone between adamellite and tonalite. Silver orebodies are lentiform or stratiform occurring in the Lower Cretaceous Bainyangpan Formation as well as contact zone between the volcanic rocks and intrusive rocks, and lead-zinc orebodies are mainly occurring in intrusive rocks and their contact

zone with volcanic rocks, and the faulted structure is obvious in ore control. In this paper, the occurrence and distribution of silver were studied based on detail field work, petrography and electron probe micro-analyzer (EPMA) researches. At the same time, the geochemical migration pattern, precipitation mechanism and metallogenic process of silver, lead and zinc were discussed. The results show that the occurrence of silver in this deposit is mainly visible silver, followed by invisible silver. Visible silver is mainly microencapsulated silver (1 ~ 10 μm) and independent silver minerals (> 50 μm), and invisible silver is mainly isomorphic silver and super-microencapsulated silver (< 1 μm). Microencapsulated silver is mostly wrapped by pyrite, quartz, potash feldspar, barite, etc. Independent silver minerals mainly embedded between quartzes and in those fissures, mainly argentite, followed by naumannite, and a small amount of natural silver, akanthite and pyrargyrite (proustite), etc. Isomorphic silver occurs in the crystal lattice of binary copper sulfides, such as digenite, yarrowite. Super-microencapsulated silver is mainly contained in galena, sphalerite and pyrite related to silver mineralization. The process of mineralization is divided into hydrothermal period and hypogene period based on the crosscutting relationship between mineralized veins, ore textures and mineral assemblages. The hydrothermal period is the main metallogenic period, which can be divided into quartz-pyrite stage, quartz-polymetallic sulfides stage, and quartz-carbonate stage. Quartz-polymetallic sulfides stage is the mainly mineralization stage, and lead-zinc mineralization was formed early in this stage, silver mineralization was formed late in this stage. The ore-forming hydrothermal fluids are rich in various elements such as Fe, Cu, Zn, Pb, Ag, S, and Se in the deposit, and metal ions of which are transported in the form of chloride complexes at the early high-temperature stage. With the decreasing of temperature of the ore-forming hydrothermal fluids and the changes of physical and chemical environments, the chloride complexes are unstable and start to decompose, and the metal ions that have not precipitated are converted into form of HS⁻ complexes and continue to migrate. The continuous decreasing of temperature of the ore-forming hydrothermal fluids leads to the separation of Fe²⁺, Zn²⁺, Cu⁺ and Pb²⁺ with HS⁻ to form metal sulfides such as pyrite, sphalerite, chalcopyrite and galena. And at this time, Ag⁺ partially replaces Cu⁺ in the form of isomorph, which occurs in binary copper sulfides, and at the same time, part of silver is captured by sulfide minerals such as pyrite, sphalerite and galena in the form of super-microencapsulated silver. The precipitation of large quantities of Fe²⁺, Zn²⁺, Cu⁺ and Pb²⁺ causes instability of [Ag(HS)₂]⁻ and the complete disintegration of silver from its HS⁻ complex and combination with Se²⁻ to form some independent silver minerals (such as argentite and naumannite), while the oversaturated silver in the solution is settled in the form of native silver. Under supergene conditions, the silver in the original carrier mineral and the discrete silver can be enriched again with the limonite mineralization of the pyrite after leaching.

摘要: 西山湾羊场银多金属矿床位于华北克拉通北缘中西段。矿区出露有较大面积的古生代二长花岗岩和英云闪长岩,中生代早白垩世白女羊盘组火山岩沿二长花岗岩与英云闪长岩之接触带的北东向张性裂隙喷发,银矿体呈透镜状或似层状产于下白垩统白女羊盘组及其与侵入岩的接触带,铅锌矿体主要产于侵入岩及其与火山岩的接触带,断裂构造控矿明显。本文在野外地质调查的基础上,结合室内显微镜下观察和电子探针分析手段,对银的赋存形式和分布情况进行了研究,对银、铅锌的地球化学迁移模式、沉淀机制及其成矿过程进行了探讨。研究表明,该矿床中银的存在形式主要为可见银,其次为不可见银。可见银主要为显微包体银(1 ~ 10 μm)和独立银矿物(> 50 μm),不可见银主要为类质同象银和超显微包体银(< 1 μm)。显微包体银多被黄铁矿、石英、钾长石和重晶石等包裹;独立银矿物主要为辉银矿,

其次为硒银矿,还有少量自然银、螺状硫银矿和深红银矿(淡红银矿)等,多分布于石英粒间及裂隙中;类质同象银主要赋存于蓝辉铜矿、雅硫铜矿等二元铜硫化物中;超显微包体银主要包裹于与银矿化相关的方铅矿、闪锌矿和黄铁矿中。根据矿(化)脉体之间的穿切关系、矿石结构构造及矿物共生组合,成矿作用过程可划分为热液期和表生期。热液期是主要的成矿期,包括石英-黄铁矿阶段、石英-多金属硫化物阶段和石英-碳酸盐阶段,其中石英-多金属硫化物阶段为主成矿阶段,铅锌矿化形成于该阶段早期,银矿化形成于该阶段晚期。富含 Fe、Cu、Zn、Pb、Ag、S 和 Se 等多种元素的成矿热液,在早期高温条件下金属离子以氯络合物的形式搬运,随着成矿热液温度降低以及其它物理化学环境的变化,氯络合物不稳定而解离,未发生沉淀的金属离子转变为以硫氢络合物的形式继续运移。成矿热液向上运移过程中,随着温度的持续降低,铁、锌、铜和铅等金属离子的硫氢络合物溶解度降低而发生分解,形成黄铁矿、闪锌矿、黄铜矿和方铅矿等金属硫化物,Ag⁺部分置换 Cu⁺以类质同象形式赋存于二元铜硫化物中,部分银以超显微包体形式被先期形成的矿物黄铁矿、闪锌矿和方铅矿等硫化物所包裹。因 Fe²⁺、Zn²⁺、Cu⁺、Pb²⁺等离子的依次沉淀,致使[Ag(HS)₂]⁻不稳定而分解,生成辉银矿,并且 Ag⁺与流体中的 Se²⁻结合形成少量硒银矿,被包裹于重晶石和石英之中,而溶液中过饱和的银则沉淀为自然银。表生条件下,原载体矿物中的银以及离散银经淋滤作用随黄铁矿的褐铁矿化而得以再次富集。

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标题: Study of the salt-formation and sedimentary evolution model of the Upper Ordovician Majiagou Formation in the Yan'an area

标题: 延安地区奥陶系马家沟组上组合膏盐岩成盐沉积演化模式研究

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作者关键词: Ordos Basin; Ordovician Majiagou Formation; the M5_{4~3}-M5_{3~2} sub-members;

gypsum salt rock; salt-forming sedimentary model

作者关键词: 鄂尔多斯盆地; 奥陶系马家沟组; 马五_{4~3}-马五_{3~2} 亚段; 膏盐岩; 成盐沉积演化模式

摘要: Over a decade of oil and gas explorations in the Yan'an area have yielded a series of breakthroughs in documenting the upper Ordovician Majiagou Formation, an important layer for natural gas exploration. This is the main sedimentary area of the Ordovician carbonate-gypsum rock symbiotic system, in which the M5_{4~3}-M5_{3~2} gypsum deposit of the upper Majiagou Formation is a typical representative of the regressive evaporative environment. Based on the latest results from the development of Ordovician gas exploration in the Yan'an gas field, utilizing data from core observations, experimental analysis, drilling and logging, and on the basis of sedimentary structure, the scale of gypsum-salt rock development, lithologic assemblage and the geological characteristics of gypsum-salt rock assemblage in the Majiagou Formation in the study area are elaborated. Finally, the sedimentary background, sedimentary facies and sedimentary evolution model of the assemblage gypsum-salt rocks in the Majiagou Formation in the study area are systematically summarized. The results indicate that against the background of sedimentary pattern of high west and low east, stratum filling is characterized by thin west and thick east, thin south and thick north. The gypsum dolomite-gypsum-salt deposit area extends from southwest to northeast. Three types of rock assemblages were vertically developed: type I gypsum dolomite-anhydrite nodule dolomite-gypsum dolomite-mudstone assemblage; type II gypsum-anhydrite nodule dolomite-gypsum dolomite-mudstone assemblage; and type III salt-gypsum-anhydrite nodule dolomite-gypsum dolomite assemblage. It is a relatively quiet and low energy lagoon sedimentary model. There is evolution of sedimentary environment into extreme evaporative salinization-evaporative gypsum-relative openness. The research results can be used as reference for geological research into the Ordovician gypsum salt rock in other areas of Ordos Basin and also provide important guidance for oil and gas exploration in the Yan'an gas field.

摘要: 延安地区经过十余年油气勘探,在奥陶系马家沟组获得了一系列的突破,其中马家沟组上组合是天然气勘探的重要层位,该区是奥陶系碳酸盐岩-膏盐岩共生体系的主要沉积区,其中马家沟组上组合马五_{4~3}-马五_{3~2} 膏盐沉积是海退蒸发环境的典型代表。本文基于延安气田奥陶系天然气勘探的最新进展,利用现场岩心观察、实验分析、钻井及测井资料,根据沉积构造、膏盐岩发育规模、岩性组合方式等,对研究区奥陶系马家沟组上组合膏盐岩的地质特征进行了详细的阐述,系统地总结了研究区马家沟组上组合膏盐岩的沉积背景及沉积相、建立了沉积演化模式,为延安气田膏盐岩研究提供基础资料。研究表明,在西高东低的沉积格局背景下,地层充填呈西薄东厚,南薄北厚的特点;自西南向东北依次为膏质白云岩-膏岩-盐岩沉积区;垂向发育三种岩石类型组合:I型膏质白云岩-硬石膏结核白云岩-膏质白云岩-泥云岩组合,II型膏岩-硬石膏结核白云岩-膏质白云岩-泥云岩组合,III型盐岩-膏岩-硬石膏结核白云岩-膏质白云岩组合;沉积环境为相对安静且低能的潟湖沉积模式。沉积环境演化为极强蒸发盐化蒸发膏化相对开放。研究成果为鄂尔多斯盆地其他地区奥陶系膏盐岩地质研究提供借鉴,对延安气田油气勘探具有重要指导意义。

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标题: Intracontinental orogenic structure-altered lithofacies mapping and prospecting model of the Changgou gold deposit in the Hanyin gold orefield, South Qinling

标题: 南秦岭汉阴金矿田长沟金矿陆内造山期构造-蚀变岩相填图与找矿模型

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作者关键词: 构造物理化学; 构造-蚀变岩相; 脆-韧性剪切带; 大比例尺矿田构造-蚀变岩相填图; 汉阴县长沟金矿床; 陆内造山期

摘要: The large-scale tectonic altered lithofacies mapping technology is a new technology gradually formed in the study of the tectonics-physics-chemistry of the orefield and the comprehensive study of the whole survey area. Based on the survey of the Shiquan- Xunyang gold mineralization belt in the South Qinling Mountain and the large-scale orefield structure mapping demonstration, it is considered that the 1 : 25000 tectonic-lithographic mapping implemented at the orefield scale and 1 : 10000 or 1 : 5000 structurealtered lithofacies mapping implemented at the mining area scale are feasible and effective. In the past ten years, the gold orefield in the north of Hanyin County, South Qinling, has made great progress in ore prospecting by structure-altered lithofacies mapping and special studies. The Changgou gold deposit in Hanyin County is a new type of altered rock type gold deposit controlled by brittle-ductile shear zones, which was discovered during comprehensive research on ore structure - altered rock facies mapping in recent years. The Changgou gold deposit is located in the DSZ3 brittle-ductile shear zone (RF5), where the lithology is mainly mylonitized biotitebearing phenocryst sericite quartz schist and garnet bearing sericite quartz schist of Lower Silurian. The alterations of the rock closely related to mineralization are biotitization, silicification, pyrite mineralization, and sericitization. Where biotite morphology is developed and quartz veins are developed densely accompanied by pyrite mineralization and is about 80~ 150 meters away from the later stage main fracture belt, the gold mineralization grade is relatively high. The ore-forming fluid mainly belongs to the medium-low temperature, medium-low salinity, and low -density NaCl-H₂O -CO₂ system. The ore-forming pressure is from 41.03 MPa to 98.04 MPa and the ore-forming depth is from 1.52 km to 3.63 km. The granodiorite veins and granite aplite related to mineralization measured by U -Pb zircon LA-ICP-MS have ages from 180.23.6 Ma to 176.01.9 Ma. The ⁴⁰Ar-³⁹Ar age of biotite is 178.440.81 Ma, and the reverse isochron age is 178.200.76 Ma. It is obvious that the ore-forming epoch of altered rock and gold is early Jurassic, and the ore -forming age belongs to Yanshanian intracontinental orogeny in this orefield. Ore-controlling structures and metallogenic structural planes belong to the brittle - ductile shear zone and its fracture system. On the basis of this study, a prediction model of the intracontinental orogenic hydrothermal altered rock type gold deposit in the Changgou gold mining area was established, and it is inferred that the extensional shear fold superimposed altered rock on the left and the periphery of the northwest of the mining area seems to be a rich ore block. In addition, the prospecting direction in the deep area is pointed out.

摘要: 大比例尺矿田构造-蚀变岩相填图技术是矿田构造物理化学研究和整装勘查区综合研究中逐渐形成的一项新技术。通过对南秦岭石泉-旬阳金矿整装勘查区调研和大比例尺矿田构造填图示范, 认为在矿田尺度实施 1 : 25000 构造-岩相填编图、在矿区尺度实施 1 : 10000 或 1 : 5000 构造-蚀变岩相填编图是可行有效的。南秦岭汉阴北部金矿田近十年来经过矿田构造-蚀变岩相填图和专题研究, 找矿预测进展较大。其中, 长沟金矿是近年矿田构造-蚀变岩相填图找矿和整装勘查区综合研究新发现的、受脆-韧性剪切带控制的蚀变岩型金矿床。长沟金矿床位于脆-韧性剪切带 DSZ3(RF5) 内。含矿岩性主要是下志留统梅子垭组糜棱岩化含黑云母变斑晶绢云母石英片岩和含石榴子石绢云母石英片岩。与成矿密切相关的蚀变主要有黑云母化、硅化、黄铁矿化、绢云母化。当黑云母变斑晶发育、石英脉密集发育, 伴有黄铁矿化, 且离构造破碎带 80~ 150 m 时, 金矿化品位较高。成矿流体主要属中-低温、中-低盐度、低密度的 NaCl-H₂O -CO₂ 体系, 成矿压力为 41.03~ 98.04 MPa, 成矿深度为 1.52~ 3.63 km。与成矿有关的花岗闪长岩脉和花岗细晶岩锆石 LA-ICP-MS 年龄为 180.23.6~ 176.01.9 Ma。

长沟矿区黑云母变斑晶化蚀变岩金矿石中黑云母 ^{40}Ar ~ ^{39}Ar 年龄为 178.440.81 Ma,反等时线年龄为 178.200.76 Ma。明确了该矿区蚀变岩成岩和金成矿时代为早侏罗世,成矿时代属于燕山期陆内。

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标题: Magmatic evolution and formation age of the Pobei mafic-ultramafic intrusion on the northeastern margin of the Tarim plate

标题: 塔里木东北缘坡北基性-超基性岩体形成时代及岩浆演化

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文献类型: Article

作者关键词: magmatic evolution; crustal contamination; zircon U -Pb age; Pobei intrusion

作者关键词: 岩浆演化; 地壳混染; 锆石 U -Pb 年龄; 坡北岩体

摘要: The Pobei mafic-ultramafic intrusion is located on the northeastern margin of the Tarim plate and has an outcrop area of 180 km². The magma differentiation was sufficient with the main lithologies consisting of such rocks as peridotite, olivine gabbro, gabbro norite, and gabbro, during the formation of the Pobei intrusion. Zircon U -Pb geochronology indicates that crystallization ages of gabbro, gabbro norite, olivine gabbro and plagioclase-bearing peridotite are 277.12.2 Ma, 273.52.9 Ma, 275.51.5 Ma and 280.2 Ma, respectively. The ages for the different types of rocks are concentrated at 270 ~ 280 Ma, which are temporally and spatially consistent with the age of the Tarim mantle plume. Mineral geochemical data suggest that olivine from the dunite has the highest Fo values, with maximum at 90.9%; clinopyroxene has similar concentrations in different types of rocks, with consistent negative relations between MgO and CaO, indicating similar primitive magma components. Moreover, these different rocks have similar variations for their trace and rare earth elements in spider pattern diagrams, suggesting that these rocks evolved from the same parental magma. Sr-Nd isotopic data indicate that the Pobei intrusion was sourced from depleted mantle and contaminated by 4%~ 15% lower crustal materials during magma ascent. Combined with published data and data obtained from this study, the authors hold that different lithofacies of the Pobei mafic-ultramafic intrusive complex have transitional or intrusive contact relation, similar formation ages and co-magmatic evolution characteristics, but they also have different emplacement sequences and degrees of crustal contamination.

摘要: 坡北基性-超基性岩体位于塔里木板块东北缘, 出露面积约 180 km², 岩浆分异充分, 主要岩性包括橄榄岩、橄榄辉长岩、辉长苏长岩、辉长岩等。锆石 U -Pb 测年结果显示, 辉长岩结晶年龄为 277.12.2 Ma, 辉长苏长岩结晶年龄为 273.52.9 Ma, 橄榄辉长岩结晶年龄为 275.51.5 Ma, 含斜长石橄榄岩结晶年龄为 280.2 Ma, 不同类型岩石形成年龄集中在 270~ 280 Ma, 与塔里木地幔柱在时间和空间上具有一定耦合性。矿物地球化学数据显示, 纯橄榄岩中橄榄石 Fo(镁铁比值)值最高, 达到 90.9%; 单斜辉石成分在不同类型的岩石中相似, MgO 和 CaO 含量连续变化, 且呈负相关关系, 指示其具有相似的原始岩浆成分; 不同类型岩石的微量元素蛛网图与稀土元素配分图变化一致, 表明其为同源岩浆演化; Sr-Nd 同位素地球化学图解显示, 坡北岩体源自亏损地幔, 经历了 4%~ 15% 下地壳物质的混染。综合研究认为, 坡北基性-超基性杂岩体不同岩相具有过渡或侵入接触关系, 形成时代相近, 具有同源岩浆演化特征, 但是岩浆就位顺序不同, 地壳混染程度存在差异。

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标题: On the Regularity of the Mineral Combination and Enrichment in Tugen Mansu Sandstone-Type Copper Deposit, Xinjiang

标题: 新疆土根曼苏砂岩型铜矿矿物组合及富集规律

来源出版物: 西北地质 卷: 53 期: 4 页: 108-119 出版年: 2020

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作者关键词: sandstone-type copper deposit; mineral combination; secondary enrichment of copper ore; Tugen Mansu; Xinjiang

作者关键词: 砂岩型铜矿; 矿物组合; 次生铜矿富集; 土根曼苏; 新疆

摘要: Tugen Mansu copper deposit in Xinjiang occurred in the upper group of the Early Carboniferous Kushanhe Group. The ore body is layered, controlled by stratum and structure in this area. Using a series of analytical methods of rock ore appraisal, electron probe and scanning electron microscope, the authors found that the main metallic minerals are pyrite, chalcopyrite, porphyry, pyroxene, copperite, copper blue, natural copper, black copper and malachite. There is an obvious mutual accountability between them. According to the mineral symbiosis combination and its spatial distribution in the vertical direction, the deposit can be roughly divided into oxidation zone, secondary sulfide zone and primary sulfide zone, in which the oxidized zone is symbolized as malachite. The secondary sulfide zone is mainly composed of chalcopyrite, porphyrite, copper blue and azurite. Raw sulfide zone mainly consists of pyrite and

chalcopyrite. Ore body is mainly distributed in the secondary sulfide zone. Weathering and erosion of the ancient land provided the basic ore-forming materials for the deposit. The huge gypsum layer existing in the upper group of the Kushan River Group is considered to be the main source of S₂- and the basin provides a favourable condition for the formation of the ore body. Ore layers were continuously squeezed above the diving surface under the effect of tectonic stress. Copper sulfide was superimposed under the surface oxidation and leaching and the copper element was enriched, thus forming a copper ore body.

摘要: 新疆土根曼苏铜矿床赋存于早石炭世库山河群上组岩层中,矿体呈层状、似层状产出,受地层、构造的控制。笔者主要利用岩矿鉴定、电子探针、扫描电镜等分析方法查明了本区金属矿物从早到晚主要为黄铁矿、黄铜矿、斑铜矿、辉铜矿、铜蓝、自然铜、黑铜矿、孔雀石等,且相互交代关系明显。同时,根据该区矿物共生组合及其在垂向上空间分布的差异,大致可将矿床分为氧化带、次生硫化物带和原生硫化物带,其中氧化带以孔雀石为标志性矿物,次生硫化物带以辉铜矿、斑铜矿、铜蓝、蓝铜矿为主,原生硫化物带则主要以黄铁矿、黄铜矿为主。研究发现,矿体主要赋存在次生硫化物带中,古陆的风化剥蚀为矿床提供了基本的成矿物质,库山河群上组的巨厚石膏层被认为是 S₂-的主要来源,盆地为矿体形成提供了良好的赋存条件。在后期构造应力作用下,含矿地层不断地被挤压抬升至潜水面以上,在表生氧化、淋滤等作用下使铜硫化物不断发生叠加交代,从而使铜元素不断富集,形成了铜矿体。

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标题: Study on Multi-Source Remote Sensing Lithologic Mapping in Baixiani Mountain Area of Beishan, Gansu Province

标题: 甘肃北山白峡尼山地区多源遥感岩性制图研究

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作者关键词: Multispectral; Lithologic interpretation; Spectrum analysis; Multi-source data

作者关键词: 多光谱; 岩性解译; 光谱分析; 多源数据

摘要: The geological structure of Beishan area in Gansu Province is complex, and the magmatic activity is intense. Due to the low level of work in this area, the 1 : 200 000 and 1 : 50 000 geological maps have been used to delineate the lithology (such as medium-acid intrusive rocks) of the Beishan, Gansu, but the boundaries are not accurate enough. Taking Baixiani Mountain in Beishan as the research area, the ETM multi-spectral image and the ZY3 panchromatic high spatial resolution image were fused by color spatial transformation (IHS), Brovey and other methods to obtain the high-resolution image with both ETM spectral resolution and ZY3 spatial resolution. Then the raw image was enhanced by ratio, principal component analysis and false color synthesis to highlight the lithological differences. The images processed by various methods were combined with Digital Elevation Model (DEM) data to construct 3D images for comprehensive interpretation. Based on the field verification of the interpretation results, sample thin section identification and reflection spectrum characteristic analysis, the results are modified to obtain the geological map of remote sensing interpretation in the study area. The results show that the existing geological maps can be updated by using multi-source remote sensing data fusion in western areas with good outcrop of bedrock, which can provide reference for subsequent mapping and ore-prospecting.

摘要: 甘肃北山地区地质构造复杂, 岩浆活动强烈, 该区工作程度较低, 已有 1:20 万、1:5 万地质图对区内岩性(如中酸性侵入岩)圈定较为笼统, 且界线不够准确。以甘肃北山白峡尼山地区为研究区, 利用彩色空间变换(IHS)、Brovey 等方法对 ETM 多光谱图像与资源三号(ZY3)全色波段高分辨率图像进行空间分辨率融合, 获得兼具 ETM 光谱分辨率与资源三号空间分辨率之长的高分辨率图像。再对原始影像进行比值、主成分分析及假彩色合成等增强处理, 突出其岩性差异, 将各种方法处理的影像与数字高程模型(DEM)数据结合构建三维影像, 进行综合解译。对解译结果进行野外验证、样品薄片鉴定及反射光谱特征分析, 据此对结果进行修正, 获得了研究区遥感解译地质图。结果表明: 对于西部基岩露头较好地区, 利用多源遥感数据融合可更新现有地质图, 为后续填图、找矿工作提供参考。

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标题: Recent research progress on small shelly fossils from the Cambrian(Terreneuvian) Yanjiahe Formation in the Three Gorges area

标题: 三峡地区寒武系纽芬兰统岩家河组小壳化石研究进展

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作者关键词: 岩家河组; 小壳化石; 第二阶; 纽芬兰统; 三峡地区

摘要: The sudden appearance of small shelly fossils near the Ediacaran-Cambrian boundary

represents one of the most conspicuous biomineralization events. It witnessed the explosive radiation of metazoans and signals the formation of the Cambrian ecosystem reigned by animals, especially bilaterians. The Yanjiahe Formation in the Three Gorges area represents one of the most important Cambrian stratigraphic sequences bridging the chronostratigraphic units between the Fortunian and Cambrian Stage 2. Here we summarize the recent progresses on small shelly fossils, particularly mollusks and cnidarians, from the Yanjiahe Formation to provide an important paleontological basis for defining the base of Cambrian Stage 2 and for better understanding the evolution and ontogeny of molluscs and medusozoans in early Cambrian oceans. The co-occurrence of *Watsonella crosbyi* and *Aldanella attleborensis*, both as the candidate GSSP markers for defining the base of Cambrian Stage 2, is documented for the first time at the base of Member 5 of the Yanjiahe Formation and assigned the age of Member 5 (Age 2). *Watsonella crosbyi* and *A. attleborensis* are widely distributed among Cambrian palaeocontinents (e.g., South China, Mongolia, Siberia, Avalonia) and range from low to high paleolatitudes in carbonate facies. The stratigraphic range is restricted to Cambrian Stage 2, which further supports the FAD of either *W. crosbyi* or *A. attleborensis* as a candidate GSSP marker for defining the base of this unit. Moreover, a single pair of cardinal processes below the apex of *W. crosbyi* most likely provide muscle attachment sites. This trait provides desiderative new data on the shell musculature of *W. crosbyi*, which suggests that this species is an untorted helcionelloid mollusc with an endogastrically coiled shell. The new hexangulaconulariid *Septuconularia yanjiaheensis* has a laterally compressed and biradially symmetrical deriderm, exhibiting fourteen gently tapered faces, thus representing a most specialized hexangulaconulariid taxon. Longitudinally, the periderm consists of three regions that probably correspond, respectively, to an embryonic stage, a transient juvenile stage, and a long adult stage. *Septuconularia yanjiaheensis* may have been derived from six-faced Hexaconularia (Fortunian Stage), which is mostly like a morphologically intermediate taxon between *Arthrochites* and *Septuconularia*. The new olivoid *Octapyrgites elongatus* is similar to the genera *Olivoides* and *Quadrapyrgites* from the Cambrian Fortunian Stage; its periderm consists of a quadrate apical region and a strongly corrugated reversed pagoda-like adapical region bearing folded apertural lobes. However, *O. elongatus* exhibits eight V-shaped apertural lobes while *Quadrapyrgites* has twelve. In contrast to the radiation-induced abundant medusozoans with diverse symmetry patterns during the Fortunian Age, the paucity of olivoids and absence of pentaradial cnidarians and carinachitids in Cambrian Stage 2 indicate a marked decline in the disparity of cnidarians during the Fortunian-Age 2 transition, when, by contrast, bilaterians underwent rapid diversification.

摘要: 埃迪卡拉纪-寒武纪转换时期小壳化石的突然出现是世人瞩目的重要演化事件之一,它见证了动物的爆发式快速演化过程,标志着以两侧对称动物为特征的寒武纪生态系统的开始。湖北三峡地区寒武系组芬兰统岩家河组处于幸运阶-第二阶这一关键层段,是研究上述问题的理想地区之一。岩家河组小壳化石研究最近取得的进展,为寒武系组芬兰统幸运阶/第二阶界线的标定,和寒武纪早期软体动物和刺胞动物的演化及个体发育提供了重要的化石依据,本文对其进行了总结。全球界线层型剖面 and 点位(GSSP)寒武系第二阶底界划分标志的 *Watsonella crosbyi* 和 *Aldanella attleborensis* 在岩家河组第5段底部的同时出现,意味着岩家河组第5段已归属寒武系第二阶。这两类软体动物化石均广泛分布于华南、蒙古、西伯利亚和北美等大陆碳酸盐岩相寒武系第二阶地层中,它们均是定义寒武系第二阶底界的有力竞争者。另外, *W. crosbyi* 壳顶下方一对肌肉附着结构的发现提供了重要的软组织结构信息,证实了 *W. crosbyi* 为内腹型壳,归属为未扭曲的软体动物太阳女神螺类。新发现六方锥石类

Septuconularia yanjiaheensis 具侧向压扁、两辐射对称的、14 个等大锥面的围鞘,是迄今所描述的六方锥石类中锥面数最多的类型。根据横肋疏密程度,围鞘由下向上可分为三部分,可能代表胚胎期、幼年期和成年期不同的生长阶段。*Septuconularia* 显然由寒武系幸运阶 *Hexaconularia* 通过扇面扩增演变而来,证明 *Hexaconularia* 可能是 *Arthrochites* 和 *Septuconularia* 之间的中间过渡类型。新发现的橄榄蛋类 *Octapyrgites elongatus* 与幸运阶 *Olivoooides* 和 *Quadrapyrgites* 十分相似,围鞘由方形的壳顶区和波纹状倒宝塔形的远顶区组成。然而 *Octapyrgites* 只有 8 个口折叶,有别于具 12 个口折叶的 *Quadrapyrgites*。通过与幸运期水母类多种对称方式对比,发现在寒武系第二阶橄榄蛋类数量减少和五辐射对称骨状壳类缺失,表明在幸运期/第二期转换时期,底栖固着型的刺胞动物水母类多样性发生了明显衰落,甚至部分绝灭,而同期的两侧对称动物则迅速辐射演化。

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标题: Characteristics of Ore-controlling Brittle-ductile Shear Zone and Ages of Deformation and Mineralization in the Northern Hanyin Gold Field, South Qinling, China

标题: 南秦岭汉阴北部金矿田脆-韧性剪切带控矿特征及构造变形-成矿年代学研究

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作者关键词: 南秦岭; 金矿田; 脆-韧性剪切带; 面理; 构造变形-成矿年代; 陆内造山

摘要: The northern Hanyin gold field occurs in the South Qinling-North Daba Mountain thrust nappe in the southern Shaanxi province. The ore bodies are hosted in the highly deformed low-grade metamorphosed schists of the Lower Silurian Meiziya Formation (S₁m), and controlled by five near NW striking brittle-ductile shear zones. Issues such as genetic types of the ore deposits, properties of the brittle-ductile shear zones and structural stages, structural ore-controlling characteristics, and ages of deformation and mineralization are still unclear, which significantly hinder the deep ore-prospecting in the orefield. To address the issues listed above, we carried out large-scale structure-alteration facies mapping and zircon U-Pb and biotite ⁴⁰Ar-³⁹Ar isotope dating of the brittle-ductile shear zones in the ore field. Three stages of structure deformation were recognized in the right-slip-thrust-uplifted ore-controlling brittle-ductile shear zone in the ore field, with the second stage (S₂) as the dominant stage of deformation. The shear zone is NW-NWW striking, dipping to NE-NNE. The ore mineralization is closely related to brittle-ductile shearing. The occurrences of ore bodies are strictly controlled by the shear zone, the S₂ foliation in particular; whereas the vertical zonation of the brittle-ductile deformation of the shear zone controls the distribution of mineralization types, i.e., the brittle and ductile deformation zones controlled the quartz vein and altered rock types, respectively. Zircon U-Pb age (180.23.6 Ma) of the undeformed granodiorite and ⁴⁰Ar-³⁹Ar plateau age (178.40.8 Ma) of biotite phenocryst in the brittle-ductile shear zone indicate that the brittle-ductile deformation in ore field took place at about 178 Ma, which belongs to the Early Jurassic intracontinental orogenic period of the South Qinling. Gold-bearing pyrite in the Yangpingwan gold deposit, which is located in the western part of the same structural belt that hosts the

Huanglong gold deposit, has Rb-Sr isochron age of 2080.88 Ma. Therefore, it is reasonable to infer that the gold mineralization initiated before the brittle-ductile shearing in the ore field and continued through the prolonged structural deformation. We thus suggest that further prospecting should be focused on the brittle-ductile shear zone, especially areas with strong alteration.

摘要: 陕南汉阴北部金矿田位于南秦岭-大巴山逆冲推覆系中。矿田内赋矿地层为下志留统梅子垭组(S_{1m})浅变质强变形片岩,构造格架为 5 条次级近 EW 走向的脆-韧性剪切带。由于矿田成因类型、脆-韧性剪切带性质及构造期次划分、构造控矿特征、构造-成矿时代等关键问题研究仍存在争议和不足,从而制约矿田深部找矿。为此,本文采用矿田(区)大比例尺构造-蚀变岩相填图、锆石 U-Pb 和黑云母~(40)Ar~(39)Ar 测年等方法,查明金矿田脆-韧性剪切带内至少存在 3 期构造变形,其中以第二期(S₂)构造变形为主,形成矿田内右行走滑-逆冲推覆控矿脆-韧性剪切带,走向 NW-NWW,倾向 NE-NNE。剪切带与蚀变矿化带空间位置关系套合较好,矿体产状变化受剪切带及 S₂ 期构造面理控制,剪切带的纵向脆性、韧性变形分带分别控制石英脉型和构造蚀变岩型矿化分布。脆-韧性剪切带内未发生剪切变形、且产状与剪切带产状近乎一致的花岗闪长岩脉锆石 U-Pb 年龄(180.23.6 Ma)和含矿黑云母变斑晶化蚀变岩黑云母~(40)Ar~(39)Ar 年龄(178.40.8 Ma),表明剪切带的活动时代应为 178 Ma 左右,属早侏罗世,处在南秦岭陆内造山期。结合前人获得的同构造带西段羊坪湾金矿载金黄铁矿 Rb-Sr 同位素年龄(2080.88 Ma),表明金矿田的成矿作用可能始于晚三叠世,延续到侏罗纪,贯穿于脆-韧性剪切带变形活动期,即金成矿期为晚三叠世-侏罗纪。下一步找矿远景区应位于矿田脆-韧性剪切带内与金矿化密切相关的蚀变带发育部位。

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作者关键词: 古地貌; 富集规律; 成藏模式; 前侏罗纪

摘要: In order to understand the accumulation regularity of the oil reservoir, Zengcha Area, Ordos Basin and guide further exploration and deployment in a much better way, and based on the data of drilling, logging, oil test and production, the palaeogeomorphic formwork of Pre- Jurassic was rebuilt, and the geologic maps made up using the impressing method. The results showed that there were five palaeogeomorphic units: paleo channel, paleo terrace and paleo slope, low monadnock and interchannel mound. Proven Yan 9 and Yan 10 oil reservoirs were mainly distributed in the paleo channels and paleo slopes, different from previous studies that indicated lower Jurassic oil reservoirs were mainly distributed in a relatively high terrain such as paleo slope. Three oil accumulation patterns were established: paleo channel- braided channel-delta plain pattern, paleo channel-distributary channel-delta plain pattern and paleo slope-braided channel-delta plain pattern, and the former two were the main palaeogeomorphic reservoirs. The controlling factors of oil accumulation of the Jurassic reservoir could be briefly summarized as sufficient oil source, high-quality physical properties and predominant migration pathway. It was suggested that the overlapping sites of the paleo channel sandbody possessed a relatively good physical properties and the low-amplitude uplift structures represented favorable oil exploration targets.

摘要: 为深化对鄂尔多斯盆地曾岔地区侏罗系油藏成藏规律认识,运用钻井、测井、试油及实际生产数据等各种资料,采用印模法精细刻画了前侏罗纪古地貌的地质,综合分析了前侏罗纪古地貌特征、油藏富集规律及成藏模式.结果表明,曾岔地区前侏罗纪发育古河道、古阶地、斜坡、低残丘及河间丘 5 种古地貌单元,已探明延 9、延 10 油藏主要分布在古地貌中地形低的古河道部位而非普遍认为的较高斜坡、河间丘上;研究区存在 3 种油藏成藏模式:古河道-

辫状河道-三角洲平原模式、古河道-分流河道-三角洲平原模式和斜坡-辫状河道-三角洲平原模式,前两种是主要成藏模式.古地貌控制下的油源足、渗砂优、通道畅的成藏组合,是油藏形成的基本条件.古河道部位物性相对较好的(分流)河道砂体带与低幅鼻状隆起构造的重叠区是勘探部署优选区域.

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作者关键词: Sangejing Formation; Molasse; Collisional orogeny; Foreland basin; Gansu Beishan

作者关键词: 三个井组; 磨拉石; 碰撞造山; 前陆盆地; 甘肃北山

摘要: Devonian of Beishan region was a critical period of the ancient Asian oceanic plate system turned to the inner plate institution, Hanshan micro-continent collided with Tarim plate then occurred orogenesis in the Late Paleozoic, the two plates spliced together to form a unified continent. Paleozoic ophiolite formed along the Hongliuhe-Niujuanzi-Xichangjin, in the south of ophiolite belt was the Pingtoushan nappe structures. As the depositional response of this collision, a huge thickness and lateral varying Sangejing Formation occurred in the Dundunshan region. Through the analysis of the lithological characteristics and sedimentary construction of the Sangejing Formation, we considered that it belonged to Molasse entirely, and the nature of the sedimentary basin was peripheral foreland basin; lithological characteristics showed a rapid accumulation, and the main source area was northern orogenic belt. Vertical sequence is coarse-fine-coarse sequence from bottom to top, which represented a complete foreland basin depression-sedimentary tectonic cycle. Combined with previous zircon U-Pb dating results, the deposition time of Sangejing Formation began in the Later Silurian, yet earlier than Later Devonian, which show that the Late Paleozoic orogenesis of Beishan began in Later Silurian, it has completed the plate splicing till the Late Devonian.

摘要: 北山地区泥盆纪是古亚洲洋由板块体制向板内体制转变的关键时期,晚古生代旱山微大陆与塔里木板块发生碰撞造山作用,两个板块拼接在一起,形成统一大陆。沿红柳河牛圈子洗肠井一带形成古生代蛇绿岩,在蛇绿岩带南部为平头山推覆构造。作为这次碰撞的沉积响应,在墩墩山一带形成厚度巨大,横向变化极大的三个井组。通过对三个井组岩性特征和沉积建造的分析研究,认为三个井组整体属于磨拉石建造,其沉积盆地性质为周缘前陆盆地;岩性显示快速堆积的特征,物源区主要为北部逆冲推覆带;垂向层序由下向上表现为粗细粗的序列,代表了一个完整的前陆盆地沉降沉积构造旋回。结合前人的锆石 U-Pb 测年结果,三个井组的沉积时间应始于晚志留世,而早于晚泥盆世,由此表明北山地区晚古生代的造山作用始于晚志留世,至晚泥盆世,已经完成板块拼接。

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标题: Characteristics of mineral combination in Permian dark shale and its geological significance in Turpan-Hami Basin, Xinjiang

标题: 吐哈盆地二叠系暗色泥页岩矿物组合特征及其地质意义

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作者关键词: Dark shale; Minerals combination; Permian; Shale gas; Turpan-Harmi Basin

作者关键词: 暗色泥页岩; 矿物组合; 二叠系; 页岩气; 吐哈盆地

摘要: Turpan-Harmi Basin is one of the important petroliferous basin in China. Lots of study of conventional oil and gas about the basin have been done, while the study of unconventional shale gas has just started. Shale gas occurs in the form of adsorption or dissociation in the shale and its interlayers. The study of the mineral components of shale provides a necessary foundation for the adsorption and storage of shale gas, as well as the study of fracture evaluation, seepage migration and fracture formation of shale. Based on description of field outcrop and core, analysis of microscope thin-section and XRD, combined with the test result of organic chemistry and vitrinite reflectance(Ro), the systemic analysis of Permian dark shale in eight field outcrop and two drilling core wells in Turpan-Harmi Basin have been done. It is proved that 1) Permian dark shale in Turpan-Harmi Basin distributed widely, have large thickness and abundance of organic matter. The dark shale is mainly formed in the shallow lake-semi-deep lake-deep lake environment with micro-evaporation and brackish water. The shale is composed of clay minerals and Quartz, while

clay minerals made of layer of illite/ smectite, Chlorite and Kaolinite mainly. 2)The distribution of dark shale mineral combination have some regular, it reflect that the lake have the characteristics of more convex and concave, convex and concave interphase in the basin. The clay mineral assemblages reflect the climatic conditions of frequent alternations between dry and humid, and have a moderate degree of weathering. 3)The dark shale is in the middle-late stage of diagenesis and shows high maturity and over-high maturity, which is good for the formation of Shale gas reservoirs. 4)More than 40% Brittle mineral content is beneficial to the fracturing exploitation of shale gas.

摘要: 吐哈盆地是我国重要的含油气盆地之一,对于常规油气前人做了大量工作。然而对非常规页岩气的研究才刚刚起步。页岩气以吸附或游离的形式存在于泥页岩及其夹层中,而泥页岩的矿物组分研究为页岩气的吸附储存以及泥页岩的裂缝评价、渗流运移、压裂造缝等的研究提供了必要的基础。本文在野外露头及钻井岩心观察的基础上,通过显微薄片分析和 X-衍射分析,结合有机地化及镜质体反射率测试结果,对吐哈盆地周边二叠系 8 个剖面及两口取心井的暗色泥页岩样品进行了系统分析,结果表明:1)吐哈盆地二叠系暗色泥页岩分布广、厚度大、有机质丰度高;暗色泥页岩主要形成于微蒸发、微咸水的浅湖半深湖深湖环境,主要由粘土矿物和石英组成,粘土矿物主要为伊/蒙混层、绿泥石和高岭石组合;2)暗色泥页岩矿物组合分布具有一定规律性,反映了盆内多凸多凹,凸凹相间的特点;粘土矿物组合反映了中二叠世晚期干旱潮湿频繁交替的气候条件,且风化程度中等;3)暗色泥页岩总体处于中-晚成岩作用阶段,成熟度高,达到了成熟高成熟阶段,有利于页岩气藏的形成;4)脆性矿物含量大于 40%,有利于页岩气的压裂开发。

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作者关键词: 地球化学; 流体包裹体; 稳定同位素; 矿床成因; 中温热液脉型矿床; 金坑子金矿床; 西秦岭南成矿亚带
摘要: Jinkengzi gold deposit is located in the southern sub-belt of west Qinling metallogenic belt in the northern margin of Bikou block.In order to find out the genesis of Jinkengzi gold deposit,the field geological characteristics,hydrogen,oxygen,sulfur isotopic composition,and fluid inclusion characteristics of the deposit were systematically studied.The results show that the ore bodies occur in the unconformity of phyllite and limestone and the fracture zone nearby,which is mainly controlled by the fracture structure;the δD_{H_2O} -VSMOW value of quartz in the different mineralization stages ranges from -81.4 to -67.5,and $\delta^{18}O_{(H_2O-VSMOW)}$ ranges from 7.51 to 10.55,indicating that the early oreforming fluid was originated mainly from the deep source magmatic water,and added with atmospheric precipitation in the late stage.The $\delta^{34}S$

value of pyrite varies from -0.7 to 0.6, indicating that the ore-forming material is mainly derived from deep magma, with the addition of stratum material. The homogenization temperature of the fluid inclusions is 155.6-304.0°C, and the salinity is 0.53%-13.29%, indicating that the ore-forming fluid has the characteristics of medium temperature, medium-low salinity, and rich in CO₂. Based on this comprehensive study, it is believed that the genetic type of Jinkengzi gold deposit is a mesothermal vein-type gold deposit formed in the Late Indosinian period.

摘要: 甘肃武都金坑子金矿床位于碧口地块北缘西秦岭南成矿亚带。本文为探讨金坑子金矿床成因,对矿床野外地质特征、H、O、S 同位素组成及流体包裹体特征进行了系统的研究。研究表明:矿体产于千枚岩与灰岩岩性不整合面及其附近的断裂破碎带中,主要受断裂构造控制;不同成矿阶段石英的 $\delta\text{D}_{\text{H}_2\text{O-VSMOW}}$ 值范围为 -81.4~-67.5, $\delta^{18}\text{O}_{(\text{H}_2\text{O-VSMOW})}$ 值范围为 7.51~10.55,显示成矿流体早期主要来源于深源岩浆水,晚期有大气降水的加入;黄铁矿 $\delta^{34}\text{S}$ 值变化范围为 -0.7~0.6,显示成矿物质主要来源于深部岩浆,并有地层物质加入;流体包裹体的均一温度为 155.6~304.0°C,盐度 (w(NaCl)) 为 0.53%~13.29%,显示成矿流体具中温、中低盐度和富含 CO₂ 的特点。结合区域研究资料,认为金坑子金矿床成因类型为印支晚期的中温热液脉型金矿床。

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作者关键词: 双向俯冲; 高硅埃达克岩; 锆石 U-Pb 年代学; 地球化学; 东天山

摘要: A series of Paleozoic sedimentary-magmatic activity records are preserved in the Dananhu-Tousuquan island arc zone in the northern part of the eastern Tianshan, an important place for the study of Paleozoic evolution mechanism of the eastern Tianshan orogenic belt. The Kezirkalasayi complex is located in the middle of the Dananhu-Tousuquan island arc zone and its lithology is mainly composed of granodiorite, monzogranite and syenogranite. LA-ICP-MS zircon U-Pb dating for the Kezirkalasayi granodiorite shows that the weighted average age of granodiorite is 374.52.8 Ma (late Devonian). Geochemical analysis reveals that the granodiorite has high contents of $w(\text{SiO}_2)$ (66.73%-68.56%), $w(\text{Al}_2\text{O}_3)$ (14.83%-16.06%), $w(\text{Na}_2\text{O})$ (3.83%-3.95%), $w(\text{K}_2\text{O})$ (1.1%-2.4%), $w(\text{Sr})$ ($583.3-811.5 \times 10^{-6}$), Sr/Y (38.65-101.44), and low content of $w(\text{MgO})$ (1.48%-2.07%), $\text{K}_2\text{O}/\text{Na}_2\text{O}$ (0.29-0.61), $w(\text{Y})$ ($8-15.1 \times 10^{-6}$), $w(\text{Yb})$ ($0.8-1.6 \times 10^{-6}$), with subtle negative Eu anomaly ($\delta\text{Eu}=0.84-0.98$). The rock is relatively rich in LREE and LILE, and depleted of HREE and HFSE ($(\text{La}/\text{Yb})_N=7.64-9.86$), with the geochemical characteristics similar to high-silicon adakite. Based on the regional tectonic evolution and previous studies, it is considered that the Kezirkalasay granodiorite was the product of subducted basaltic plate, which resulted from the mantle peridotite assimilation and metasomatization during the bidirectional subduction of the Paleo-Kangguer Ocean.

摘要: 大南湖-头苏泉岛弧带位于东天山北部, 带内保存了一系列古生代沉积-岩浆活动记录, 是研究东天山造山带古生代演化机制的重要场所。克孜尔卡拉萨依复合岩体位于大南湖-头苏泉岛弧带中部, 岩性主要由花岗闪长岩、二长花岗岩及正长花岗岩组成。本次研究针对克孜尔卡拉萨依花岗闪长岩, 进行了 LA-ICP-MS 锆石 U-Pb 年代学及全岩主微量元素地球化学分析。获得花岗闪长岩 $(^{206}\text{Pb}/^{238}\text{U})$ 的加权平均年龄为 374.52.8 Ma, 属于晚泥盆世早期。地球化学数据显示, 花岗闪长岩样品具有高的 $w(\text{SiO}_2)$ 66.73%~68.56%, $w(\text{Al}_2\text{O}_3)$ 14.83%~16.06%, $w(\text{Na}_2\text{O})$ 3.83%~3.95%, $w(\text{Sr})$ 583.3~811.5 $\times 10^{-6}$, Sr/Y (38.65~101.44), 和低 $w(\text{K}_2\text{O})$

1.1%~2.4%, $w(\text{MgO})$ 1.48%~2.07%, $\text{K}_2\text{O}/\text{Na}_2\text{O}$ (0.29~0.61), $w(\text{Y})$ ($8-15.1 \times 10^{-6}$), $w(\text{Yb})$ ($0.8-1.6 \times 10^{-6}$), Eu 负异常特征不明显 ($\delta\text{Eu}=0.84-0.98$), 相对富集轻稀土和大离子亲石元素,

亏损重稀土和高场强元素((La/Yb)_N=7.64~9.86),具有与高硅埃达克岩相似的地球化学特征。结合区域构造演化及前人研究,认为克孜尔卡拉萨依岩体为古康古尔洋双向俯冲时,俯冲的玄武质板片熔体被地幔橄榄岩同化和交代产物。

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标题: Ecological Function Zoning of Tibet Autonomous Region Based on SOFM Network at Watershed Scale

标题: 基于 SOFM 网络的西藏自治区流域尺度生态功能分区

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文献类型: Article

作者关键词: ecological function zoning; ecosystem services; SOFM network; watershed unit; Tibet Autonomous Region

作者关键词: 生态功能分区; 生态系统服务; SOFM 网络; 流域单元; 西藏自治区

摘要: [Objective]Based on the regional key ecosystem services,the regional ecological function regionalization of Tibet Autonomous Region was studied to provide basis for the regional comprehensive cognition and spatial comprehensive management of the plateau ecosystem.[Methods]With the support of GIS technology,the index system of ecological function partition in Tibet was constructed based on the regional key ecosystem service.Using the self-organizing feature mapping(SOFM)clustering grid cell index,the boundary of ecological functional area was determined by merging small watershed cells.[Results]① The ecosystem service function index exhibited a notable decreasing gradient from the southeast to the

northwest.② According to the landscape aggregation index of each classification grid,the optimal classification number was five.③ The fragmented five clustering results were finally divided into five ecological function areas after the merger of small watershed cells.[Conclusion]According to the characteristics of each regional ecosystem,the five ecological functional areas including:the ecologically fragile alpine desert grasslands in Northern Tibet,the animal husbandry surplus areas in Central Tibet region,the agriculture and animal husbandry product supply areas in East Asia tropical mountain coniferous forests,the water production areas in Southeast Asia tropical mountain coniferous forests,and the biodiversity protection areas in Southeast Tibet tropical seasonal rain forests.

摘要: [目的]基于区域关键生态系统服务,研究西藏自治区生态功能区划,为高原生态系统的区域综合认知和空间综合治理提供科学依据。[方法]在 GIS 技术支持下,基于区域关键生态系统服务功能构建西藏生态功能分区指标体系,运用自组织特征映射(SOFM)网络聚类栅格单元指标,并基于小流域单元逐步合并破碎化的聚类结果来确定生态功能区边界。[结果]①区域内各生态系统服务功能指标整体上呈现出从东南向西北递减的格局;②根据各分类栅格的景观聚集度指数确定最优分类数为 5 类;③破碎化的 5 种聚类结果经过子流域单元的合并而最终被划分为 5 个生态功能区。[结论]根据各区域生态系统特征进行命名,划分出藏北高寒荒漠草原生态脆弱区、藏中草原牧业盈余区、藏东亚热带山地针叶林农牧产品供给区、藏东南亚热带山地针叶林产水区和藏东南热带季雨林生物多样性保护区 5 个生态功能区。

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标题: Application of scanner for the rock-mineral identification and petrography - Thin section scanning method

标题: 扫描仪在岩矿鉴定与岩相学研究中的应用--薄片扫描法

来源出版物: 矿物学报 卷: 40 期: 1 页: 1-8 出版年: 2020

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作者关键词: The thin section scanning method; large view image; scanner; polarizer

作者关键词: 薄片扫描法; 大视域图像; 扫描仪; 偏振光片

摘要: The rock-mineral identification and petrographic analysis by using the polarized light microscopy are basic works in mineralogical and petrological researches. The narrow viewing scope of polarizing microscope and its inconvenience in changing visual field size resulted in the difficult to observe and identify the texture, structure, micro-geological phenomenon as well as the large mineral particles of rocks through the polarizing microscope. Taking the above factors into consideration, on the basis of the image forming principle of polarizing microscope, a method to obtain an image of large view of thin section by using scanner and polarizer of microscope, called thin section scanning method, has been developed in this paper. Images of plane polarized light and perpendicular polarized light under microscope with large horizon can be obtained by using this method in order to provide accurate and comprehensive image evidence data for the scientific research. The thin section scanning method is characterized with simple equipment and easy operation procedure. Large view exquisite digital images which show clear mineral textures, structures, and geological phenomena can be obtained by using this method which is a new scientific method for identifying mineralogical and petrological information. The thin section scanning method is suitable for studying samples with micro-geological phenomena of large mineral particles and complicated morphologies, textures and structures which were not capable to be shown using the conventional polarizing microscope. The successful development of thin section scanning method has great practical significance to researches of petrology and structural petrography.

摘要: 利用偏光显微镜进行岩矿鉴定和岩相学分析是矿物学、岩石学研究的一项基本工作。常用偏光显微镜的观察视域范围狭小,视域大小不能随意变动,这对大视域观察与识别镜下岩石的结构、构造、显微地质现象和粗大矿物等造成困难。基于上述问题,本文在偏光显微镜成像原理基础上,开发出利用扫描仪和偏振光片获取岩石薄片大视域图像的方法,即薄片扫描法。该方法能获得大视域的单偏光和正交偏光图像,为科学研究提供精确的、全面的图像证据资料。薄片扫描法所需设备简单、操作简易、能获得全域精美的数字化图像、能清晰的反映矿物结构构造和地质现象,为识别矿物学和岩石学信息提供了科学方法。薄片扫描法适用于矿物颗粒粗大、形态复杂的显微地质现象,常规偏光显微镜下不能反映结构、构造的样品。薄片扫描法的成功开发,对岩相学、构造岩相学等方面的研究具有现实意义。

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标题: Numerical taxonomy of Miocene Trapa L.fossil fruits from eastern Zhejiang,China

标题: 浙东中新世菱属果实化石的数量分类

来源出版物: 地学前缘 卷: 27 期: 4 页: 110-123 出版年: 2020

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作者关键词: Miocene Shengxian Formation; Trapa L.; fossil fruits; cluster analysis; principal component analysis

作者关键词: 中新世嵯县组; 菱属植物; 果实化石; 聚类分析; 主成分分析

摘要: Abundant Trapa L.fruit fossils are found in the late Miocene Shengxian Formation in Tiantai,eastern Zhejiang.The fossils are well preserved with rich three-dimensional characteristics.However,the identification and taxonomy of Trapa L.have been controversial because of its large taxonomic variations yet subtle differences in the fossil's three-dimensional features.Since the characteristics of Trapa L.fossils are distinct and easy to measure and record,we used numerical statistics methods to classify TrapaL.fossils.The main methods include cluster and principal component analyses.The purpose of this research is to identify the Trapafossil fruits and find the guiding characters for their identification and classification.First,we performed numerical analysis on living Trapafruits and obtained good taxonomical result.Next,we analyzed Trapafossil fruits.We believe the analyses can classify Trapafossils and at the same time eliminate redundant characteristics used for identification.Finally,we obtained some discrimination characteristics,including fruit body shape,with or without head,valgus head,fruit top shape,upper or lower horn growth direction,length of lower horns,and number of degenerate tuberculate lower horns.Based on these characteristics,the fossil fruits can be effectively divided into two taxa.

摘要: 在浙东天台晚中新世嵊县组发现大量菱属果实化石。该化石保存完好,特征丰富。由于其种类多、性状冗杂不明显,菱属植物的鉴定与分类一直存在很大争议。本研究基于菱属果实化石性状特征多、便于测量记录的特点,通过聚类分析和主成分分析等数值统计方法对菱属果实进行鉴别、归类,寻找鉴定分类中的指导性性状。首先,利用上述方法对现生菱属果实进行数量分析,取得了较好结果。然后,采用同样方法对菱属果实化石进行研究,认为聚类分析和主成分分析法能够对化石种进行有效的鉴定分类,可以成功剔除冗余性状。最后,研究得出果体形状、是否有果冠、果冠是否外翻、顶部形态、肩角生长方向、腰角生长方向、腰角长度、瘤状退化腰角数目等特征是菱属果实化石鉴定的关键性状。基于以上性状,嵊县组菱属果实化石可以分为两个类群。

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标题: Banded iron formations: Their characteristics, genesis and implications for ancient Earth's environment

标题: 条带状铁建造:特征、成因及其对地球环境的制约

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作者关键词: geology; Banded Iron Formations; oxidation event; anoxic and ferruginous ocean; submarine hydrothermal fluids; Precambrian

作者关键词: 地质学; 条带状铁建造; 氧化事件; 缺氧、富铁海洋; 海底热液; 前寒武纪

摘要: Banded Iron Formation (BIF) is iron-rich and siliceous chemical sedimentary rocks, which show typical thin bedded or laminated structure. BIF has recorded state and evolution of lithosphere, atmosphere, hydrosphere and biosphere of the Earth, and, what is more, its related iron ore deposit is also an important iron ore source. Although the study of BIF has made remarkable achievements, both newly novel viewpoints and important discoveries provide many important thinking approaches and researching clues for the further understanding of the origin of BIF. The characteristics, mineralogical and geochemical features of BIF were summarized in this study. Meanwhile, the formation conditions and the mechanism of disappearance of BIF were discussed. The authors also discussed the relationship between BIF deposition and two-step rise of oxygen in Earth's atmosphere (Paleoproterozoic Great Oxidation Event, 2.4~2.1 Ga, and Neoproterozoic Oxygenation Event, 0.8~0.55 Ga?), and argued that the formation of BIF was genetically linked to submarine magmatism and hydrothermal activities. Finally, the authors propose that the emerging and disappearance of BIF were intimately associated with major geological events, which complicatedly reacted with each other and influenced the evolution of atmosphere-ocean conditions, geobiology and geodynamics. However, the precise depositional age, formation mechanism of band/lamina and the problem as to how major geological events constrained the formation of BIF and microbiological origin of BIF are also poorly understood. With the application of big data, precise chronology, laboratory experiments, progress in new technologies of nontraditional stable isotopes (e.g., Fe, Cr, U, Mo, Cu isotopes) and further investigations of modern seafloor hydrothermal system, the genesis of BIF will be surely unveiled

step by step.

摘要: 条带状铁建造(BIF)是由硅质和铁质组成的化学沉积岩,通常具有典型的薄层或薄板状构造。BIF 不仅记录了丰富的岩石圈、大气圈、水圈和生物圈状态及演化的信息,而且与其相关的铁矿也是世界上最重要的铁矿资源类型。虽然对 BIF 的研究已取得了丰富的成果,近年来若干新颖的观点和重要的发现对进一步深入研究 BIF 成因提供了重要思考途径和研究线索。文章总结了 BIF 类型、矿物学和地球化学特征,分析了 BIF 形成条件及大规模缺失机理,阐述了 BIF 的形成和大气圈两次重大氧化事件(古元古代大氧化事件,2.4~2.1 Ga,新元古代氧化事件,0.8~0.55 Ga?)之间的关系,认为 BIF 与海底岩浆-热液活动具有密切的成因联系。最后,提出 BIF 的沉积和消亡与重大地质事件密切相关,这些重大地质事件也相互作用,共同制约着大气海洋环境演化、地球生物学和地球动力学过程。关于 BIF 精细成矿时代、条带/条纹形成的机制、重大地质事件对 BIF 形成的制约和 BIF 微生物成因等方面仍存在较多问题。随着大数据、精细成矿年代学、模拟实验、非传统稳定同位素(Fe、Cr、U、Mo 和 Cu 同位素等)新技术方法的进步,及对现代洋底热液系统的深入认识,将有助于揭开 BIF 成因的神秘面纱。

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标题: Division of tectonic units in Yining Block:Evidence from volcano-magmatism

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作者关键词: 伊宁地块; 构造单元划分; 大哈拉-喀拉峻岛弧带; 阿吾拉勒叠加岛弧带; 早石炭世

摘要: The Yining Block is not a uniformity terrane" or a uniform terrane" that is distinctly different from the previous persistent view, but was formed by the superposition and collage of the southern and northern secondary structural belts (two arc basin" systems) bounded by the Wusunshan-Talde regional large-scale fault. This paper set up a new division and re-establishment about its tectonic units by using the widespread volcano-magmatism in this block. The southern structural belt is composed of the Kalajun island arc belt to the south and the Atengtao back-arc basin to the north, which mainly developed from the Late Devonian to early stage of Early Carboniferous. The peak isotopic age of volcanic rocks in this belt ranges from 355 Ma to 350 Ma, with an average age of 351 Ma ($n = 17$). While the northern structural belt can be subdivided into, namely from north to south, the Qingshuihe-Subutai back-arc basin, the Awulale superimposed island arc belt and the Tekesi-Xinyuan fore-arc basin, which was mainly developed in the middle-late stage of Early Carboniferous. The peak isotopic age in this belt concentrates in 345 ~ 329 Ma with an average age of 340 Ma ($n = 18$). The two arc-basin systems are dominated by calc-alkaline volcanic rocks of the Dahalajunshan Formation, and they coexist with the fore-arc and back-arc basin sedimentary associations in the Early Carboniferous Akeshake Formation. The Dahalajunshan Formation is dominated by island arc volcanic rocks, including Nb-enriched basalts, high-magnesium andesites, sybionic adakites and highly differentiated I-type granites, and some alkaline volcanic rocks, alkaline bimodal rhyolites and sybionic bimodal volcanic rocks that predominantly cropped out in the back-arc basin. Studies show that not only the volcanic rocks of the Dahalajunshan Formation show significant differences in each tectonic facies, but also the sybionic sedimentary rocks of the Akeshake Formation are obviously different in each tectonic facies. The above two structural belts have experienced independent histories of the basement formation, the basin sedimentation, and the volcanic magmatic and tectonic

evolution. The Shanshan Movement indicates that the southern and northern structural belts were superimposed and collaged together at the end of Early Carboniferous, forming the unified Yining Block. During the Late Carboniferous, the block entered into a unified intracontinental tectonic development and evolution stage, and during this period of time, a series of rift-related volcanic constructions as represented by the alkaline bimodal volcanic rocks of the Late Carboniferous Yishijilike Formation were formed.

摘要: 伊宁地块不是一个之前一贯认为的均匀地块或均一地块,而是以乌孙山-塔勒得近东西向区域性大断裂为界的南、北两大次级构造带(弧-盆体系)叠加拼贴增生而成,火山岩浆作用为这一新的构造单元划分与建立提供了佐证。南构造带由喀拉峻岛弧带和其北的阿腾套弧后盆地构成,主要发育于晚泥盆世-早石炭世早期,火山岩同位素年龄峰值为 355~350Ma,17 个年龄平均值为 351Ma;北构造带由北而南可再细分出清水河-苏布台弧后盆地阿吾拉勒叠加岛弧带特克斯-新源弧前盆地,主要发育于早石炭世中-晚期,同位素年龄峰值集中于 345~329Ma,18 个火山岩年龄平均值为 340Ma。这两个弧-盆体系以大哈拉军山组钙碱性火山岩为主体,共生早石炭世海相阿克沙克组弧前及弧后沉积岩组合。大哈拉军山组火山岩主体以岛弧火山岩为主,见有富 Nb 玄武岩、高镁安山岩等,共生埃达克岩和高分异 I 型花岗岩等小岩体;在弧后还见有碱性火山岩、碱性球泡流纹岩,共生双峰式火山岩。不仅大哈拉军山组火山岩在各构造相中显著有别,而且共生的阿克沙克组在各构造相中差异极为显著。两大次级构造带具有独立的基底建造史,差异显著的盆地沉积史,独特的火山岩浆史和构造演化史。早晚石炭世之间的鄯善运动使南、北两个次级构造带叠加拼贴,构成统一的伊宁地块,晚石炭世进入统一的陆内构造发展演化阶段,发育以伊什基里克组碱性双峰式火山岩为代表的裂谷火山岩浆建造。

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标题: Geochemistry, petrogenesis and geological significance of Early Carboniferous adakite in Sawuer region, West Junggar, Xinjiang

标题: 新疆西准噶尔萨吾尔地区早石炭世埃达克岩地球化学特征、岩石成因及其意义

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作者关键词: Adakite; Early Carboniferous; Aketamu Formation; Sawuer region; West Junggar

作者关键词: 埃达克岩; 早石炭世; 阿克塔木组; 萨吾尔地区; 西准噶尔

摘要: The Aketamu Formation, as a new defined lithostratigraphic unit in Sawuer region, West Junggar, is composed of intermediate volcanic lavas and pyroclastic rocks, with minor of acidic volcanic lavas. The LA-ICP-MS zircon U-Pb age of rhyolite from the Aketamu Formation is 337.9 0.77Ma. Therefore, the rhyolite is formed in Early Carboniferous. Geochemically, the andesites in the Aketamu Formation are characterized by high SiO_2 (53.42% ~64.74%), Al_2O_3 (16.05% ~19.23%) and Na_2O (4.05% ~8.13%), and low K_2O (0.36% ~3.65%). They have high Sr (448.1 $\times 10^{-6}$ ~1507 $\times 10^{-6}$) contents, high Sr/Y (36.6 ~89.0) ratios, and slightly positive Eu anomalies. Moreover, the andesites are enriched in large-ion-lithophile elements (such as K, Rb, Ba, Th and U) and light rare earth elements, and are depleted in high-field-strength elements (such as Nb, Ta and Ti) and heavy rare earth element, especially Y and Yb, showing the characters of a typical adakite. The studied results show that the andesites from Aketamu Formation were the products resulting from slab melting, with the residual minerals (eg. amphibole + garnet) in the source of garnet amphibolite. In combination with the regional geological background, the authors hold that the subducted oceanic slab edges were heated by the asthenospheric mantle rise through slab window, which is the result of the southward subduction of the Irtysh-Zaysan Ocean between Kazakhstan in the south and Altai in the north. The reaction of upward migrating adakitic magmas with mantle peridotite gave rise to the adakite and Nb-enriched arc basalt suites, and led to the Cu-Au mineralization at the same time. The discovery of Early Carboniferous adakite in Aketamu Formation provides evidence for further understanding of the Late Paleozoic tectonic evolution, magmatism and metallogenic of ore deposits in West Junggar.

摘要: 新疆西准噶尔萨吾尔地区阿克塔木组(新建)为一套中性火山熔岩、火山碎屑岩夹少量酸性火山熔岩建造。流纹岩 LA-ICP-MS 锆石 U-Pb 年龄为 337.9 0.77Ma, 属早石炭世。安山岩地球化学特征表现为高 SiO_2 (53.42%~64.74%)、 Al_2O_3 (16.05%~19.23%), 富 Na_2O (4.05%~8.13%) 贫 K_2O (0.36%~3.65%), 富 Sr (448.1 $\times 10^{-6}$ ~1507 $\times 10^{-6}$), 低 Yb (0.94 $\times 10^{-6}$ ~1.79 $\times 10^{-6}$)、Y (8.48 $\times 10^{-6}$ ~16.92 $\times 10^{-6}$), 高 Sr/Y 比值 (36.6~89.0), 富集 LREE, 亏损 HREE, 弱 Eu 正异常, 明显的 Nb、Ta、Ti 负异常, 具有典型的埃达克岩特征, 为玄武质洋壳在石榴角闪岩相高度部分熔融的产物。阿克塔木组火山岩形成于与洋内俯冲有

关的岛弧环境,为早石炭世额尔齐斯-斋桑洋南向俯冲的岩浆记录。俯冲板片边缘受到来自板片窗的高温软流圈物质加热,部分熔融形成的埃达克质熔体与地幔橄榄岩发生熔体-岩石反应,从而形成埃达克岩+富 Nb 玄武岩组合,同时发生与之相关的 Cu-Au 成矿作用。阿克塔木组早石炭世埃达克岩的发现,为西准噶尔地区晚古生代岩浆活动、构造演化和金属成矿等研究提供了可靠的依据。

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文献类型: Article

作者关键词: net primary productivity; soil conservation; water yield; tradeoff; synergy

作者关键词: 净初级生产力; 土壤保持; 产水; 权衡; 协同

摘要: We quantitatively estimated net primary productivity(NPP),soil conservation and water yield from 1982 to 2015 in Xinjiang based on CASA model,RUSLE model,and InVEST model. The spatial analysis and hot spot analysis were used to characterize the regional variation of ecosystem services. The Sen's method was used to analyze the temporal and spatial variations of ecosystem services. The tradeoffs and synergies among three ecosystem services were explored based on partial correlation analysis. From 1982 to 2015,the variation of annual NPP in Xinjiang was relatively stable with an increasing trend,whereas the inter-annual variation of soil conservation and water yield fluctuated greatly. Both soil conservation and water yield were positively correlated with NPP. The changes of soil conservation and water yield were synergistic,and the strong synergies being dominant. Over the whole examined period,the synergistic interaction between NPP and soil conservation tended to weaken in the whole province. The relationship between NPP and water yield transferred from tradeoffs to synergies. The synergies between soil conservation and water yield were strengthened first and then weakened.

摘要: 基于 CASA 模型、RUSLE 模型和 InVEST 模型定量测算了新疆 1982-2015 年的净初级生产力(NPP)、土壤保持和产水三种生态系统服务物质量。使用空间分析和热点分析方法对生态系统服务的分区差异进行了刻画,并使用 Sen 趋势度方法分析了生态系统服务的时空变化趋势,进一步基于逐像元偏相关分析,对三种生态系统服务之间的权衡与协同关系及时空变化进行了分析。结果表明: 1982-2015 年,新疆 NPP 年际变化较为稳定,呈现逐渐增加的趋势,土壤保持和产水量的年际变化波动较大; NPP 与土壤保持、产水之间为协同关系;土壤保持与产水之间呈现明显的协同关系,且主要是强协同关系; NPP 与土壤保持的协同关系在全省范围内有弱化趋势,NPP 与产水之间由权衡关系过度到协同关系,土壤保持和产水协同关系先强化后弱化。

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标题: Methods of ASTER remote sensing data used in extracting mineralization and alteration information in the Hutouya mining area of the Qimantag metallogenic belt, Qinghai Province

标题: 基于 ASTER 数据的矿化蚀变遥感异常提取技术方法---在青海祁漫塔格成矿带虎头崖矿区的应用

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作者关键词: ASTER satellite data; data processing; alteration anomaly information extraction; Qimantag metallogenic belt in Qinghai Province; Hutouya mining area

作者关键词: ASTER 卫星数据; 数据处理; 蚀变异常信息提取; 青海祁漫塔格成矿带; 虎头崖矿区

摘要: Using ASTER remote sensing images as the data source, the extraction of mineralization and alteration anomaly in the Hutouya mining area of the Qimantag metallogenic belt in Qinghai Province is studied through two methods. One method is using the minimum noise component(MNF)transform, pixel purity index(PPI), n-Dimensional Visualization to do the end element recognition and mixture tuned matched filtering(MTMF), in order to obtain the mineral distribution map of the mining area. The other is principal component analysis, through which ferric contamination anomaly is extracted in ASTER 1, 2, 3, 4 band, skarnization alteration anomaly in 1, 3, 4, 5 band, montmorillonite, illite and sericite in 3, 4, (5 + 6)/2 band and calcite, biotite, chlorite and other minerals in 1, 3, 4, 8 band. The results of remote sensing extraction of alteration anomaly verified by ArcGIS 10.1 software are in good consistency with the mineral deposits and mineralization points determined by the field survey, indicating that the extraction results and the data processing method are reliable, which is of great guiding significance for the expansion of the prospecting scale and the discovery of mineralization enrichment areas.

摘要: 以 ASTER 遥感影像为数据源, 对青海祁漫塔格成矿带虎头崖矿区, 应用成像光谱法和

主成分分析法对矿区矿化蚀变异常信息进行提取分析。成像光谱方法利用最小噪音分量(MNF)变换、像元纯度指数(PPI),n 维可视化(n-Dimensional Visualization)端元识别,并进行混合谱匹配滤波(MTMF),最终得到矿区的矿物信息分布图。而主成分分析法则选择 ASTER1、2、3、4 波段提取铁染异常信息,1、3、4、5 波段提取矽卡岩化蚀变异常信息,1、3、4、(5+6)/2 波段提取蒙脱石、伊利石与绢云母等矿物的蚀变异常信息,1、3、4、8 波段提取方解石、黑云母、绿泥石等矿物的蚀变异常信息。利用野外实地踏勘确定的矿床、矿(化)点,在 ArcGIS10.1 软件中对遥感提取蚀变异常信息进行验证显示,二者吻合效果良好,表明提取结果与数据处理方法较可靠,对于扩大找矿规模和发现矿化富集地段具有重要的指导意义。

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作者: 周艳龙; 李永军; 王祚鹏; 杨高学; 常好营; 高吉鹏; 王伟宁

标题: Detrital Zircon Geochronology and Provenance Analysis of the Lower Akeshake Formation in the Atengtao Mountain, Yining massif

标题: 伊宁地块阿腾套山阿克沙克组下段碎屑锆石年代学及物源分析

来源出版物: 新疆地质 卷: 38 期: 2 页: 174-183 出版年: 2020

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文献类型: Article

作者关键词: Yining Massif; Atengtao Mountain; Akeshake Formation; Detrital zircon; U-Pb dating

作者关键词: 伊宁地块; 阿腾套山; 阿克沙克组; 碎屑锆石; U-Pb 测年

摘要: The Carboniferous in the Atengtao Mountain, Yining massif, is an important material record

of basin evolution and orogenic process of the Western Tianshan orogen, fossils in the clastic rocks are hard to find, so the sedimentary age and regional correlation of the strata are highly controversial. This paper aimed to clarify the sedimentary age, the source of detrital material and source characteristics of the clastic rocks that found in the Atengtao Mountain and to divide stratigraphic attribution and regional correlation reasonably. LA-ICP-MS detrital zircon U-Pb dating of Conglomeratic tuffaceous coarse sandstone shows that the detrital zircons have relatively narrow and successive range of zircon ages from 393 to 325 Ma, which could be divided into 3 groups: the main age peak at 365~350 Ma, the secondary age peaks at 345~325 Ma and 393~370 Ma. Based on the detrital zircon dating result, combined with the petrography, cathodoluminescence image and age spectrum, we conclude that: (1) The youngest detrital zircon age is (3255) Ma, suggesting the sedimentary age is not earlier than 325 Ma, and this clastic rocks could be classified into the lower Early Carboniferous Akeshake Formation; (2) This clastic rocks are rapidly accumulating near source volcanic-magmatic rocks, the main provenance of clastic material is the Early Carboniferous intrusive and the Dahalajunshan Formation volcanic rocks in the southern margin of the basin, the Nalati structural belt and late Early Carboniferous volcanic clastics in the south also contributes to the material. (3) The results show that there are at least three major volcanic magmatic events in the southern margin of Yining massif during Paleozoic, which are concentrated in ca. 393~370 Ma, ca. 365~350 Ma, ca. 345~325 Ma. Volcanic activity still existed in the Yining massif during the deposition of the late Early Carboniferous Akeshake Formation.

摘要: 伊宁地块阿腾套山一带石炭系,是西天山造山带盆地演化和造山过程的重要物质记录,区内多数碎屑岩段化石难觅,地层时代及区域对比多有争议。为查明阿腾套山中部长套碎屑岩时代、物源及源区特征,合理划分地层归属与区域对比,通过对含砾凝灰岩质粗砂岩进行 LA-ICP-MS 碎屑锆石 U-Pb 测年实验,综合岩相学、锆石阴极发光图像与年龄谱特征,得出:①阿腾套山中部长套碎屑岩最年轻年龄为(3255) Ma,指示沉积时代不早于 325 Ma,对比划归早石炭世阿克沙克组下段;②该碎屑岩为近源火山-岩浆岩风化后快速堆积,物源为盆地南缘大哈拉军山组火山岩及早石炭世侵入岩,部分碎屑源于南侧的那拉提构造带;③碎屑锆石佐证伊宁地块南缘古生代至少存在 3 期主要火山-岩浆事件,集中于 393~370 Ma、365~350 Ma、345~325 Ma,早石炭世晚期阿克沙克组沉积时该区可能仍存在火山活动。

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标题: Ordovician carbonate gravity deposition in the southwestern margin of Ordos and its palaeogeographical significance

标题: 鄂尔多斯西南缘奥陶系碳酸盐重力沉积及古地理意义

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作者关键词: carbonate gravity deposition; debris flow; palaeogeography; Ordovician; southwestern margin of Ordos

作者关键词: 碳酸盐重力沉积; 碎屑流; 古地理; 奥陶系; 鄂尔多斯西南缘

摘要: Based on the systematic observations of abundant outcrops and drilling cores in the southwest margin of Ordos, the main types of Ordovician carbonate gravity deposition are identified, and its genetic mechanism and palaeogeographic background are discussed. The result indicates that carbonate gravity deposition is well developed in Ordovician of the southwestern margin of Ordos, which mainly include rockfall, slide, slump, debris flow and turbidity flow. According to the source of clasts, the carbonate debris flow can be divided into endogenous, exogenous, terrestrial and mixed source types, reflecting the different genetic mechanisms and tectonic backgrounds. In Early-Middle Ordovician, the Ordos Basin was a vast shallow-water carbonate platform deposit in the craton epicontinental sea, only a small amount of carbonate gravity flow developed in the southwestern margin. Since the end of Middle Ordovician

Kelimoli Period,the southwest margin of the Ordos began to evolve into depression-rift type pericontinental Sea of craton margin. In south margin,there developed amount of carbonate slump-debris flow-turbidity deposits and in west margin,carbonate collapse -debris flow deposits were more developed.

摘要: 为了查明鄂尔多斯西南缘奥陶系碳酸盐重力沉积的主要类型,探讨其成因机制以及古地理背景,对大量野外剖面 and 钻井岩心进行了系统观察。研究表明,奥陶系碳酸盐重力沉积丰富多样,主要发育岩崩、滑动、滑塌、碎屑流和浊流沉积。根据碎屑来源可将碳酸盐碎屑流划分为内源、外源、陆源及混源等类型,反映不同的成因机制和构造背景。研究后认为,鄂尔多斯地块早中奥陶世为广阔的克拉通陆表海浅水碳酸盐台地沉积,仅在西南缘有少量碳酸盐重力流发育。中奥陶世末克里摩里沉积期,鄂尔多斯西南缘演变为克拉通边缘拗陷-裂陷型陆缘海沉积格局,南缘大量发育碳酸盐滑塌-碎屑流-浊流沉积,西缘大量发育碳酸盐垮塌-碎屑流沉积。

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标题: Impact of farmers'livelihood capital characteristics on agricultural production efficiency in Loess Hilly region

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作者关键词: 生计资本; 农业生产效率; 黄土丘陵地区; 贫困; DEA- BCC 模型

摘要: The characteristics of peasant household livelihood capitals are the key factors affecting agricultural production efficiency. Based on the survey data of 1314 households in Suide County, and focused on the background of precise poverty alleviation strategy, we analyzed the difference of farmers' livelihood capitals and their impacts on agricultural production efficiency. The results show that: (1) Poor households are mainly manifested in the lack of natural capital and material capital, while non poor households are manifested in the lack of policy capital and financial capital. (2) There are 67.35% of farmers who are lack of human capital, which restricts the development of farmers' livelihood level in loess hilly area. Financial capital and policy capital are the key factors that caused the difference of livelihood capital between poor and non- poor households. (3) The agricultural production efficiency in the Loess Plateau area is at a moderately low level, 25% of households lost more than 70% of their agricultural efficiency. (4) Improving the natural capital, increasing human capital, reducing the differences between policy capital and financial capital between poor and non- poor households are the key measures to improve the agricultural production efficiency of loess hilly area.

摘要: 文中在"贫困识别"的背景下, 基于绥德县 1314 户农户调查数据, 在可持续生计资本分析的框架下对比了不同类型农户的生计资本差异, 借助 DEA- BCC 模型和 Tobit 回归模型, 分析了生计资本对农业生产效率的影响。研究发现: (1) 贫困户表现为自然资本和物质资本的缺乏, 非贫困户表现为政策资本和金融资本的缺乏。 (2) 67.35% 的农户缺乏人力资本, 人力资本不足是制约黄土丘陵区农户生计水平提升的根本, 金融资本和政策资本是导致贫困户与非贫困生计资本差异的关键。 (3) 黄土丘陵区的农业生产效率处于中等偏低的水平, 近 1/4 农户的农业生产效率损失达 70% 以上。 (4) 改善自然资本、增加人力资本、缩小政策资本和金融资本在贫困户和非贫困户之间的差异, 是提高黄土丘陵区农业生产效率、改善区域贫困状况的有效措施。

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标题: Quantitative Analysis of Morphotectonic Features of the Longxian-Qishan Fault in the Southwestern Margin of Ordos Block

标题: 鄂尔多斯西南缘陇县-岐山断层构造地貌特征定量分析

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作者关键词: 鄂尔多斯西南缘; 陇县-岐山断层; 构造地貌; 地貌指数; 垂直滑动速率

摘要: The Longxian-Qishan fault, located in the joint of the northeast of Tibetan Plateau, Ordos Block and Weihe River Basin, is the forefront to the northeast of the Tibetan Plateau, and also the linking between the Haiyuan-Liupanshan fault and the northern Qinling fault system. In-depth study of its tectonic geomorphic features, tectonic activities and dynamic mechanism is helpful to further understanding the NE extension mechanism and tectonic transformation of NE Tibetan Plateau. Based on 30m resolution ASTER-GDEM data, this article analyzed the structural geomorphologic features and tectonic activities by geomorphologic parameters, and estimated the vertical slip rate according to the empirical formula. The fault can be separated into seven geomorphic segments according to the linear feature of mountain fronts. Analysis of the extracted tectonic geomorphology index of 48 drainage basins and 31 mountain front facets and the estimated uplift rates reveal a general pattern of strong tectonic uplift in the southeast and weak tectonic uplift in the northwest. Combined with the above research results and the fault kinematics characteristics, the dynamic mechanism of tectonic geomorphologic evolution was also discussed. The above research suggests that Longxian-Qishan fault is affected by the northeastern extension of Tibetan Plateau and the northwest section of the fault is dominated by left-lateral strike-slip movement while the southeast is dominated by tectonic uplifting with a northwest tilting direction under the influence of Weibei uplift.

摘要: 陇县-岐山断层位于青藏高原东北缘、鄂尔多斯地块及渭河盆地三者结合部位,既是青藏高原北东向扩展的前锋,也是海原-六盘山断裂带与秦岭断裂系之间构造转换的桥梁与纽带。深入地认识其构造地貌特征、活动特性及动力学机制,有助于进一步揭示青藏高原北东向扩展机制及构造转换特征。基于 30m 分辨率 ASTER-GDEM 数据,利用定量构造地貌参数分析构造地貌特征及构造活动性差异,根据经验公式估算其垂直滑动速率,并结合断层运动学特征探讨了构造地貌演化的动力机制。根据断层山前带的线性特征,断层自西北向东南可以划分为 7 个次级段落,48 个流域及 31 个山前面的地貌参数及估算的垂直滑动速率显示出断层

东南部构造抬升强于西北部。综合分析认为,陇县-岐山断层受青藏高原北东向扩展的远程影响,西北部以左行走滑运动为主;东南部受渭北隆起影响以构造抬升运动为主,且向西北方向翘倾。

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作者: 刘宝星; 裴先治; 李瑞保; 陈有炘; 王盟; 赵少伟

标题: Age and Provenance of the Metasedimentary Rocks of Hengxianhe Area in Mianlue Tectonic Belt of Southern Qinling: Evidence from Detrital Zircons LA-ICP-MS U-Pb Dating

标题: 南秦岭勉略构造带横现河地区变质沉积岩形成时代及物源来自 LA-ICP-MS 碎屑锆石 U-Pb 年龄的证据

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detrital zircon LA-ICP-MS U-Pb dating

作者关键词: 南秦岭; 勉略构造带; 朱家山岩组; 乔子沟岩片; 碎屑锆石 U-Pb 定年

摘要: The Zhujiashan Formation and Qiaozigou Slice are located in the north of Hengxianhe of Mianxian-Lueyang Tectonic Belt in the south of Qinling, which are the sedimentary rocks with intense ductile deformation in the Mianlue Tectonic belt. As the basement rock series of the Mianlue Tectonic belt, it is of great significance to research the yielded ages and sediment provenances for understanding the yielded ages and tectonic evolution of the Mianlue Tectonic belt. In this paper, the metamorphic sedimentary rocks (sericite phyllite) are studied by LA-ICP-MS detrital zircon U-Pb chronology in Zhujiashan Formation and Qiaozigou Slice in the north of Hengxianhe area to explore their yielded ages and sediment provenances. The obtained detrital zircon age can be divided into three groups: the Paleozoic age group, the Neoproterozoic age group and the Late Mesoproterozoic age group. The Paleozoic age group (375 to 542 Ma) can be divided into the early Late Paleozoic-late Early Paleozoic age group (from 375 to 424 Ma) and the Early Paleozoic Age group (from 530 to 542 Ma), with the prominent peaks age being 390 Ma and 394 Ma. The Neoproterozoic age group (from 552 to 977 Ma), with the prominent peaks age being 758 Ma and 787 Ma, can be divided into late Neoproterozoic age groups (from 552 to 797 Ma) and the Early-Middle Neoproterozoic age group (from 800 to 977 Ma) with the prominent peaks age being 855 Ma and 951 Ma. The Late Mesoproterozoic age is from 1008 to 1124 Ma. The minimum age group of detrital zircons of Zhujiashan Formation and Qiaozigou Slice is from 375 to 385 Ma (average age 380.3 Ma) and from 377 to 389 Ma (average age 383 Ma), indicating that the sedimentary age is not earlier than the Middle-Late Devonian. Comprehensive study shows that the provenances of the two samples are mainly derived from magmatic rock in Bikou block of Mianlue Tectonic Zone and the northern margin of Yangtze plate. The sedimentary environment is rift basin, and from extensional rifting to stable platform-platform deposition.

摘要: 朱家山岩组、乔子沟岩片位于南秦岭勉略构造带横现河以北,是勉略构造带中强烈韧性变形的沉积岩系,是勉略构造混杂岩带的基质岩系,研究其形成时代、沉积物源,对于深入了解勉略构造带的形成时代与构造演化具有重要意义。笔者以横现河以北地区朱家山岩组、乔子沟岩片中的变质沉积岩(绢英千枚岩)为研究对象,进行碎屑锆石 LA-ICP-MS 锆石 U-Pb 年代学研究,探讨其形成时代及沉积物源。所获得的碎屑锆石年龄可以分为 3 组:古生代年龄组 (375~542 Ma),可以划分为晚古生代早期早古生代晚期年龄组 (375~424 Ma),主要峰值为 390 Ma、394 Ma,早古生代早期年龄组 (530~542 Ma);新元古代年龄组 (552~977 Ma),可以划分为新元古代晚期年龄组 (552~797 Ma),主要峰值为 758 Ma、787 Ma,新元古代早中期年龄组 (800~977 Ma),主要峰值为 855 Ma、951 Ma;中元古代晚期年龄组 (1008~1124 Ma)。朱家山岩组、乔子沟岩片碎屑锆石最小年龄组分别为 375~385 Ma (平均年龄为 380.3 Ma)、377~389 Ma (平均年龄为 383 Ma),说明朱家山岩组、乔子沟岩片浅变质沉积岩系的沉积时代不早于中晚泥盆世。综合研究认为 2 件样品物源主要都来自勉略构造带、碧口微地块和扬子板块北缘地区的岩浆岩,沉积环境为裂陷盆地且由伸展裂陷过渡为稳定的台盆-台地沉积。

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标题: Detrital Zircon U-Pb Age and Geological Significance of Metamorphic Strata from Xiaobianhe-Changba Area in the Mianlue Tectonic Belt of Southern Qinling

标题: 秦岭南缘勉略构造带小碛河长坝地区变质地层碎屑锆石 U-Pb 年龄及地质意义

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作者关键词: 南秦岭; 勉略构造带; 碎屑锆石; 变质沉积地层; LA-ICP-MS 锆石 U-Pb 定年

摘要: A set of low-amphibolite facies metasedimentary stratum with the age undetermined is exposed in the Xiaobianhe-Changba area, Mianlue tectonic belt of the South Qinling orogeny. The formation of the era was classified as Paleoproterozoic, Early Paleozoic, Silurian-Triassic, Devonian etc., due to the long-standing controversy over its formation and the lack of accurate chronological evidence. In this paper, the study of LA-ICP-MS zircon U-Pb chronology of metamorphic clastic rocks is carried out on the metamorphic clastic rocks in this area, and a sample of zircon measuring points is completed with a total of 80 points. The metamorphism is obtained in the Xiaobianhe-Changba area, in which the minimum age-weighted average of metamorphic stratigraphic units in Xiaobianhe-Changba area is 576.5 ± 12.4 Ma, and the age of main clastic zircon ages is between 850 Ma and 658 Ma. Based on the previous data, it is considered that the sedimentary age of metamorphic stratigraphic units should be Early Paleozoic in Xiaobianhe-Changba area; the provenances mainly come from the volcanic rocks in the Mianlue tectonic belt, the Neoproterozoic magmatic rocks in Bikou block in the northwestern margin of the Yangtze block; their sedimentary events correspond to the Early Paleozoic sedimentary process of the extensional rifting in Mianlue tectonic belt and the northwestern margin of the Yangtze block.

摘要: 南秦岭勉略构造带小碛河长坝地区发育一套时代有争议的低角闪岩相变质沉积地层。由于该变质沉积地层受到了强烈变质和变形作用的改造,且缺少精确的年代学证据,在以往的地质研究和地质图中将其形成时代划归为古元古代、早古生代、志留纪三叠纪、泥盆纪、泥盆纪石炭纪等。笔者以该区的变质碎屑岩为研究对象,进行 LA-ICP-MS 锆石 U-Pb 年代学研究,完成锆石测点一个样品共计 80 个,获得小碛河长坝地区的变质地层主要碎屑锆石年龄为 850~658 Ma,最小年龄加权平均值为 (576.5 ± 12.4) Ma。结合前人资料,认为小碛河长坝地区变质地层的沉积时代主体应为早古生代;物源主要来自勉略构造带内部火山岩、碧口微地块及扬子地块西北缘新元古代岩浆岩;其沉积事件对应了勉略构造带及扬子地块西北缘地区早古生代伸展裂陷沉积过程。

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标题: Geochronology, Geochemistry and Tectonic Interpretation of Akebulake Plutons in Qinghe County, Northern Xinjiang

标题: 新疆青河县阿克布拉克花岗闪长岩年代学、地球化学特征及其构造意义

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作者关键词: Altay; Akebulake; granodiorite; LA-ICP-MS zircon U-Pb dating; tectonic interpretation

作者关键词: 阿尔泰; 阿克布拉克; 花岗闪长岩; LA-ICP-MS 锆石 U-Pb 定年; 构造意义

摘要: The Akebulake plutons, outcropped in Qingeli River in Qinghe County of southern margin of Altay orogenic belt, are mainly granodiorite. LA-ICP-MS zircon U-Pb indicates that the plutons were formed in the early Devonian (397.65.2 Ma), which is a large scale magmatic event in the Altay orogenic belt in Devonian. The SiO_2 contents range from 69.17% to 74.70% and A/CNK from 0.97 to 1.09, indicating that the plutons are metaluminous, mid-high K calc-alkaline series rock. In addition, the plutons are enriched in K, Rb, Th, La, Ce and Nd, obvious negative anomaly in Ba, Nb, Ta, Ti, Sr and Eu ($\delta\text{Eu}=0.581.23$), which are consistent with the characteristics of granitoid rocks formed in island-arc. Based on the previous studies, this paper suggests that the Akebulake plutons were generated from the tectonic environments of continental margin arc by the subduction of the Paleo-Asian Ocean plate. Dark-coloured inclusion bodies in the rocks and the geochemical properties suggest that the plutons are the mixing and differentiation of the mantle magma melting the lower crust.

摘要: 阿克布拉克岩体位于新疆阿尔泰造山带中段青河县大青格里河昆格依特西南, 岩性主要为花岗闪长岩。LA-ICP-MS 锆石 U-Pb 分析结果表明其形成于早泥盆世 (397.65.2) Ma, 为阿尔泰造山带晚古生代早期大规模岩浆活动的产物。地球化学分析结果表明, 该岩体 SiO_2 含量为 69.17%~74.70%, A/CNK 值为 0.97~1.09, 属准铝质钙碱性-高钾钙碱性系列岩石。岩体富集 K、Rb、Th、La、Ce、Nd 等元素, 相对亏损 Ba、Nb、Ta、Ti、Sr 等, 微量元素蛛网图与稀土元素配分曲线均显示为明显的右倾型, 正/负 Eu 异常均可见 ($\delta\text{Eu}=0.58\sim 1.23$), 其中花岗闪长岩多为负 Eu 异常, 黑云母花岗闪长岩则全部为正 Eu 异常, 应为岩浆结晶分异不同阶段的结果, 与岛弧岩浆岩特征一致。结合前人研究成果, 笔者认为阿尔泰造山带南缘早泥盆世阿克布拉克岩体形成于古亚洲洋俯冲背景下的陆缘弧构造环境, 岩体中的暗色微粒包体及地球化学属性推断其为幔源基性岩浆底侵加热下地壳使之熔融, 形成的混合岩浆分异演化的产物。

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标题: Phenological changes of desert steppe vegetation and its effect on net primary productivity in Inner Mongolia from 2000 to 2017

标题: 2000-2017 年内蒙古荒漠草原植被物候变化及对净初级生产力的影响

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作者关键词: desert steppe; phenology; net primary productivity; growing season; Inner Mongolia

作者关键词: 荒漠草原; 物候; 净初级生产力; 植被生长季; 内蒙古

摘要: Desert steppe is distributed in the semiarid and arid areas and is extremely sensitive to climate change. However, limited field observations and lack of community surveys have resulted in insufficient research on the vegetation phenology and productivity of the desert steppe. Based on the normalized difference vegetation index (NDVI) data from the MODIS dataset during 2000-2017, we used a relative threshold method to extract the phenological parameters in the desert steppe of Inner Mongolia, including the start of growing season (SOS), the end of growing season (EOS), and the length of growing season (LOS). We then estimated the spatiotemporal changes in net primary productivity (NPP) of the desert steppe vegetation by the Carnegie- Ames- Stanford Approach (CASA) model. Finally, we analyzed the relationship between desert steppe productivity, phenophases, and climate variables. Our results show that: 1) during the study period, SOS advanced significantly at a rate of 0.88 d/a ($P < 0.05$), while EOS advanced at a rate of 0.13 d/a (non-significant). The average LOS lengthened significantly by 0.76 d/a ($P < 0.05$). The SOS was correlated negatively with mean temperature from February to April in 81.53% pixels (8.21% was significant) and negatively correlated with April precipitation in 60.80% pixels (6.12% was significant). The EOS showed a negative relationship with mean temperature in September in

65.16% pixels(5.03% was significant)but positively correlated with precipitation from July to September in 78.61% pixels(10.12% was significant).2)The average annual NPP from 2000 to 2017 was 104.71gC/(m² · a)in the study area, showing regional differences with an obviously decreasing trend from east to west.Net primary productivity in spring, summer, and the growing season increased insignificantly, while NPP in autumn showed an insignificant decreasing trend.The increase of precipitation in the growing season is beneficial to the accumulation of ecosystem NPP.3)Advance of SOS was conducive to the accumulation of spring NPP, and the delay of EOS promoted the accumulation of autumn NPP.There was a significant correlation between the LOS and NPP during the growing season(P<0.05).This study revealed the impacts of climate change on vegetation phenology and productivity of the desert steppe in Inner Mongolia, which is significant for ecosystem management and ecological construction of the region.

摘要: 荒漠草原分布于干旱区和半干旱区,对气候变化的响应极为敏感,但目前学术界对于荒漠草原物候与生产力变化的研究仍较为薄弱。有鉴于此,论文采用 2000-2017 年 MODIS NDVI 数据和气象数据,利用通用数量化方法提取内蒙古荒漠草原植被的生长季始期(start of season,SOS)和生长季末期(end of season,EOS);基于 Carnegie- Ames-Stanford Approach(CASA)模型估算了植被净初级生产力(NPP),并分析了植被物候和净初级生产力之间的关系。研究结果表明:①2000-2017 年内蒙古荒漠草原 SOS 呈显著提前趋势(0.88 d/a,P<0.05),EOS 不显著提前(0.13 d/a,P>0.05),生长季长度(length of season,LOS)呈显著延长趋势(0.76 d/a)。81.53%像元的 SOS 与 2-4 月平均气温呈负相关(8.21%显著相关,P<0.05),60.80%像元的 SOS 与 4 月降水量呈负相关关系(6.12%显著相关,P<0.05);65.16%像元的 EOS 与 9 月平均气温呈负相关(5.03%显著相关,P<0.05),78.61%像元的 EOS 与 7-9 月降水量呈正相关关系(10.12%显著相关,P<0.05)。②内蒙古荒漠草原多年平均 NPP 为 104.71 gC/(m² · a),有自东向西逐渐降低的区域差异;在研究时段内,春、夏季和生长季的 NPP 均呈不显著增加趋势,秋季 NPP 有不显著减少趋势;生长季降水量增加有利于生长季 NPP 的积累。③春季 NPP 与 SOS 呈不显著负相关,秋季 NPP 与 EOS 呈显著正相关。LOS 的延长促进了 NPP 的累积,其中生长季 NPP 与 EOS 的推迟关系更为密切。研究结果揭示气候变化对内蒙古荒漠草原植被物候和生产力有显著影响,对区域生态系统管理和生态建设具有重要参考意义。

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标题: Genesis of the Jianzhupo Pb-Zn-Sb Polymetallic Deposit in the Wuxu Ore Field, Guangxi Province: Constraints from Sulfur Isotopes of Sulfides and Trace Elements Compositions of Sphalerites

标题: 广西五圩矿田箭猪坡 Pb-Zn-Sb 多金属矿床成因研究: 来自硫同位素和闪锌矿微量元素的制约

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作者关键词: sphalerite; sulfur isotope; trace elements; magmatic hydrothermal fluid; Jianzhupo deposit

作者关键词: 闪锌矿; 硫同位素; 微量元素; 岩浆热液; 箭猪坡矿床

摘要: In order to constrain the material sources and ore genesis of the Jianzhupo Pb-Zn-Sb Polymetallic deposit, sulfur isotopes of sulfides and trace elements compositions of sphalerites that were formed at metallogenic stage of the deposit have been analyzed in this paper. The results show that the $\delta^{34}\text{S}_{\text{(VCDT)}}$ values of sulfides vary from 3.92 to 8.00, indicating that those sulfides were formed under thermal equilibrium condition. The ore-forming temperatures range from 114 to 377 °C, calculated by using Sulfur isotope geological thermometer. Based on the $\delta^{34}\text{S}_{\text{(VCDT)}}$ values of sphalerite and coexisting pyrite ($\Delta^{34}\text{S}_{\text{(Py-Sp)}}$ values), the calculated total $\delta^{34}\text{S}_{\text{(SigmaS-fluids)}}$ value of the ore-forming fluid is 5.93, suggesting that sulfur was predominantly derived from magmatic source, with possible minor contribution of sedimentary source. The sphalerites of the Jianzhupo deposit are relatively enriched in elements such as Fe, Cd, Mn, Cu, In. Furthermore, multiple geochemical indicators (such as Zn/Cd, Cd/Fe, Cd/Mn, and Ga/In ratios), the discrimination diagram of In/Ga-In/In, and geological characteristics of the deposit show features of the magmatic hydrothermal deposit, indicating that the source of ore-forming materials of the deposit is related to the magmatic hydrothermal fluid.

摘要: 为探讨箭猪坡 Pb-Zn-Sb 多金属矿床的成因及物质来源, 对该矿床主成矿阶段的硫化物进行了硫同位素分析、对闪锌矿进行了微量元素分析。结果表明, 硫化物的 $\delta^{34}\text{S}_{\text{(VCDT)}}$ 值为 3.92~8.00, 硫化物沉淀过程中硫同位素已达平衡。利用硫同位素温度计估算的成矿温度为 114~377 °C, 利用共生矿物对 ($\Delta^{34}\text{S}_{\text{(Py-Sp)}}$ 值) 估算出成矿流

体中总硫的 $\delta^{34}\text{S}(\text{Sigma}_{\text{S-fluids}})$ 为 5.93, 暗示硫主要来自岩浆, 但不排除有少量地层硫的加入。箭猪坡矿床闪锌矿相对富集微量元素 Fe、Cd、Mn、Cu、In 等, 元素对比值如 Zn/Cd、Cd/Fe、Cd/Mn 和 Ga/In 值, InGa-InIn 关系判别图解以及地质特征均显示岩浆热液型矿床特征, 说明其成矿物质来源与岩浆热液有关。

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作者: 赵虹; 党犇; 党永潮; 王小军; 吴娜; 杨骁; 王宇

标题: Depositional system and its evolution of the Lower Yan'an Formation Jurassic in Ansai district, Ordos Basin

标题: 鄂尔多斯盆地安塞志丹地区侏罗系延安组下部组合沉积演化及其对油气的控制

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作者关键词: Jurassic; the Lower Yan'an Formation; depositional system; AnsaiZidan district; Ordos Basin

作者关键词: 侏罗系; 延安组下部组合; 沉积体系; 安塞志丹地区; 鄂尔多斯盆地

摘要: Based on the observation and description of outcrop and core data of the Lower Yan'an Formation, combining the analysis of well logs and test data, the sedimentary characteristics, lithological successions and well logging facies have been detailed studied. The palaeogeography of the lower part Yan'an Formation has been rebuilt. The results show that Yan10 is a set of braided depositional systems. The ancient topography caused by the Indo-China movement in the end of the Late Triassic controlled the development of sedimentary facies. During the time of Yan9-Yan7, rapid delta extension formed the basic characteristic, which is the delta front underwater distributary channel deposition, which is the important target to exploit oil and gas of the Lower Yan'an Formation.

摘要: 在野外剖面及岩心观察与描述的基础上,结合研究区大量的钻测井资料及测试分析资料,对延安组下部组合的沉积特征、岩性序列及测井相进行详细的研究,重建延安组下部组合的古地理概貌。结果表明,研究区延安组延10期为一套辫状河沉积体系,沉积相的发育受晚三叠世末印支运动造成的古地貌控制。延9延7期,演化随着湖区面积的增大,形成以三角洲前缘亚相水下分流河道及水下分流间湾微相为主的湖泊三角洲沉积体系。砂体展布受到沉积相带控制,呈近南北方向条带状分布,三角洲水下分流河道砂体、河流河道砂体是安塞油田延安组油气储集的骨架砂体。结合古地貌特点认为,延10古河道砂坝侧翼部位,延9、延8三角洲前缘分流河道为油气勘探的有利目标区。

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作者: 韩玲; 张恒; 张庭瑜; 韩霁昌; 赵永华; 赵路

标题: Determining Runoff Accumulation Threshold for Loess Gully Extraction Based on DEM

标题: 基于 DEM 的黄土沟道提取汇流量阈值确定方法

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作者关键词: loess channel; gully extraction; hydrological analysis; runoff accumulation threshold; ROC curve

作者关键词: 黄土沟道; 沟道提取; 水文分析; 汇流量阈值; ROC 曲线

摘要: Gully is the essential geographical and hydrological feature of loess plateau. Runoff accumulation threshold is the key to extracting loess gully by hydrological analysis. Present method for determining the accumulation threshold is highly subjective. To address the uncertainty problem of the accumulation threshold, we present a method of determining the runoff accumulation threshold based on the receiver operating characteristic (ROC) curve. We select the 30 m resolution DEM of Nianzhuanggou catchment in Baota District of Yanan City as the basic data. Firstly, we collect 69 starting points of actual gullies and analyze the convergence characteristics of the starting points, and determine the interval of confluence gathering. Secondly, we extracted 500 first-order gully points as sample points and obtain the optimal threshold of runoff accumulation by analyzing the diagnostic value of runoff accumulation to the gully based on ROC curve. Research results demonstrate that the runoff accumulation is of high diagnostic value for gully. An accumulation threshold could well determine whether the sample point is a gully; the root mean square error of the gully extracted under the optimal accumulation threshold determined by the ROC curve analysis method is less than 2.5 pixels, and the result is ideal.

摘要: 沟道是黄土高原重要的地形特征和水文特征,汇流量阈值是采用水文分析方法提取沟道的关键,目前已有汇流量阈值的确定方法具有较强的主观性。为解决汇流量阈值不确定性的问题,采用 30m 分辨率 DEM 为基础数据,以延安市宝塔区碾庄沟流域为研究区,提出了一种基于受试者工作特征曲线(ROC 曲线)确定汇流量阈值的方法。首先采集 69 个实际沟道起点,分析沟道起点的汇流特征,并确定了汇流量集聚区间;其次提取了 500 个一级沟道点作为样本点,采用 ROC 曲线分析了汇流量对沟道的诊断价值,得到了汇流量最优阈值。结果表明:汇流量对沟道具有较高的诊断价值,存在某一汇流量阈值能够较好地判定样本点是否为沟道;采用 ROC 曲线法确定的汇流量最优阈值提取的沟道均方根误差<2.5 个像元,结果较为理想。

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作者: 杨亮彦; 孔金玲; 王雅婷; 李健锋; 张文博

标题: Research on remote sensing retrieval of atmospheric water vapor content in arid region

标题: 旱区大气水汽含量遥感反演算法研究

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作者关键词: Landsat8; SWCVR; atmospheric water vapor; Landsat 8; SWCVR; Arid Region

作者关键词: 大气水汽含量; 旱区

摘要: Aiming at the problem that it is difficult to obtain atmospheric water vapor content in arid area and the accuracy is not high, this paper uses two thermal infrared bands of Landsat8 to construct the retrieval model of atmospheric water vapor content in arid area based on SWCVR algorithm. Compared with the measured data of meteorological station, and the root mean square error is $0.31\text{g}/\text{cm}^2$ and the absolute error is $0.25\text{g}/\text{cm}^2$. Compared with MOD05 water vapor products, it is found that the average values of water vapor are 2.63 and $2.37\text{g}/\text{m}^2$ respectively, and the spatial distribution is basically the same, but the spatial resolution and imaging time are different. The results show that the window size of 30×30 is the best for Landsat8 thermal infrared remote sensing data, which not only retains the advantages of medium and high spatial resolution, but also obtains the accuracy of practical value. The retrieval method of atmospheric water vapor content based on SWCVR algorithm has a good application in wind beach area.

摘要: 针对旱区大气水汽含量难以获取,且精度不高的问题,该文利用 Landsat8 两个热红外波段,基于 SWCVR 算法构建旱区大气水汽含量反演模型。与气象站实测数据进行验证,其均方根误差为 $0.31\text{g}/\text{cm}^2$,绝对误差为 $0.25\text{g}/\text{cm}^2$;与 MOD05 水汽产品对比发现,两者水汽的平均值分别为 2.63 和 $2.37\text{g}/\text{cm}^2$,且空间分布基本一致,但空间分辨率和成像时间的不同,导致存在一定差异性。结果表明,针对 Landsat8 热红外遥感数据, 30×30 的窗口大小最优,既保留了中高空间分辨率的优点,又获得了具有实用价值的精度;基于 SWCVR 算法的大气水汽含量反演方法在风沙滩地区具有较好的应用。

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标题: Global-scale risk assessment of sudden geological disasters in world natural heritage sites

标题: 世界自然遗产地突发性地质灾害全球尺度危险性评价

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作者关键词: world natural heritage sites; sudden geological disasters; risk assessment; global scale

作者关键词: 世界自然遗产地; 突发性地质灾害; 风险评估; 全球尺度

摘要: World natural heritage sites have become the focus of world because of its outstanding universal value. However, in recent years, sudden geological disasters have seriously threatened the integrity and sustainable development of heritage sites. Based on the spatial and statistical data of global sudden geological disasters and natural heritage sites, using GIS and mathematical statistics methods, this paper constructs a global-scale risk assessment method for three different types of sudden geological disasters in natural heritage sites: volcanic eruption, landslides and earthquakes, and classifies the disaster risk levels of 239 heritage sites. The evaluation results are analyzed from two aspects of space and quantity. The results show that 149 natural heritage sites are significantly exposed to at least one sudden geological hazard. Natural heritage sites in North America have the highest risk of volcanic eruption, and natural heritage sites in Asia have the highest risk of landslides and earthquakes, while the three disaster risks of natural heritage sites in Oceania are relatively low. Landslides are more prevalent and threatening to natural heritage sites than volcanic eruptions and earthquakes. The research results can provide effective reference for ascertaining the actual disaster situations in world natural heritage sites, optimizing the protection funds, and improving the "Sustainable Development Goals 2030" 11.4.

摘要: 世界自然遗产地因具有突出普遍价值而成为全世界关注的焦点,但近年来突发性地质灾害严重威胁了遗产地的完整性和可持续发展。基于全球自然遗产和突发性地质灾害空间及统计数据,利用地理信息系统和数理统计方法,构建了自然遗产地火山爆发、滑坡、地震 3 种类型的突发性地质灾害全球尺度危险性定量评估的方法,划分出全球 239 个自然遗产地的灾害危险等级,并从空间和数量两个方面对评估结果进行了分析。结果显示: 149 个自然遗产地至少显著暴露于一种突发性地质灾害;北美洲的自然遗产地具有较高的火山爆发危险,亚洲的

具有较高的滑坡和地震危险,而大洋洲的自然遗产地在 3 种灾害中危险性都相对较低;滑坡相比火山爆发和地震,对于自然遗产地更具有普遍性且危险程度更高。研究结果可为摸清自然遗产地灾害风险情况、优化保护资金投入、完善《2030 年可持续发展目标》11.4 提供有效参考。

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标题: 陕西省耕地等别空间特征

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作者关键词: land use; cultivated land quality; classing index area; spatial distribution; Shaanxi Province

作者关键词: 土地利用; 耕地质量; 分等指标区; 空间分布; 陕西省

摘要: In order to deeply understand the spatial pattern and distribution characteristics of cultivated land quality in Shaanxi Province, and to provide theoretical support for the protection of cultivated land quality, based on the results of county agricultural land classification in Shaanxi Province in 2016, we quantitatively analyzed the spatial distribution characteristics of cultivated land quality, and utilized ArcGIS 10.2 to express spatial data. The results showed that: (1) the average grade of cultivated land quality in Shaanxi Province was 11.33, which was generally low; the cultivated land mainly belonged to the moderate or lower classes, accounting for 82.70% of the cultivated land of the whole province; (2) the spatial differences of cultivated land quality in the whole province were obvious; the cultivated land quality in Guanzhong was the best, followed by southern Shaanxi, and the cultivated land quality in northern Shaanxi was the worst, and the average grades of cultivated land qualities in Guanzhong, southern Shaanxi and northern Shaanxi was 9.68, 11.28 and 13.34, respectively; (3) in terms of county scale, the cultivated land qualities of 48 counties were higher than the average level of the whole province, and the cultivated land qualities of 56 counties were lower than the average level of the whole province, differences of prominent spatial distribution were significant; (4) in the provincial classing index areas, cultivated land quality rank decreased in the order: Guanzhong Weihe plain area > Low mountains and hills in southern Shaanxi > Qinba mountains in southern Shaanxi > Weibei loess upland area > Shangluo mountain hilly area > Loess hilly and gully region of northern Shaanxi > sandstorm along the Great Wall in northern Shaanxi; in the first-level index areas, the grade of cultivated land was consistent with the background elements of resources; the higher the multiple cropping was, the smaller the grade was; in general, the higher the altitude is, the lower the quality of cultivated land is.

摘要: 为进一步认识陕西省耕地质量的空间格局及分布特征, 以为耕地质量保护提供理论支持, 以 2016 年陕西省县域农用地分等成果为数据源, 使用多空间尺度定量方法分析了耕地质量空间分布特征, 并基于 ArcGIS 10.2 进行了空间数据表达。结果表明: (1) 陕西省耕地质量整体偏低, 综合等别为 11.33 等, 以中、低等地为主, 占全省耕地的 82.70%; (2) 全省耕地质量空间差异明显, 总体上呈关中 > 陕南 > 陕北, 耕地质量综合等别依次为 9.68 等、13.34 等和 11.28 等; (3) 从县域尺度看, 48 个县耕地质量高于全省平均水平, 56 个县低于全省平均水平, 空间分布差异突出; (4) 省级分等指标区内, 耕地质量关中渭河平原区 > 陕南低山平坝区 > 陕南秦巴中高山区 > 渭北黄土旱塬区 > 商洛山地丘陵区 > 陕北黄土丘陵沟壑区 > 陕北长城沿线风沙区, 一级指标区内, 耕地等别同资源本底要素一致, 复种熟制越高, 等别越小; 总体上, 海拔越高, 耕地质量越低。

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作者: 吴小力; 李荣西; 胡建民; 刘福田; 赵帮胜; 覃小丽

标题: Discovery and Petroleum Geologic Significance of Cenozoic Hydrocarbon Inclusions in Liupanshan Basin,North China

标题: 中国北方六盘山盆地新生界油气包裹体的发现及其油气地质意义

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作者关键词: hydrocarbon inclusions; hydrocarbon source rocks; oil-source correlation; Cenozoic; Liupanshan basin; petroleum geology

作者关键词: 油气包裹体; 烃源岩; 油源对比; 新生界; 六盘山盆地; 石油地质

摘要: A large quantity of hydrocarbon inclusions were found in the gypsum of Cenozoic Qingshuiying Formation in Liupanshan basin,which is of a crucial significance to the understanding of the oil and gas reservoir-forming conditions and the development of exploration concept.Development and composition features of hydrocarbon inclusions in gypsum of Qingshuiying Formation were studied by field geological investigation,sample collection and laboratory analysis,etc.Sources and formation of the oil and gas were analyzed by oil-source correlation,and then the conditions and characteristics of petroleum accumulation in Cenozoic of

Liupanshan basin were studied. The results show that the oil in the crystal gypsum was derived from the hydrocarbon source rock of Qingshuiying Formation, while the oil in the filament gypsum was derived from the hydrocarbon source rock of Cretaceous Madongshan Formation. The hydrocarbon source rock of Qingshuiying Formation has certain hydrocarbon generating potential, which is the potential source rock in Liupanshan basin. The oil and gas was derived from the Cretaceous hydrocarbon source rock, which can migrate to the upper formation along the fault, and accumulate in Cenozoic. The reservoir traps near the faults connected to the Cretaceous source rock are the favorable oil accumulation zones in Cenozoic.

摘要: 在六盘山盆地新生界清水营组石膏中发现了大量的油气包裹体,而油气包裹体的研究对认识盆地新生界油气成藏条件,拓展盆地油气勘探思路具有重要的意义.通过野外地质调查、样品采集和分析测试等手段对清水营组石膏中油气包裹体的发育特征和组成特征进行研究,并开展油源对比,分析油气包裹体中油气的来源和形成过程,探讨了六盘山盆地新生界油气成藏条件和运聚特征.结果表明:清水营组结晶状石膏中油气包裹体原油来源于清水营组烃源岩;纤维状石膏脉中油气包裹体原油来源于白垩系马东山组烃源岩.六盘山盆地清水营组泥岩具有生烃潜力,是盆地潜在的烃源岩;白垩系烃源岩生成的油气可以沿着断裂等输导体系向上覆地层运移,并在新生界聚集,沟通白垩系烃源岩断层附近的新生界圈闭是六盘山盆地有利的油气聚集区.

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作者: 丁坤; 梁婷; 周义; 凤永刚; 张泽; 丁亮; 李侃

标题: Petrogenesis of Dahongliutan Biotite Monzogranite in Western Kunlun Orogen:Evidence from Zircon U-Pb Age and Li-Hf Isotope

标题: 西昆仑大红柳滩黑云母二长花岗岩岩石成因:来自锆石 U-Pb 年龄及 Li-Hf 同位素的证据

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作者关键词: 锆石 U-Pb 年龄; Li-Hf 同位素; 岩石成因; 大红柳滩岩体; 西昆仑

摘要: The Dahongliutan pluton is located in the eastern part of the West Kunlun Orogenic Belt and is mainly consisted of biotite monzonitic granite, monzonitic granite and two mica granite. The Zircon LA-ICP-MS U-Pb dating of biotite monzonitic granite in the southeastern part of Dahongliutan intrusion shows that the emplacement age of biotite monzonitic granite is 214 ± 1.8 Ma, indicating that the Dahongliutan pluton was formed in the Late Indosinian. The Dahongliutan pluton has higher value of $\delta^{7}\text{Li}$ ($0.76 \sim 3.25$) and lower content of lithium ($5.04 \sim 52.22$) $\times 10^{-6}$. The biotite monzonitic granite has zircon $\epsilon_{\text{Hf}}(t)$ values of -1.86 to 2.16 , and the two-stage mode age ranged between 1113 and 1368 Ma. In the $\epsilon_{\text{Hf}}(t)$ vs. age diagram, all the data points lie near the chondrite evolution line. The comprehensive research shows that the Dahongliutan pluton has derived from a mixed magma of mesoproterozoic crust and mantle.

摘要: 大红柳滩岩体位于西昆仑造山带东段, 主要由黑云母二长花岗岩、二长花岗岩及二云母花岗岩组成。笔者对大红柳滩岩体东南部的黑云母二长花岗岩进行了锆石 LA-ICP-MS U-Pb 定年, 测得黑云母二长花岗岩的侵位年龄分别为 (214 ± 1.8) Ma, 说明大红柳滩岩体为印支晚期岩浆活动的产物。大红柳滩岩体具有高 $\delta^{7}\text{Li}$ ($0.76 \sim 3.25$) 和低 Li ($5.04 \sim 52.22$) $\times 10^{-6}$ 同位素地球化学特征; 黑云母二长花岗岩样品的锆石 $\epsilon_{\text{Hf}}(t)$ 值介于 $-1.86 \sim 2.16$, 二阶段模式年龄为 $1113 \sim 1368$ Ma; 在 $\epsilon_{\text{Hf}}(t)$ -锆石 U-Pb 年龄图解中, 所有数据点均落在球粒陨石演化线附近。综合研究表明, 大红柳滩岩体的原始岩浆是由地幔与中元古代地壳 2 个单元形成的混合岩浆。

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标题: Petrology, geochemistry and zircon U-Pb geochronology of the Chaidamushan granite from the southern margin of Qilianshan

标题: 祁连南缘柴达木山花岗岩的岩石学、地球化学及锆石 U-Pb 年代学研究

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作者关键词: 柴达木山花岗岩; 锆石 U-Pb 定年; 祁连南缘; I 型; 多期次

摘要: The Chaidamushan granite rock mass, in the Dachaidan Town, Qinghai Province, is mainly composed of porphyritic monzonitic granite, granite porphyry and rapakivi granite. Representative rocks were selected for main and trace element study and LA-ICP-MS zircon U-Pb geochronology to explain the magma genesis, tectonic setting and their significance. The results show that in the Chaidamushan granite the K_2O/Na_2O ratio changed from 1.11 to 4.41, the Litman index ranged between 1.31 to 2.20, A/CNK between 1.06 and 1.66, indicating a high potassium calc-alkaline, peraluminous and highly fractionated I-type granite. In the primitive

mantle-normalized trace element distribution pattern, they show different degrees of enrichment of large ion lithophile elements (LILE) Cs, Pb, K, etc. and light rare earth elements (LREE), relative loss of high field strength elements (HFSE) Y, Yb, has obvious negative anomalies of Ba, Nb, Ta, Sr, P and Ti. The total amount of rare earth elements is $207.94 \times 10^{-6} \sim 418.40 \times 10^{-6}$, the ratio of LREE/HREE is 5.67~10.29, the ratio of (La/Yb)_N is 5.88~13.84, δEu is 0.09~0.50, δCe is 0.99~1.36, Sr/Y is 0.87~3.47, Rb/Sr is 1.22~15.45, K/Rb is 0.01~0.02, and Nb/Ta is 0.63~11.88. Rare earth element chondrite-normalized distribution pattern is characterized by the relative enrichment of light rare earths, the right-dip type of heavy rare earth relative loss, and negative Eu anomaly. Four samples were selected for LA-ICP-MS zircon U-Pb dating; the results showed that the granite porphyry in D3755-1 $\sim$ (206)Pb/ $\sim$ (238)U age ranged from 400Ma to 407Ma, and the weighted average age was 404.62.9Ma (MSWD=0.094); in PM11-1 $\sim$ (206)Pb/ $\sim$ (238)U age ranged from 413Ma to 424Ma, with a weighted mean age of 418.43.0Ma (MSWD=0.30); in monzonitic granite D1028-1 $\sim$ (206)Pb/ $\sim$ (238)U age ranged from 426Ma to 436 Ma, with a weighted mean age of 434.32.0Ma (MSWD=0.21); in granodiorite D1506-1 $\sim$ (206)Pb/ $\sim$ (238)U age ranged from 434Ma to 439Ma, with a weighted mean age of 437.22.6Ma (MSWD=0.076), suggesting that the crystallization age of the Chaidamushan granite is between 437.2Ma to 404.6Ma i.e. from the Early Silurian to the Early Devonian. The magmatism in the southern margin of the Qilianshan-North Chaidam lasted for a long time (372~473Ma), with multiple stages dated to 450~470Ma, 430~450Ma, 410~430Ma, 400~410Ma, 370~400Ma, amongst which 430~450Ma and 400~410Ma represent the two main peak periods of granite intrusion closely related to the high-pressure or ultra-high pressure metamorphism. The early period (430~470Ma) is a response to the northward subduction of the south-Qilian ocean plate beneath the Qilian block; as the Qaidam block continued to subduct, the Qilian block from the north to the south thrust over the Qaidam block to form a series of continuous magmatic intrusion activities in continent-continent collision zones. The late period (370~430Ma) is a response to the deep subduction plate after the Qaidam block and the Qilian plate collided, were dismantled, and reentered a series of magmatic intrusion activities in the stretching and sliding between different blocks. Spatial distribution of the Saishitengshan and the Aolaoshan in the northern margin of Chaidam represents the early magmatic activity, mainly I-type granite. The Luliangshan-Dachaidan-Xitieshan-Dulan area represents the late magmatic activity and has the characteristics of I- and S-type granites. The Chaidamushan rock mass represents the multi-stage magmatic activity in the southern margin of the Qilian, and is simultaneous with the magmatic activity of the northern margin of the Qaidam Basin.

摘要：祁连南缘柴达木山花岗岩岩体，位于青海省大柴旦镇，岩性主要为似斑状二长花岗岩、花岗斑岩、环斑花岗岩等。本文选择代表性岩石进行了主量元素、微量元素和 LA-ICP-MS 锆石 U-Pb 年代学研究，旨在说明其岩浆成因、构造环境及意义。结果表明，柴达木山岩体 K_2O/Na_2O 比值变化为 1.11~4.41，里特曼指数介于 1.31~2.20，A/CNK 介于 1.06~1.66，地球化学特征显示，柴达木山岩体具有高钾钙碱性、过铝质、高分异 I 型花岗岩特征。在原始地幔标准化的微量元素分布图中，表现出不同程度的富集大离子亲石元素 (LILE) Cs、Pb、K 等和轻稀土元素 (LREE)，相对亏损高场强元素 (HFSE) Y、Yb，具有明显的 Ba、Nb、Ta、Sr、P、Ti 负异常。稀土元素总量为 $207.94 \times 10^{-6} \sim 418.40 \times 10^{-6}$ ，LREE/HREE 稀土元素之比为 5.67~10.29，(La/Yb)_N 比值为 5.88~13.84， δEu 介于 0.09~0.50 显示负异常， δCe 介于 0.99~1.36，Sr/Y 介于 0.87~3.47，Rb/Sr 介于 1.22~15.45，Nb/Ta 介于 0.63~11.88，稀土元素球粒陨石标准化分配型式表现为轻稀土相对富集，重稀土相对亏损的右倾型且 Eu 负异常较明显。选

取其中四个样品进行 LA-ICP-MS 锆石 U-Pb 定年,结果表明花岗斑岩(D3755-1)~(206)Pb/~(238)U 年龄范围为 400Ma~407Ma,其加权平均年龄为 404.62.9Ma(MSWD=0.094);花岗斑岩(PM11-1)~(206)Pb/~(238)U 年龄范围为 413~424Ma,其加权平均年龄为 418.43.0Ma(MSWD=0.30);二长花岗岩(D1028-1)的~(206)Pb/~(238)U 年龄范围为 426Ma~436Ma,其加权平均年龄为 434.32.0Ma(MSWD=0.21);花岗闪长岩(D1506-1)的~(206)Pb/~(238)U 年龄范围为 434Ma~439Ma,其加权平均年龄为 437.22.6Ma(MSWD=0.076),暗示柴达木山岩体的结晶年龄至少为 404.6Ma~437.2Ma,形成的地质时期为早志留世-早泥盆世。祁连南缘-柴北缘早古生代岩浆活动持续时间长(372Ma~473Ma),具有多期次,主要年龄段为 450~470Ma、430~450Ma、410~430Ma、400~410Ma、370~400Ma,其中 430~450Ma、400~410Ma 分别代表了花岗岩类侵入的两个主峰期。早期(430~470Ma)反映了南祁连洋板块向北俯冲于祁连陆块之下,柴达木陆块的继续俯冲,祁连陆块由北向南逆冲到柴达木陆块之上形成了陆陆碰撞带等一系列持续的岩浆侵入活动;晚期(370~430Ma)反映了柴达木陆块与中南祁连板块碰撞后深俯冲板块拆沉-折返及碰撞后造山带上不同块体之间的伸展、滑塌等一系列岩浆侵入活动。在空间分布上,柴北缘赛什腾山-噶崂山代表了岩浆早期活动,主要为 I 型花岗岩;绿梁山-大柴旦地区-锡铁山-都兰一带,代表了岩浆晚期活动,具有 I 和 S 型花岗岩特征。柴达木山岩体代表了祁连南缘岩浆多期活动,与柴北缘岩浆活动具有同时性。

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作者: 吴金华; 刘思雨; 史敏

标题: Evaluation of intensive utilization of cultivated land in Shaanxi province based on network analysis

标题: 基于网络分析法的陕西省耕地集约利用评价

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作者关键词: Analysis Network Process; intensive utilization; Shaanxi Province

作者关键词: 网络分析法; 集约利用; 陕西省

摘要: In the process of determining the weight,the interaction between the indicators is often neglected. In order to increase the scientific rationality of determining the weight,the Analysis Network Process was introduced to determine the weight,and evaluate the intensive utilization degree of cultivated land in Shaanxi province. The results show that the level of intensive use of cultivated land in Shaanxi province was increasing year by year,and the differences of intensive use of cultivated land among cities were obvious. The intensive use of cultivated land in Guanzhong Plain of Shaanxi province was relatively high,while the intensive use of cultivated land in southern Qinba Mountains and Northern Shaanxi Plateau was relatively low. The intensive use of cultivated land in Shaanxi Province was expanded from plain to mountainous area,from center zones such as Xi'an City and Yangling Demonstration to the surrounding areas gradually.

摘要: 为避免在权重确定过程中忽略指标间相互影响的情况,增加权重的科学合理性,文中引入网络分析法确定权重,更加科学地对陕西省耕地集约利用水平进行分析。研究表明陕西省耕地集约利用水平整体提高,城市间耕地利用集约度差异明显;空间上呈现陕西关中平原区耕地利用集约度较高,南部秦巴山区及陕西北部高原区耕地利用集约度较低的特征;陕西省耕地集约利用趋势呈现由平原向山区,以西安市和杨凌示范区为中心,渐次向外扩展的态势。

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标题: Feasibility of hybrid classification models for landslide susceptibility mapping A case of Baota district,Yan'an City

标题: 混合分类模型在滑坡易发性分区中的适用性研究以延安市宝塔区为例

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作者关键词: Loess Plateau; landslide; susceptibility mapping; data mining

作者关键词: 黄土高原; 滑坡; 易发性分区; 数据挖掘

摘要: In order to explore the application of mixed classification model to landslide susceptibility zoning, Baota District of Yan'an was taken as the study area. Firstly,the landslide points were divided into training samples and validation samples according to the ratio of 7 /3. Then a total of 11 external and internal factors were regarded as landslide conditioning factors. The kernel logistic regression model (KLR) was established by using the attribute value of the impact factor as input data. On this basis,the SI-KLR model was constructed with the information quantity (SI) as the input data of the KLR model,and these two classification models were applied for landslide susceptibility mapping in the study area. These two models were then evaluated based on statistical indicators and ROC curves. The results showed that the results obtained by the SI-KLR model and the KLR model had higher credibility,and the AUC values of the SI-KLR model were larger than the AUC values of the KLR model in the training and validation datasets. In conclusion,the hybrid classification model is more suitable for the study of landslide susceptibility mapping in the study area,and also provides a reference for landslide susceptibility research in the study area.

摘要: 为研究混合分类模型在滑坡易发性分区中的应用,文中以延安市宝塔区为研究区,将 316 个滑坡点按 7 /3 的比例分成训练样本和测试样本。选取了共 11 种外因和内因作为滑坡易发性影响因子。首先利用影响因子的属性值作为输入数据建立核逻辑回归模型(KLR),在此基础上以信息量(SI)作为 KLR 模型的输入数据构建 SI-KLR 模型,利用这两种分类模型对研究区进行滑坡易发性分区。随后基于统计学指标和 ROC 曲线对分区结果进行评价。结果表明,基于 SI-KLR 和 KLR 模型所得到的分区结果都有较高的可信度。且在训练样本和测试样本中,SI-KLR 模型的 AUC 值均大于 KLR 模型,说明混合分类模型更适合在研究区开展滑坡易发性分区研究,同时也为该地区的滑坡防治研究提供了参考。

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标题: Study on channel characteristics and differentiation laws of loess hilly and gullied region

标题: 黄土丘陵沟壑区沟道特征及分异规律研究

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作者关键词: channel; channel characteristics; spatial differentiation; loess hilly and gullied area

作者关键词: 沟道; 沟道特征; 空间分异; 黄土丘陵沟壑区

摘要: In order to understand the channel characteristics and differentiation laws of the loess hilly and gullied region more clearly, the Nianzhuanggou Watershed in Yan'an City was taken as the research area, and the GIS-based hydrological and spatial analysis methods were used to calculate the grade, length, dispersion and the gradient characteristics of the channels, and the channel characteristics and their differentiation laws were analyzed at the channel scale and the watershed scale. The results show that the grade, length, dispersion and gradient of the channel characterized with obvious spatial differentiation laws at the channel scale. The higher the channel grade is, the smaller the channel number is, and the larger the channel length is, the smaller the channel gradient is. The channel grade and channel dispersion has no correlation. At the small watershed scale, the maximum channel grade, average channel length, average channel dispersion and average channel gradient of different watersheds have spatial differentiation, but spatial autocorrelation is not obvious.

摘要: 为了更清楚地认识黄土丘陵沟壑区沟道特征及其分异规律,以延安市碾庄沟流域为研究区,采用基于 GIS 的水文分析方法和空间分析方法计算了沟道级别、长度、高差和比降特征,并从沟道尺度和流域尺度分别分析了沟道特征及其分异规律。结果表明:在沟道尺度下,沟道级别、沟道长度、沟道高差和沟道比降 4 种特征具有明显的空间分异规律,沟道级别越高,沟道数量越少,沟道长度越大,沟道比降也越小,而沟道级别与沟道高差无相关性;在小流域尺度下,不同流域的最大沟道级别、平均沟道长度、平均沟道高差和平均沟道比降具有空间分异性,但空间自相关性不显著。

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标题: Petrogenesis and Tectonic Significances of the Late Paleozoic Mafic Dykes in the Beishan Area in Gansu Province

标题: 甘肃北山晚古生代基性岩墙群岩石成因及其构造意义

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作者关键词: the Beishan area in Gansu Province; mafic dyke; geochronology; geochemistry; tectonic setting

作者关键词: 甘肃北山; 基性岩墙; 地质年代学; 地球化学; 构造环境

摘要: In order to probe the petrogenesis and tectonic significances of mafic dykes in the Beishan area in Gansu Province, petrogeochemical and LA-ICP-MS zircon U-Pb geochronological studies of the mafic dykes have been carried out in this paper. LA-ICP-MS U-Pb zircon analysis yield an age of (2854) Ma for diabase, indicating its emplacement in Early Permian. The samples are rich in LREE and LILEs (Rb, U, K, Pb) and poor in HFSEs (Nb, Ta). The analysis of petrogenesis suggests that the mafic dykes could be derived from lithospheric mantle source, metasomatized by subduction-related fluid, which was mainly composed of the phlogopite and spinel-bearing

lherzolite, and was not apparently contaminated by crustal materials during the magma migration, rising and emplacement. Combined with the related tectonic setting discrimination and regional research data, it is believed that the Late Paleozoic mafic dykes in the Beishan area were emplaced in an intraplate extensional setting and the ancient ocean basin of the area was closed earlier than the Early Devonian. The Permian magmatism has a subduction signal, indicating that the metasomatism of early subduction fluids on the lithosphere still had constraint on geochemical characteristics of the magma.

摘要: 为探讨甘肃北山地区晚古生代基性岩墙群的岩石成因及其构造意义, 对该岩墙群岩石进行了锆石 U-Pb 年龄测定和全岩地球化学分析。结果显示, 辉绿岩中锆石 U-Pb 加权平均年龄为 (2854) Ma, 属早二叠世; 岩石富集轻稀土元素和大离子亲石元素 (Rb、U、K、Pb), 亏损高场强元素 (Nb、Ta)。岩石成因分析表明, 基性岩墙的岩浆源区为俯冲流体交代的岩石圈地幔, 主要为含金云母尖晶石二辉橄榄岩, 岩浆在运移和上升侵位过程中未受到明显的地壳混染作用。结合大地构造环境判别和区域研究资料认为, 甘肃北山地区晚古生代基性岩墙群形成于板内伸展环境, 本区域古洋盆于早泥盆世之前闭合。二叠纪岩浆活动带有俯冲消减信号表明, 早期俯冲流体对岩石圈的交代作用仍制约着岩浆的地球化学特征。

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标题: The Fibrous Crystal Growth Driven by Force of Crystallization: Petrographic Evidence of Antitaxial Fibrous Gypsum Veins in the Qingshuiying Formation of the Ningnan Basin

标题: 结晶力驱动纤维状晶体生长: 宁南盆地清水营组背生式纤维状石膏脉体的岩相学证据

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作者关键词: 背生式纤维状石膏脉体; 结晶力; 流体超压; 宁南盆地; 清水营组

摘要: The antitaxial fibrous vein, mainly occurred in the low-permeability mudstone and shale, is a mineral vein with a distinctly elongated crystal morphology. Its formation mechanism still remains controversial. Based on the detailed field and petrographic observations of the antitaxial fibrous gypsum veins in the Qingshuiying Formation of the Ningnan Basin combined with kinematic and dynamic characteristics for the opening and propagation of the fibrous gypsum veins, the formation mechanism of the veins has been studied in this paper. The results show that the single antitaxial fibrous gypsum veins consist of median zone and fibrous zones which have obviously different characteristics, indicating they were formed in different formation mechanisms. The median zone, which is the primary position for vein opening, had filled with blocky gypsum crystals and many host rock fragments and bands, indicating that the median zone of the antitaxial fibrous gypsum vein was formed by the crack-seal mechanism. The fibrous zone is composed of parallel-aligned fibrous gypsum crystals. These gypsum fibres have optical continuity with no obvious growth competition between neighbour crystals, indicating that there is no fracturing in the growing process of gypsum fibres. It is inferred that the force of crystallization could firstly result in the disturbance of local stress field, subsequently result in the deviation of vein tip from the original propagation direction of the vein and then the gradual bending growth of the vein tip toward the adjacent vein, and finally result in the deformation of host rocks in the interaction zone of veins and the difference of thicknesses of various fibrous zones.

摘要: 背生式纤维状脉体是一种发育在低渗透泥岩中具有明显延长晶体形态的矿物脉体, 其成因机制存在争议。通过对宁南盆地清水营组中背生式纤维状石膏脉体详细的野外和岩相学观察, 结合脉体开启和延伸的运动学和动力学特征, 研究了脉体的成因机制。结果显示, 单个背生式纤维状石膏脉体由中间带和纤维状带组成, 二者特征明显不同, 指示不同的生长机制。中间带是脉体开启的原始位置, 充填块状石膏晶体和大量围岩碎片、条带, 表明背生式纤维状石膏脉体的中间带是通过裂开-愈合机制形成。纤维状带由平行对齐的纤维状石膏晶体组成, 单个晶体具有光学连续性, 相邻晶体之间没有明显的生长竞争, 表明纤维状晶体生长过程中没有发生破裂。我们推测是结晶力造成了局部应力场扰动, 使脉体尖端偏离了脉体延伸方向, 并逐渐向相邻脉体弯曲生长, 最终导致了脉体相互作用区域围岩变形和脉体纤维状带厚度差异。

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标题: 回填土质量评价体系和标准研究进展

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作者关键词: 回填土; 质量评价; 标准体系; 评价流程

摘要: The research on the quality standard of backfill in the field of construction has been increasingly going into the depth, but attention has not paid to the concentration of pollutants in backfill in the existing standards, so this problem should be considered in the formulation of relevant standards in the future. The quality standard of backfill in polluted sites is mainly determined by land use. In this paper, the authors mainly determined the quality control of soil reuse after remediation in the aspects of construction land and agricultural land, and provided suggestions for the establishment of quality standard of backfill in polluted sites. Sludge land use is mainly divided into four aspects: landscaping, land improvement, agriculture and forestry. At present, there is no evaluation standard for backfill quality of special mine both in China and abroad, and the relevant index system has not been formed. The authors focused on the analysis of mine backfill types and quality evaluation indicators, mainly from the type of land reclamation, backfill soil nature and the aspect of backfilling depth, and hold that avoiding geological disasters and preventing the spread of pollutants constitute the core of mine backfill quality control. At the same time, the authors preliminarily established the process of evaluating the quality of backfill soil in mines based on the existing relevant standards and norms, in order to provide a theoretical basis for the establishment of the quality standard of backfill in mine and provide reference for the formulation of the relevant backfill standards in the future.

摘要: 在建筑施工领域回填土的质量标准研究已较深入,但现有标准中未关注到回填土污染物浓度问题,在今后相关标准制定中需对其加以考虑。污染场地中回填土的质量标准主要由土地用途决定,本文主要从建设用地和农业用地两方面对修复后土壤再利用的质量控制进行厘定,为污染场地回填土的质量标准建立提供建议。污泥土地利用可大致分为园林绿化、土地改良、农用和林地 4 种类型,不同土地利用的质量评价指标也有所不同。有关矿山回填土的质量标准研究缺乏,从土地复垦类型、回填土性质、回填深度等方面初步建立矿山回填土的质量控制标准,认为避免地质灾害和预防污染物扩散是矿山回填土质量控制的核心,同时利用现有相关标准和规范,初步建立矿山回填土质量评价流程,为矿山回填土质量标准建立提供理论基础,为今后相关回填土标准的制定提供借鉴。

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标题: Built-up area detection from high resolution remote sensing images using geometric features

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作者关键词: 高分辨率遥感影像; 几何特征提取; 建筑区域检测; Gabor 变换; 张量投票; 概率密度场; 高分二号

摘要: Based on characteristic of High Spatial Resolution (HSR) image, an adaptive local geometric invariant feature extraction method based on Gabor transform and Tensor Voting (TV) is proposed and applied to building area extraction from HSR remote sensing images. First, image geometric features are analyzed. Second, the feasibility of extracting built-up area using local feature points and probability density estimation are determined. This study provides specific methods and steps. First, considering the abundant geometric features of high spatial resolution remote sensing images, multi-scale and multi-direction Gabor filter banks are adopted in detecting the singularity of images contain building area. In order to extract edge information of buildings, only real part Gabor coefficients are used. Meanwhile, we also measured the influence of Gabor kernels of different size on geometric feature extraction experiments, and the optimal scale parameter intervals for geometric feature extraction of remote sensing images with different spatial resolutions are thus determined. Second, it is a fact that the response of Gabor filter at each pixel is a measure for orientation certainty, thus, we introduce the orientation tensor which represents an ideal direction in the direction of the unit vector perpendicular to frequency. By weighting the orientation tensor with Gabor coefficients and summing over it to complete the information fusion, the resulting tensor gives an estimate for local orientation and orientation

uncertainty at image position. The tensors are then used as an initial estimate for global context refinement using tensor voting and the points are classified based on the their likelihoods of being part of a feature type, non-maximal suppression is used to extract geometric features. A key advantage of combining the Gabor filtering and tensor voting is that it eliminates the need for any thresholds therefore removing any data dependencies. In order to achieve a reliable extraction of local invariant feature such as corners from built-up area, three criterions are further proposed to refine the first stage result. Finally, each local building corner indicates a building be detected in image. However, only one of them is not sufficient alone to detecting a building. In fact, the more local points a buildings has, the more probable its detection becomes. Based on that fact, a probability density estimate method is generated to describe the probability that the pixel belongs to the building area, and the Otsu method is used to automatically extract the polygon area of the residential area. Experiments were carried out using image data sets such as Google and GF-2 with resolution higher than 1 meter, results showing that the proposed method can achieve higher accuracy in building area detection compared with the state-of-the-art corner detection algorithm such as Harris corner and High-speed corner detect method.

摘要: 及时准确地获取城市建筑区域的空间分布及其变化信息对于城市规划、空间地理数据库建设及区域社会经济分析具有重要意义。本文提出一种基于多尺度 Gabor 变换和感知聚类方法即张量投票 TV(Tensor Voting)相结合的自适应局部几何不变特征检测方法,并将其应用于高空间分辨率遥感影像建筑区域提取。首先,考虑到高分辨率遥感影像复杂的几何结构特征,使用 Gabor 滤波器组对影像进行多尺度多方向变换检测奇异性特征。然后,在感知聚类框架下,根据张量投票理论将不同方向子带系数位置编码为相应的二阶对称方向张量,为了突出影像几何特征,对不同尺度、不同方向子带中任意像素位置方向张量使用滤波器响应系数加权并求和完成多尺度特征融合。再次,对张量特征分解得到点结构与线结构显著性图并使用非极大抑制提取相应角点和曲线等局部几何特征,同时生成约束准则筛选角点以确定建筑物坐标。最后,利用概率密度估计结合局部角点特征生成全局概率密度场描述影像中像素从属于建筑目标的概率,并使用最大类间方差法(Otsu)阈值分割自动提取居民地多边形区域。使用分辨率分别为 0.49 m、0.98 m 的 Google Earth 及 0.8 m 的高分二号等影像数据集进行实验,实验结果表明本文方法相对于已有的 Harris 和 HSCD 点检测算法,在建筑区域提取质量上(Quality)上分别提高了 4.79%,5.96%;1.47%,3.76%和 1.91%,4.08%。

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作者: Liang Yihang; Zhen Lin; Hu Yunfeng; Yan Huimin; Zhang Changshun

标题: Analysis of the Food Consumption Mode and Its Influencing Factors in Kazakhstan

标题: 哈萨克斯坦食物消费模式及影响因素分析

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作者关键词: food consumption; consumption mode; supply; consumption habits

作者关键词: 食物消费; 消费模式; 供给; 消费习惯

摘要: The excessive influence of human activity has highlighted the dilemma between maintaining a stable ecosystem while satisfying consumer demands for food. Kazakhstan has ecological problems caused by the conflict between humans and the land, grasslands and raising livestock. Therefore, this study of the food consumption modes in Kazakhstan aims to improve the sustainability of food consumption while maintaining the integrity of the ecosystem. Based on the data of food consumption in Kazakhstan in 2012 and 2016, and through the delineation of consumption modes and the analysis of their changes, this study found three very different food consumption modes in Kazakhstan—one dominated by milk and cereals; one by milk, cereals and meat; and one by milk, cereals, meat, vegetables and fruit. These three modes were distributed separately in the northern, central and southern regions of Kazakhstan, respectively. It is worth noting that food consumption in Kazakhstan is developing into a pattern of milk, cereals and meat. Confronted with the different food consumption modes and their tendencies toward variations, the basic theories of food production need to be revised, and the exchange of information and cooperation between the different regions of Kazakhstan and relevant interests abroad should be encouraged in order to increase the well-being of local consumers.

摘要: 人类对生态系统的过度利用使得维持生态系统服务功能和食物消费需求间的矛盾日益突出。哈萨克斯坦作为全球生态问题最突出的国家之一,人地、草畜矛盾非常严峻。因此,探究哈萨克斯坦食物消费模式及影响因素,进而提高食物消费可持续性、维持生态系统服务功能显得尤为重要。本文以2012年、2016年哈萨克斯坦食物消费数据为基础,通过对消费模式的划分及其变化分析,得到了以下主要结论:受消费习惯、食物供给和社会经济发展影响,哈萨克斯坦存在三种食物消费模式,分别为以奶、谷物消费为主的模式,以奶、谷物和肉类为主的模式,以奶、谷物、肉类、蔬果消费为主的模式,三种消费模式特征差异明显,分别分布在

哈萨克斯坦的北、中、南地区;值得注意的是,哈萨克斯坦的食物消费有向以奶、谷物和肉类为主的模式变化的趋势。面对不同的食品消费模式及其变化趋势,政府可通过转变食物生产观念、加大国内外区域间交流合作来增加当地居民的福祉。

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标题: A study of S isotope and REE geochemistry of Batebakebulake iron deposit in Altay, Xinjiang, and their geological significance

标题: 新疆阿尔泰巴特巴克布拉克铁矿床硫同位素和稀土元素地球化学特征及其意义

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作者关键词: 地球化学; 铁矿床; 矽卡岩; 硫同位素; 稀土元素; 巴特巴克布拉克; 阿尔泰

摘要: The Batebakebulake iron deposit in the Altay Orogenic Belt of Xinjiang is hosted in the metamorphosed volcano- sedimentary sequence of the Upper Silurian-Lower Devonian Kangbutiebao Formation. Orebodies occur as stratoid, lenticular and irregular forms, and their distribution is spatially associated with skarns. The REE geochemical characteristics show that the wall rocks (amphibolite, leptynite, leucoleptite) in the ore district have similar chondrite-normalized REE patterns which show enrichment of LREE, similar to those of the tonalite, suggesting that wall rocks have a clear genetic link with the tonalite. In addition, most of the ores and skarns have similar chondrite-normalized REE patterns which show enrichment of HREE. The $\delta^{34}\text{S}$ values of sulfides range from 1.4 to 4.8, with an average of 3.57. The S isotopic data, together with REE geochemical characteristics, indicate that the metallogenic material was derived from the basic volcanic rocks. The skarn probably resulted from the interaction of post-magmatic hydrothermal fluids with volcanic rocks, and the formation of magnetite was associated with the retrogressive metamorphism of the skarn. The deposit was formed in a weak reducingoxidizing environment.

摘要: 新疆阿尔泰巴特巴克布拉克铁矿床赋存于上志留统下泥盆统康布铁堡组变质火山-沉积岩的矽卡岩中,矿体形态复杂,呈似层状、透镜状及不规则状分布。围岩斜长角闪岩、变粒岩和浅粒岩稀土元素配分模式为轻稀土元素相对富集的右倾型,与矿区英云闪长岩稀土元素配分模式相似;矿石和矽卡岩稀土元素配分模式多表现为重稀土元素相对富集的左倾型,综合了围岩和英云闪长岩二者的特征,表明它们之间有明显的成因联系。结合硫同位素特征(1.4~4.8)表明,成矿物质来源于基性火山岩(围岩)。矽卡岩为花岗质岩浆期后热液交代火山岩的产物,铁矿化是矽卡岩退化蚀变的产物,矿床形成于弱还原-氧化环境。

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经济与管理学院

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标题: Measuring the Capacity Utilization of China's Transportation Industry Under Environmental Constraints

标题: 环境约束下中国交通运输业产能利用测算

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作者关键词: traffic engineering; integrated transportation; difference method; capacity utilization; transportation industry; environmental constraints

作者关键词: 交通工程; 综合交通运输; 差分法; 产能利用; 交通运输业; 环境约束

摘要: Measuring the capacity utilization of the transportation industry can help it solve the challenges of capacity optimization, energy saving, and emission reduction, thereby achieving high-quality development. This study aims to construct a universal capacity utilization evaluation framework under environmental constraints and to measure the capacity utilization of the transportation industry accordingly. This study incorporated energy consumption and CO₂ emissions from the transportation industry into the evaluation framework. In particular, improved data envelopment analysis-based (DEA-based) difference methods were used to measure the capacity utilization of China's transportation industry in 2011-2017. The results thus obtained indicate the following: ① The average CU value of China's transportation industry from 2011 to 2017 was 0.026 0. Specifically, it showed a decreasing trend first after which it increased; here, 2014 was the critical point. This shows that China's transportation industry has been underutilizing its capacity, especially in the past three years. ② Regional differences in the CU levels in the transportation industry are significant. During the study period, compared with the CU levels in other regions of China, the issue of the underutilization of capacity in southwestern China was highly concerning. ③ A comparison with the measurement results obtained using the generalized CU indicator method illustrates the rationality and superiority of the proposed method. ④ Promoting innovation and development in transportation technology and rationally planning transportation resources are the key ways to improve the status of capacity utilization. This paper

provides a basis for the formulation of a scientific and effective promotion policy for capacity utilization in the transportation industry and has practical guiding significance for the establishment of a sound monitoring system for capacity utilization in the transportation industry. This is conducive to the overall improvement of the production capacity utilization level of China's transportation industry.

摘要: 测度交通运输业产能利用可帮助交通行业应对产能优化和节能减排的双重挑战,实现高质量发展。研究旨在环境约束视角下,构建一个普适性的产能利用(CU)评价框架,并用于交通运输业产能利用测度研究。将交通运输业能源消耗量和 CO₂ 排放量纳入产能利用评价框架,采用改进的基于数据包络分析的差分法,测度 2011~2017 年中国交通运输业产能利用。研究表明:①2011~2017 年间中国交通运输业平均 CU 值为 0.026 0,并以 2014 年为临界点,呈现先降后增的趋势,这表明中国交通运输业确实存在产能利用不足的问题,且 2015~2017 年非常严重;②交通运输业产能利用水平区域差异化显著,研究期内与中国其他地区的 CU 水平相比,西南地区产能利用不足问题最严重;③与原始差分法的测度结果进行对比,所提出的改进方法更具合理性和先进性;④推动交通技术创新发展和合理规划交通资源是产能利用水平提升的关键途径。该研究为制定交通运输业产能利用提升的政策提供科学依据,对建立完善的交通运输业产能利用监测体系具有实际指导意义,有利于实现中国交通运输业产能利用水平整体的提升。

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标题: Analysis of Service Policies with Preference Heterogeneity Customers Based on Queuing System

标题: 基于排队系统的偏好差异性顾客服务策略分析

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作者关键词: service operation; service rate; M/M/1 queuing model; heterogeneous customer; pricing

作者关键词: 服务运作; 服务速度; M/M/1 排队模型; 差异性顾客; 定价

摘要: In the queuing system where service providers provide differentiated services to customers with different preferences, the profits are affected by factors such as demand scale and customer type. How to develop a policy to achieve the goal of serving a specific type of customer and obtaining the maximum profits? Based on customer intensive services in which service time and effectiveness are positively related, this paper studies the scenario where the service provider provides two services for two customers with different preferences on the basis of M/M/1 model, and classifies customers into type 1 and type 2 according to the low and high effects obtained from the preference service. The results show that, ① As the potential customers arriving rate increases, the three basic policies applied to the optimal policy are, in order, the fair policy, the providing of priority service for type 2 customer policy, and the providing of exclusive service only for type 2 customer policy; ② The scope of application of the three basic policies is related to the service selection criteria of the type 1 customers; ③ In the policy of providing priority service for certain type customers, the effective arrival rate and service rate are determined by the characteristics of the other type of customers.

摘要: 在服务商为不同偏好顾客提供差异性服务的排队系统中,其收益受到需求规模、顾客类型等因素影响,如何制定策略才能达到服务特定类型顾客并获取最大收益的目的?本文以服务时间与效果正相关的顾客密集型服务为背景,基于 M/M/1 模型对服务商为两种偏好顾客提供两种服务的情景进行研究,并将从偏好服务所获基准效用相对较低、较高的顾客分别定义为 1 类、2 类顾客。结果表明,①随着潜在顾客规模的增加,最优策略所适用的 3 种基本策略依次为公平策略、优先服务 2 类顾客的策略以及仅服务 2 类顾客的排他性策略;②3 种基本策略的适用范围仅与 1 类顾客的服务选择标准相关;③在优先服务某类顾客的策略中,有效到达速率及服务速度由另一类顾客的特征决定。

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第 3 条, 共 4 条

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标题: Study on willingness to pay and preference of ecological compensation for residents in the midstream and downstream of the Weihe watershed based on choice experiment method

标题: 基于选择实验法的流域中下游居民生态补偿支付意愿及其偏好研究以渭河流域为例

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文献类型: Article

作者关键词: watershed ecological compensation; willingness to pay; preference; choice experiment

作者关键词: 流域生态补偿; 支付意愿; 偏好; 选择实验法

摘要: In the establishment of watershed ecological compensation mechanism, the willingness and behavior of ecological compensation of relevant stakeholders is essential to the management and execution of policies. This article uses choice experiment to examine the willingness to pay (WTP) of the residents in the midstream and downstream of Weihe watershed. We empirically analyzed the WTP of urban and rural residents and the respondents' preferences by the Mixed Logit model. The results showed that the choice of urban and rural residents was positively affected by water quality, river area /water, soil and water loss situation, and the animal species /quantity, while negatively affected by payments. Secondly, the urban and rural residents had the highest willingness to pay for the property of water quality, the second highest willingness to pay for the property of river area /water volume, and the lowest willingness to pay for the property of animal species /number. Finally, the average WTP of the urban and rural residents was respectively 13.168 yuan /month / person and 9.050 yuan /month /person. The former WTP was significantly higher than the latter.

摘要: 在流域生态补偿机制的建设中, 相关利益主体的生态补偿意愿和行为的分析对政策的管理和执行至关重要。运用选择实验法对渭河流域中下游居民的支付意愿进行考察, 通过构建 Mixed Logit 模型对城乡居民的支付意愿及其偏好进行实证分析。研究发现, 城镇和农村居民的选择显著受到水质、河流面积/水量、水土流失情况、动物种类/数量这 4 个属性变量的正向影响, 支付金额的负向影响; 其次, 城镇和农村居民对水质这一属性具有最高的支付意愿, 对河流面积/水量这一属性具有次高的支付意愿, 而对动物种类/数量这一属性具有最低的支付意愿; 最后, 城镇和农村居民的平均支付意愿分别为 13.168 元月⁻¹人⁻¹和 9.050 元月⁻¹人⁻¹, 前者的支付意愿明显高于后者。

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第 4 条, 共 4 条

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标题: Antioxidation of Edible Rose from Different Producing Areas and Varieties

标题: 不同产地不同品种食用玫瑰抗氧化研究

来源出版物: 西南农业学报 卷: 33 期: 10 页: 2215-2219 出版年: 2020

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文献类型: Article

作者关键词: Edible rose; Antioxidant capacity; Different rose varieties

作者关键词: 玫瑰; 抗氧化; 不同品种

摘要: **【Objective】**The present paper aimed to know the antioxidant capacity of different kinds of edible rose in different places. **【Method】** The polyphenol content,MDA content and enzyme activity of antioxidant enzyme system of three kinds of edible rose buds in Anning of Kunming,Wuding of Chuxiong and Malong of Qujing were measured and analyzed in this study.

【Result】 The results showed that the self heredity of different varieties and the average annual sunshine duration had great effects on the antioxidant capacity of edible rose. The antioxidant capacity of Bajie rose was the strongest among the three kinds of edible rose,and the annual sunshine duration was positively correlated with the antioxidant capacity of edible rose.

【Conclusion】 The genetic characteristics of rose were the main factors affecting the polyphenol content and antioxidant capacity of different rose varieties. The average annual sunshine duration was also the main factor affecting the antioxidant capacity of rose. The higher the average annual sunshine hours,the stronger the antioxidant capacity of rose.

摘要: **【目的】** 为了解不同产地不同品种食用玫瑰的抗氧化能力。**【方法】** 对昆明安宁、楚雄武定、曲靖马龙的 3 个不同食用玫瑰的玫瑰花蕾多酚含量、丙二醛(MDA)含量和抗氧化酶系统超氧化物歧化酶(SOD)、过氧化物酶(POD)和过氧化氢酶(CAT)的酶活性进行测定分析。

【结果】 不同品种的自身遗传性和年均日照时数对食用玫瑰花的抗氧化能力影响较大,在研究的 3 个品种中安宁八街玫瑰品种的抗氧化能力最强,年均日照时数与食用玫瑰花品种抗氧化能力呈正相关。**【结论】** 玫瑰自身遗传性状是影响不同品种玫瑰多酚含量和抗氧化能力的主要因素。年均日照时数也是影响玫瑰花抗氧化能力的主要因素,年均日照时数越高,玫瑰花

抗氧化能力越强。

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理学院

第 1 条, 共 21 条

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标题: Mechanism of bubble sinking in vertically vibrating water

标题: 垂直振动水柱中气泡下沉机理

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作者关键词: vertical vibration; bubble sinking; stable oscillation; Basset force

作者关键词: 垂直振动; 气泡下沉; 稳定振荡; Basset 力

摘要: When a container filled with water is subjected to vertical vibration, bubbles in the water may sink. This phenomenon exists widely in the field of engineering, and has a non-negligible influence on aerospace engineering and ship engineering. Therefore, it is of great significance to study the movement of bubble sinking in order to reduce the adverse effect caused by bubble sinking in the project. In previous papers, the effect of Basset force on bubble motion was usually ignored. In this paper, the bubble motion model based on the ideal gas equation is built for spherical bubbles, and the influence of the Basset force on the bubble motion is considered in the model. In

the process of solving Basset force, the motion is directly separated and the convergence factor is introduced in theoretical solution. The equal step composite trapezoid formula is applied to the numerical solution. The results of numerical calculation show that the added mass force is important for bubble sinking. We find that the Basset force has no effect on the stable oscillation position of bubble, but it can accelerate the later trajectory of bubble motion. Importantly, we demonstrate that the bubble is hindered by the following component forces: buoyancy, viscous resistance, and flow thrust (which are ordered from large to small value). The movement of the bubble is observed to be in the form of oscillation, and there exists a depth, i.e. a critical depth: the bubble oscillate steadily at this depth, specifically, the bubble rises above this depth and sinks below this depth. When the vibration pressure changes, the location of the bubble's stable oscillation will also be affected. The origin can be ascribed to the change of added mass force caused by the change of vibration pressure. Meanwhile, on the basis of digital image processing method, denoising, filtering, local stretching, image binarization and image filling are used to extract the characteristic dimension of bubbles. The theoretical value of the critical depth of bubble sinking matches the experimental result and their relative error is less than 5%. These new findings enrich the understanding of the moving bubbles in liquid materials used in nuclear reactors, rocket propulsion fuels and chemical experiments.

摘要: 对装有水的容器施加垂直振动, 水中的气泡可能出现下沉的现象. 针对球形气泡构建了基于理想气体方程的气泡运动学模型, 该模型考虑了 Basset 力对气泡运动的影响. 观察到气泡的运动呈振荡形式, 存在一个临界深度, 气泡在临界深度时稳定振荡, 在临界深度以上时上升, 在临界深度以下时下沉. 采用分离气泡运动和引入收敛因子的方法对 Basset 力进行理论求解, 并通过等步长复合梯形公式对 Basset 力进行数值求解. 模型的数值模拟结果表明: 附加质量力是气泡下沉的关键因素, 而 Basset 力对气泡下沉的临界深度和气泡下沉的前期轨迹无明显影响, 但对气泡下沉的后期轨迹有较大影响. 采用去噪、二值化、填充图像等数字图像处理的办法提取气泡的特征尺寸, 可提高实验参数测量的准确性, 使气泡下沉的临界深度与理论值相匹配.

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标题: Theoretical and numerical simulation investigations on axial energy absorption character of thin-walled multi-cell tube

标题: 基于理论和数值模拟的薄壁多胞管轴向吸能特性研究

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作者关键词: thin-walled multi-cell tube; energy absorption; axial loading; mean crushing force

作者关键词: 薄壁多胞管; 吸能; 轴向荷载; 平均压溃力

摘要: Based on the simplified super folding element (SSFE) theory and constitutive element (CE) method, a theoretical model was proposed to predict mean crushing force of polygonal thin-walled multi-cell tube. The deformation modes and energy absorption character of square, hexagon and octagon thin-walled multi-cell tube with inner panels were obtained by using numerical simulation under quasi-static axial compression. The results show that theoretical predictions and numerical simulation are in good agreement with previous experimental results. The energy absorption character of polygonal thin-walled multi-cell tube can be improved by adding inner panels. The improvement of specific energy absorption of square, hexagon and octagon thin-walled multi-cell tube with cruciform panel is greater than that of the tube with X-shaped panel, and increases by 68.936%, 17.725% and 15.297%, respectively. The normalized mean crushing force is related to effective crushing distance factor and width-thickness ratio, and increases with the increase of width-thickness ratio. The normalized mean crushing force of the multi-cell tube is higher than that of the corresponding single-cell tube.

摘要: 基于简化的超折叠单元理论和基本单元法, 提出了一种预测多边形薄壁多胞管平均压溃力的理论模型, 并通过数值模拟得到了内部添加肋板的四、六、八边形薄壁多胞管在准静态轴向压缩过程中的变形模式和吸能特性。结果表明: 理论预测和数值模拟与以往的实验结果吻合较好。在内部添加肋板可显著提高多边形薄壁管的吸能特性, 四、六、八边形管内部添加十字型肋板比添加 X 型肋板的薄壁多胞管的吸能能力提高更多, 比吸能分别提升了 68.936%、17.725% 和 15.297%。正则化平均压溃力与有效压缩距离因子和边厚比有关, 且随

着边厚比的增大而增大。多胞管的正则化平均压溃力高于对应的单胞管。

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标题: A Theoretical Study of 8-Azaguanine Radical Cation Deprotonation

标题: 理论研究 8-氮杂鸟嘌呤自由基阳离子脱质子反应

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作者关键词: 8-azaguanine; one-electron oxidation; deprotonation reaction; potential energy surface

作者关键词: 8-氮杂鸟嘌呤; 单电子氧化; 脱质子反应; 势能面

摘要: Due to the lower redox potential comparing with guanine, it is the 8-azaguanine (8-AG) as the hole trap to form 8-azaguanine radical cation (8-AG $\cdot^+$) after one-electron oxidation of DNA containing 8-azaguanine. In generally, the 8-AG $\cdot^+$ may suffer from deprotonation to generate 8-AG(-H) $\cdot$. In this text, we were stimulated to investigate the deprotonation reaction of 8-AG $\cdot^+$ generating by one-electron oxidation at M06-2X/6-31+G(d) level with explicit water molecules and polarized continuum model (PCM) to simulate the solvent effect. By building deprotonation model with different number of explicit water molecules, we found that these four water molecules locating around N(1)H, O(6), N(2)H of 8-AG $\cdot^+$ as well as the one locating in the second water shell which was hydrogen-bonding with the water around O(6) were necessary. If the water in the second water shell was not included, the imino proton (N(1)H) would not transfer into the bulk water. In parallel, the N(1)H would transfer to the O(6) of 8-AG $\cdot^+$ by

intramolecular proton transfer. If the water molecule locating around N(2)H was removed, the 8-AG $\cdot\sim$ + deprotonation would continue but the energy barrier would be lowered from 24.8 kJ/mol to 16.3 kJ/mol. In addition, the site of the water molecule in the second water shell was also studied. If putting the water in the second water shell around N(2)H of 8-AG $\cdot\sim$ +, the proton would be stabilized between the N(1) of 8-AG $\cdot\sim$ + and the oxygen of water molecule around N(1)H meaning the proton would not be transferred into bulk water. Further, in order to test the influence of water number on 8-AG $\cdot\sim$ + deprotonation, the fifth water molecule, which is hydrogen-bonding with the water molecule around N(2)H and another N(2)H, was added. The potential energy surface with 5H₂O revealed that it is almost no effect on the deprotonation pathway and energy barrier (25.5 kJ/mol). Lastly, so as to obtain the exact energy barrier of 8-AG $\cdot\sim$ + deprotonation, the deprotonation model with more explicit water molecules (9H₂O) was proposed, where the additional water molecules were placed around N(2)H, N(3), O(6), N(7) and N(8). From the potential energy surface, the deprotonation energy barrier of 8-AG $\cdot\sim$ + was confirmed to be 19.5 kJ/mol. These theoretical results provide valuable dynamics information and mechanistic insights for further understanding the properties of nucleic acid base analogues and one-electron oxidation of DNA.

摘要: 由于 8-氮杂鸟嘌呤(8-AG)的氧化还原电势比鸟嘌呤(G)更低,所以单电子氧化嵌有 8-AG 的 DNA 后,空穴最终会被 8-AG 捕获形成 8-氮杂鸟嘌呤自由基阳离子(8-AG $\cdot\sim$ +)。因为酸性的急剧增强,8-AG $\cdot\sim$ + 一般会发生脱质子反应。在本工作中,在 M06-2X/6-31+G(d)理论水平,使用显性水分子和连续溶剂化模型模拟 8-AG $\cdot\sim$ ++ 的溶剂化效应,对其脱亚氨基质子(N(1)H)反应进行了研究。发现位于 8-AG $\cdot\sim$ ++ 中 N(1)H、O(6)、N(2)H 附近以及在 O(6)水分子附近稍微远离 8-AG $\cdot\sim$ ++ 的 4 个水分子会对 8-AG $\cdot\sim$ ++ 脱质子反应产生重要影响,质子从 8-AG $\cdot\sim$ ++ 传递到溶液中具有方向性;最后,通过进一步在 N(2)H、N(3)、O(6)、N(7)和 N(8)等位点附近添加水分子(9H₂O)得到了更加精确的 8-AG $\cdot\sim$ ++ 脱质子反应能垒(19.5 kJ/mol)。

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第 4 条, 共 21 条

作者: Fang Shu; Zhang Tailei; Li Zhimin

作者: 方舒; 张太雷; 李志民

标题: Stochastic model of heroin drug dissemination with psychological effects

标题: 一类具有心理效应的海洛因毒品传播随机模型

来源出版物: 山东大学学报. 理学版 卷: 55 期: 1 页: 12-22 出版年: 2020

文献号: 1671-9352(2020)55:1<12:YLJYXL>2.0.TX;2-Y

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文献号: 1671-9352(2020)55:1<12:YLJYXL>2.0.TX;2-Y

文献类型: Article

作者关键词: stochastic model; oscillating behavior; persistence; extinction

作者关键词: 随机模型; 振荡行为; 持续性; 灭绝性

摘要: In this paper, considering the relapse of heroin addicts, we establish a stochastic model with psychological effects for the transmission of heroin drugs. The existence of global unique positive solutions of the model is proved by using stopping time theory. When the basic reproduction number of the corresponding deterministic model is equal or less than 1, the heroin-free propagation equilibrium point of the stochastic model is globally randomly asymptotically stable. It shows that the solutions of the stochastic model oscillates near the corresponding deterministic model heroin propagation equilibrium point when the basic reproduction number of the deterministic model is greater than 1. Sufficient conditions are obtained for the average persistence of solutions and the extinction of drugs. Finally, the numerical simulation further shows the dynamic behavior of the model.

摘要: 考虑海洛因吸食者的复吸性, 针对海洛因毒品传播建立了一类具有心理效应的随机模型。利用停时理论, 分析了模型全局唯一正解的存在性。当对应的确定性模型基本再生数小于等于 1 时, 随机模型的无海洛因传播平衡点是全局随机渐近稳定的; 当对应的确定性模型基本再生数大于 1 时, 随机模型的解围绕确定性模型海洛因传播平衡点进行振荡, 并得到模型的解平均持续存在和导致毒品灭绝的充分条件。最后, 数值模拟进一步显示了模型的动力学行为。

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第 5 条, 共 21 条

作者: Wang Hu; Chen Xiang; Wang Ya

作者: 王虎; 陈翔; 王雅

标题: Mechanical Analysis of Viscoelastic Pavement under the Condition of Interlayer Contact

标题: 层间接触条件下黏弹性铺装层力学分析

来源出版物: 重庆交通大学学报. 自然科学版 卷: 39 期: 7 页: 66-72 出版年: 2020

文献号: 1674-0696(2020)39:7<66:CJJCTJ>2.0.TX;2-Z

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文献号: 1674-0696(2020)39:7<66:CJJCTJ>2.0.TX;2-Z

文献类型: Article

作者关键词: bridge engineering; deck pavement; box girder; interlayer contact; viscoelastic; finite element analysis

作者关键词: 桥梁工程; 桥面铺装; 箱梁; 层间接触; 黏弹性; 有限元分析

摘要: In order to analyze the stress of viscoelastic pavement under the condition of interlayer contact, the finite element analysis model was established by taking the simply supported box girder bridge as an example. And the mechanical response of pavement under different asphalt layer thickness, different bond layer thickness and different contact cohesive force was analyzed under horizontal impact load. The results show that under the condition of interlayer contact, the maximum value of lateral stress of pavement layer appears at the edge of load area, and the minimum value appears at the center of load area. Increasing the thickness of asphalt layer will increase the longitudinal tensile stress of asphalt layer, but it can improve the appearance of unstable ruts. Increasing the thickness of the bond layer will reduce the longitudinal and transverse tensile stress of the pavement layer, but it has little effect on other stresses and deformation of the pavement layer. The change of contact cohesion between asphalt layer and bond layer has little influence on the stress. When the cohesion is greater than 0.01 MPa, the stress of each layer remains unchanged.

摘要: 为了分析黏弹性铺装层在层间接触条件下的应力情况,以简支箱梁桥为例建立了有限元分析模型,通过水平冲击荷载加载,分析了在不同沥青层厚度、不同黏结层厚度以及不同接触黏聚力下铺装层的力学响应。结果表明:在层间接触条件下,铺装层横向位置应力最大值出现在荷载区域边缘,最小值则出现在荷载区域中心;增加沥青层厚度会增大沥青层纵向拉应力,但是能改善路面失稳型车辙的出现;增加黏结层厚度会减小铺装层纵横拉应力,但是对铺装层其它应力以及变形影响较小;沥青层与黏结层间接接触黏聚力的改变对应力影响较小,当黏聚力大于 0.01 MPa 时,各层受力均保持不变。

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第 6 条, 共 21 条

作者: Wang Hui; Wang Le; Tian Runze

作者: 王慧; 王乐; 田润泽

标题: STRUCTURAL DAMAGE DETECTION USING CORRELATION FUNCTIONS OF TIME DOMAIN VIBRATION RESPONSES AND DATA FUSION

标题: 基于时域响应相关性分析及数据融合的结构损伤检测研究

来源出版物: 工程力学 卷: 37 期: 9 页: 30-37,111 出版年: 2020

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文献类型: Article

作者关键词: structural damage detection; time domain vibration response; correlation analysis; inner product vector (IPV); cross correlation function amplitude vector (CorV); data fusion

作者关键词: 结构损伤检测; 时域振动响应; 相关性分析; 内积向量; 互相关函数幅值向量; 数据融合

摘要: Structural damage detection techniques using time domain vibration responses are of interests in structural health monitoring. Two structural characteristic vectors (SCVs) defined by cross correlation functions of time domain vibration responses, i.e. inner product vector (IPV) and cross correlation function amplitude vector (CorV), as well as the corresponding damage detection technique are reviewed. In order to utilize more information in the correlation functions, the two SCVs are then generalized to several derived SCVs, and the damage detection procedure using data fusion technique with these SCVs is also proposed to enhance the accuracy of the damage detection results. The damage detection results of an experimental 8-storey shear frame structure show that the small damage in the frame structure can be located by the proposed method.

摘要: 基于时域振动响应的结构损伤检测方法因其便于实现在线监测受到了越来越多的关注。该文回顾了两种利用时域响应相关函数建立的结构特征向量(即内积向量及互相关函数幅值向量)及其对应的损伤检测方法。为了从时域响应相关函数中提取更多的结构健康信息,通过利用不同的结构响应组合,将上述两种结构特征向量扩展到了多种结构特征向量,并进一步采用数据融合理论,提出了检测精度更高的结构损伤检测方法。针对 8 层框架结构损伤检测的试验研究结果表明,该文方法可以对框架结构上的微小损伤进行定位。

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作者: 徐世强; 王明山; 李杰; 胡耀洲; 任洪远

标题: Main Influencing Factors of Dust Removal Efficiency by Negative Ionization in Tunnel Construction

标题: 施工隧道负离子除尘效率的主要影响因素

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文献类型: Article

作者关键词: tunnel engineering; dust particles; negative ion; numerical simulation; field test

作者关键词: 隧道工程; 粉尘颗粒; 负离子; 数值模拟; 现场试验

摘要: In order to study the influence of dust particle size, particle concentration, ventilation velocity, the working voltage of a negative ion system and its longitudinal installation position on the dust removal efficiency of the negative ion system in tunnel construction, a three-dimensional model of tunnel and negative ion system is established and the tunnel calculation parameters are selected according to investigation and measurement for numerical simulations. The RNG $k-\epsilon$ dual equation turbulence model is used to solve the current field by the momentum equation with electric field force source term. The trajectory of dust particles is solved by Lagrange method. The SIMPLE (semi-implicit method for pressure linked equations) algorithm is used to simulate the coupling between discrete and fluid phases of electric field, flow field and particle motion. In addition, field tests in the tunnel were carried out to verify the accuracy of the simulation results. The results show that the dust removal efficiency of the negative ion system improves with larger dust particle size, greater dust concentration, lower wind speed of the tunnel, higher working voltage of the negative ion system, and closer installation position of the system to the tunnel working face. Dust removal efficiencies of two groups of field sampling tests were 41.2% and 56.7% while the counterparts of numerical simulations were 38.2% and 51.1%, hence deviations being 15.5% and 12.9%, respectively. Therefore, considering the influence of large space and complex environment of tunnel under construction, it is feasible to study the dust removal efficiency of negative ion system and its relationship with main influencing factors by numerical simulation.

摘要: 为研究施工隧道内粉尘颗粒粒径、颗粒浓度、通风风速和负离子系统工作电压、纵向安装位置对负离子系统粉尘降除效率的影响,依据调研和实测选取隧道计算参数,建立隧道及负离子系统三维模型,采用 RNG $k-\epsilon$ 双方程湍流模型,并通过动量方程附加电场力源项的方法求解电场,利用拉格朗日法求解粉尘颗粒的运动轨迹,用 SIMPLE 算法对颗粒运动与电场流场进行离散相和流体相相间耦合的数值模拟计算,并将模拟结果和隧道现场抽样试验结果对比分析.研究表明:隧道粉尘粒径越大,浓度越大,风速越低,负离子系统工作电压越高,系统纵向安装位置越偏于上风口,负离子系统除尘效率越高;两组现场抽样试验与对应数值模拟所得的除尘效率分别为 41.2%、56.7%和 38.2%、51.1%,误差分别为 15.5%和 12.9%.考虑施工隧道大空间复杂环境的影响,通过数值模拟的方法来研究负离子系统除尘效率及其与主要影响因素的关系是可行的.

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作者: Gao Yunqiao; Ma Jianmin

作者: 高云樵; 马建敏

标题: Variable threshold interval-set concept lattices

标题: 变精度区间集概念格

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作者关键词: fuzzy formal context; interval set; variable threshold concept lattice; variable threshold interval-set concept lattice

作者关键词: 模糊形式背景; 区间集; 变精度概念格; 变精度区间集概念格

摘要: Variable threshold concept lattice is obtained by using an implication operator and a threshold value on a fuzzy formal context. In order to depict a partially-known variable threshold concept, the interval set is introduced into the fuzzy formal context. A variable threshold interval-set concept lattice is defined with whose extension and intension are both interval sets, and the related properties are also discussed. Based on these, the relationships between the variable threshold concept lattice and variable threshold interval-set concept lattice are studied. According to the structural characteristics of variable threshold interval-set concepts, a variable threshold interval-set concept lattice is divided into several sublattices which are isomorphic to the variable threshold concept lattice. Then the method of constructing the variable threshold interval-set concept lattice is given.

摘要: 变精度概念格是利用蕴含算子和一个阈值定义的模糊形式背景下的概念格. 为刻画部分已知的变精度概念格, 将区间集引入到模糊形式背景上, 定义外延与内涵均为区间集的变精度区间集概念格, 研究它们的性质. 在此基础上进一步研究变精度概念格与变精度区间集概念格之间的关系. 根据变精度区间集概念的结构特点, 将变精度区间集概念格分解成与变精度概念格同构的几个子格, 由此给出了构造变精度区间集概念格的方法.

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第 9 条, 共 21 条

作者: Yang Hui; Liu Yahong; Hou Xiuhui; Yin Guansheng

作者: 杨辉; 刘亚红; 侯秀慧; 尹冠生

标题: A study on the mechanical properties of aluminum honeycomb under combined shear-compression loading

标题: 铝蜂窝在压-剪组合荷载作用下的力学特性研究

来源出版物: 振动与冲击 卷: 39 期: 12 页: 121-128 出版年: 2020

文献号: 1000-3835(2020)39:12<121:LFWZYJ>2.0.TX;2-G

来源出版物: Journal of Vibration and Shock 卷: 39 期: 12 页: 121-128 出版年: 2020

文献号: 1000-3835(2020)39:12<121:LFWZYJ>2.0.TX;2-G

文献类型: Article

作者关键词: aluminum honeycomb; combined loads; numerical analysis; mechanical response

作者关键词: 铝蜂窝; 组合荷载; 数值分析; 力学响应

摘要: The deformation characteristics of aluminum honeycomb under combined compression-shear loads were studied by an experiment. Numerical models of aluminum honeycomb were established based on the experiment to analyze the influence of parameters for the mechanical behaviors of aluminum honeycomb under combined compression-shear loads. The results show that the deformation of aluminum honeycomb gradually changes from one end (loading end) to two ends (loading end and non-loading end) when it was loaded at a TL plane. When it was loaded at TW plane, the deformation of honeycomb occurred at one end (loading end), and the debondings were more likely to occur during the loading process. The peak load, average load, and specific energy of honeycomb are negatively correlated with the value of l/t under combined compression-shear loads. If the values of l/t of honeycombs are the same, the smaller the length l and the wall thickness t are, the larger the average load and specific energy of the honeycomb are. The change of length l has greater effects on the average load of honeycomb than the change of wall thickness t . Increasing the height of honeycomb will reduce the energy absorption efficiency.

摘要: 对铝蜂窝在压-剪组合荷载作用下的变形特征进行试验研究,并基于试验建立铝蜂窝数值计算模型,分析各参数对铝蜂窝在压-剪组合荷载作用下力学行为的影响。结果表明:在 TL 面内加载时,蜂窝变形逐渐由只在一端(加载端)变形过渡到同时在两端(加载端和非加载端)变形。在 TW 面加载时,蜂窝主要在一端(加载端)产生变形,并且更容易出现脱胶破坏;蜂窝峰值荷载、平均荷载以及比能与 l/t 值呈负相关关系。 l/t 值相同时,单元边长 l 、单元壁厚 t 越小,则蜂窝平均荷载和比能越大。单元边长 l 对蜂窝平均荷载的影响要大于单元壁厚 t 对平均荷载的影响;增大蜂窝高度会降低结构吸能效率。

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第 10 条, 共 21 条

作者: 李志民; 张太雷; 高建忠

作者: Li Zhimin; Zhang Tailei; Gao Jianzhong

标题: Analysis on an SIRS Epidemic Model with Nonlinear Pulse Vaccination

标题: 一类具有非线性脉冲接种的 SIRS 流行病模型分析

来源出版物: 数学进展 卷: 49 期: 3 页: 333-348 出版年: 2020

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来源出版物: Advances in Mathematics (China) 卷: 49 期: 3 页: 333-348 出版年: 2020

文献号: 1000-0917(2020)49:3<333:AOASEM>2.0.TX;2-K

文献类型: Article

作者关键词: nonlinear pulse vaccination; periodic solution; globally asymptotically stable; permanence

作者关键词: 非线性脉冲接种; 周期解; 全局渐近稳定; 持久性

摘要: In this paper, we establish an SIRS epidemic model with pulse vaccination and saturated contact rate and nonlinear pulse immunization function. By using the stroboscopic map of discrete dynamical systems, the disease-free periodic solution (DFPS for short) of the model with impulsive vaccination is obtained. Based on the Floquet theory and comparison principle of impulsive differential equations, the global asymptotic stability of the DFPS is given, and the sufficient conditions for the permanence of the model are obtained. In addition, numerical simulations are done to illustrate our analytical results.

摘要: 本文建立了一类具有非线性脉冲免疫接种与饱和接触率的 SIRS 传染病模型;利用离散动力系统的频闪映射方法得到了模型的无病周期解;利用 Floquet 乘子理论和脉冲微分方程比较定理证明了该周期解的全局渐近稳定性,并获得了模型持久性的充分条件;还通过数值模拟展示了数值模拟结果和理论结果的一致性.

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第 11 条, 共 21 条

作者: Zheng Supei; Wang Miaomiao; Wang Ling

作者: 郑素佩; 王苗苗; 王令

标题: Reconstructing Osher-Solomon scheme based on WENO-Z for shallow water equations

标题: 基于 WENO-Z 重构的 Osher-Solomon 格式求解浅水波方程

来源出版物: 水动力学研究与进展. A 辑 卷: 35 期: 1 页: 90-99 出版年: 2020

文献号: 1000-4874(2020)35:1<90:JYWZZG>2.0.TX;2-Y

来源出版物: Chinese Journal of Hydrodynamics 卷: 35 期: 1 页: 90-99 出版年:

2020

文献号: 1000-4874(2020)35:1<90:JYWZZG>2.0.TX;2-Y

文献类型: Article

作者关键词: Osher-Solomon numerical flux; WENO-Z reconstruction; finite volume method; shallow water equation

作者关键词: Osher-Solomon 数值通量; WENO-Z 重构; 有限体积法; 浅水波方程

摘要: The shallow water equations have important applications in hydraulic, ocean and environmental engineering. A high-resolution scheme for approximating solutions of two-dimensional shallow water equations is presented, the paper proposes reconstructing conservative variables with third-order WENO-Z at the interface. The scheme is reconstructed by the third-order WENO-Z reconstruction in space, the third-order strong stability preserving Runge-Kutta method is used in time. The algorithm is utilized widely for analyzing the several shallow water equations. Moreover, the numerical results are analyzed for the algorithm's property, which show that the resolution of Osher-Solomon scheme reconstructed by the third-order WENO-Z is higher than original scheme.

摘要: 浅水波方程在水利、海洋和环境工程中有着非常重要的应用。该文提出一种求解浅水波方程的高分辨算法,对单元交界面处守恒变量进行三阶 WENO-Z 重构。空间方向上采用三阶 WENO-Z 重构的 Osher-Solomon 数值通量,时间方向上采用三阶强稳定的 Runge-Kutta 方法,将新格式应用于一维和二维不同初值问题的浅水波方程数值求解中,并分析与比较了研究格式的分辨率。数值结果表明:与原格式相比,三阶 WENO-Z 重构的 Osher-Solomon 格式分辨率更高。

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第 12 条, 共 21 条

作者: Zhang Qian; Dong Anguo; Song Rui

作者: 张倩; 董安国; 宋睿

标题: Hyperspectral Image Classification Based on Multiple Features and an Improved Autoencoder

标题: 基于多特征和改进自编码的高光谱图像分类

来源出版物: 激光与光电子学进展 卷: 57 期: 8 出版年: 2020

文献号: 1006-4125(2020)57:8<JYDTZH>2.0.TX;2-Q

来源出版物: Laser & Optoelectronics Progress 卷: 57 期: 8 出版年: 2020

文献号: 1006-4125(2020)57:8<JYDTZH>2.0.TX;2-Q

文献类型: Article

作者关键词: image processing; hyperspectral image; multiple features; manifold learning; autoencoder network; neural network

作者关键词: 图像处理; 高光谱图像; 多特征; 流形学习; 自编码网络; 神经网络

摘要: In this study, we propose a hyperspectral image classification algorithm based on multiple features and the improved stacked sparse autoencoder network to solve the problems of insufficient feature utilization and less training samples. The low-dimensional data structures of the hyperspectral images can be obtained using manifold learning, and the local binary pattern (LBP) features with spatial information and extended multi-attribute profiles (EMAP) features can be extracted from the hyperspectral images. Further, Active learning is used to query and label highly characteristic unlabeled samples. Then, the samples fusing space spectrum joint information are used to train the stacked active sparse autoencoder neural network; these samples are subsequently classified using the SoftT_(max) classifier. The overall classification accuracy of the Indian pines dataset was 98.14%, whereas the overall classification accuracy of the Pavia U dataset was 97.24%. The experimental results prove that the proposed algorithm has a high classification accuracy and can appropriately classify the boundary points.

摘要: 针对高光谱图像特征利用不足和训练样本难以获取的问题,提出了一种具有多特征和改进堆栈稀疏自编码网络的高光谱图像分类算法。采用流形学习获得高光谱图像的低维数据结构,并提取高光谱图像的光谱特征、具有空间信息的局部二值模式(LBP)特征及拓展多属性剖面(EMAP)特征。利用主动学习查询特征性强的未标记样本并将其标记,利用融合空谱联合信息的样本训练堆栈主动稀疏自编码神经网络并用 SoftT_(max)分类器对其分类。Indian pines 数据集的总体分类精度达到 98.14%, Pavia U 数据集总体分类精度达到 97.24%。实验结果表明,该算法分类精度高,边界点分类效果更好。

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第 13 条, 共 21 条

作者: Liu Hongchao; Dong Anguo

作者: 刘洪超; 董安国

标题: Hyperspectral Remote Sensing Image Classification Algorithm Based on Nonlocal Mode

Feature Fusion

标题: 基于非局部方式特征融合的高光谱遥感图像分类算法

来源出版物: 激光与光电子学进展 卷: 57 期: 6 出版年: 2020

文献号: 1006-4125(2020)57:6<JYFJBF>2.0.TX;2-C

来源出版物: Laser & Optoelectronics Progress 卷: 57 期: 6 出版年: 2020

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文献类型: Article

作者关键词: image processing; hyperspectral remote sensing image; image classification; deep learning

作者关键词: 图像处理; 高光谱遥感图像; 图像分类; 深度学习

摘要: Aiming at the characteristics of high dimensionality of the hyperspectral image data,nonlinearity of the feature and difficulty of obtaining the tag data,combined with the stack sparse automatic coding network,we propose a two-level classification algorithm based on nonlocal mode feature fusion.Compared with the traditional stack sparse automatic coding network,the spectral angle matching algorithm stacks the spectral information found most similar to the classified pixel to form new spectral information,and puts it into the SoftMax classifier for firstlevel classification.The pixels satisfying the condition are added to the training data set for classification training of the stack sparse coding network.Finally,the classification algorithm is modified according to the spatial neighborhood information to make the classification result more smooth.Compared with other classification algorithms,it is found that the improved classification algorithm has higher accuracy and can effectively improve the classification effect of hyperspectral image.

摘要: 针对高光谱图像数据维度高、特征非线性以及标签数据获取难度大的特点,结合堆栈稀疏自动编码网络,提出了一种基于非局部方式特征融合的二级分类算法。与传统堆栈稀疏自动编码网络相比,光谱角匹配算法将找到的与被分类像元最相似的光谱信息堆叠形成新的光谱信息,然后输入到 SoftMax 分类器中进行一级分类;将满足条件的像元添加到训练数据集,用于堆栈稀疏编码网络的分类训练;最后根据空间邻域信息对分类算法进行修正,使分类结果更加趋于平滑。通过与其他分类算法进行对比,发现改进后的分类算法在各类别的分类精度较高,且可以有效改善高光谱图像分类效果。

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研究方向: Remote Sensing (由 Clarivate Analytics 提供)

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第 14 条, 共 21 条

作者: Zheng Supei; Wang Ling; Wang Miaomiao

作者: 郑素佩; 王令; 王苗苗

标题: Solution of 2D Shallow Water Wave Equations With the Moving-Grid Rotating-Invariance Method

标题: 求解二维浅水波方程的移动网格旋转通量法

来源出版物: 应用数学和力学 卷: 41 期: 1 页: 42-53 出版年: 2020

文献号: 1000-0887(2020)41:1<42:QXEWQS>2.0.TX;2-B

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文献号: 1000-0887(2020)41:1<42:QXEWQS>2.0.TX;2-B

文献类型: Article

作者关键词: Runge-Kutta 法; moving-grid method; rotating invariance; entropy stable format; Runge-Kutta method; finite volume method

作者关键词: 移动网格法; 旋转不变性; 熵稳定格式; 有限体积法

摘要: In order to improve the resolution of the numerical algorithm for solving the 2D shallow water wave equation,a new algorithm was proposed based on the moving-grid method,with the entropy stable numerical flux function and by means of the mixed numerical flux obtained through the rotating invariance.The numerical solution of the shallow water wave equation and the grid computation process based on the characteristics of the solution were interleaved.The variational principle was used to reconstruct the mesh,and the physical quantity on the new mesh was computed with the 2nd-order precision conservation interpolation formula.The 3rd-order strongly stable Runge-Kutta method and the entropy stable format satisfying the 2nd law of thermodynamics were used to numerically solve the shallow water wave equation.The numerical results show that,the new algorithm has good discontinuity capture ability and high resolution.

摘要: 为提高求解二维浅水波方程数值算法的分辨率,拟构造求解该方程的新算法:基于移动网格法,选用熵稳定数值通量函数,利用旋转不变性得到混合数值通量.该算法中,浅水波方程的数值求解和依据解的特性进行自适应疏密分布的网格计算过程交错进行.利用变分原理进行网格重构,新网格上的物理量采用二阶精度的守恒型插值公式计算,最终采用三阶强稳定 Runge-Kutta 法与满足热力学第二定律的熵稳定格式实现浅水波方程的数值求解.数值结果表明,新算法具有良好的间断捕捉能力,分辨率高.

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第 15 条, 共 21 条

作者: Shu Hong; Feng Shuo; Xie Buqing

作者: 舒红; 封硕; 谢步庆

标题: Improved ant colony algorithm for Wheeled robot path planning

标题: 轮式机器人路径规划的改进蚁群算法

来源出版物: 制造业自动化 卷: 42 期: 1 页: 64-69 出版年: 2020

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作者关键词: 蚁群算法; 模糊集; 多维信息素; 轮式机器人路径规划

摘要: 针对轮式机器人在多窟障碍地形图中的路径规划问题,为了克服基本蚁群算法的局部最优问题,提高算法的收敛速度,以及节约找寻最优路径的时间,提出了一种基于多维信息素及模糊集的改进蚁群算法。在栅格化地图上,通过模糊集将某一点距离障碍物以及接受目标的信息程度表达出来,重新更新栅格化地图,从而减少地图中搜索空间,节约搜索时间。其次把传统蚁群算法中的一维信息素改进为多维信息素,得到满足多个约束条件下的路径。通过多组仿真实验的结果表明,验证了改进算法的可行性和有效性,提高了基本蚁群算法对最优路径问题的优化性能与收敛速度。与现有算法相比较,迭代次数节约了 70%左右,缩小了 20%的蚁群数量。

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第 16 条, 共 21 条

作者: Liu Yahong; Yin Guansheng; Li Xuan; Yao Ruyang

作者: 刘亚红; 尹冠生; 李轩; 姚如洋

标题: Influence of lay angle and friction coefficient on in-plane compression behavior of wire rope ring

标题: 捻角和摩擦系数对钢丝绳圈面内压缩行为的影响

来源出版物: 塑性工程学报 卷: 27 期: 3 页: 154-162 出版年: 2020

文献号: 1007-2012(2020)27:3<154:NJHMCX>2.0.TX;2-T

来源出版物: Journal of Plasticity Engineering 卷: 27 期: 3 页: 154-162 出版年: 2020

文献号: 1007-2012(2020)27:3<154:NJHMCX>2.0.TX;2-T

文献类型: Article

作者关键词: wire rope ring; energy absorption; lay angle; friction coefficient; in-plane

compression; finite element

作者关键词: 钢丝绳圈; 能量吸收; 捻角; 摩擦系数; 面内压缩; 有限元

摘要: The influence of lay angle and friction coefficient on the in-plane compression behavior of the wire rope ring was studied using numerical simulation method, and the energy absorption of wire rope ring was analyzed. The results show that the smaller the lay angle is, the more obvious the loose strands phenomenon appearing in the deformation process is, and the worse the stability is. The internal energy produced in the rope ring is inversely proportional to the lay angle. When the lay angle is 15.9° , the specific energy absorption of the rope ring reaches the maximum value in the compression process, which indicates that the lay angle is a significant factor affecting the crashworthiness of the wire rope ring. Changing the friction coefficient has little effect on the deformation mode of the rope ring. The ratio of energy dissipated by friction to internal energy varies from 0.6% to 2.6%, and increases with the increase of friction coefficient.

摘要: 采用数值模拟方法研究了捻角和摩擦系数对钢丝绳圈面内压缩行为的影响, 分析了钢丝绳圈的能量吸收情况。结果表明: 捻角越小, 钢丝绳圈在变形过程中出现的股松散现象越明显, 稳定性越差; 绳圈产生的内能与捻角成反比关系; 当捻角为 15.9° 时, 绳圈在压缩过程中比吸能达到最大值, 说明捻角是影响钢丝绳圈耐撞性的一个重要因素。改变摩擦系数对绳圈变形模式的影响不大; 钢丝绳圈的摩擦耗散能与内能之比在 0.6% ~ 2.6% 之间变化, 且比值随摩擦系数的增大有所增加。

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第 17 条, 共 21 条

作者: Chang Fanfan; Ma Jianmin

作者: 常凡凡; 马建敏

标题: Interval-set rough approximations based on a relation matrix

标题: 基于关系矩阵的区间集粗糙近似

来源出版物: 山东大学学报. 理学版 卷: 55 期: 3 页: 98-106 出版年: 2020

文献号: 1671-9352(2020)55:3<98:JYGXJZ>2.0.TX;2-Q

来源出版物: Journal of Shandong University. Natural Science 卷: 55 期: 3 页: 98-106

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文献号: 1671-9352(2020)55:3<98:JYGXJZ>2.0.TX;2-Q

文献类型: Article

作者关键词: relation matrix; interval vector; interval set; interval-set rough approximations

作者关键词: 关系矩阵; 区间向量; 区间集; 区间集粗糙近似

摘要: Based on the intuition of a matrix and the simplicity of the matrix operations, this paper introduces the interval vector, which gives a new representation of an interval set, and the related properties of them are investigated. The operations between the interval vector and the relation matrix are discussed. On the basis of relation matrices, the equivalent representations of the rough lower and upper approximations are depicted for the classical rough sets. By using the operations between the relation matrix and interval vectors, the interval-set rough lower and upper approximations are shown in the view of relation matrices. An approach and the related algorithm to obtain the interval-set rough lower and upper approximations according to a relation matrix are also given. An example is used to show the simplicity and effectiveness of the algorithm.

摘要: 基于矩阵的直观性和矩阵运算的简便性引入区间向量, 给出了区间集一种新的表达形式, 探讨了区间向量的相关性质, 给出了区间向量与关系矩阵的运算法则。在经典粗糙集中, 给出了基于关系矩阵的粗糙下、上近似的等价表示, 进而利用关系矩阵和区间向量提出了基于关系矩阵的区间集粗糙下、上近似, 构造了基于关系矩阵计算区间集粗糙下、上近似的方法, 给出了其相应的算法, 并通过实例说明了该方法的简便性与有效性。

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作者: Guo Qingchun; Ma Jianmin

作者: 郭庆春; 马建敏

标题: Judgment Methods of Interval-set Consistent Sets of Dual Interval-set Concept Lattices

标题: 对偶区间集概念格上区间集协调集的判定方法

来源出版物: 计算机科学 卷: 47 期: 3 页: 98-102 出版年: 2020

文献号: 1002-137X(2020)47:3<98:DOQJG>2.0.TX;2-B

来源出版物: Computer Science 卷: 47 期: 3 页: 98-102 出版年: 2020

文献号: 1002-137X(2020)47:3<98:DOQJG>2.0.TX;2-B

文献类型: Article

作者关键词: Interval set; Dual concept lattice; Dual interval-set concept lattice; Attribute reduction; Interval-set consistent set

作者关键词: 区间集; 对偶概念格; 对偶区间集概念格; 属性约简; 区间集协调集

摘要: The dual interval-set concept lattice is generated by introducing the interval set into the dual concept lattice. It extends the extension and intension of the dual concept from the classical sets to the interval sets, which makes it to be a mathematical tool to describe uncertain concepts. As one of the core topics of data mining, attribute reduction is a method to study the essential characteristics of concept lattice. It simplifies the representation of the concept by removing redundant attributes. This paper mainly discussed the judgment approaches of the interval-set consistent sets of the dual interval-set concept lattices. Firstly, based on the isomorphism for the structure of the dual interval-set concept lattices, interval-set consistent sets were defined, and a series of judgment theorems were then investigated for the dual interval-set concept lattices. Then, the method about obtaining attribute reduction interval-set by using the interval-set consistent set was described.

摘要: 对偶区间集概念格是将区间集引入到对偶概念格产生的, 它将对偶概念的外延与内涵从经典集合推广到区间集, 使之成为一种描述不确定性概念的数学方法。而属性约简是数据挖掘的核心内容之一, 是一种研究概念格本质特征的方法, 它通过删除冗余属性使数据表中概念的获取与表示变得更简洁。文中主要研究对偶区间集概念格上区间集协调集的判定方法。首先基于对偶区间集概念格的同构, 引入了区间集协调集, 给出了对偶区间集概念格上区间集协调集的一系列判定定理, 进而讨论了利用区间集协调集获取区间集属性约简的方法。

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作者: Yao Ruyang; Zhao Zhenyu; Yin Guansheng; Zhang Bei

作者: 姚如洋; 赵振宇; 尹冠生; 张蓓

标题: Theoretical analysis on thin-walled holed circular tubes under axial loading

标题: 薄壁开孔圆管在轴向荷载作用下的理论研究

来源出版物: 振动与冲击 卷: 39 期: 2 页: 141-147 出版年: 2020

文献号: 1000-3835(2020)39:2<141:BBKKG>2.0.TX;2-Q

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文献类型: Article

作者关键词: thin-walled structure; holed circular tube; axial crashworthiness; crushing force;

specific energy absorption

作者关键词: 薄壁结构; 开孔圆管; 轴向耐撞性; 压溃力; 比吸能

摘要: The investigation of axial crashworthiness of thin-walled holed circular tubes is helpful for their wide application in buffering and energy absorption fields. By considering the energy absorption behaviors of holed and unholed regions respectively and introducing the strain-hardening effect of material, a theoretical model for the axisymmetric mode of a holed circular tube under axial crushing was proposed based on the plastic hinge method. The expressions for bending strain energy, stretching strain energy, mean crushing force and specific energy absorption were deduced. The results show that the theoretical predictions agree well with the experimental and simulation results; the normalized mean crushing force increases obviously with the decrease of the half-fold slenderness ratio; the effect of the hole number in each row on the normalized mean crushing force decreases with the increase of the wall thickness of tube or the decrease of hole radius. The specific energy absorption increases with the decrease of the hole number in each row or the reduction of hole radius.

摘要: 研究薄壁开孔圆管的轴向耐撞性有助于其在缓冲、吸能领域的广泛应用。通过分别考虑开孔区域和未开孔区域的能量吸收特征并引入材料的应变强化效应,根据塑性铰理论建立了轴向荷载下开孔圆管轴对称压溃模式的理论模型,得到了弯曲应变能、拉伸应变能、平均压溃力、比吸能的解析表达式。分析结果表明:该理论模型的预测结果与数值和实验结果相吻合;正则化平均压溃力会随半褶皱长细比的降低而显著增加;单层孔数对正则化平均压溃力的影响会随管壁厚度的增加或孔半径的减小而降低;比吸能可通过减少单层孔数或减小孔半径提高。

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作者: Chen Tong; Chang Anding; Li Jiangjie; Wu Tianjun

作者: 陈童; 常安定; 李江杰; 吴田军

标题: Application of adaptive differential evolution algorithm in reversing aquifer parameters

标题: 自适应差分进化算法在反求含水层参数中的应用

来源出版物: 西北农林科技大学学报. 自然科学版 卷: 48 期: 2 页: 143-147,154
出版年: 2020

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来源出版物: Journal of Northwest A & F University. Natural Science Edition 卷: 48 期: 2
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文献号: 1671-9387(2020)48:2<143:ZSYCFJ>2.0.TX;2-K

文献类型: Article

作者关键词: aquifer parameters; Tess formula; differential evolution algorithm; adaptive differential evolution algorithm

作者关键词: 含水层参数; 泰斯公式; 差分进化算法; 自适应差分进化算法

摘要: **【Objective】** This study researched the applicability of adaptive differential evolution algorithm in reversing aquifer parameters. **【Method】** Taking the mean of square summation of deviations between theoretical and observed values as the objective function, an adaptive differential evolution algorithm was applied to optimize the estimation of aquifer parameters. Based on related examples, it was compared with the adaptive differential evolution algorithm, improved linear graph algorithm, chaotic sequence optimization algorithm, simplified algorithm, Tess matching method, and linear regression method. **【Result】** The calculation results of adaptive differential evolution algorithm had small difference with actual observations and were more accurate than those of improved linear graphic method, chaotic sequence optimization algorithm, simple algorithm, Tess wiring method and linear regression method. Adaptive differential evolution algorithm had the advantages of high stabilization, high optimal rate and high calculation accuracy for different ranges of aquifer parameters. **【Conclusion】** The adaptive differential evolution algorithm is an effective method to reverse aquifer parameters.

摘要: **【目的】** 研究自适应差分进化算法在反求含水层参数中的适用性。 **【方法】** 以理论计算值与实际观测值的离差平方和的均值作为目标函数, 应用自适应差分进化算法优化待估含水层参数; 计算相关实例, 对比改进直线图解法、混沌序列优化算法、简算法、泰斯配线法、线性回归法与自适应差分进化算法的最终优化结果。 **【结果】** 与改进直线图解法、混沌序列优化算法和简算法等计算方法相比, 自适应差分进化算法的计算结果更加精确, 与实际观测值的差异较小; 对于不同的含水层参数取值范围, 自适应差分进化算法较传统差分进化算法稳定且寻优率与计算结果精度更高。 **【结论】** 自适应差分进化算法是一种有效的反求含水层参数的方法。

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第 21 条, 共 21 条

作者: Wang Ling; Zheng Supei

作者: 王令; 郑素佩

标题: Solving shallow water wave equation based on moving grid entropy stable scheme

标题: 基于移动网格的熵稳定格式求解浅水波方程

来源出版物: 水动力学研究与进展. A 辑 卷: 35 期: 2 页: 188-193 出版年: 2020

文献号: 1000-4874(2020)35:2<188:JYYDWG>2.0.TX;2-3

来源出版物: Chinese Journal of Hydrodynamics 卷: 35 期: 2 页: 188-193 出版年: 2020

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文献类型: Article

作者关键词: shallow water wave equation; moving grid method; entropy stable format; Runge-Kutta method; numerical dissipation

作者关键词: 浅水波方程; 移动网格法; 熵稳定格式; 龙格库塔法; 数值耗散

摘要: In order to effectively improve the resolution and discontinuous capture ability of the solution to shallow water wave equations, an entropy stable scheme based on moving grid is proposed to solve shallow water wave equations. The moving grid method consists of two independent parts: evolution of partial differential equations and mesh reconstruction. Using the equal distribution principle for mesh reconstruction, using the second-order conservation interpolation formula to calculate the physical quantity on the new mesh; using the entropy stable format that satisfies the second law of thermodynamics to solve the numerical flux, and combined with the third-order strong stable Runge-Kutta method the numerical solution at the next moment is obtained. The numerical examples are used to verify the discontinuous capture capability and high resolution of the new method.

摘要: 为有效提高求解浅水波方程解在间断处的分辨率和间断捕捉能力,提出一种基于移动网格的熵稳定格式来求解浅水波方程。移动网格法包括两个独立部分:偏微分方程演化和网格重构。利用等分布原理进行网格重构。采用二阶守恒型插值公式计算新网格上的物理量;使用满足热力学第二定律的熵稳定格式求解数值通量,结合三阶强稳定龙格库塔法得到下一时刻的数值解。通过数值算例验证新方法的间断捕捉能力和高分辨率。

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建筑学院

第 1 条, 共 9 条

作者: Yu Kanhua; Fan Qiannan; Li Danni

作者: 余侃华; 范倩楠; 李丹妮

标题: Research on the Coupling Mechanism of Urban-rural Spatial Integration and Institutional Reforms of "Town-level city" in the Context of Rural Revitalization:Taking Hengkou Town of Southern Shaanxi as an Example

标题: 城乡融合视阈下秦巴山区镇级市空间演进及振兴路径析论以陕西省恒口镇级小城市综合改革试验区为例

来源出版物: 城市发展研究 卷: 27 期: 12 页: 中彩页 22-中彩页 28 出版年: 2020

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文献类型: Article

作者关键词: Urban-rural Integration; Township City; Spatial Evolution Revitalization Path

作者关键词: 城乡融合; 镇级市; 空间演进; 振兴路径

摘要: Urban rural integration is the organic combination of the new urbanization and the Rural Revitalization,and it is also the fundamental demand of urban-rural integration development.As the frontier of reform practice and exploration,"town level city" is an important hub and support to promote the integration of urban and rural development.This paper studies the origin of "town level city" scientifically,and analyzes the dynamic mechanism of urban-rural integration development under the guidance of "town level city" reform.Based on the field investigation of Hengkou in Qinba mountain area,analyzes the development status of Hengkou.It is found that there are some common problems such as imbalance of urban and rural development and unequal allocation of elements.Summarizing the urban and rural development trends and opportunities in Hengkou,and puting forward the coupling revitalization path from six aspects of elements,facilities,industry,space,ecology and culture.We should reconstruct the relationship between urban and rural areas,and enhance the integration of urban and rural areas,providing new ideas for the comprehensive development of urban and rural integration of"town level city" in the new period.

摘要: 城乡融合是新型城镇化战略和乡村振兴战略的有机契合,也是当前城乡一体化发展的根本诉求。镇级市作为改革实践和探索的前沿,是推动城乡融合发展的重要枢纽和依托。在科学研判镇级市提出根源的基础上,系统分析镇级市改革导向下城乡融合发展的动力机制,结合对秦巴山区恒口示范区的实地调研,分析恒口镇级市发展现状,发现城乡发展失衡、要素配置不均等共性问题。总结恒口城乡发展趋势和机遇,针对要素、设施、产业、空间、生态及文化六个方面提出耦合振兴路径,多方位重构城乡关系,增强城乡融合契合度,为新时期镇级市全面展开城乡融合发展提供新思路。

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研究方向: Business & Economics (由 Clarivate Analytics 提供)

ISSN: 1006-3862

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第 2 条, 共 9 条

作者: Li Ling

作者: 李凌

标题: Establishment of Characteristic Atlas of Traditional Settlements Landscape in Multicultural Area: Take Southern Shaanxi for Example

标题: 多元文化交错地区传统聚落景观特征图谱的构建--以陕南地区为例

来源出版物: 地域研究与开发 卷: 39 期: 5 页: 175-180 出版年: 2020

文献号: 1003-2363(2020)39:5<175:DYWHJC>2.0.TX;2-T

来源出版物: Areal Research and Development 卷: 39 期: 5 页: 175-180 出版年: 2020

文献号: 1003-2363(2020)39:5<175:DYWHJC>2.0.TX;2-T

文献类型: Article

作者关键词: multicultural interlaced area; traditional settlement landscape; characteristic atlas; establishment method; Southern Shaanxi

作者关键词: 多元文化交错地区; 传统聚落景观; 特征图谱; 构建方法; 陕南地区

摘要: Taking Southern Shaanxi, which is located in the transition zone of climate and cultural between north and south of China, as an example, this paper explored the effective way to identify, extract and express the main characteristics and composition rules of the traditional settlement landscape in the multicultural area as well as establishment methods of characteristic atlas of traditional settlement landscape from the perspective of settlement and architecture by applying landscape information chain and landscape gene theory. The research shows that, as a typical multicultural ecotone, the theoretical forms of the general atlas of traditional settlement landscape in Southern Shaanxi are diverse. According to the combination of different landscape feature types, 12 kinds of traditional settlement landscape and 35 280 kinds of architectural landscape theoretical characteristic forms are generated respectively. By comparing the differences of acting force of various features in the regional landscape composition, 6 kinds of traditional settlement landscape and 26 kinds traditional architectural landscape representative characteristic forms are extracted from the theoretical forms. Zoning atlases can draw lessons from the construction method of general atlas, and establish characteristic atlas system of the traditional settlement landscape from macro to micro, from generalization to concrete.

摘要: 以地处我国南北地理和文化过渡带的典型多元文化交错区--陕南地区为例,运用图谱的抽象概括和类型化原理,从聚落整体和建筑单体层面,应用景观信息链和景观基因理论,探索多元文化交错区传统聚落景观主体特征及其构成规律的识别、提取和表达的有效途径及图谱化方法。结果表明:作为典型的交错区,陕南地区传统聚落景观形态十分多样。基于景观特

征的组合重构可生成 12 种传统聚落、35 280 种传统建筑景观图谱的理论形式。根据各类特征在陕南地域性景观构成中的作用力差异,进一步筛选提炼为 6 种传统聚落和 26 种传统建筑景观特征总图谱的代表性形式。后续分区图谱应借鉴总图谱构建方法,建立从宏观到微观、从概括到具体的交错区传统聚落景观特征图谱体系。

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第 3 条, 共 9 条

作者: Lyu Nan; Zhao Jingyuan

作者: 吕楠; 赵敬源

标题: Location Optimization of Logistics Park Based on Bayesian Probability Theory

标题: 基于贝叶斯概率理论的物流园区选址优化研究

来源出版物: 中国公路学报 卷: 33 期: 9 页: 251-260 出版年: 2020

文献号: 1001-7372(2020)33:9<251:JYBYSG>2.0.TX;2-9

来源出版物: China Journal of Highway and Transport 卷: 33 期: 9 页: 251-260 出版年: 2020

文献号: 1001-7372(2020)33:9<251:JYBYSG>2.0.TX;2-9

文献类型: Article

作者关键词: traffic engineering; site selection; Bayesian method; logistics park; evaluating index; risk evaluation

作者关键词: 交通工程; 物流园区; 贝叶斯方法; 选址模型; 评价指标; 风险评估

摘要: The site selection of a logistics park is an indispensable part of its planning and construction. Conventional site-selection methods mainly focus on qualitative analysis and lack evaluation criteria for the reliability of selection results. In this study, the probability method was used to analyze the site selection and planning theory of a logistics park. By using the EM algorithm and GeNie software, a Bayesian network model was constructed to explore the internal causal and logical relationships among the influencing factors, quantify the significance of each influencing factor, and construct a scientific and reasonable logistics-park site-selection planning evaluation index system. The K-means clustering method was adopted to establish the logistics-park-location model, and MATLAB was used to iteratively calculate the established model. The gray fuzzy risk assessment model was also optimized based on the Bayesian network method. Moreover, the combination of qualitative analysis and quantitative calculation was used to obtain the corresponding location risk coefficient and evaluation risk probability, and the site-selection risk-level assessment of the logistics park was completed. The results show that the site-selection model based on the Bayesian method can fully consider the influence of city scale, economic and social development, urban logistics volume, and traffic location in the selection

process;realize the quantitative evaluation of logistics-park-location results;reduce the impact of human subjective factors and objective data ambiguity on site selection;and effectively improve the site selection of logistics parks.Ten prefecture-level cities in Shaanxi Province were selected as candidate sites to verify the feasibility of the site-selection model.The site-selection risk coefficient of Xi'an logistics park was 4.030 1,which indicates a low risk level.According to the overall risk probability,the reliability of determining the low risk level was 65.50%.Thus,the results confirmed that the risk coefficient of constructing logistic parks in Xi'an is low,which is scientifically feasible.Moreover,the risk-assessment result of the Xi'an port has relatively high reliability.

摘要: 物流园区选址是其规划建设中不可或缺的部分,传统的选址方法以定性分析为主,缺乏对选址结果可靠性的评判标准,为此,引入贝叶斯概率方法开展了物流园区选址规划理论研究。借助 EM 算法和 GeNie 软件,构建了贝叶斯网络模型,挖掘出各影响因素间存在的内在因果和逻辑关系,量化各影响因素的显著性,构建科学合理的物流园区选址规划评价指标体系;采用 K-means 聚类方法建立了物流园区选址模型,使用 MATLAB 软件对建立的模型进行迭代计算,并引入贝叶斯判别方法对聚类结果进行了可靠性分析;基于贝叶斯网络方法优化了灰色模糊风险评估模型,结合了定性分析和定量计算,得出相应的选址风险系数与评估风险概率,完成了物流园区的选址风险等级评估。研究结果表明:基于贝叶斯方法建立的物流园区选址模型能够充分考虑城市规模、经济社会发展、城市物流量及交通区位等多因素的影响,实现了对物流园区选址结果的量化评价,降低了人为主观因素和客观数据的模糊性对物流园区选址方案的影响,有效提高了物流园区选址规划的科学性和可靠性。以陕西省 10 个地级市为候选地点验证该选址模型的可行性,结果显示:西安建设物流园区的选址风险系数为 4.030 1,处于低风险水平,依据总体风险概率确定低风险水平的可靠性为 65.50%,证实了在西安建设物流园区(西安港)风险系数较低,科学可行,且西安港风险评估结论具有较高的可靠性。

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第 4 条, 共 9 条

作者: Liu Wei; Lu Ye; Liu Mengxun

作者: 刘伟; 卢烨; 刘孟荀

标题: ON SHAPING CHARACTERISTICS OF CONTEMPORARY THEATRICAL BUILDINGS

标题: 论当代观演建筑的形态塑造特征

来源出版物: 工业建筑 卷: 50 期: 8 页: 43-47 出版年: 2020

文献号: 1000-8993(2020)50:8<43:LDDGYJ>2.0.TX;2-D

来源出版物: Industrial Construction 卷: 50 期: 8 页: 43-47 出版年: 2020

文献号: 1000-8993(2020)50:8<43:LDDGYJ>2.0.TX;2-D

文献类型: Article

作者关键词: theatrical building; shaping; spatial operation; symbolic metaphor; material optimization

作者关键词: 观演建筑; 形态塑造; 空间操作; 象征隐喻; 材料优化

摘要: The main research was on shaping characteristics of contemporary theatrical buildings. The paper analyzed the shaping motivation of theatrical buildings based on their functions, techniques, aesthetics and cultural connotations; and starting from spatial operations, symbolic metaphors and material optimization, discussed the constructing logic and development tendencies for large-scale public buildings by case study of several existing theatres and concert halls. Finally, shaping approaches to rational construction combining with conceptual design innovation of buildings were analyzed.

摘要: 以当代观演建筑的形态塑造特征为研究对象,依据此类建筑基于功能工艺、技术美学和文化内涵的塑形动因,从空间操作、象征隐喻、材料优化等具体切入点出发,结合相应设计实例研究当代剧院、音乐厅等大型公共建筑形态塑造的生成逻辑及发展趋势,分析理性构筑与感性创意相结合的形态塑造途径。

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研究方向: Architecture (由 Clarivate Analytics 提供)

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第 5 条, 共 9 条

作者: Li Chen; Xu Wenping; Meng Xianfeng; Zhao Guohui; Li Yu

作者: 李琛; 徐文平; 孟宪锋; 赵国辉; 李宇

标题: Seismic Response of Seismic Isolated Beam Bridge with HDR Bearing under Bilateral Near-field Ground Motions

标题: 双向近场地震作用下 HDR 隔震梁桥地震响应研究

来源出版物: 震灾防御技术 卷: 15 期: 1 页: 67-76 出版年: 2020

文献号: 1673-5722(2020)15:1<67: SXJCDZ>2.0.TX;2-P

来源出版物: Technology for Earthquake Disaster Prevention 卷: 15 期: 1 页: 67-76

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文献号: 1673-5722(2020)15:1<67: SXJCDZ>2.0.TX;2-P

文献类型: Article

作者关键词: Near-field ground motion; Seismic isolated beam bridge; High damping rubber bearing(HDR bearing); Bidirectional coupling effect; Hysteretic curve

作者关键词: 近场地震动; 隔震梁桥; 高阻尼橡胶支座; 双向耦合效应; 滞回曲线

摘要: The effect of the bidirectional coupling effect of the HDR bearing on the seismic response of the seismic isolated beam bridge (SIBB) is studied by inputting the typical near-field ground motions into the multi-degree-of-freedom model and equivalent bilinear single-degree-of-freedom system of the SIBB with the HDR bearing. The main conclusions are as follows: the hysteretic curve of the HDR bearing is typical bilinear without considering the bidirectional coupling effect; the area of the hysteretic curve of the HDR bearing considering bidirectional coupling effect is smaller than that of the HDR bearing without considering bidirectional coupling effect; in the longitudinal direction, the peak displacement of the HDR bearing without considering the bidirectional coupling effect is larger than that of the HDR bearing with considering the bidirectional coupling effect, but the results are opposite in the transverse direction; when the seismic isolated design with the HDR bearing is done for beam bridges under near-field ground motions, the peak shear and moment on the bottom of piers are conservative without considering the bidirectional coupling effect; the effect of the bidirectional coupling effect of HDR bearing on the near-field seismic energy response of the SIBB with the HDR bearing can be neglected.

摘要: 以 HDR 隔震梁桥多自由度(MDOF)模型和等效双线性单自由度(SDOF)模型为研究对象,以典型近场地震动作作为输入,研究 HDR 支座双向耦合效应对 HDR 隔震梁桥地震响应的影响。研究表明:不考虑双向耦合效应的 HDR 支座滞回曲线呈典型双线性;考虑双向耦合效应的 HDR 支座滞回曲线面积小于不考虑双向耦合效应的 HDR 支座滞回曲线面积。不考虑双向耦合效应的顺桥向 HDR 支座位移峰值 δ_b 大于考虑双向耦合效应时,但横桥向的结果相反。近场地震作用下,对梁桥进行 HDR 支座隔震设计时,忽略双向耦合效应计算得到的墩底剪力峰值和弯矩峰值均偏于保守。可忽略 HDR 支座双向耦合效应对 HDR 隔震梁桥近场地震能量的影响。

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第 6 条, 共 9 条

作者: Zhao Jingyuan; Lye Nan

作者: 赵敬源; 吕楠

标题: Layout of logistics park based on improved SLP method

标题: 基于改进 SLP 法的物流园区布局

来源出版物: 长安大学学报. 自然科学版 卷: 40 期: 3 页: 100-108 出版年: 2020

文献号: 1671-8879(2020)40:3<100:JYGJSF>2.0.TX;2-Z

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文献号: 1671-8879(2020)40:3<100:JYGJSF>2.0.TX;2-Z

文献类型: Article

作者关键词: traffic engineering; logistics park; functional layout; logistics demand; SLP method; Markov chain

作者关键词: 交通工程; 物流园区; 功能布局; 物流量; SLP 法; 马尔科夫链

摘要: Aiming at the problems of immature layout method, single layout mode and low cooperation ability of each part of logistics park, Markov chain (MC) was introduced to improve the traditional systematic layout planning(SLP), to research and analyze the logistics park function layout planning from five aspects of production P, quantity Q, production route R, service department S and time T. Combined with relevant historical statistical data, the gray Markov forecasting model was used to quantitatively calculate the logistics volume of the logistics park and determine the reasonable development scale. From the perspective of the relationship between logistics and non-logistics, the correlation strength of each functional area was analyzed, and the functional areas closely related to each other were arranged nearby. The land occupation related diagram of each core functional area was preliminarily determined, and the relevant actual conditions and restrictions factors were fully considered, to improve and optimize the area related map and determine the best functional area layout plan. Finally, Xi'an Port logistics park was used as an example to verify the scientificity and applicability of the improved SLP method, and optimize the original planning scheme. The results show that the method avoids the influence of the fluctuation of historical data, improves the prediction accuracy of the logistics volume of the logistics park greatly, and strengthens the reliability of the quantitative calculation of the material flow. At the same time, it makes a scientific and reasonable layout of the spatial layout and land use scale of the internal functional areas of the logistics park. The improved SLP method can effectively formulate a reasonable layout plan to solve the complex and tedious layout problems, and can image the layout plan. So that the function and role of the logistics park can be fully played, which has important theoretical and practical significance for the orderly construction, reasonable organization and operation of the logistics park. 10 tabs, 3 figs, 23 refs.

摘要: 针对现有物流园区布局方法不成熟、布局模式单一,以及各部分协同工作能力低下等问题,引入马尔科夫链(Markov chain,MC)改进传统系统布局设计(systematic layout planning,SLP)方法,从产品 P、产量 Q、生产路线 R、辅助服务部门 S、时间 T 等 5 个方面对物流园区功能布局规划进行研究分析。结合相关历史统计数据,运用灰色马尔科夫预测模型定量计算物流园区物流量,确定合理的发展规模;从物流与非物流关系角度探析各功能区间的关联强度,对

相互关系密切的功能区就近布置,初步确定各核心功能区的占地面积相关图,并充分考虑相关实际条件与限制因素,对面积相关图进行完善与优化,确定最佳功能区布置方案。并以西安港物流园区为例,对改进 SLP 方法的科学性和适用性予以验证,并对原规划方案进行优化。研究表明:该方法避免了历史数据波动性的影响,大大提高了物流园区物流量的预测精度,加强了物流量定量计算的可靠性;同时,对物流园区内部功能区的空间布局和用地规模进行了科学合理布局。改进 SLP 方法能高效制定合理的布局方案来解决复杂繁琐的布局问题,并能将布局方案图像化,使物流园区职能与作用得以充分发挥,对有序建设、合理组织物流园运营区具有重要的理论意义和实际价值。

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标题: Study on Modified Park-Ang seismic damage model for interior joints of enhanced recycled aggregate concrete frame

标题: 修正的 Park-Ang 性能增强再生混凝土框架中节点地震损伤模型

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作者关键词: enhanced recycled aggregate concrete(EC-RAC); frame interior joint; damage model; error analysis

作者关键词: 性能增强再生混凝土(EC-RAC); 框架中节点; 损伤模型; 误差分析

摘要: Three full-featured reinforced interior joints of enhanced recycled aggregate concrete(EC-RAC) frame were considered in the low-cyclic loading test. The evolution process of seismic damage was studied, in which actual damage state and damage index were also determined. Meanwhile, a modified Park-Ang dual-parameter damage model was proposed, since the traditional model could not accurately describe the damage evolution and cumulative behavior of the EC-RAC frame joints after loading displacement greater than 100mm. The coefficients of

fiber term, displacement term and energy term were fitted based on the above test results. Finally, taking HF-RAC2 as an example, the error of the damage index was analyzed based on the developed model. The results show that the average error is within 6%, which means the damage model can be applied to the EC-RAC frame joints for seismic damage and evaluation analysis.

摘要: 通过对 3 个足尺性能增强再生混凝土(EC-RAC)框架中节点进行低周反复加载试验,分析其结构模型地震损伤演化过程,确定其震后实际损伤状态与损伤指标。同时,针对传统钢筋混凝土 Park-Ang 双参数损伤模型无法准确描述加载位移大于 100mm 后 EC-RAC 框架节点模型的损伤演化与累积行为的缺点,本文提出了一种修正的 Park-Ang 双参数损伤模型,并基于前述试验结果,拟合了纤维项系数、位移项系数、能量项系数。最后,利用所提出的损伤模型,以 HF-RAC2 为例进行损伤指标误差分析,结果表明:平均误差在 6%以内,即所提出的双参数损伤模型能够适用于 EC-RAC 框架节点地震损伤与评估分析。

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作者: 陈稳亮; 冀剑雄; 宋孟霖

标题: From Decay to Continuation: A Probe into the Progressive Protection and Development Model of Hancheng Ancient City

标题: 从衰变到延续: 韩城古城渐进式保护与发展模式初探

来源出版物: 城市发展研究 卷: 27 期: 2 页: 中彩页 7-中彩页 12 出版年: 2020

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作者关键词: Decay; Continuation; Ancient City Protection and Development; Gradual; Hancheng Ancient City

作者关键词: 衰变; 延续; 古城保护与发展; 渐进式; 韩城古城

摘要: In the context of rapid urbanization, many historical cities and historic districts of our country are faced with the dual dilemma of decline and dissimilation in protection and renewal. Historical urban protection and its vision of "authenticity, integrity, and continuity of life is fading away. The sustainable protection and development of historic towns face great challenges. For this reason, this article takes Hancheng ancient city as an example. Based on the status analysis and problem diagnosis of the decay phenomenon of ancient city decline and dissimilation, this article follows the idea of "continuation of characteristics, continuation of life, continuation of the system, and continuation of value". Then this article explores and studies the gradual protection and development model of Hancheng ancient city.

摘要: 快速城镇化背景下, 我国的许多历史城市及历史街区在保护和更新中面临衰退与异化的二元困境, 历史城市保护与其真实性、完整性和生活延续性的愿景渐行渐远, 其可持续的保护与发展面临巨大挑战。为此, 以韩城古城为例, 在对古城衰退与异化这一衰变现象进行现状分析与问题诊断的基础上, 遵循特色延续-生活延续-系统延续-价值延续的思路, 对韩城古城渐进式保护与发展的模式进行了探索与研究。

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标题: Geological culture village: scientific connotation, construction content and implementation path

标题: 地质文化村: 科学内涵、建设内容与实施路径

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作者关键词: geological culture village; scientific connotation; construction content; implementation path

作者关键词: 地质文化村; 科学内涵; 建设内容; 实施路径

摘要: With the proposal of national strategies such as ecological civilization and rural revitalization, the geological culture village has become an important starting point to expand service fields and promote the integration of geological work and socio-economic development. Basing on the geological culture village of six dimensional attribute as the breakthrough point, this paper discusses the spatial carrier, constructional theme, interest subject, main function, behavioral criterion and value orientation of geological culture village, and proposes that the geological culture village is a characteristic village that takes the village as the space carrier, highlights the theme of geology+or+geology, takes co-construction and sharing as a development mode, characterized by diversified functions, takes lightweight construction and ecological tourism as a benchmark, and aims at harmonious relationship between human and nature. The construction should focus on the five major revitalizations of the rural as the general outline, arounding infrastructure and public service systems, the IP of geological and cultural products, efficient industries and projects, multiple talent systems, geological protection measures, and cultural village management institutions. In the future, the healthy and sustainable development of geological culture village should be promoted by strengthening the connection of planning, formulating industry standards, carrying out national pilot projects, increasing capital investment, building a propaganda and marketing platform, and carrying on system training.

摘要: 伴随着生态文明、乡村振兴等国家战略的提出,地质文化村成为拓展服务领域、促进地质工作与社会经济发展融合的重要抓手。本文以地质文化村的六维属性为切入点,探讨了地质文化村的空间载体、建设主题、利益主体、主要功能、行为准则、价值导向等内涵,提出地质文化村是以村域为空间载体,以突出地质+或+地质文化为主题,以共建共享为发展模式,以多元化功能为特征,以轻质建设和生态旅游为基准,以人地关系和谐为目标的特色村落。建设重点应以乡村五大振兴为总纲,围绕基础设施和公共服务体系、地质文化产品 IP、高效产业及项目、多元人才体系、地质保护措施、文化村管理机构等方面开展;未来应通过强化规划衔接、制定行业标准、开展全国试点、加大资金投入、搭建宣传营销平台和进行系统培训等路径,促进地质文化村的健康持续发展。

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人文学院

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作者: Liu Lanjian; Teng Ying

作者: 刘兰剑; 滕颖

标题: Does the Level of Technological Innovation Depend on Technical Efficiency or Scale Effect?
--Measurement Research from China and OECD Countries

标题: 提高科技创新水平依靠技术效率还是规模效应?--来自中国与 OECD 国家的测度研究

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作者关键词: 创新型国家; 全要素生产率; 研发效率; 规模效应

摘要: At present, innovation has become a key factor in maintaining national competitiveness and economic growth. Governments in various countries have taken technological innovation as an important strategy to enhance their international competitiveness. Typical innovative countries such as the United States and Japan rely mainly on technological efficiency to enhance technological innovation, while countries such as South Korea and Sweden rely on increasing economies of scale, which raises the question of how to improve the level of scientific and technological innovation. In order to investigate whether the improvement of technological innovation level depends on technological efficiency or scale effect, and whether there is an optimal ratio between the two, the study measures and compares the innovation performance of China and the OECD countries, with a view to explaining this issue more accurately. The research focuses on scientific and technological innovation, innovative countries, and R & D efficiency. The study used a way by combining DEA and Malmquist indexes to measure the input-output efficiency of China and 11 innovative countries from OECD member countries from 2003 to 2016. Select R & D funding and R & D personnel as input indicators for research, and papers and tripartite patents as output indicators. Perform correlation analysis on input and output indicators. There is a correlation between variables and can be used for research. These are the preparations needed before the study. Next, the DEA method was used to measure the innovation performance gap between China and innovative countries. Then, the Malmquist index method was used to introduce total factor productivity (TFP) to more intuitively measure the impact of technological progress and management level on technological innovation. The research draws the following

conclusions: First, the R & D efficiency of world innovation activities has generally declined, China's total factor productivity has shown a growth trend, and the gap with innovative countries is gradually narrowing. Second, China's technological innovation efficiency is in the middle reaches of the sample countries. Position, compared with some innovative countries in terms of scientific and technological investment intensity, full-time equivalent of R & D personnel, the number of tripartite patent applications and the number of high-quality papers published; third, China's scale efficiency contribution to scientific and technological innovation is greater than Technical efficiency. The data shows that it is difficult to fully improve China's level of technological innovation based on scale efficiency alone. To achieve the long-term development of technological innovation, China should pay more attention to the simultaneous improvement of technological efficiency and scale effects. Based on the above research conclusions, the following suggestions are made: first, there is a certain threshold for the intensity of scientific and technological input, and continuous increase in scientific and technological input does not necessarily lead to sustained growth in innovation level, so the government needs to adjust and control the amount of scientific and technological input and output in a timely manner; secondly While paying attention to scale efficiency, we should pay more attention to the improvement of technical efficiency, invest in scientific research funds and personnel according to local conditions, rationally allocate scientific and technological resources, and improve the level of scientific research management. Finally, we must pay equal attention to quality and quantity in scientific and technological innovation. Increase the output of high-quality scientific and technological achievements. In addition, there are some shortcomings and prospects for future research in the research process.

摘要: 科技投入产出效率评价是衡量各国科技创新水平的主要手段。运用 DEA 与 Malmquist 指数相结合的分析方法,从静态和动态两方面对 2003-2016 年中国和 OECD 创新型国家的科技投入产出进行分析。结果表明,第一,中国全要素生产率呈现进步态势,但研发效率变化并非由技术研发引起,而是由于规模效应提升改善的。第二,典型的创新型国家大多表现为技术效率和规模效应同时提高科技创新水平。第三,未发现技术效率和规模效应的理想配比,需要本国根据自身发展的阶段及实际水平确定投入和产出的适当规模,注重科技创新中量与质的转化。

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作者: Liu Lanjian; Xiang Lilin; Xia Qing

作者: 刘兰剑; 项丽琳; 夏青

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作者关键词: innovation ecosystem; innovation policy; high-tech industry; evaluation

作者关键词: 创新生态系统; 创新政策; 高新技术产业; 评估

摘要: At present,the theoretical research on innovation ecosystem (innovation 3.0) has made some achievements.It is urgent for empirical research to further explore and test the ideas put forward in the theoretical research.It is also an effective measure to guide the construction of innovation ecosystem and optimize the third generation innovation policy.Starting from the innovation policy,this paper studies the ideas,methods and indicators of innovation ecosystem evaluation,and constructs an innovation ecosystem evaluation index system including three dimensions:dynamic evolution,sustainable innovation and openness,by selecting the data of high-tech industry in China from 2007 to 2016 for empirical evaluation.The findings are as follows:first,the innovation ecosystem of China's high-tech industry has a large growth space,which also proves that the current innovation policy needs to be transformed.Second,in recent years,China's innovation policies have achieved good results in promoting the population structure of high-tech industries,but at present,the collaborative innovation among populations is still lack of power.Third,we have made some achievements in promoting the transformation of scientific and technological achievements,but we still need to adjust policies to improve the proportion of innovation input and output,and we should pursue more extensive system openness in the future.Fourth,innovation policy should focus on promoting the coordinated development of innovation ecosystem in dynamic evolution,sustainable innovation and openness,so as to avoid the abnormal development of innovation ecosystem caused by excessive guidance.According to the results of empirical analysis,this paper puts forward the following policy recommendations for the development of innovation ecosystem of high-tech industry.First,continue to give play to the guiding role of the government and accelerate the transformation to the third generation innovation policy.Pay attention to the coordinated development of the dynamic evolution,sustainable innovation and system openness of the innovation ecosystem of high-tech industry,gradually form the innovation policy system conducive to the development of the ecosystem of high-tech industry,and guide the reasonable development of the industry.Second,in the environmental policy,we should focus on promoting the cooperation policy of industry,university and research,increase the power for the cooperation of innovation population,build a policy system conducive to the overall competitiveness of innovation ecosystem,distinguish the functions and tasks of basic research,applied research,development research and other links,so that the contributions of each link are mutually supported and the division of labor is relatively clear,which cannot simply require all of the scientific research is application-oriented.Third,in the supply side policy,we should integrate scientific and

technological resources,continue to promote the transformation of innovative achievements,enhance the protection of innovative achievements,continue to support the development of scientific and technological intermediaries,and create a good environment for the operation of innovation ecosystem.Fourth,in the demand side policy,we should focus on adjusting the investment structure and building a multi-channel and multi-level investment mechanism for high-tech industry.Financial support should reflect the dominant position of enterprises in technological innovation.In addition to the advantages of large-scale high-tech enterprises,it should also pay attention to small and medium-sized enterprises with development potential,and provide them with certain financing platform and policy welfare.

摘要: 当前关于创新生态系统(创新 3.0)的思辨研究取得了一定的成就,迫切需要实证研究对思辨中提出的理念进一步深入探索 and 实际检验。建立适用于创新生态系统的评估指标体系,是引导创新生态系统建设、优化第三代创新政策的有效举措。本文从创新政策出发,研究创新生态系统评估的思路、方法和指标等问题,建构了包含创新生态系统动态演化、可持续创新、开放性三个维度的创新生态系统评估指标体系。选择 2007-2016 年我国高新技术产业的相关数据进行实证评估。研究发现:第一,我国高新技术产业创新生态系统增长空间较大,同时也佐证了当前的创新政策亟需转型。第二,近年来我国创新政策在促进高新技术产业种群结构方面取得了较好的效果,但目前种群之间协同创新仍动力不足。第三,在推动科技成果转化方面取得了一定成效,但在改善创新投入与产出比例上尚需调整政策,未来应追求更加广泛的系统开放性。第四,创新政策应注重促进创新生态系统动态演化、可持续创新和开放性等方面的协同发展,避免因过度引导而产生的创新生态系统的畸形发展问题。

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第 3 条, 共 4 条

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作者: 刘兰剑; 张田; 牟兰紫薇

标题: An empirical study of the evaluation of innovation policies on the advanced equipment manufacturing industry

标题: 高端装备制造业创新政策评估实证研究

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文献类型: Article

作者关键词: advanced equipment manufacturing industry; innovation policy; performance evaluation

作者关键词: 高端装备制造业; 创新政策; 绩效评估

摘要: Advanced equipment manufacturing industry is one of the seven strategic emerging industries in China, and the country has issued a series of innovation policies to support its development. Focusing on the development of advanced equipment manufacturing industry is the only way to improve the core competitiveness of China's industry, which is of strategic significance to accelerate the industrial transformation and upgrading, and complete the transformation from a manufacturing power to a advanced equipment manufacturing industry power. Innovation policy is one of the key driving forces to promote industrial development. After years of innovation policy support for advanced equipment manufacturing industry, how does innovation policy promote the development of advanced equipment manufacturing industry? It is urgent to evaluate the innovation policy performance of advanced equipment manufacturing industry to answer this question, and take the evaluation results as the basis for the adjustment and optimization of technology innovation policies in this industry. Policy performance evaluation is an important method to analyze the effectiveness of policies. This paper collected 67 innovation policies of advanced equipment manufacturing industry from 2006 to 2017, the number of PCT patents published by the World Intellectual Property Organization, sales revenue of new products and other data. In this study, the number of PCT patents and sales revenue of new products were used as indicators to measure innovation output. Through quantitative evaluation of policy text and construction of structural equation model, this paper studies the impact of innovation policy on innovation output, and studies the innovation policy performance of China's advanced equipment manufacturing industry, so as to put forward suggestions on the improvement of innovation policy of advanced equipment manufacturing industry. This research constructs a three-dimensional quantitative evaluation framework for innovation policies of advanced equipment manufacturing industry to calculate the score of innovation policies, including policy intensity (X dimension), number of policy issuing departments (Y dimension) and policy frequency (Z dimension). Then, this study studies the impact of innovation policies on innovation output of advanced equipment manufacturing industry by building a Structural Equation Model, and sets up four potential variables, including 10 observation variables, including technological innovation planning, research and development activities, industrialization activities and innovation output. Four research hypotheses are proposed as follows. Hypothesis 1: technological innovation planning has a positive impact on research and development activities; Hypothesis 2: research and development activities have a positive impact on innovation output; Hypothesis 3: research and development activities have a positive impact on industrial activities; Hypothesis 4: industrial

activities have a positive impact on innovation output. In addition, the empirical data analysis results of this study support the four research hypotheses proposed, (1) technology innovation planning has a positive impact on research and development activities; (2) research and development activities have a positive impact on innovation output; (3) research and development activities have a positive impact on industrial activities; (4) industrial activities have a positive impact on innovation output.

摘要: 作为我国七大战略新兴产业之一的高端装备制造业,一系列中央及相关部委和地方出台了許多激励政策,这些创新政策的绩效亟待评估。本文收集了 2006-2017 年间与研究对象相关的 67 项创新政策、PCT 专利与新产品销售收入等数据,通过量化评估政策文本、构建结构方程模型等方法评估创新政策产生的影响。研究发现:第一,技术创新规划、研究开发活动、产业化等相关政策对专利产出、创新产品的经济效益等具有程度不一的促进作用;第二,高端装备制造业创新政策对创新产出具有正向影响,但影响程度有限;第三,创新政策存在着对科技成果转化重视不足等问题。

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第 4 条, 共 4 条

作者: Cai Jie; Liu Fei; Xia Xianli

作者: 蔡洁; 刘斐; 夏显力

标题: Rural industry convergence, non-agricultural employment and rural households' income: Microscopic evidence based on Liupanshan area

标题: 农村产业融合、非农就业与农户增收基于六盘山的微观实证

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文献类型: Article

作者关键词: rural industrial integration; non-agricultural employment capacity; rural households' income; moderating effect

作者关键词: 农村产业融合; 非农就业能力; 农户收入; 调节效应

摘要: Promoting rural households' income and narrowing the income gap among rural households are of great important to achieve the rural revitalization. Based on the field survey of the rural industry convergence in the Liupanshan area, we analyzed the impact of rural industrial integration and the non-agricultural employment capacity on the rural households' income, and examined the adjustment mechanism of non-agricultural employment capacity to the rural industries integration. The research results showed that: firstly, participation in rural industry integration and improvement of non-agricultural employment capacity increased the rural households' income and narrowed the income gap. Secondly, the improvement of non-agricultural employment capacity strengthened the promotion effect of rural industrial integration on the rural households' income and the inhibitory effect on the expansion of income gap. Thirdly, with the increase of non-agricultural employment capacity of rural households, the predicted marginal value of rural households' income of participating in rural industrial integration was lower than that of non-participating households, and the predicted marginal value of Gini coefficient was lower than that of non-participating households.

摘要: 促进农民增收、缩小农户收入差距是实现乡村振兴的重要目标。文中根据六盘山集中连片区农村一二三产业融合的实地入户调查,分析了农村产业融合、非农就业能力对农户收入的影响,并考察了非农就业能力对农村产业融合的调节机制。研究结果表明:参与农村产业融合、提高非农就业能力能够增加农户家庭收入、缩小收入差距;非农就业能力的提高强化了农村产业融合对农户家庭人均收入的促进效应及对收入差距扩大的抑制效应;随着非农就业能力的提高,参与农村产业融合的农户家庭人均收入的预测边际值比未参与农户的高、基尼系数的预测边际值比未参与农户的低。

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运输工程学院

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作者: 马书红; 李阳; 岳敏

标题: Study on intercity passenger transfer mode choice based on travel chain

标题: 考虑出行链的城际旅客换乘选择行为研究

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文献类型: Article

作者关键词: transportation planning and management; travel chain; travel mode choice; psychological latent variable; ICLV model

作者关键词: 交通运输规划与管理; 出行链; 出行方式选择; 心理潜变量; ICLV 模型

摘要: In order to study the intercity passenger transfer choice based on travel chain, and to reveal the influence of socio-economic attributes, travel characteristics and psychological latent variables of passengers on the choice of transfer mode. Based on the intercity passenger survey data of BeijingTianjinGuangzhou and BeijingShijiazhuangGuangzhou, a MIMIC model is constructed to analyze the causal relationship between the socio-economic attributes of passengers and the three latent variables of transfer comfort, transfer convenience and transfer economy. The results show that gender, income, whether or not possessing a car have a significant impact on the psychological latent variables. Then the latent variables are added to the discrete choice model as explanatory variables to build ICLV model based on the travel chain. It is found that gender, occupation, and departure time have great influence on the choice of travel chain. Finally, the choice of intercity passenger trip chain is predicted, and the error between the predicted values and the survey data is within 3%; the results show that the model considering the latent variables has great explanation ability.

摘要: 为研究基于出行链的城际旅客换乘选择行为,揭示旅客个体社会经济属性、出行特性与心理潜变量对出行方式选择的影响,基于北京天津广州、北京石家庄广州两条运输通道的城际旅客调查数据,构建多指标多原因模型分析旅客社会经济属性与换乘舒适性、方便性、经济性三个潜变量间的因果关系.研究表明,性别、收入、有无小汽车对心理潜变量影响较显著.将潜变量作为解释变量加入离散选择模型中,构建基于出行链的混合选择模型,发现性别、职业、出发时间等对出行链的选择影响较大.最后对城际旅客出行链的选择进行预测,预测值与调查数据的误差在 3%以内,表明考虑潜变量的模型具有良好的解释能力.

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第 2 条, 共 12 条

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标题: Current Status and Future Prospects of Existing Research on Digitalization of Highway Infrastructure

标题: 道路基础设施数字化研究进展与展望

来源出版物: 中国公路学报 卷: 33 期: 11 页: 101-124 出版年: 2020

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作者关键词: traffic engineering; highway infrastructure digitalization; review; technical system; development prospect

作者关键词: 交通工程; 道路基础设施数字化; 综述; 技术体系; 发展前景

摘要: For further promoting the highway transportation infrastructure to be digitalized, networked, and intelligent, the literature was searched in order to analyze the research progress and development trends in the field of highway infrastructure digitization. The literature related to the subject was firstly searched in the Chinese core collection database of CNKI, Web of Science~(TM), IEEE, and other English databases (229 articles in Chinese and 2 395 articles in English are found), then was sorted out and analyzed based on the Mapping Knowledge Domains, and highway infrastructure digitization was defined combined with the technical fields and engineering application scenarios in existing research. The technical frame of highway infrastructure digitalization was built on this basis, including the perception acquisition layer, integrated processing layer, business application layer, standard and regulatory system, and security and control system. The development status of key technologies such as digital road information perception technology, data management, and analysis technology, and full life cycle engineering applications was primarily discussed, along with the prospects for future technology

development.Finally,the existing problems and shortcomings of the previous research on highway infrastructure digitalization were summarized and a prospect for its future development was proposed in the discussion.The results showed that the digitalization of highway infrastructure is composed of specific detection and perception technologies,data transmission and communication networks,information platforms and security systems,and has multiple intelligences.In the process of collecting road information,the technical problems of sensors in terms of durability and practicability still need to be further resolved.It is shown that technical methods including the Internet of Things (IOT),Geographic Information System (GIS),Building Information Models (BIM),Cyber-physical Systems (CPS),Digital Twin,and big Data-driven techniques,have broad application prospects in the process of highway infrastructure performance monitoring and management.

摘要: 为进一步促进交通基础设施向数字化、网络化、智能化发展,采用文献研究法对道路基础设施数字化领域的研究进展和发展趋势进行分析。首先通过检索中国知网(CNKI)中文核心合集数据库和 Web of Science~(TM)、IEEE 等英文数据库中与主题相关的文献(中文 229 篇,英文 2 395 篇),基于科学知识图谱对文献进行梳理与分析,并结合现有研究中的技术领域与工程应用场景,对道路基础设施数字化做出了定义。在此基础上进一步构建了道路基础设施数字化的技术架构,包括:感知获取层、集成处理层、业务应用层、标准与规范体系以及安全与管控体系;此外重点介绍了数字道路信息感知技术、数据管理与分析技术、全生命周期工程应用等关键技术的发展现状,进一步展望了未来技术发展的前景。最终通过梳理道路基础设施数字化现有研究存在的问题和不足,对其今后的发展做出展望。结果表明:道路基础设施数字化是由特定的检测与感知技术、数据传输与通讯网络、信息平台与安全系统构成,具有多元智能性。在路面信息的采集过程中,传感器在耐久性和实用性等方面存在的技术难题仍需进一步解决;物联网、地理信息系统、建筑信息模型、信息物理系统、数字孪生、大数据驱动在内的多种技术手段在道路基础设施性能监测和管理过程中具有广阔的应用前景。

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标题: Study on Highway Accessibility of Urban Agglomerations and Its Connection Improvement

标题: 城市群公路可达性与衔接提升研究

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文献类型: Article

作者关键词: traffic engineering; highway traffic; comparative analysis; transport accessibility; urban agglomerations

作者关键词: 交通工程; 公路交通; 比对分析; 可达性; 城市群

摘要: To explore the service ability of highway networks in urban agglomerations and improve the level of urban agglomeration accessibility,the concept of accessibility was considered by taking the travel time from the central city to other nodes as the basis for the calculation of urban agglomeration accessibility,and measuring the transport service according to the isochrone.The accessibility measurement method of urban agglomerations under highway traffic and highway + other traffic modes was presented.According to the travel time to the central city,each region was divided into different levels of traffic circles,and the level of accessibility of urban agglomerations under highway traffic and highway + other traffic modes was evaluated by the coverage rate of the hourly traffic circle with three indicators:area,population,and GDP.Taking the Guanzhong urban agglomeration as an example,the accessibility in three scenarios:highway network,highway + high-speed railway (HSR),and highway + planned HSR,were calculated.Through comparative analysis,it was found that the highway + HSR mode makes an important contribution to expanding the 2 h traffic circle of urban agglomerations.The counties with obvious improvement in traffic circle levels were mainly distributed along the railway line.The farther away from the central city of Xi'an,the higher the promotion.The advantage of the highway + HSR mode was mainly reflected in medium and long-distance travel,that is,1 h and 2 h traffic circles.After the introduction of planned HSR and intercity railways,it was found that the accessibility of urban agglomerations improved,and the coverage rate of the 2 h traffic circle expanded to 95%.However,there are still a few areas in the urban agglomeration that are over 2 h away from the central city;that is to say,the planned road network still cannot meet the goal of 2 h accessibility of urban agglomerations in the Outline for Building a Leading Transportation Nation,which requires a faster transportation mode and road network improvement.

摘要: 为探究城市群路网服务能力,提升城市群可达性水平,提出以中心城市到其他节点的出行时间作为城市群可达性基数,按照等时线测度交通服务的可达性概念,给出了公路交通以及公路衔接其他交通方式下的城市群可达性测算方法。根据测算出的到中心城市出行时间将各区域划分为不同等级的交通圈,并分别以面积、人口、GDP 三项指标的小时交通圈覆盖率对公路交通以及公路衔接其他交通方式下城市群可达性水平进行评价。以关中城市群为例,分别测算了公路网络、公路衔接现状高速铁路网络与公路衔接规划中高速铁路网络 3 种情景下的城市群可达性。经过比对分析发现,公路衔接高速铁路对扩大城市群 2 h 交通圈具有重要贡献,其中交通圈等级提升明显的县域主要沿铁路线路分布,且呈现距离中心城市西安越远,提升等级越高的趋势。公路衔接高速铁路模式的优势主要体现在中长距离的出行,即 1,2 h 交通圈上。在引入规划中的高速铁路、城际铁路后,发现城市群可达性进一步提升,2 h 交通圈覆盖率进一步扩大,面积覆盖率达到 95%,但城市群内仍有少部分区域距离中心城市的出行时间达到 2 h 以上,即规划的路网仍不能满足《交通强国建设纲要》中"城市群 2 小时通达"的目标,需要考虑进一步引入更快速的交通方式并配合完善公路网。

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标题: An Accident Induction and Evacuation System Considering the Mixing Rate of the Large Vehicles Under the Freeway Network

标题: 路网环境下考虑大型车混入率事故疏散诱导模型

来源出版物: 中国公路学报 卷: 33 期: 11 页: 275-284 出版年: 2020

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文献类型: Article

作者关键词: traffic engineering; accident evacuation; dynamic space occupancy model; mixing rate of the large vehicles; traffic wave model; freeway

作者关键词: 交通工程; 事故疏散; 动态空间占有率模型; 大型车混入率; 交通波模型; 高速公路

摘要: The mixing rates of large vehicles strongly affect the traffic flow in a freeway, especially during an accident. To provide guidance that can help drivers and emergency personnel deal with accidents efficiently, this study added the dynamic space occupancy model, which considers the mixing rate of large vehicles, to the traffic wave model, and constructed an accident influence model with and without intervention. Taking an accident that occurred in the Zheng-Yao freeway as an example, the accuracy and feasibility of the model were verified. The relationships between several factors (i.e., evacuation time, evacuation volume, accident location, and traffic flow) and two indices (i.e., maximum queue length and recovery time) were analyzed. The results show a positive correlation between the evacuation time and impact of the accident; a negative correlation between the evacuation volume and degree of influence the accident; and weak correlation between the distance from the accident point to the upstream ramp and the degree of influence of the accident. The service level of the freeway is 0.456, and the number of vehicles is 1 321 veh·h⁻¹. To prevent the accident from affecting traffic on the upstream ramp, the mixing rate of large vehicles should be controlled to less than 50.1% to ensure that the maximum queuing length is within 10 km. If it exceeds 58%, the intervention cannot effectively prevent traffic on the upstream ramp. It is better to apply interventions when the evacuation time is less than 35 min. If it exceeds 35 min, the accident recovery time will rapidly increase, which hinders network recovery. Then, this trend will tend to stabilize. The simulation results showed that when the traffic flow increased by 50 vehicles, the increasing ranges of the recovery time and the maximum queue length are about [1.5 min, 3.6 min] and [1.209 km, 1.543 km], respectively. The research results can serve as a reference for the formulation of freeway accident induction strategies and the improvement of evacuation outcomes.

摘要: 大型车的混入对高速公路交通流产生了较大的影响,尤其是在交通事故情景下。为了引导事故条件下驾驶人和组织者做出高效准确的决断,将考虑了大型车混入率的动态空间占有率模型引入到交通波模型,构建干涉与非干涉情景下的交通事故影响模型。以郑尧高速为例,对模型的准确性和可行性进行了验证,分别对干涉情景下的疏散时间、疏散量以及事故发生的位置、车辆数等指标与事故影响程度的指标(包含事故最远排队长度,事故持续时间)关系进行分析。研究结果表明:疏散时间与事故影响程度成正相关关系,疏散量与事故影响程度成负相关关系,而事故发生点与上游匝道之间的距离与其关系不大;道路服务水平为 0.456,车辆数为 1 321 veh·h⁻¹时,为了使得分合流区不受影响,在不采取任何措施的情景下,应将大型车混入率控制在 50.1% 以下,使得最远排队长度在 10 km 内;当大型车混入率大于 58% 时,将很难通过干涉引导避免对上游分合流区产生影响;在 35 min 以内采取干涉措施的效果最为明显,而大于 35 min 时,事故持续时间会发生一个急剧的增加,不利于路网恢复,之后事故恢复时间将趋于平稳;对道路交通量进行模拟可知交通量每增加 50 veh,疏散时间和距离增加的范围为 [1.5 min, 3.6 min] 和 [1.209 km, 1.543 km]。研究结果可为高速公路事故诱导策略制定和疏散效果提升提供参考。

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标题: Analysis on injury severity of pedestrian in motor vehicle-pedestrian accidents

标题: 机动车-行人事故中行人伤害严重程度分析

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文献类型: Article

作者关键词: motor vehicle-pedestrian crashes; injury severity; partial proportion odds model; elasticity analysis; dependent variable; independent variable

作者关键词: 机动车-行人碰撞事故; 伤害严重程度; 部分优势比模型; 弹性分析; 因变量; 自变量

摘要: In order to explore factors affecting pedestrian's injury severity in motor vehicle-pedestrian crashes, 6101 cases of such crash accidents in a city were investigated. 19 variables were selected from four aspects, including human, vehicles, roads and environmental conditions, and a pedestrian injury severity analysis model was established by using partial proportion odds model. Then, influence of significant variables on injury severity was analyzed quantitatively through elasticity analysis. The results show that 12 variables have a significant impact on pedestrian's injury severity in these crashes, including drivers' gender and age, pedestrian's gender and age, vehicle types, pavement structure, road types, time of accident, whether there is a traffic signal

control,visibility,lighting conditions and terrain. Among them,variables like drivers'gender and age meet the proportional odds assumption,while those like pavement structure do not.

摘要: 为探究影响机动车-行人碰撞事故中行人伤害严重程度的因素,以某市的 6 101 起机动车-行人交通事故为研究对象,从人、车辆、道路和环境 4 个方面选择 19 个变量,采用部分优势比模型建立行人伤害严重程度分析模型,通过弹性分析法定量分析各显著变量对行人受伤情况的影响程度。结果表明:驾驶员性别与年龄、行人性别与年龄、车辆类型、路面结构、道路类型、事故发生时间、交通信号控制、能见度、照明情况以及地形等 12 个变量会显著影响机动车-行人碰撞事故中行人的伤害严重程度。其中,驾驶员性别与年龄等变量满足比例优势假设,而路面结构等变量不满足比例优势假设。

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标题: Multi-mode passenger flow sharing characteristics of highway-rail composite intercity corridor

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文献类型: Article

作者关键词: transportation planning; passenger flow sharing rate; distance diversion curve; MNL model; highway-rail composite corridor; intercity travel

作者关键词: 交通规划; 客流分担率; 距离转移曲线; MNL 模型; 公铁复合走廊; 城际出行

摘要: Four node cities, including Xianyang, Weinan, Huangling and Yan'an within 350km from the central city of Xi'an in Shaanxi Province were selected. The passenger flow characteristic parameters such as travel volume, time inside the vehicle, ticket price or toll of high-speed railway, ordinary railway, long-distance bus and car on the highway were collected. Various methods of intercity passenger flow sharing analysis were summarized. A distance transfer curve model and multivariate Logit model were constructed and were calibrated by curve fitting, trial calculation and regression analysis. According to the model calibration results, the sensitivities of passenger flow sharing rate to distance, time and cost were analyzed, respectively. The sharing characteristics of regional intercity multi-mode passenger flow were obtained, and the relevant suggestions on the planning and management of intercity corridors were given. Analysis result indicates that the fitting results of sharing rate-distance transfer curves of three modes, including high-speed railway, ordinary railway and car on the highway, are ideal. The determination coefficients are all above 0.94. When MNL model takes 90-150min out of the vehicle, the fitting effect is preferable and the determination coefficients are all above 0.79. The determination coefficients reach the peak values when the time value is 50-70yuan·h⁻¹. With the increase of intercity travel distance, the travelers choose to transfer from car on the highway to intercity railway travel. A high-speed railway has more advantage than an ordinary railway. The sharing rate of the car on the highway between Xi'an and Xianyang in a near distance is 96.91%. The sharing rate of the high-speed railway between Xi'an and Yan'an in a long distance is 53.66%, and that of the ordinary railway is 30.58%. Taking the outside time of 120min as an example: the ranges of impedance coefficient of high-speed railway, ordinary railway, longdistance bus and car on the highway are 0.029-0.044, 0.034-0.042, 0.030-0.040 and 0.028- 0.048, respectively, car and high-speed railway have a larger growth range, making both services more sensitive to travel costs. The impedance coefficients of the four modes are 0.038-0.042 under the condition that the time value is 60yuan·h⁻¹. There is no significant difference between the four services on the generalized time sensitivity of travel. It is suggested that more passenger flow sharing rules of inter city corridors in urban agglomerations should be explored. The details of an urban end of an inter city travel chain should be considered accurately to guide the macro planning and management of intercity corridors preferably. 6tabs, 7figs, 30refs.

摘要: 选取了陕西省内距中心城市西安 350km 范围内的咸阳、渭南、黄陵、延安 4 个节点城市,搜集了相关公铁复合城际走廊上高速铁路、普通铁路、长途客车、小汽车高速出行的出行量、车内时间、票价或通行费等客流特征参数,梳理了各种城际客流分担分析方法;构建了距离转移曲线模型和多元 Logit 模型,通过曲线拟合、试算和回归分析对模型进行了标定,并根据模型标定结果分析了客流分担率对距离、时间和费用的敏感性,得到区域城际多模式客流分担特征,给出城际通道规划管理的相关建议。研究结果表明:高速铁路、普通铁路和小汽车高速出行 3 种模式的分担率-距离转移曲线拟合结果理想,决定系数均在 0.94 以上;MNL 模型在车外时间取 90~150min 时,拟合效果较好,决定系数均在 0.79 以上,且在时间价值取 50~70 元·h⁻¹情景下决定系数达到峰值;随着城际出行距离的增加,出行者选择从小汽车高速出行转移到城际铁路出行,且高速铁路较普通铁路更有优势,西安与近距离的咸阳之间小汽车高速分担率达 96.91%,与远距离的延安之间高速铁路分担率达 53.66%,普通铁路分担率达

30.58%;以车外时间为 120min 为例,高速铁路、普通铁路、长途客车、小汽车 4 种出行模式的阻抗系数分别为 0.029~0.044、0.034~0.042、0.030~0.040、0.028~0.048,小汽车高速出行和高速铁路增长幅度较大,2 种出行对费用更加敏感,在时间价值取 60 元·h⁻¹条件下,4 种出行模式的阻抗系数为 0.038~0.042,4 种出行对广义时间敏感性无明显差异;建议进一步挖掘更多城市群城际通道客流分担规律,并精确考虑城际出行链的城市端细节,以更好地指导城际走廊的宏观规划与管理。

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标题: Vehicle scheduling model considering individual driving speed deviation

标题: 考虑个体驾驶速度偏差的车辆调度模型

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作者关键词: vehicle scheduling; scheduling scheme; genetic algorithm; driving speed deviation; driver assignment

作者关键词: 车辆调度; 调度方案; 遗传算法; 驾驶速度偏差; 驾驶人分配

摘要: In view of driving speed deviation, a vehicle scheduling model was established for multidrivers, multi-vehicles, multi-materials, multi-depots, and multi-demands targeting at the shortest overall transportation time, the lowest overall transportation cost and the least multi-objective overall transportation time and cost, respectively. The effects of individual driving speed deviation on the above targets were studied. The driver parameters were input into the gene coding of the genetic algorithm. The constraints of driver uniqueness, initial location, and the supply and demand quantities of materials were established to ensure that the distribution scheme of drivers in each gene was feasible and the material transportation did not exceed the total supply and demand. A genetic algorithm was applied to solve the vehicle scheduling schemes for each target with and without driving speed deviation under the condition of randomly assigned drivers. Calculation result shows that the optimized scheduling schemes satisfy all the constraints in the model. For the three optimal schemes, the driver assignments are different, indicating that the target function is affected by the driving speed deviation. The dispatching results of each target with driving speed deviation are superior to those without driving speed deviation. The difference ratios of the three objective functions are 3.5%, 2.96% and 1.13%, respectively, which shows that the driving speed deviation has a certain influence on the solving quality. The target scheduling results of the driver's random assignment are inferior to the corresponding optimal results. The different ratios of the three objective functions are 3.91%, 2.47% and 1.98%, respectively, showing that the dispatching efficiency is affected by the driving speed deviation, and optimizing the driver allocation scheme can reduce the overall transport time and cost. Analysis result shows that the vehicle scheduling scheme, which is more in line with the scheduling target, closer to reality, and more economical and time-saving, can be obtained by allocating drivers reasonably according to the specific dispatching target. 13 tabs, 1 fig, 35 refs.

摘要: 考虑驾驶速度偏差,建立了多驾驶人、多种车型、多种物资、多仓库点和多需求点的物资车辆调度模型,分别以整体运输时间最短、整体运输成本最低以及综合整体运输时间与成本最小为目标,研究了个体驾驶速度偏差对上述目标的影响;将驾驶人参数加入到遗传算法的基因编码中,建立了驾驶人唯一性约束、初始地点约束以及物资供需数量约束,保证每个基因个体中驾驶人分配方案可行,且物资运输不超供需总量;采用遗传算法求解了随机分配驾驶人条件下有驾驶速度偏差与无驾驶速度偏差时各目标的车辆调度方案。计算结果表明:优化调度方案满足模型中的所有约束条件;3种目标下的最优方案中,驾驶人的分配方案不同,说明目标函数受驾驶人驾驶速度偏差影响;有驾驶速度偏差情况下的各目标调度结果均优于相应无驾驶速度偏差的调度结果,3种目标函数差比分别为3.50%、2.96%和1.13%,说明驾驶速度偏差对求解质量有一定影响;驾驶人随机分配时的各目标调度结果均劣于相应最优结果,3种目标函数差比分别为3.91%、2.47%和1.98%,说明驾驶速度偏差会影响调度效率,优化驾驶人分配方案能降低整体运输时间与成本。由此可见,根据特定的调度目标对驾驶人进行合理分配,可以得到更符合调度目标、更贴近实际、更经济省时的车辆调度方案。

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标题: Characteristics and vulnerability of rail transit network based on perspective of passenger flow characteristics

标题: 客流特征视角下的轨道交通网络特征及其脆弱性

来源出版物: 交通运输工程学报 卷: 20 期: 5 页: 208-216 出版年: 2020

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文献类型: Article

作者关键词: urban rail transit; topology; Space L method; passenger flow characteristics; passenger demand; vulnerability

作者关键词: 城市轨道交通; 拓扑结构; Space L 方法; 客流特征; 乘客需求; 脆弱性

摘要: In order to improve the objectivity of vulnerability assessment of urban rail transit network, passenger demand characteristics were integrated into the calculation of network vulnerability. Based on the static topological structure of urban rail transit network established by using the Space L method, the weighted network of rail transit was established with passenger flow as the weight. Based on the passenger flow index, the station connection strength and weighted node betweenness were proposed to reflect the dynamic network structure characteristics and measure the interaction strength between nodes. Aiming at the spatial-temporal characteristics of passenger flow in urban rail transit network, combined with the demand characteristics of network passenger flow, the passenger effective path subgraph and OD loss rate of network passenger flow under the condition of station failure were defined by using the maximum travel consumption tolerance threshold to evaluate the vulnerability of urban rail transit network. Taking Xi'an urban rail transit network as an example, the features and vulnerability of urban rail transit network were

interpreted from the perspective of passenger flow characteristics. Research result shows that the current rail transit network in Xi'an has the characteristic of small world network and its average path length is 10.7. Xiaozhai Station and Beidajie Station are the key nodes of the network, their connection strengths are 166 795 and 149 059, respectively, and their weighted node betweennesses are 0.365 and 0.369, respectively. The interruption of the two stations will result in 40.1% and 39.4% reduction in network efficiency. The passenger travel tolerance threshold greatly affects the importance ranking of the stations in the network. With the increase of passenger travel tolerance threshold, the network vulnerability gradually decreases. The correlation between vulnerability and betweenness is stronger than those with degree and intensity. With the increase of travel tolerance threshold, the correlation between weighted betweenness and vulnerability gradually decreases. Therefore, the calculation indicators and methods proposed in this paper highlight the impact of passenger flow characteristics and passenger demand on the vulnerability of rail transit network, which can well reflect the functional characteristics of rail transit network. 4 tabs, 8 figs, 30 refs.

摘要: 为提高城市轨道交通网络脆弱性评估的客观性,将乘客需求特性集成到网络脆弱性的计算中;在城市轨道交通网络 Space L 空间下静态拓扑结构的基础上,以客流为权重建立了轨道交通加权网络;基于客流指标提出了车站连接强度和加权节点介数,用于反映动态网络结构特征,度量节点间相互作用强度;针对城市轨道交通网络客流的时空特性,结合网络客流需求特性,基于出行消耗最大容限阈值,构建了站点故障条件下的乘客有效路径子图和网络客流的 OD 损失率,进而评估城市轨道交通网络的脆弱性;以西安城市轨道交通网络为例,从网络客流视角分析了城市轨道交通网络特征及其脆弱性。研究结果表明:西安市轨道交通网络具有小世界网络特性,平均路径长度为 10.7,其中小寨站和北大街站为网络关键节点,其车站连接强度分别为 166 795、149 059,加权节点介数分别为 0.365、0.369,这两个站点的中断对西安市轨道交通网络效率的影响分别为 40.1%、39.4%;乘客出行容限阈值极大地影响着网络中站点的重要性排序,网络脆弱性随着乘客出行容限阈值的增大而逐渐降低;脆弱性与介数的相关性强于脆弱性与度和强度的相关性,随着出行容限阈值的增大,加权介数与其脆弱性的关联性逐渐降低。可见,提出的计算指标和方法突出了客流特征与乘客需求对轨道交通网络脆弱性的影响,能够很好地体现轨道交通网络的功能特性。

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标题: Simulation of COVID-19 propagation and transmission mechanism and intervention effect based on generalized SEIR model

标题: 基于广义 SEIR 模型的新冠肺炎传播机制及干预效果仿真

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作者关键词: COVID-19; generalized SEIR model; system dynamics model; sensitivity analysis; Anylogic simulation

作者关键词: 新冠肺炎; 广义 SEIR 模型; 系统动力学模型; 敏感性分析; Anylogic 仿真

摘要: The coronavirus disease 2019 has spread to a great number of countries and regions around the world, and the spread processes and the infection prediction models of the COVID-19 vary from country to country. Based on the COVID-19 published data from the United States and China, this paper first applies the generalized SEIR model to estimate the disease transmission parameters, then, determines the influence of each parameter in the basic infection number R_0 on the disease. Based on the Anylogic simulation, a system dynamics model is used to analyze the parameter sensitivity, and to quantitatively characterize the influence of key parameters on the disease transmission. Finally, according to the analysis results, some targeted prevention and control intervention measures are put forward, with China and the United States as examples to simulate the intervention effects of different prevention and control levels. It is found that the generalized SEIR model fits well with the transmission mechanism of the COVID-19 in China and the United States. The protection rate, the infection rate and the average quarantine time have a significant impact on the prevention and the control of the epidemic. Targeted measures are adopted to improve the protection rate, reduce the infection rate and shorten the average quarantine time.

摘要: 新型冠状病毒肺炎(新冠肺炎)已在全球多个国家和地区蔓延,且不同国家和地区新冠肺炎的传播扩散过程和传染预测模式不尽相同。以美国和中国新冠肺炎公开数据为样本,首先应用广义 SEIR 模型,对疾病传播参数进行估计。其次,确定基本传染数 R_0 中各参数对疾病的影响,进而基于 Anylogic 仿真,利用系统动力学模型进行参数敏感性分析,定量表征关键参数对疾病传播的影响。最后,根据分析结果提出针对性的防控干预措施,以中美为例模拟不同防控级别的干预效果。研究发现,广义 SEIR 模型对中国与美国新冠肺炎传播机制的拟合性较好,保护率、感染率和平均检疫时间对防控疫情影响显著,并可以通过针对性的措施来提高保护率、降低感染率、缩短平均检疫时间。

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标题: 基于 PVAR 模型的环境规制与公路运输效率关系探究

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作者关键词: highway transportation efficiency; environmental regulation; three-stage SBM-DEA model; PVAR model

作者关键词: 公路运输效率; 环境规制; 三阶段 SBM-DEA 模型; PVAR 模型

摘要: From the perspective of input and output, the three-stage SBM-DEA model was used to measure the highway transportation efficiency (HTE) of 31 provinces (municipalities or autonomous regions) in China from 2008 to 2017. Finally, the dynamic relationship between HTE and environmental regulation is studied by using PVAR model. Results show that: after eliminating the influence of environmental variables and random factors, the national HTE shows an overall high level and it has a rising trend between 2008 and 2017. The relationship between HTE and pollution reduction cost were mutually causal, but there was only unidirectional causality relationship with HTE and pollution emission intensity. In the short term, the impact of

government's emission reduction policies on HTE has timeliness. But in the long run, it cannot promote the sustainable growth of HTE. Therefore, the government should formulate reasonable environmental policies in order to achieve a win-win situation of vigorous development of HTE and improvement of environmental quality.

摘要: 该文从投入产出角度运用三阶段 SBM-DEA 模型测度了 2008-2017 年中国 31 个省(市、自治区)的公路运输效率,运用 PVAR 模型研究了公路运输效率与环境规制两者的动态关系。结果发现:(1)剔除环境变量和随机因素影响后,2008-2017 年全国公路运输效率呈现整体偏高且上升的趋势;(2)公路运输效率与污染减排成本和污染排放强度分别呈现出双向因果和单向因果关系;(3)短期而言,政府减排政策对公路运输效率的影响具有时效性,但长期来看,无法促进公路运输效率持续增长。因此,政府应制定合理的环境政策,以达到公路运输业蓬勃发展和环境质量改善的双赢局面。

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标题: Short-term passenger flow forecast of urban rail transit based on different time granularities

标题: 基于不同时间粒度的城市轨道交通短时客流预测

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作者关键词: traffic engineering; urban rail transit; short-term passenger flow forecast; ARIMA model; time granularity; similarity measure

作者关键词: 交通工程; 城市轨道交通; 短时客流预测; ARIMA 模型; 时间粒度; 相似性度量

摘要: In order to explore the relationships between forecast accuracy and time granularity of passenger flow in urban rail transit, based on the inbound passenger flow data of automatic fare collection (AFC) system for 50 consecutive days in Xi'an Metro, the effective time of metro operation was divided into different time granularities, such as 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours and 1 day. The similarity of passenger flow time series under different time granularities was measured by Pearson coefficient method. The autoregressive integrated moving average (ARIMA) model was used to fit and predict the total network entry under different time granularities. Taking Pearson coefficient equal to 0.95 as the threshold of time granularity selection for short-term passenger flow forecast, ARIMA model was finally used for short-term passenger flow forecast under three time granularities of 30 minutes, 60 minutes and 1 day. The forecast results of ARIMA model were compared with those of autoregressive (AR) model, support vector regression (SVR) and BP neural network model. The results show that the time granularity correlation coefficient change presents a single peak form, and the average relative error of ARIMA model for 30 minutes, 60 minutes and 1 day time granularities are 4.12%, 3.54% and 4.97% respectively. The forecast results of the four models show that the average forecast accuracy of the ARIMA model is the highest. The four methods have the same change tendency for the forecast error at different time granularities, that is, the average forecast error decreases according to the three time granularities of 1 day, 30 minutes and 60 minutes. Therefore, the extreme selection of time granularity will not directly improve the effect of short-term passenger flow forecast, the optimized time series model has high accuracy in the analysis and short-term prediction of passenger flow data of Xi'an Metro stations, the research results can provide technical support for the optimization of the operation organization of urban rail transit. 7 tabs, 10 figs, 24 refs.

摘要: 为探究城市轨道交通进站客流量预测精度与时间粒度之间的关系,以西安地铁自动售检票(AFC)系统连续 50 d 进站客流量数据为研究依据,将地铁运营有效时间划分为 5、15、30 min、1、2 h 及 1 d 等不同时间粒度,并对不同时间粒度下客流量时间序列采用 Pearson 系数法进行相似性度量,然后利用差分整合移动平均自回归(ARIMA)模型对不同时间粒度下的全网进站量进行拟合。以 Pearson 系数等于 0.95 作为短时客流预测时间粒度的选取阈值,最终选取在 30、60 min 及 1 d 三种时间粒度下用 ARIMA 模型进行短时客流预测,并与自回归滑动平均(AR)模型、支持向量回归(SVR)模型和 BP 神经网络预测模型的预测结果进行比较分析。研究表明:时间粒度相关性系数变化呈现单波峰形态,在 30、60 min 及 1 d 时间粒度下,ARIMA 模型预测结果平均相对误差分别为 4.12%、3.54%、4.97%;在这 4 种模型中,ARIMA 模型平均预测精度最高,在不同时间粒度下这 4 种模型的预测误差呈现相同的变化趋势,即平均预测误差由大到小的 3 种时间粒度分别为 1 d、30、60 min。因此,时间粒度大小选取的极端化并不会带来短时客流预测效果的直接提升,优化后的时间序列模型在西安地铁全网进站客流量短期预测方面具有较高的精度,研究成果可为城市轨道交通行车组织优化提供技术支持。

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标题: Analysis on Regulatory Regime Change, Policy Evolution and Effect of Taxi Industry

标题: 出租汽车行业管理制度变迁、政策演变与效应评析

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作者关键词: transport economics; policy effect evaluation; literature review method; taxi; system change

作者关键词: 运输经济; 政策效应评析; 文献综述法; 出租汽车; 制度变迁

摘要: In order to clarify the problems in the taxi industry and their causes, the institutional historical changes, policy evolutions, and effects of 21 important documents for taxi industry at the national level are sorted out and studied by the literature review method. The result shows that (1) The development of the taxi industry has obvious time-series characteristics, which can be divided into free development stage, storming stage and great change stage. In free development stage (1988-1997), the main contradiction of the taxi industry is the contradiction between supply and demand. The government adopts the free examination and approval system to solve the imbalance between supply and demand. Enterprises use market mechanism to solve operational problems, but discriminatory access and unguided enterprise operation mechanism have created the variable economic relationship between enterprise and drivers, which has hidden risks for the development of the industry. In storming stage (1998-2013), the system reform of taxi industry and

the subsequent policy such as quantity control have caused industry storming. The operating rights can be paid for sale and the multiple management system have injected momentum into the disorderly expansion of taxis, supply and demand balance formed in the free stage has broken, the negative external effect of excessively rapid expansion of transport capacity and the implicit and mutated economic relationship contradictions gradually became apparent. During the great change stage (2014-), online ride-hailing cars severely impacted the cruise taxi market by virtue of technology, mode and financial advantages, the industry's conflicts of interest have intensified. Measures such as improving the access conditions of people, vehicles and platforms for online ride-hailing have temporarily eased conflicts. (2) The discriminatory access policy adopted during the free development stage is the source of industry contradictions, the quantitative control and the irregular transfer of operating rights during the storming stage directly intensified the contradictions, and the differentiated development orientation of cruise cars and online ride-hailing cars during the great change stage temporarily resolved the contradiction between the old and the new business formats, but the policy of free use of operating rights cannot fundamentally relieve the driver's pressure, and may cause public revenue to flow out.

摘要: 为厘清出租汽车行业存在的问题及成因,采用文献综述法,对出租汽车行业国家层面的21个重要文件的制度历史变迁、政策演变及效应进行梳理和研究。研究发现(1)出租汽车行业发展具有明显的时序特征,可以分为自由发展期、震荡期和巨变期。自由发展期(1988-1997),出租汽车行业主要矛盾是供需矛盾,政府采用无偿审批制来解决供需失衡问题,企业利用市场机制解决运营问题,但歧视性准入和无引导的企业运营机制在企业 and 司机间产生了变异的经济关系,为行业发展埋下了隐患;震荡期(1998-2013),出租汽车行业制度改革及后续的数量管制等政策引发了行业震荡,经营权可以有偿出让多头管理体制为出租汽车无序扩张注入了动力,打破了出租汽车在自由阶段形成的供需平衡,运力过快扩张的负外部效应显现,内隐的变异的经济关系矛盾逐步显化;巨变期(2014-),网约车凭借技术、模式、资金优势严重冲击了巡游出租汽车市场,行业利益冲突加剧,通过将网约车纳入监管,提高网约车人、车、平台等准入条件等措施,暂时缓解了矛盾冲突。(2)出租汽车自由发展时期采取的歧视性准入政策是行业矛盾的源头,震荡期的数量管制和经营权的不规范转让直接激化了矛盾,巨变期的巡游车和网约车差异化发展定位暂时化解了新旧业态矛盾,而经营权无偿使用政策不能从根本上解决司机压力,有可能使公共收益外流。

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土地工程学院

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标题: Impacts of Ecological Restoration on Water Resources in Middle Reaches of Yellow River

标题: 黄河中游地区生态恢复对流域水资源的影响

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作者关键词: ecological recovery; water resource; evapotranspiration; the middle reaches of Yellow River; grain for green program

作者关键词: 生态恢复; 水资源; 蒸散发; 黄河中游; 退耕还林还草工程

摘要: [Objective]The impacts of ecological restoration in the middle reaches of Yellow River on water resources were studied in order to provide a scientific basis for the eco-environment protection and high-quality development of the basin.[Methods]Based on the GIMMS NDVI,ET,soil moisture,surface runoff and other hydrology data,the study used trend analysis and double cumulative curve methods to analyze the spatial and temporal characteristics of the evapotranspiration,soil water and surface runoff in the middle reaches of Yellow River,before and after ecological restoration.[Results]From 1982to 2018,the fractional vegetation cover of the middle reaches of Yellow River increased by 29.72%.As the fractional vegetation cover increased by 1%,the evapotranspiration increased by 3~4mm.In the ecological restoration area,the decline rate of soil moisture was 0.001 3%per year.The average runoff was decreasing from 1961to 2018, and human activities represented by ecological restoration played an important role in the decline of runoff. [Conclusion]Due to the climate warming and drying and ecological restoration,there is a serious shortage of water resources in the middle reaches of Yellow River.People should consider water resources comprehensively, reduce human interference,and focus on natural vegetation restoration in the follow-up ecological restoration.

摘要: [目的]研究黄河中游地区生态恢复对水资源的影响,为流域生态保护和高质量发展提供科学依据。[方法]利用 GIMMS NDVI、ET、土壤水分、地表径流等相关水文数据,基于趋势分析和双累积曲线等方法,探讨生态恢复前后黄河中游地区蒸散发、土壤水分、地表径流的时空变化特征。[结果]19822018 年,黄河中游地区植被覆盖度增加了 29.72%;在黄河中游地区植被覆盖度增加 1%,蒸散发量增加了 3~4mm;在生态恢复区土壤水分呈下降趋势,下降速率为 0.001 3%/a;各站点的平均径流量在 19612018 年呈逐年下降趋势,以生态恢复为代表的人类活

动对径流量下降起到重要作用。[结论]由于生态恢复和暖干化的气候背景,黄河中游水资源严重短缺。建议后续黄河中游生态恢复综合考虑水资源,减少人为干扰,以自然植被恢复为主。

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作者关键词: soil fungi; forest ecosystem; influence factor; research progress

作者关键词: 土壤真菌; 森林生态系统; 影响因素; 研究进展

摘要: Fungi is an important part of global biodiversity and plays an important role in the function of forest ecosystems. They affect the community structure of plants and animals through symbiotic-parasitic interactions. With the development of high-throughput sequencing technology (Roche FLX 454, Illumina MiSeq), researchers have been able to carefully explore the biogeographic pattern and ecological effects of constructing fungal communities, which has greatly promoted the understanding of functional characteristics and fungal diversity. In this paper, a review was presented the latest research progress about fungal communities in the forest ecosystem, besides, we analyzed the trends and driving factors of the diverse geographic scales of fungal communities, and focused on the relationship between vegetation types and fungal diversity. It was found that the change of forest type caused by geographical distance was one of the main factors influencing the fungal community. In the forest ecosystem, there were four patterns of elevation gradient fungal community diversity, including increasing, decreasing, peak pattern and no significant change, and the driving factors of different forest types were different. The composition and diversity of fungal community in forest soil were influenced by various soil characteristics (pH, C/N), and the influence of vegetation type on fungal community was also uncertain. Therefore, it is necessary to analyze the classification and functional structure of fungal communities on a small scale to study the relationship between dominant vegetation diversity and fungal communities along the altitude. More research should be conducted on the classification and functional structure of specific tree species, mixed forests, and fungal communities in forest areas (from soil to flora) in forest ecosystems with complex and diverse vegetation types. In addition, it is necessary to understand the organisms (human, plant, and soil organisms) that drive the elemental cycle and the environmental conditions (climate, soil physicochemical properties, and topography) that regulate their activities to improve our understanding of fungal communities and ecosystem functions, using functional genes to explore the fungal community compositions and explore the links between ecosystem functions.

摘要: 真菌是全球生物多样性的的重要组成部分,在森林生态系统功能中发挥着重要作用,通过共生-寄生的相互作用影响着动植物的群落结构。高通量测序技术(Roche FLX 454, Illumina MiSeq)的兴起,使得研究人员能够仔细构建真菌群落的生物地理格局和生态效应,极大地促进了人们对真菌功能特征、多样性的理解。文章综述了森林生态系统真菌群落的最新研究进展,分析了真菌群落多样性地理尺度上的变化趋势与驱动因素,并重点关注植被类型与真菌多样性的关系。研究结果发现,地理距离引起的森林类型的变化是影响真菌群落的主要因素之一。在森林生态系统中,海拔梯度的真菌群落多样性存在上升、下降、单峰、无显著变化4种模式,且不同森林类型的驱动因素也存在差异。森林土壤真菌群落组成和多样性受到各种土壤特征(pH、C/N)的影响,植被类型对真菌群落的影响方式也存在不确定性。在今后的研究过程中,有必要对较小尺度上真菌群落的分类和功能结构进行更多分析,探讨海拔梯度下优势植被多样性与真菌群落的关系。在植被类型复杂多样的森林生态系统中,对特异性树种、混交林以及林区(从土壤到植物圈)真菌群落的分类和功能结构进行进一步研究。此外,了解驱动元素循环的生物(人类、植物和土壤生物)以及调节其活动的环境条件(气候、土壤理化特性和地形),从而提高我们对真菌群落与生态系统功能的认识,利用功能基因探索真菌群落组成并探索生

态系统功能之间的联系。

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标题: Land Consolidation Potential and Spatial Restructuring of Hollowed Village in the Loess Hilly and Gully Region

标题: 黄土丘陵沟壑区空心村土地整治潜力及空间重构

来源出版物: 水土保持研究 卷: 27 期: 6 页: 285-292 出版年: 2020

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作者关键词: population hollowing; land consolidation; rural spatial restructuring; rural revitalization; Changwu County

作者关键词: 人口空心化; 土地整治; 乡村空间重构; 乡村振兴; 长武县

摘要: In order to understand the rural population hollowing level and the potential of land consolidation in the loess hilly and gully region, Changwu County of Shaanxi Province was taken as an example, which is located in the loess hilly and gully region. We used the comprehensive evaluation method to measure the degree of population hollowing out of Changwu County on the town scale. The indicators were used to construct the evaluation model of the land consolidation potential of the hollow village, and the scores and zoning of the land consolidation potential evaluation were obtained. Based on this, the rural spatial restructuring strategy was proposed. The results show that: (1) the population hollowing index of Changwu County has increased significantly over time; the average values in 2010, 2014 and 2018 were 21.25, 27.50 and 33.65 respectively. The population hollowing index value of Zhaoren Street which is close to the urban area and has a strong economy is higher than other areas; (2) based on the evaluation score of the potential of land consolidation potential in hollowed village, the study area is divided into Class I priority land consolidation area, Class II key land consolidation area, and Class III general land consolidation area, the land treatment potential scores were 0.636, 0.453, and 0.216 respectively. The degree of rural population hollowing in Changwu County and the potential of land consolidation in hollow villages are positively correlated with the local socioeconomic development levels and natural conditions. A reasonable strategy should be formulated to promote rural production, living and ecological space restructuring, to optimize the evolution of the spatial form of the village, and promote the transformation of rural regional system.

摘要: 为了解黄土丘陵沟壑区的农村空心化水平及土地整治潜力,以地处黄土丘陵沟壑区的陕西省长武县为例,采用综合测评法,以镇域尺度对长武县人口空心化程度进行测度,构建空心村土地整治潜力评价模型,对长武县空心村土地整治潜力进行了评价并分区,进而探究了乡村空间重构策略。结果表明:(1)长武县镇域人口空心化指数在时间上动态大幅上升,2010年、2014年、2018年均值分别为21.25,27.50,33.65,在地域上靠近城区且经济较强的昭仁街道人口空心化指数值高于其他地区;(2)基于空心村土地整治潜力评价得分,将长武县划分为I类优先整治区、II类重点整治区和III类一般整治区3类整治类型,土地整治潜力依次为0.636,0.453,0.216。研究得出长武县人口空心化的程度和空心村土地整治潜力的大小与当地社会经济发展水平和自然条件呈正相关。应制定合理的乡村三生空间的可持续重构策略,优化村庄各层次的空间形态演变,促使乡村地域系统向良性转变。

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标题: Spatial and Temporal Differentiation of Urban Economic Influence in Prefecture-Level Cities of Shaanxi Province (2008-2017)

标题: 20082017 年陕西地级城市经济影响力时空分异

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文献号: 1000-8462(2020)40:7<65:2NSXDJ>2.0.TX;2-B

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作者关键词: urban economic impact; spatial panel data; principal component analysis; Shaanxi Province

作者关键词: 城市经济影响力; 空间面板数据; 主成分分析; 陕西省

摘要: The urban economy is of great significance to the positioning and development of cities. With the development of cities,the differences in economic influence among cities gradually emerge,and their spatial and temporal distribution characteristics and driving mechanisms are explored in order to provide a basis for urban planning positioning and policy formulation. Based on the spatial and temporal differentiation of prefecture-level city economy in Shaanxi Province,this paper uses principal component analysis to calculate and analyze the economic influence of Shaanxi Province from 2008 to 2017. The research shows that: 1)The economic influence of each city in Shaanxi Province has increased year by year, the growth rate of each city is different,and the overall stability,local changes; 2)Nature,capital and policy jointly drive the change of the urban economy,and the score of urban economic influence is significant Positive correlation; 3)During 2008-2017,Shaanxi's urban economic influence hot spots and cold spots showed obvious spatial heterogeneity. Cold spots were mainly distributed in southern Shaanxi,with Xi'an ranking first in hot spots with 7.285,Followed by Yulin (2.337); 4)The trend surface of 2008 and 2017 showed an inverted U-shaped trend in the east and west,south and north directions,highlighting the influence of Xi'an as the economic center of Shaanxi Province.

摘要: 城市经济对城市的定位、发展具有重要意义,随着城市的发展,各城市之间经济影响力的差异逐渐显现,探索其时空分布特征及驱动机制,可以为城市规划定位、政策制定等提供依

据。文章基于陕西省地市级城市经济的时空分异性,运用主成分分析法,对 20082017 年陕西省城市经济影响力进行测算并分析。研究表明:①陕西省各市经济影响力随时间推移逐年提升,各市增速不同,总体稳定,局部变动;②自然、资本和政策共同驱动着城市经济的变化,与城市经济影响力得分显著正相关;③20082017 年陕西省城市经济影响力热点区和冷点区呈现出明显的空间异质性,冷点区主要分布在陕南,西安市以 7.285 居热点区第一位,榆林(2.337)次之;④2008 与 2017 年趋势面在东西、南北两个方位均呈现倒 U 型趋势,凸显西安市作为陕西省经济中心的影响力。

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标题: Changes of Ecological Service Value in Yan'an City Pre and Post Returning Farmland to Forestland Based on Land Use

标题: 基于土地利用的延安市退耕还林前后生态服务价值变化

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作者关键词: ecological service; land use; returning farmland to forestland; Yan'an

作者关键词: 生态服务; 土地利用; 退耕还林; 延安

摘要: Returning farmland to forestland is an important ecological protection project in China. Based on the dynamic data of land utilization in Yan'an City from 1989 to 2016, this paper employed the ecological service value calculation method which regarded regional differentiation as reference calibration to estimate ecological service value of Yan'an. The results turned out as follows. When the implementation of returning farmland to forestland was regarded as the node from 1989 to 1999, the change of total value of ecological service in Yan'an was slow with an increase of 8.76 million RMB; the changes of ecological service values of various kind of land utilization were not significant. From 1999 to 2016, the total value of ecological service varied significantly with an increase of 56.79 billion RMB, of which the value of forestry ecological services increased the most, with an increase of 75.19 billion RMB, and the value of cultivated land ecological services decreased the most, with a decrease of 15.77 billion RMB. Cereal production in ecology service function reduced, but soil conservation, gas regulation and biodiversity increased sharply. The analysis of the relationship between ecosystem service value and land use showed that the change of ecosystem service value was significantly related to the changes of the areas of forest land, pasture land, cultivated land, garden land and unused land. Forestland had the greatest impact on ecological service value, and the least affected land was farmland. The project optimized land utilization structure and improved the ecological conditions of the research area significantly, making regional ecological service value increase sharply. The study of ecological-economic value relationship showed that the project was coordinated with regional economic development, but the environmental pressure caused by population growth still existed. The project needs to continue to be advanced, ecological environment construction also needs to be strengthened.

摘要: 以退耕还林工程的重要实施地延安市为对象,以土地利用变化数据为基础,采用区域差异性和生产总值指数为参照校正的生态服务价值计算方法,对延安市 1989-2016 年的生态服务价值进行估算,并使用灰色关联度法分析生态服务价值与土地利用类型之间的关系。结果表明,退耕前的 1989-1999 年,延安市生态服务总价值变化缓慢,仅增加 8.76×10^9 元,各土地利用类型生态服务价值变化均不显著;退耕后的 1999-2016 年,生态服务总价值变化显著,增加了 56.79×10^9 元,其中林地生态服务价值增长最多,增加了 75.19×10^9 元,耕地生态服务价值降低最多,减少了 15.77×10^9 元;生态服务功能中粮食生产功能下降,但保持土壤、气体调节、生物多样性等功能迅速增加。生态服务价值的变化和林地、牧草地、耕地、园地、未利用地面积的改变显著相关;土地利用类型中对生态服务价值影响最大的为林地,影响最小的为耕地,退耕还林工程的实施,优化了土地利用结构,促进了耕地向林地的流转,使区域生态服务价值迅速增加。生态-经济价值关系研究表明,退耕还林工程与区域经济发展相协调,但人口增长带来的环境压力依然存在,需要继续推进生态环境建设。

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其他

第 1 条, 共 5 条

作者: Ju Chengting; Li Yuan; He Liguu; You Xuqun

作者: 鞠成婷; 李苑; 何立国; 游旭群

标题: Cognitive Resources Modulate Decision Making under Risk among Different Levels of Sensation Seekers

标题: 认知资源对不同感觉寻求者风险决策的调节

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文献类型: Article

作者关键词: decision making under risk; the advantage of intuitive processing; cognitive resources; sensation seeking

作者关键词: 风险决策; 直觉加工优势; 认知资源; 感觉寻求

摘要: Although most of the researchers believe that the intuitive-experience system is the cause of

various irrational biases in decision-making, there are more and more researchers who emphasize the advantages of the intuitive-experience system. Previous studies used GDT+n-back dual-task paradigm to explore the relationship between intuitive-experience system and rational-analytical system in decision-making under risk. However, the results had certain contradictions. Some research found that the decision-making performance had been improved when decision-making is accompanied with an n-back task, indicating that there was an advantage of intuitive processing when cognitive resources were limited. Whereas some research found that the decision-making performance had been impaired when decision-making is accompanied with an n-back task, indicating that there was no advantage of intuitive processing when cognitive resources were limited. In the current study, we believe that sensation-seeking explains such differences in decision-making. Many studies have shown that there is a relationship between sensation-seeking and individual differences in decision-making. High sensation-seekers rely more on emotional heuristics for risk judgement. Thus, the present research aims to explore whether cognitive resources modulate decision-making under risk among different levels of sensation-seekers. According to the scores of sensation-seeking questionnaires, 150 of 1386 college students were selected to participate in the experiment. There were 75 people (29 males and 46 females) in the low sensation-seeking group, with an average age of 21.561.88. There were 75 people (23 males and 52 females) in the high sensation-seeking group, with an average age of 20.831.48. The experiment employed a 3(cognitive resources: high/medium/low)*2(sensation-seeking: high/low) between-subjects design. We used n-back task to manipulate cognitive resources. The high level of cognitive resources referred to those who finished single GDT task; The medium level of cognitive resources referred to those who finished GDT+1-back task; And the low level of cognitive resources referred to those who finished GDT+2-back task. The specific manipulation procedure was as follows: Firstly, according to the scores of sensation-seeking questionnaires, participants were divided into low (the first 20% and scores below 38) and high (the last 20% and scores higher 52) sensation seeking groups. Then, participants were randomly divided into three decision groups (GDT, GDT+1-back, and GDT+2-back). Each group included 50 people. Gender, age, and sensation-seeking were all counterbalanced across three different decision-making groups. Participants in each condition were instructed to conduct the specific decision-making task (GDT/GDT+1-back/GDT+2-back). In the formal experiment, each group completed three rounds of the corresponding decision-making task. Each round of task included 18 trials of decision-making. After completing each round, the subjects had enough time to rest. (1) In the low level sensation-seeking group, the GDT performance is improved when decision-making is accompanied with an n-back task, but not with a 1-back task, indicating that there is an advantage of intuitive processing when cognitive resources is limited; (2) In the high level sensation-seeking group, there is no significant difference in the GDT, indicating that there is no advantage of intuitive processing. The advantage of intuitive processing in decision-making under risk relies both on cognitive resources and sensation-seeking of decision-makers.

摘要: 本研究采用 GDT+n-back 双任务范式,考察认知资源和感觉寻求对风险决策的影响。实验采用 3(认知资源:高/中/低)*2(感觉寻求:高/低)被试间设计。结果发现,低感觉寻求组中,低认知资源条件下的风险决策绩效显著高于高(或中)认知资源条件下的绩效;而高感觉寻求组中,风险决策绩效在三种认知资源条件下无显著差异。结果表明,低感觉寻求者风险决策在认知资源不足时表现出直觉加工优势;而高感觉寻求者风险决策没有直觉加工优势。

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作者: 吴彦成; 顾鑫; 朱继涛; 胡博; 贺美杰

标题: Research Advances of Biological Nitrogen Removal from Wastewater via Fe(III)Reduction Coupled to Anaerobic Ammonium Oxidation(Feammox)Process

标题: 铁氨氧化污水生物脱氮技术的研究进展

来源出版物: 中国给水排水 卷: 36 期: 18 页: 38-44 出版年: 2020

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文献类型: Review

作者关键词: biological nitrogen removal; Feammox; reaction mechanism; research advance

作者关键词: 生物脱氮; 铁氨氧化; 反应机制; 研究进展

摘要: Recently, the newly discovered Fe(III)reduction coupled to anaerobic ammonium oxidation(Feammox)process, which can convert ammonium(NH_4^{+}) to N_2 , nitrate(NO_3^{-}) or nitrite(NO_2^{-}) with Fe(III) as the electron acceptor under anaerobic conditions, can fulfill the biological nitrogen removal by combining with ANAMMOX process, traditional denitrification process or nitratedependant Fe(II)oxidation(NDFO)process. Compared with the traditional denitrification, there are lots of advantages of Feammox process, such as needlessness of organic carbon source and aeration, higher tolerance to heavy metals. The discovery, the mechanism, the strain distribution and its application in biological nitrogen removal from wastewater were reviewed. Furthermore, based on the indepth analysis of the Feammox process, the challenge faced and the possible research directions of the Feammox process were proposed.

摘要: 近年来新发现的铁氨氧化过程(Feammox)能够在厌氧条件下以三价铁离子[Fe(III)]为电子受体将铵根离子(NH_4^{+})直接氧化为氮气(N_2)、硝酸根(NO_3^{-})或亚硝酸根(NO_2^{-}),能够耦合厌氧氨氧化过程、反硝化过程或铁盐反硝化(NDFO)过程完成污水生物脱氮。铁氨氧化相比传统硝化反硝化过程具有诸多优点,如不需要有机碳源、无需曝气、对重金属有更

高的耐受力等。对铁氨氧化的发现过程、反应机制、菌种分布及其在污水生物脱氮领域的应用进行了综述,并在对铁氨氧化脱氮研究现状进行深入分析的基础上,指出了铁氨氧化工艺面临的挑战和可能的研究方向。

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作者: Zhao Huan; Lu Yitong

作者: 赵欢; 卢奕彤

标题: Study on preparation of novel defluorinated ironloaded($\text{Fe}^{(3+)}$)chelating flocculanty

标题: 新型除氟载铁($\text{Fe}^{(3+)}$)螯合絮凝剂的制备研究

来源出版物: 应用化工 卷: 49 期: 8 页: 1899-1903,1908 出版年: 2020

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文献类型: Article

作者关键词: polyacrylamide; Freundlich model; iron; defluorinated flocculant

作者关键词: 聚丙烯酰胺; Freundlich 模型; 载铁; 除氟絮凝剂

摘要: Polyacrylamide flocculant was used as the raw material, using iron salts to reduce fluoride ion, modification of flocculant-loaded iron to obtain iron-bearing chelating flocculant and achieving the aim of removing the content of F- from the water. Determine the optimal preparation parameters of the defluorinating agent by changing the amount of flocculant, the concentration of iron ions, the pH value, the reaction temperature and the reaction time in the modification

experiment,fitting the defluorination process by an isothermal adsorption model description,and explore the effect of interfering ions on the defluoridation effect of iron-loaded flocculants.The experiments indicate that the best reaction conditions for modification experiment is that 4 mL iminodiacetic acid grafted polyacrylamide flocculant,the iron content in Fe^{3+} soln is 0.013 mol/L,the pH value is 2.1,reaction temperature is 35 °C,react 50 min,the removal rate of F-in the water is 97% and the defluorination process can be described by Freundlich isotherm adsorption model.Na₂SO₄ has a serious effect on the fluoride removal effect,followed by KCl and CaCl₂,so when using modified iron-loaded flocculants to remove fluoride,first remove interference ions to avoid weakening the effect of fluoride removal.The method does not introduce other ions into water,has low cost,easy operation,good defluorination effect,and can be used for large-scale fluorine-containing water treatment.

摘要: 以聚丙烯酰胺絮凝剂为原料,利用铁盐对氟离子的还原作用,将絮凝剂载铁改性得到载铁螯合絮凝剂,该改性絮凝剂能达到从水中除去 F- 的目的。通过改变改性实验中絮凝剂的用量、铁离子的浓度、pH 值、反应温度、反应时间来确定除氟剂的最佳制备参数,用等温吸附模型描述对其除氟过程进行拟合,并探究干扰离子对载铁絮凝剂除氟效果的影响。实验表明,改性实验的最佳反应条件为 4 mL 亚氨基二乙酸接枝聚丙烯酰胺絮凝剂,0.013 mol/L 三氯化铁溶液,pH 值为 2.1,在 35 °C 下反应 50 min,除氟率可达 97%,除氟过程可用 Freundlich 等温吸附模型描述。Na₂SO₄ 对除氟效果影响严重,KCl 和 CaCl₂ 次之,用改性载铁絮凝剂除氟时,要先除去干扰离子,避免减弱除氟效果。方法不会在水中引入其他离子、成本低、操作易、除氟效果好、可用于大规模含氟水处理。

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作者: Wu Sai; Zhao Junhai; Zhang Dongfang; Wang Juan

作者: 吴赛; 赵均海; 张冬芳; 王娟

标题: Influence of rigid ground on propagation characteristics of blast wave

标题: 刚性地面对爆炸冲击波传播规律的影响

来源出版物: 工程爆破 卷: 26 期: 2 页: 1-8 出版年: 2020

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文献类型: Article

作者关键词: blast wave; rigid ground; propagation law; numerical analysis

作者关键词: 爆炸冲击波; 刚性地面; 传播规律; 数值分析

摘要: In order to study the propagation characteristics of blast wave on rigid ground, the propagation process of TNT explosive on rigid ground was analyzed based on the finite element analysis software ANSYS/LS-DYNA. The propagation law and characteristic parameters of blast wave on rigid ground and in free air were compared and analyzed. A formula for calculating the peak of overpressure on rigid ground at a proportional distance between $0.5\text{m/kg}^{1/3}$ and $3.0\text{m/kg}^{1/3}$ was obtained. The influence of blasting height to the propagation law of blast wave near rigid ground was studied and the influence scope of rigid ground reflection was amended. The numerical results of this paper can provide some references that valued on the estimation of the blast load on rigid ground.

摘要: 为研究刚性地面对爆炸冲击波传播特性的影响, 采用 ANSYS/LS-DYNA 对 TNT 炸药在刚性地面工况下起爆后的整个过程进行了数值分析, 得到了刚性地面工况下爆炸冲击波的传播规律以及特征参数, 并将其与自由空气工况下爆炸冲击波的传播规律以及特征参数进行了对比分析。建立了 TNT 炸药在刚性地面工况下起爆后, 比例距离在 $0.5\text{m/kg}^{1/3} \leq Z \leq 3\text{m/kg}^{1/3}$ 之间时的冲击波超压峰值简便计算公式, 分析了起爆高度对刚性地面附近冲击波的影响规律, 并得到了刚性地面反射增强效应作用范围的判别公式。数值分析所得结果可为结构或构件在刚性地面上发生爆炸时荷载的初步确定提供一定的参考。

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作者: Guo Yuxi; Yuan Wei; Chen Yunxing

作者: 郭羽熙; 袁伟; 陈运星

标题: Correlation between drivers' visual behavior and workload in urban road environments

标题: 城市道路环境中驾驶人视觉行为与工作负荷的相关性

来源出版物: 长安大学学报. 自然科学版 卷: 40 期: 5 页: 97-104 出版年: 2020

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作者关键词: traffic engineering; urban road; driver's visual behavior; workload; heart rate; heart rate variability; correlation

作者关键词: 交通工程; 城市道路; 驾驶人视觉行为; 工作负荷; 心率; 心率变异性; 相关性

摘要: To carry out the workload evaluation test of drivers in urban road environments, the correlation between drivers' visual behavior and workload was studied. A typical urban road was selected in Xi'an, including ordinary urban roads and urban expressways, and 25 participants were recruited to carry out a real road driving test. The KF2 physiological instrument and Eyelink II eye tracker were used to collect the electrocardiogram (ECG) indicators (heart rate, heart rate variability) and visual behavior data of each driver during the test. Statistical methods were used to analyze the correlation between drivers' visual behavior parameters and ECG (heart rate growth rate, low frequency, and root mean square of successive heartbeat differences) indicators. The results show that there is a positive correlation between driver's saccade behavior parameters (saccade amplitude, peak saccade speed, average saccade speed, and saccade duration) and the heart rate growth rate (correlation coefficient $r \geq 0.5$), but there is a negative correlation with the heart rate variability ($r \leq -0.5$) in the urban road environment, among them, the correlation between saccade amplitude, peak saccade speed and driver's workload is stronger, while the correlation between average saccade speed, saccade duration and driver's workload is weaker. The saccade behavior parameters in urban road environments can be used to evaluate driver's workload. These findings not only enrich the evaluation indicators of the driver's workload, but also provide a theoretical reference for the monitoring of the driver's condition during driving, and help to improve the driving safety in urban road environments. 2 tabs, 14 figs, 26 refs.

摘要: 为开展城市道路环境中驾驶人的工作负荷评价试验,研究了驾驶人视觉行为与工作负荷之间的相关性。在西安选取了 1 条典型城市道路路线,包括普通城市道路和城市快速路,招募了 25 名驾驶人开展实车试验,采用 KF2 生理检测仪和 Eyelink II 型眼动仪,分别采集试验中每位驾驶人的心电指标(心率、心率变异性)和视觉行为数据,运用统计学方法分析驾驶人视觉行为参数与心率增长率和心率变异性(低频和相邻 2 个 R-R 间期差值的均方根)指标之间的相关性。研究结果表明:城市道路环境中,驾驶人扫视行为参数中的扫视幅度、扫视峰值速度、扫视平均速度和扫视持续时间与心率增长率和心率变异性之间分别存在正相关性(相关系数 $r \geq 0.5$)和负相关性($r \leq -0.5$),扫视幅度、扫视峰值速度与工作负荷之间的相关性表现更强,而扫视平均速度、扫视持续时间与工作负荷之间的相关性表现较弱,说明城市道路环境中可以采用扫视行为参数来评价驾驶人的工作负荷。该研究丰富了驾驶人工作负荷的评价指标,为驾驶过程中驾驶人状态监测提供了理论借鉴,有助于提高城市道路环境中驾驶人的行车安全性。

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