



Volume 21 Number 1  
January 2024

ISSN 1672-7029  
CN 43-1423/U

# 铁道科学与工程学报

Journal of Railway Science and Engineering

铁道科学与工程学报

Volume 21 Number 1

Pages 1-432

January 2024



中南大学 主办  
中国铁道学会



## 目次

### 高速铁路技术

|                                    |                               |
|------------------------------------|-------------------------------|
| 高速铁路土工格栅加筋膨胀土边坡作用机制 .....          | 张锐,周豫,兰天,郑健龙,刘昭京,李彬(1)        |
| 高速铁路预售期旅客购票量分布预测 .....             | 徐光明,林珊珊,米希伟,王凯,胡心磊(13)        |
| 外置转向架包覆对高速列车气动阻力影响 .....           | 邓海,丁艳思,向南葵,项涛,张洁,梁习锋(26)      |
| 高速列车流线型转向架与底部导流板的气动减阻效果研究<br>..... | 柳宁,李岩松,龙金兰,姜琛,何龙凤,高广军,苗秀娟(38) |
| 轨道车辆制动副摩擦自激对车轮磨耗的影响 .....          | 宋瑞,张宇航,周劲松,张忠凯,孙丽霞,沈钢(48)     |

### 智慧交通与物流

|                                      |                        |
|--------------------------------------|------------------------|
| 基于时间敏感网络的列车通信网络实时流量调度优化 .....        | 梁晨,贺德强,任子阳,靳震震,杨卫峰(58) |
| 面向高质量开行的中欧班列开行方案动态优化方法研究 .....       | 罗君培,王莹,胡梦影(70)         |
| 铁路集装箱客运化班列停站方案与运行图协同优化研究 .....       | 韩涛,魏玉光,王怀相,夏阳,罗莹(82)   |
| 基于改进 YOLOX 与多级数据关联的行人多目标跟踪算法研究 ..... | 韩锟,彭晶莹(94)             |

### 轨道与基础

|                                   |                              |
|-----------------------------------|------------------------------|
| 钢管混凝土双块式轨枕无砟轨道结构疲劳性能试验研究<br>..... | 刘晓春,陈佳琦,罗延亮,朱志辉,李启航,郑纬奇(106) |
| 基于数字图像相关的地聚物混凝土轨枕的力学性能分析 .....    | 韩宜康,王俊逸,张睿哲,井国庆(116)         |
| 循环荷载下重载铁路道砟磨耗破碎及力学特性试验研究 .....    | 肖源杰,张冲冲,王萌,华文俊(125)          |
| 风积沙填筑铁路路基累积塑性变形及临界动应力试验研究 .....   | 韦朝(138)                      |
| 三维土工网边坡防护水土保持能力研究 .....           | 李时亮,曾长贤,王亚飞,李立,吴昊,郑烨炜(149)   |
| 考虑级配影响的透水性基床填料细观空隙特征研究 .....      | 于群丁,王萌,肖源杰,华文俊,李文奇,王小明(158)  |
| 广义对数螺旋型滑面模型的构建与验证 .....           | 李亮,李媛媛,邓东平(171)              |



循环荷载作用下浅埋坎儿井地基的稳定性研究

.....张冲,田凯元,袁胜洋,翟伟,闵琦,宋瑾阳,陈伟志,刘先峰(183)

成层土中基坑二维稳态渗流场解析解研究 .....余俊,张志中,和振,李东凯(194)

## 桥梁隧道与结构

断层永久位移预测及断层悬索桥地震响应研究 .....程维,唐清华,贾宏宇,钟钰,许智,郑史雄(204)

地震作用下拱肋-一字撑损伤模式与抗震性能评价 .....徐粒寒,徐略勤,邓海容,江林松(215)

小剪跨比铁路圆端桥墩拟静力试验及易损性分析 .....沈林白,洪彧,周志达,王涵玉,蒲黔辉,文旭光(228)

地表堆卸载对浅覆土盾构隧道影响试验研究 .....符宇坤,康成,梁荣柱,向黎明,王理想,柯宅邦,吴小建(241)

基于壳单元的盾构隧道参数化结构计算与验证 .....李霖皓,陈珂,陈健,丁文军(253)

盾尾密封失效诱发砂土地基盾构管片环失稳坍塌研究 .....钟小春,余明学,竺维彬,米晋生,黄威然,钟长平(264)

离散侧向平移支撑圆弧拱的自由振动分析 .....陈隆凯,蔡勇,吕晓勇,谢金(275)

UHPC后浇装配式节点抗震性能试验研究 .....黄俊,康爽,单英杰,周泉,何勇,龚永智,章建平(286)

## 智能制造与装备

双盘转子—电磁轴承系统的碰摩振动特性 .....尹凤伟,王学明,张晓蓉(299)

通气孔对新型不锈钢芯管平压性能影响分析 .....吴佳东,颜东煌,刘国坤,许红胜,潘权,张超,尹章强(314)

三电平辅助变流器寿命优化控制 .....向超群,杜京润,孙士杰,李佳怡,范子寅,于天剑(328)

基于AMCPSO优化Kriging插值的温度补偿方法研究 .....张森,王大志,黄晨涛,陈相吉,郑晓虎,刘梦哲(342)

## 工程经济·工程管理·规划设计

基于出行费用的城市轨道交通补贴优化模型 .....汪晴,邓连波,刘康妮,徐光明(354)

山区铁路工程节能设计关键要素识别研究 .....闫林君,杨继兴,鲍学英,王起才,郭海东(363)

盾构施工诱发临近桥梁安全风险评价 .....樊燕燕,王瑞,李子奇(375)

## 工程诊所·工匠之家

基于3D相机的轨道扣件部件丢失与松动智能检测 .....李胜腾,薛亚东,迟胜超,樊晓东,张宜霞,杨维(386)

基于多源检测数据融合的高速铁路路基沉降诊断研究 .....赵文博,杨飞,支洋,尤明熙,胡伟松(396)

隧道围岩分级特征智能识别及可视化研究 .....陈卫东,李天斌,黄音昊,杨罡,王皓,肖华波(406)

基于CS-BP的列车卫星定位欺骗干扰检测方法 .....王思昊,刘江,蔡伯根,王剑,陆德彪(422)

责任编辑: 阳丽霞      英文编审: 杨小礼

期刊基本参数: CN43-1423/U\*2004\*m\*A4\*432\*zh\*P\*¥50.00\*1500\*37\*2024-01



CONTENTS

High-speed Railway Technology

Action mechanism of geogrid reinforced expansive soil slope in high-speed railway  
.....ZHANG Rui, ZHOU Yu, LAN Tian, ZHENG Jianlong, LIU Zhaojing, LI Bin(1)

Prediction of passenger booking volume distribution during pre-sale period for high-speed railways  
.....XU Guangming, LIN Shanshan, MI Xiwei, WANG Kai, HU Xinlei(13)

Influence of covers for the bogies with external axle boxes on the aerodynamic drag of a high-speed train  
.....DENG Hai, DING Yansi, XIANG Nanshen, XIANG Tao, ZHANG Jie, LIANG Xifeng(26)

Aerodynamic drag reduction of streamlined bogie and bottom deflector of high-speed train  
.....LIU Ning, LI Yansong, LONG Jinlan, JIANG Chen, HE Longfeng, GAO Guangjun, MIAO Xiujuan(38)

Influence of friction self-excitation of brake pair on wheel wear of rail vehicle  
.....SONG Rui, ZHANG Yuhang, ZHOU Jinsong, ZHANG Zhongkai, SUN Lixia, SHEN Gang(48)

Intelligent Transportation and Logistics

Real-time traffic scheduling optimization of train communication network based on time-sensitive network  
.....LIANG Chen, HE Deqiang, REN Ziyang, JIN Zhenzhen, YANG Weifeng(58)

Study on the high quality operation plan of China Railway Express .....LUO Junpei, WANG Ying, HU Mengying(70)

Integrated optimization of stop planning and timetabling for railway container trains under passenger transport mode  
.....HAN Tao, WEI Yuguang, WANG Huaixiang, XIA Yang, LUO Ying(82)

Pedestrian multi-object tracking algorithm based on improved YOLOX and multi-level data association  
.....HAN Kun, PENG Jingying(94)

Track and Foundation

Experimental study on fatigue performance of ballastless track with concrete-filled tube connected double-block sleepers  
.....LIU Xiaochun, CHEN Jiaqi, LUO Yanliang, ZHU Zhihui, LI Qihang, ZHENG Weiqi(106)

Mechanical properties of geopolymer concrete sleepers based on digital image correlation  
.....HAN Yikang, WANG Junyi, ZHANG Ruizhe, JING Guoqing(116)

Experimental investigation of particle abrasion and breakage characteristics and mechanical behavior of heavy-haul railway  
ballasts subjected to repeated loading .....XIAO Yuanjie, ZHANG Chongchong, WANG Meng, HUA Wenjun(125)

Experimental study on cumulative plastic deformation and critical dynamic stress of aeolian sand embankment of railway  
.....WEI Zhao(138)

Soil and water conservation capacity of slope protected by three-dimensional geonet  
.....LI Shiliang, ZENG Changxian, WANG Yafei, LI Li, WU Hao, ZHENG Yewei(149)

Investigating meso-scale pore characteristics of unbound permeable aggregate base materials considering gradation effects  
.....YU Qunding, WANG Meng, XIAO Yuanjie, HUA Wenjun, LI Wenqi, WANG Xiaoming(158)

Structure and validation of an generalized logarithmic spiral slip surface model.....LI Liang, LI Yuanyuan, DENG Dongping(171)

Stability of shallow-buried Qanat foundation under cyclic load  
.....ZHANG Chong, TIAN Kaiyuan, YUAN Shengyang, ZHAI Wei, MIN Qi, SONG Jinyang,  
CHEN Weizhi, LIU Xianfeng(183)

Analytical solution of two-dimensional steady-state seepage field in foundation pits in layered soils  
.....YU Jun, ZHANG Zhizhong, HE Zhen, LI Dongkai(194)

## Bridge, Tunnel and Structure

A prediction of fault displacement and study of seismic response of suspension bridge across fault  
..... CHENG Wei, TANG Qinghua, JIA Hongyu, ZHONG Yu, XU Zhi, ZHENG Shixiong(204)

Arch rib-straight brace damage pattern and the seismic performance evaluation under earthquakes  
..... XU Lihan, XU Lueqin, DENG Hairong, JIANG Linsong(215)

Fragility analysis of railway round-ended pier with small shear span ratio in transverse direction  
.....SHEN Linbai, HONG Yu, ZHOU Zhida, WANG Hanyu, PU Qianhui, WEN Xuguang(228)

Experimental investigation on effect of surface loading and unloading on shield tunnel with shallow overburden  
.....FU Yukun, KANG Cheng, LIANG Rongzhu, XIANG Liming, WANG Lixiang, KE Zhaibang, WU Xiaojian(241)

Parametric structural calculation and verification of shield tunnel based on shell elements  
..... LI Linhao, CHEN Ke, CHEN Jian, DING Wenjun(253)

Instability and collapse of shield segment ring in sand foundation induced by shield tail sealing failure  
.....ZHONG Xiaochun, YU Mingxue, ZHU Weibin, MI Jinsheng, HUANG Weiran, ZHONG Changping(264)

Free vibration analysis of circular arches with discrete lateral translational braces  
.....CHEN Longkai, CAI Yong, LÜ Xiaoyong, XIE Jin(275)

Experimental study on seismic performance of UHPC post-casting assembled joints  
..... HUANG Jun, KANG Shuang, SHAN Yingjie, ZHOU Quan, HE Yong, GONG Yongzhi, ZHANG Jianping(286)

## Intelligent Manufacturing and Equipment

Rub-impact vibration characteristics of double-disc rotor system with magnetic bearings  
..... YIN Fengwei, WANG Xueming, ZHANG Xiaorong(299)

Influence of vent hole on flat compression performance of new stainless steel core pipe  
.....WU Jiadong, YAN Donghuang, LIU Guokun, XU Hongsheng, PAN Quan, ZHANG Chao, YIN Zhangqiang(314)

Lifetime optimization control of three-level auxiliary converter  
.....XIANG Chaoqun, DU Jingrun, SUN Shijie, LI Jiayi, FAN Ziyin, YU Tianjian(328)

Temperature compensation method based on AMCPSO Optimized Kriging interpolation  
..... ZHANG Sen, WANG Dazhi, HUANG Chentao, CHEN Xiangji, ZHENG Xiaohu, LIU Mengzhe(342)

## Engineering Economy • Engineering Management • Planning and Design

Optimization model of urban rail transit subsidies based on travel fare  
.....WANG Qing, DENG Lianbo, LIU Kangni, XU Guangming(354)

Identification of key elements of energy-saving design of mountainous railway engineering  
.....YAN Linjun, YANG Jixing, BAO Xueying, WANG Qicai, GUO Haidong(363)

Safety risk assessment of adjacent bridges induced by shield construction .....FAN Yanyan, WANG Rui, LI Ziqi(375)

## Engineering Clinic • Craftsman's Home

Intelligent lost and loose detection of track fastener components based on 3D camera  
..... LI Shengteng, XUE Yadong, CHI Shengchao, FAN Xiaodong, ZHANG Yixia, YANG Wei(386)

Subgrade settlement recognition of high-speed railway based on multi-source detection data fusion  
.....ZHAO Wenbo, YANG Fei, ZHI Yang, YOU Mingxi, HU Weisong(396)

Intelligent identification of classification features of tunnel surrounding rock and visualization  
.....CHEN Weidong, LI Tianbin, HUANG Yinhao, YANG Gang, WANG Hao, XIAO Huabo(406)

Spoofing interference detection method for satellite-based train positioning based on CS-BP  
..... WANG Sihao, LIU Jiang, CAI Baigen, WANG Jian, LU Debiao(422)



中国科技期刊卓越行动计划入选期刊  
湖南省培育世界一流湘版科技期刊重点建设期刊  
美国《工程索引》(EI Compendex) 收录期刊  
Scopus收录期刊  
美国《化学文摘》(CA) 收录期刊  
日本科学技术振兴机构数据库 (JST) 收录期刊  
中国科学引文数据库 (CSCD) 收录期刊  
中国中文核心期刊  
中国科技核心期刊  
RCCSE中国核心学术期刊  
中国科技论文统计源期刊  
CNKI中国期刊全文数据库收录期刊  
中国学术期刊综合评价数据库来源期刊  
万方数据-数字化期刊群收录期刊  
VIP中文科技期刊数据库收录期刊



## 铁道科学与工程学报

(TIEDAO KEXUE YU GONGCHENG XUEBAO)

(月刊, 2004 年创刊)

第 21 卷第 1 期 (总第166期) 2024 年 1 月出版

主管单位 中华人民共和国教育部  
主办单位 中南大学  
中国铁道学会  
主 编 余志武  
执行主编 蒋学东  
副 主 编 阳丽霞 彭立敏  
编辑部主任 蒋学东  
出版单位 中南大学出版社  
印 刷 湖南鑫成印刷有限公司  
国内总发行 长沙市报刊发行局  
国内订购处 全国各地邮局  
国外总发行 中国国际图书贸易总公司  
(100044 北京 399 信箱)  
编辑部地址 长沙市韶山南路 22 号  
(邮政编码: 410075)  
电子邮箱 jrse@csu.edu.cn  
网络地址 http://www.jrse.csu.edu.cn  
电 话 (0731)82656536, 82656100

## Journal of Railway Science and Engineering

(Monthly, Started in 2004)

Volume 21 Number 1 (Sum 166), January 2024

Administrated by Ministry of Education, P.R.China  
Sponsored by Central South University  
China Railway Society  
Chief Editor YU Zhiwu  
Excutive Editor-in-Chief JIANG Xuedong  
Deputy Chief Editors YANG Lixia PENG Limin  
Editorial Director JIANG Xuedong  
Published by Central South University Press  
Printed by Hunan Xincheng Printing Co.Ltd.  
Distributed Abroad by China International  
Book Trading Corporation  
(P.O.Box 399, Beijing, China)  
Address: 22 Shaoshan South Road,  
Changsha, China, 410075  
E-mail: jrse@csu.edu.cn  
http: //www.jrse.csu.edu.cn  
Tel: +86-731-82656536 or 82656100

ISSN 1672-7029  
CN 43-1423/U

邮发代号 42-59  
国外代号 BM4440

定价: 600 元/年

ISSN 1672-7029

