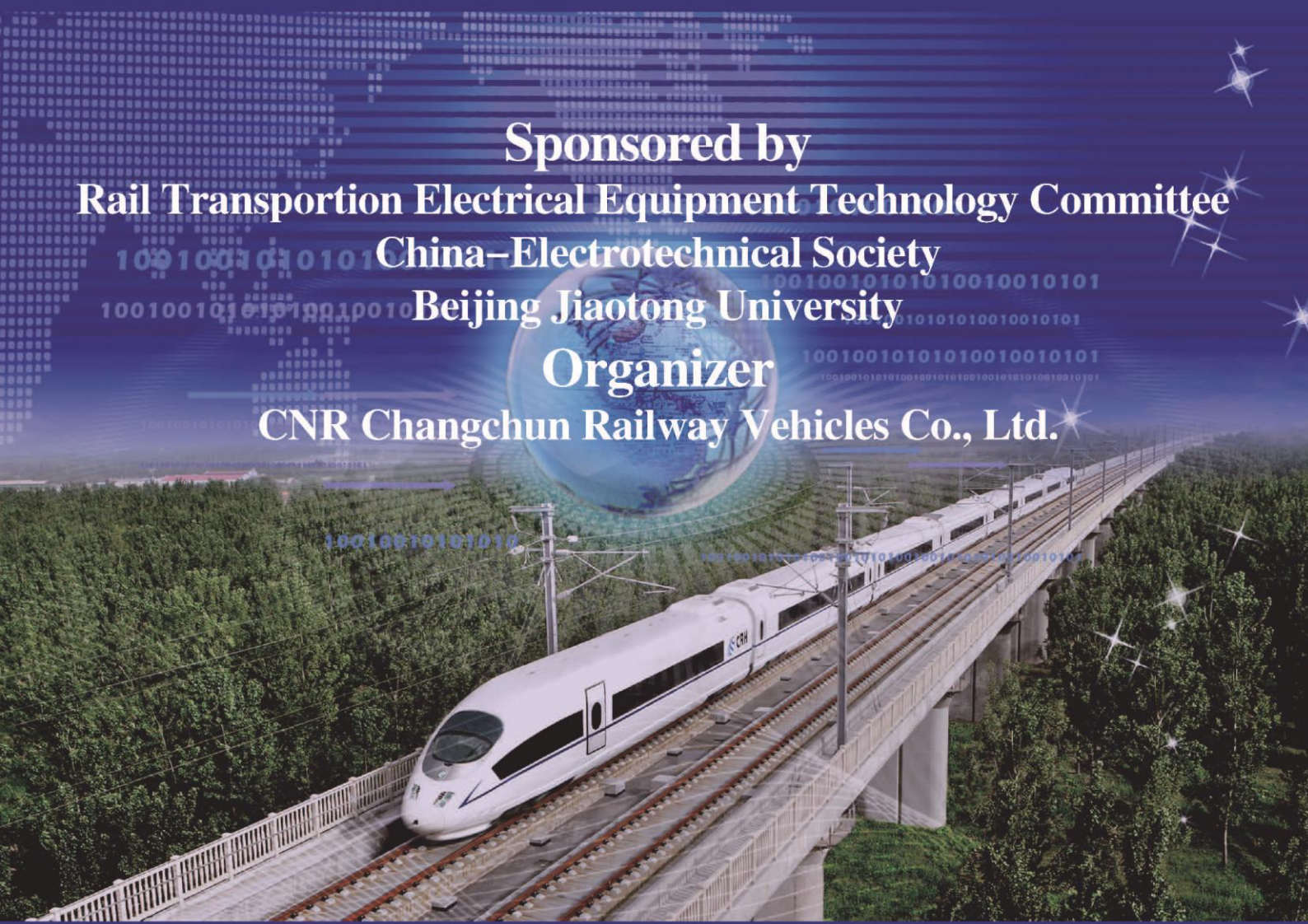


**2013 International Conference on Electrical and Information
Technologies for Rail Transportation (EITRT2013)**
2013年轨道交通电气与信息技术国际学术会议

Final Program

Sponsored by
Rail Transportation Electrical Equipment Technology Committee
China-Electrotechnical Society
Beijing Jiaotong University
Organizer
CNR Changchun Railway Vehicles Co., Ltd.



Nov. 7-9, 2013 Changchun China

2013 年
轨道交通电气与信息技术国际学术会议
**2013 International Conference on Electrical
and Information Technologies for Rail
Transportation (EITRT2013)**

程序册
Final Program

主办单位

中国电工技术学会轨道交通电气设备技术专业委员会
北京交通大学

承办单位

中国北车长春轨道客车股份有限公司

Sponsored by

**Rail Transportation Electrical Equipment Technology Committee, China-
-Electrotechnical Society
Beijing Jiaotong University**

Organizer

CNR Changchun Railway Vehicles Co., Ltd.

2013 年 11 月 7-9 日, 中国 长春
Nov. 7-9, 2013, Changchun China

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前 言

轨道交通电气与信息技术领域是近年来轨道交通行业技术发展最快的领域之一，为轨道交通的自动化、信息化和智能化等“三化”为代表的现代化发展发挥了重要的作用。

2013 年轨道交通电气与信息技术国际学术会议（EITRT2013）于 2013 年 11 月 7-10 日在吉林长春召开，本次会议由中国电工技术学会轨道交通电气设备技术专业委员会、北京交通大学联合主办，中国北车长春轨道客车股份有限公司承办。EITRT2013 致力于为广大轨道交通电气与信息技术领域的学者和科技人员提供一个高水平的国际交流平台，交流和分享近年来在轨道交通电气与信息技术领域的最新研究成果。

本次会议共收到 400 余篇英文论文和近百篇中文论文，投稿覆盖了轨道交通电力牵引及供电、系统安全与应急管理、信息与计算机技术、运输组织与自动控制以及节能及新能源技术在轨道交通中的应用等主题。所有被收录的论文都经过严格的审稿过程，并最终分别收录在 EITRT2013 的中英文论文集中。此论文集将为来自学术、工业、政府的研究者和工程技术人员全面了解轨道交通自动化、信息化和智能化的最新发展提供重要的参考。

EITRT2013 会议的顺利召开得到了主办、承办及协办单位的大力支持，也得到了大会组织委员会和程序委员会各位专家教授的大力支持，同时论文审稿及编辑工作人员为之付出了辛勤的劳动。在此，谨代表中国电工技术学会轨道交通电气设备技术专业委员会对本次大会提供支持和帮助的单位和个人表示衷心的感谢。

2013 年轨道交通电气与信息技术国际学术会议主席
中国电工技术学会轨道交通电气设备技术专业委员会主任

贾利民

2013 年 11 月

会议组织机构

主办单位：中国电工技术学会轨道交通电气设备技术专业委员会
北京交通大学

承办单位：中国北车长春轨道客车股份有限公司

协办单位：北京千驷驭电气有限公司

University of Birmingham, UK

北京东方华光文化交流有限公司

Springer-Verlag, Germany

Scientific Research Publishing, USA

会议举办地点

酒店：长春华天大酒店

地址：长春市绿园区景阳大路 2288 号（春城大街与景阳大路交汇处西南角，详细位置交通图请见后面的附 1）

酒店电话：0431-8780999 订房专线：0431-87809742

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王树宾：13654408786

刘 铮：15243129118

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徐春梅：13691069712

程晓卿：13811518023

北京东方华光文化交流有限公司（会议论文集出版）

贾玉泉：18511581038

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Prof. Dr.-Ing. Kyandoghene Kyamakya, Universität Klagenfurt, UK

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Prof. Wolfgang A. Halang, FernUniversität in Hagen, Germany

中国电工技术学会轨道交通电气设备技术 专业委员会

随着国民经济的飞速发展，城市之间及城市内部的交通瓶颈问题已越来越严重，在诸多交通方式中，轨道交通以其高效、快捷、方便、舒适、安全等特点成为我国交通产业的重要发展方向，加快轨道交通建设已经成为我国实施可持续发展战略的重要组成部分。且随着技术的发展，轨道交通车辆装备应用中的电气技术越来越重要，其技术含量和在车辆中所占的技术比重已远超过其他技术。电气工程学科在轨道交通领域的贡献越来越突出。

为了进一步推进电气技术在轨道交通领域的应用与发展，加强电气轨道交通技术的国内外交流与合作，活跃该学科的学术气氛，经部分业内领导及专家学者认真商讨，在中国电工技术学会的统一领导下，2012年11月，由北京交通大学等18家高等院校及企业联合发起成立的中国电工技术学会轨道交通电气设备技术专业委员会，该委员会致力于以电气工程学科为主要依托，推动轨道交通电气装备的发展，为轨道交通电气设备技术的发展提供学术与技术研究园地、搭建交流平台。

主要业务范围为：

- (1) 搭建轨道交通电气工程学术交流平台，为电工科技工作者服务。
- (2) 加强学术界的交流，促进学术界与产业的交流，加强学术界与政府的联系。
- (3) 创建自主创新平台。
- (4) 加速创新成果的产业化。
- (5) 工程继续教育工作。
- (6) 开展技术咨询服务与科学普及工作。
- (7) 编辑出版专业期刊。
- (8) 发挥桥梁和纽带作用，为经济社会和行业发展服务。

轨道交通电气装备专业委员将进一步推进电气技术在轨道交通领域的应用与发展，加强电气轨道交通技术的国内外交流与合作，活跃该学科的学术气氛等方面作出不懈的努力，为轨道交通电气设备技术的发展提供学术与技术研究园地、搭建交流平台，贡献自己的力量。

Beijing Jiaotong University (BJTU)

Beijing Jiaotong University (BJTU) is a national key university of China, under the direct administration of the Ministry of Education and jointly sponsored by the Ministry of Education and the Ministry of Railways. BJTU is one of the first universities in China authorized to confer master's and doctoral degrees autonomously. BJTU is one of the first



National 211 Project universities, one of Innovation Bases of the National 985 Project, and one of the 56 universities authorized to establish a Graduate School in China.

BJTU has 8 national key disciplines, which are Traffic and Transportation Planning and Management, Traffic Information Engineering and Control, Communication and Information Processing, Information and Signal Processing, Industrial Economics, Road and Railway Engineering, Transportation Tools Application Engineering, and Bridge and Tunnel Engineering. The University has 120 master's programs, 60 doctoral programs under 11 first-level doctoral discipline categories, 13 post-doc research stations, and 4 professional degree programs including MBA, Meng, MPAcc and JM. There are 1 national key lab, 2 national engineering labs, 1 national engineering research center, 3 national certification labs,



3 MoE key labs, 4 MoE engineering research centers, 4 municipal key labs, China Integrated Transportation Research Center and China Center for Industrial Economic Security Research. In recent year, the University has been responsible for over 4,000 research projects at national, ministry and municipal levels.

CNR Changchun Railway Vehicles Co., Ltd.

CNR Changchun Railway Vehicles Co., Ltd. (hereinafter referred to as CNR CRC) which is under China CNR Corporation Limited was established in March 2002. Its capital stock and registered capital both are 1.11 billion. CNR CRC, formerly known as Changchun Car Company was founded in 1954 as one of the national key construction projects of China during the “First Five Year Plan” period. With continuous construction and development for over half a century, CNR CRC has grown into China’s largest and strongest R&D, manufacturing and exportation base of mainline passenger vehicles and urban mass transit vehicles.

CNR CRC has more than 10 thousand staff, and factory area of 3.10 million m² (1.50 million m² for the old and 1.60 million m² for the new). In May 2010, the Stage 1 Project of the High-speed EMU Manufacturing Base of CNR CRC was completed. By far it is a professional high-speed EMU manufacturing base with the largest scale and most advanced facilities in the world.

CNR CRC has a state-level enterprise technology center, a postdoctoral scientific research workstation, as well as a group of experienced skilled workers, having formed a scientific research team which has complete specialties and reasonable echelonment structure. Every year CNR CRC researches and develops more than 30 types of railway vehicles, EMUs and urban mass transit vehicles, making leading status in China.

At present, CNR CRC owns more than 4000 sets of equipments for various uses, including over 300 sets of imported equipments. Particularly the equipments for key working sequences have come to the internationally advanced level. CNR CRC has many world-class special manufacturing facilities, such as



the highest-level production line for aluminum alloy car, most powerful production line for stainless steel car, maximum automatized production line for bogie welding and machining, most advanced painting line, and dynamic commissioning line with all types of power supply.

From the establishment of company, CNR CRC has accumulatively manufactured more than 30 thousand various railway vehicles (including EMUs), approximately taking up 44% of entire operating vehicles; accumulatively manufactured more than 4100 various urban mass transit vehicles (including CNR Bombardier), taking up about 55% of domestically operating vehicles. The products of CNR CRC have been exported to North Korea, Iran, Iraq, Pakistan, Sri Lanka, Bengal, etc.. In recent years, the products even step into high level markets such as Hong Kong, Thailand, New Zealand, Australia, Saudi Arabia, Brazil, etc.. From 1995 until now, CNR CRC has accumulatively obtained more than 3 billion dollars' export orders.

Based on the new market demand and development strategy, CNR CRC is now implementing and building three major business sectors for high-speed EMUs, urban mass transit vehicles and bogies, and establishing four professional manufacturing bases of high-speed EMUs, urban mass transit vehicles, railway passenger vehicles and bogies. CNR CRC is trying to realize “three top-one” on the aspects of production scale, product level and R&D capability, and to make the company having strong international competitiveness.

中国北车长春轨道客车股份有限公司
CNR CHANGCHUN RAILWAY VEHICLES CO., LTD.

接轨世界 牵引未来
Join the World Drawing the Future

成为轨道交通装备行业世界级企业



大会酒店交通位置图

长春华天大酒店地址：长春市绿园区景阳大路 2288 号（春城大街与景阳大路交汇处西南角）



交通路线：

1. 长春站北出口

- 乘坐 110 路公交车至东广场站（时间约为 23 分钟），转 280 路公交车至春城大街站（时间约为 37 分钟）；
- 乘坐出租车约 17 元钱（时间约为 30 分钟）。

2. 长春西站

- 乘坐 139 路公交车至西环城路站（时间约为约 10 分钟），转 197 路公交车至肝胆医院站（时间约为 15 分钟）；
- 乘坐出租车约 13 元钱（时间约为 10 分钟）。

3. 长春机场

- 乘坐机场大巴 2 号线至文化广场站（约 1 小时 42 分钟），转 240 路公交车至春城大街站（时间约为 20 分钟）；
- 乘坐出租车约为 85 元钱（时间约为一小时 20 分钟）。

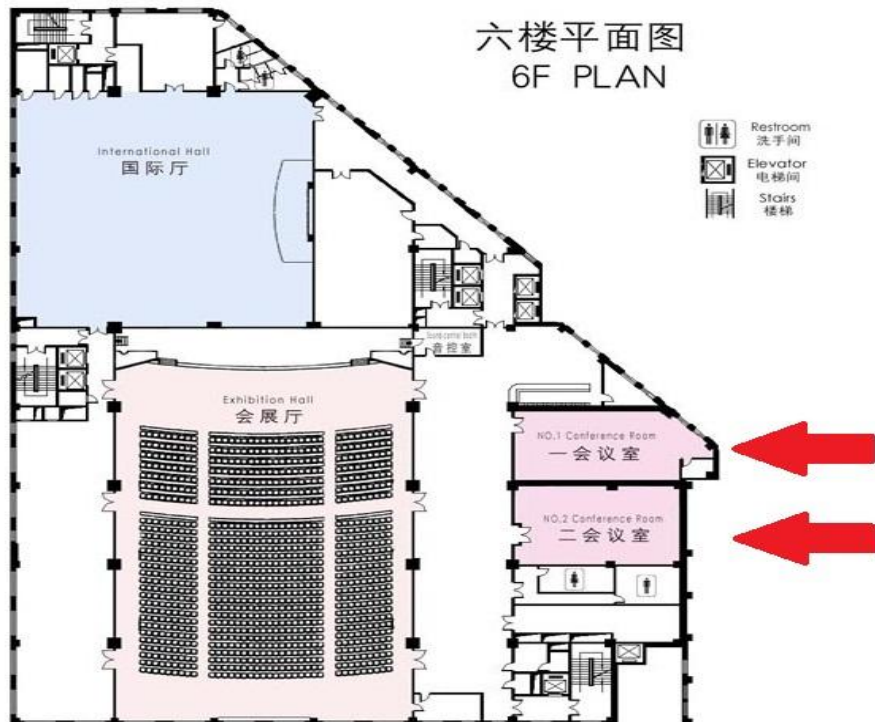
会议酒店周边宾馆信息

会议酒店周边宾馆信息如下，请各位参会代表提前预订好酒店。

宾馆名称	地 址	住宿平均 价格	与华天酒 店距离
长春华天大酒店	长春市绿园区景阳大路 2288 号	488 元	
开元名都大酒店	景阳大路 2299 号（华天酒店对面）	500 元	0.3 公里
长春一品吉粮国际 酒店	绿园区春城大街 1515 号（与皓月大路交 汇处）	380 元	0.55 公里
7 天连锁酒店（景阳 广场店）	景阳大路 1777 号	170 元	0.58 公里
速 8 酒店（景阳大路 店）	景阳大路 3333 号（高力北方汽贸城对面）	170 元	1.1 公里
速 8 酒店（汽贸城 店）	汽车产业开发区南阳路 900 号（创业广 场旁）	171 元	1.4 公里
锦江之星（汽贸城 店）	绿园区创业大街 2 号（创业广场旁）	180 元	1.25 公里
汉庭酒店（汽贸城 店）	吉林省长春市绿园区正阳街 79 号（汽贸 城正阳广场）	160 元	1.26 公里
如家快捷酒店（一汽 店）	长春市汽车产业开发区长青路 47 栋（汽 车场 5 号门前）	150 元	2.1 公里

注：以上酒店住宿价格按实际情况略有浮动。

会场及用餐区域分布图



EITRT2013 会议日程(Conference Program)

2013 年 11 月 7 日 (周四)	
14:00 —19:00 一楼大厅 The Hall	会议报到及现场注册 Registration
2013 年 11 月 8 日 (周五):	
8:30—10:00 一楼大厅 The Hall	会议报到及现场注册 Registration
9:00—9:30 五楼正阳厅 F5, ZhengYang Hall	开幕式及领导致辞 (主持人: 赵明花) Opening Ceremony
9:30—9:45	集体合影 Group Photo
9:45—12:00 五楼正阳厅 F5, ZhengYang Hall NOTES: about 30mins for every keynote speech (including Q & A), and 10:45-11:00 am for Tea Break	<p>大会报告 1 (主持人: 刘志刚):</p> <ul style="list-style-type: none"> ● Satoru SONE, 曾根悟, 东京大学教授, 报告题目: Purposes and configuration of hybrid traction(Translator: Prof. Yang Zhongping) ● 贾利民 (Jia Limin), 北京交通大学, 教授, 博导, 报告题目: Real-time Holistic Monitoring and Safety Warning Technology of Urban Rail Trains ● Dr. Buchheit Karlheinz, 西门子公司专家, 报告题目: 挑战高速铁路--多系统列车控制 (Challenges in high speed, multi system train control) ● 陈维荣(Chen Weirong), 西南交通大学, 教授, 博导, 报告题目: 燃料电池混合动力现代有轨电车 (Modern Fuel Cell hybrid Trams)

<p>14:00—17:45</p> <p>五楼正阳厅</p> <p>F5, ZhengYang Hall</p> <p>NOTES: about 30mins for every keynote speech (including Q & A), and 16:00-16:15 pm for Tea Break</p>	<p>大会报告 2 (主持人: 秦勇):</p> <ul style="list-style-type: none"> ● 安民(An Min), 伯明翰大学教授, 英国, 报告题目: 英国轨道交通安全及风险管理目前的状况 (Current Status of Railway Safety and Risk Management in the UK) ● 赵明花(Zhao Minghua), 中国北车长春轨道客车股份有限公司, 总工程师。报告题目: 轨道车辆智能化研究 (Research on intelligent vehicle) ● 寺泽 清(Terasawa kiyoshi), 日立公司专家。报告题目: CRH3A 城际 EMU 用牵引变流器 辅助变流器的开发 (Development of traction and auxiliary converters for CRH3A EMU) ● 刘志刚 (Liu Zhigang), 北京交通大学, 教授, 博导。报告题目: 电力电子技术在城市轨道交通牵引供电与传动系统中的最新进展与应用示范 (State-of-Art and Application of Power Electronic Technique for Traction Power and Drive Systems in Rail Transit) ● 李砾工 (Li Ligong), 大连电牵公司, 总设计师, 教授级高工。报告题目: 机车车辆牵引控制技术研究 (Study on control technology of traction locomotive) ● 苏众庆, 香港理工大学机械工程学系 (Zhongqing SU, The Department of Mechanical Engineering, The Hong Kong Polytechnic University), 副教授 王强 (Wang Qiang), 南京邮电大学, 副教授报告题目: 针对高速列车转向架的实时在线结构健康监测及其在京沪高铁上的应用 (In-situ Guided-wave-based Health Monitoring for Train Bogie Structures: Technique Development and Application to Beijing-Shanghai High-speed Railway) ● 秦勇 (Qin Yong), 北京交通大学, 教授, 博导。报告题目: 轨道交通系统运营安全与应急管理理论方法及技术的发展趋势与应用 (The trends and applications of rail transit system operation safety and emergency management)
<p>18:00</p> <p>五楼春城厅</p> <p>F5, ChunCheng Hall</p>	<p>晚宴</p> <p>Banquet</p>

2013年11月9日（周六）8:30--12:00am & 14:00--15:00pm

分组报告 Oral Sessions

NOTES: about 12 mins for every talk (including Q & A) and 10:00-10:15am for Tea Break)

<p>分论坛一 Session 1 8:30—15:00 五楼绿园 A 厅 F5, LvYuan Hall, NO. A</p>	<p>分论坛一：轨道交通电力牵引及供电 Session 1: Electrical Traction and Power Supply of Rail Transportation 主持人：刁利军，北京交通大学 Chair: DIAO Lijun</p> <p>Simulation on PMSM from the Establishment of Air-gap Magnetic Field <i>Huaxiang LI, YuePin YUAN</i></p> <p>Application of Affinity Propagation Clustering Algorithm in Fault Diagnosis of Metro Vehicle Auxiliary Inverter <i>Junwei Gao, Zengtao Ma, Yong Qin, Limin Jia and Dechen Yao</i></p> <p>Application of GA-LSSVM in Fault Diagnosis of Subway Auxiliary Inverter <i>Junwei Gao, Ziwen Leng, Yong Qin, Limin Jia and Dechen Yao</i></p> <p>Primary permanent magnet linear motors for rail transit <i>Ruiwu Cao, Ming Cheng</i></p> <p>Research on Beat-less Control Strategy Based on Frequency Domain Analysis <i>Kan DONG, Lijun DIAO, Leiting ZHAO, Yizhou CHEN, Zhigang LIU</i></p> <p>Calculations of leakage impedance of rail to earth in ballastless track by finite element method <i>Teng Li, Mingli Wu, Fan He and Kejian Song</i></p> <p>The Vector Analysis of the Traction Motor's Rotor Flux in EMU <i>Haibo Zhao</i></p> <p>Research on Harmonic Suppression of High-speed Railway Traction Power Supply System Based on A LC Filter Branch <i>Baishui Ruan, Gang Zhang, Fan Yang, Zhigang Liu</i></p> <p>Decoupling Control Method of Normal and Tangential Force in a Linear Induction Motor <i>Sijia LIU, Yu FAN, Shuo LI, Wei QIN, Baoyu QIAO</i></p>
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<p>分论坛一</p> <p>Session 1</p> <p>8:30—15:00</p> <p>五楼绿园 A 厅</p> <p>F5, LvYuan Hall, NO. A</p>	<p>Quality Control of CRH380BL EMU Vehicles Electrical Connector Connection Safty <i>Zi-lu LI, Zhi-xin QI, Fei-fei XIAO</i></p> <p>Design of a 6kW Battery Charger Based on Full-Bridge Phase-Shifted ZVZCS PWM Converter <i>Tao Sun, Zhigang Liu, Chao Li, Lei Wang, Lijun Diao</i></p> <p>Investigation on Track Length Control for Metro VVVF system <i>Liangjie LIU</i></p> <p>Development and Actuality of Auxiliary Power Supply System for Urban Railway Vehicles <i>Shubin WANG, Yan XIA, Huiqing DU, Jie CHEN</i></p> <p>Locomotive DC600V Power Supply Design and Control Redundancy Improvement <i>Yan Xia, Chunmei Xu and Lei Wang</i></p> <p>Research on EMC Design and Test of Train <i>Bo Zhang, Hongju Cui, Shiping Gao, Yan Wang</i></p> <p>Fault Diagnosis of PWM Rectifier Based on Wavelet -neural Network <i>Linghui Meng, Yunxiao Fu, Zhigang Liu, Limin Jia, Lei Wang</i></p> <p>Railway Power Transformer Reliability Evaluation Model Based on Operating Conditions <i>Juan Zhang, Zhensheng Wu</i></p> <p>Research on fault detection method and device of EMU traction motors <i>Jiangang Cao, Hongju Cui and Ning Li</i></p> <p>Fault Modeling and Fault Diagnosis of Three-phase Inverter Circuit <i>Zhaoyang Zhou, Chunmei Xu, Lei Wang and Linghui Meng</i></p> <p>Common Faults Analysis for EMU's roof high voltage electrical system <i>Zhaohui Zhang, Mingli Wu, Chenxi Guo</i></p> <p>Main Circuit Topology and Parameters of Gird-Side Converter of Electric Multiple Units <i>Xuqin XIE, Gang ZHANG, Baishui RUAN, Zhigang LIU</i></p>
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<p>分论坛二 Session 2 8:30—15:00 五楼绿园 B 厅 F5, LvYuan Hall, NO. B</p>	<p>分论坛二：节能及新能源技术在轨道交通中的应用 Session 2: Application of Energy-Saving and New Energy Technology in Rail Transportation 主持人：李军，高级工程师，长春轨道客车股份有限公司副总工程师 Chair: LI Jun</p> <p>Discussion on Integrated Energy Saving Technologies of High-speed Trains <i>Bangcheng SUN, Minggao LI, Chao AN, Jijun MA, Jinpeng YU</i></p> <p>Load Calculation of Dropper and Electrical Connector in Overhead Contact Suspension of Electrical Railway <i>Zhenyu CHU</i></p> <p>Research on the Pipe Rail Transport System-Based Control Strategies of Linear Motor <i>Li Xuefei, Zhao Leiting, Jin Zheming</i></p> <p>Hardware-in-the-Loop Simulation for Subway Applications With Onboard Supercapacitor <i>Wei Wang, Ming Cheng, Ya Wang, Bangfu Zhang, Ying Zhu and Shichuan Ding</i></p> <p>Design and Verification of Hybrid Power Box of 100% Low-floor LRV <i>Li Ming, Li Minggao, Shi Junjie, Yang Guang, Shao Nan</i></p> <p>The Control Strategy Research of Hybrid EMU Energy Storage System <i>Wenhui He, Xiaoguang Jia, Zheming Jin, Lijun Diao and Zhigang Liu</i></p> <p>Research on Parallel Characteristics of Lithium Iron Phosphate Batteries for Dual Electric Multiple Units <i>Yanru Zhang, Jiuchun Jiang, Weige Zhang, Wei Shi, Zeyu Ma, Fangdan Zheng</i></p> <p>A Design and Development of the On-line Monitoring System for the Parameters of the Storage Battery of the Train <i>Ning LI, Guanji XU, Jiangang CAO</i></p>
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<p>分论坛二 Session 2 8:30—15:00 五楼绿园 B 厅 F5, LvYuan Hall, NO. B</p>	<p>Application Effect Analysis of the Medium-voltage Type Regenerative Braking Energy Utilization Device <i>Zhiwei Han, Gang Zhang, Zhigang Liu, Fuqiang Mu</i></p> <p>Research on Dual Series and Parallel Control Schemes for Three-phase Voltage-sourced PWM Rectifier <i>Fan Yang, Zhigang Liu, Gang Zhang and Baishui Ruan</i></p> <p>Research of the Lithium Battery Based Energy Storage System for Light-Rail Vehicle <i>Xiaoguang Jia, Zhigang Liu, Wenhui He, Zheming Jin, Lijun Diao</i></p> <p>Research on application of on-line UPS topology in novel energy-storage traction converter <i>Zheming Jin, Zhigang Liu, Wenhui He, Xiaoguang Jia and Lijun Diao</i></p> <p>On EMU safe power transmission <i>Shangyu LI</i></p> <p>Study on power battery's voltage and temperature acquisition system in rail traffic <i>Xiaoshi LIU, Weige ZHANG, Bingxiang SUN, Runyu YANG, Yan BAO</i></p> <p>Clamped Three-level Inverter Midpoint Potential Control Method <i>Haijie Jia, Xuedong Jiang, Lei Wang and Zheming Jin</i></p> <p>Research on Beat-less Control in Traction Drives <i>Yizhou Chen, Ruichang Qiu, Kan Dong, Lijun Diao</i></p> <p>The Control Strategy of Network-side Converter in Dual-power Electric Multiple Units <i>Lichenxin Jiang, Gang Zhang, Baishui Ruan, Zhigang Liu</i></p>
<p>分论坛三 Session 3 8:30—15:00 六楼一会议室 F6 NO.1 Meeting Room</p>	<p>分论坛三：轨道交通系统安全与应急管理 Session 3: system safety and emergency management 主持人：秦勇，北京交通大学教授 副主持：魏秀琨，北京交通大学副教授 Chairs: QIN Yong, WEI Xiukun</p> <p>The city rail train safety detection sensor network platform's using on online track detection <i>Shaohuang Pang, Weiping Zhao, Honghui Dong, Wenlong Peng, Jian xiao Chen</i></p>

<p>分论坛三 Session 3 8:30—15:00 六楼一会议室 F6 NO.1 Meeting Room</p>	<p>Safety Analysis of ZPW-2000A/K Track Circuit System Based on Risk Estimation <i>Ju Zhang, Huibing Zhao, Guo Zhou, Hongyu Quan</i></p> <p>Analysis of Related Factors Influencing Reliability of Railway signaling Systems Based on Fuzzy Analytical Hierarchy Process <i>Hongxia Chen and Min An</i></p> <p>Using Asynchronous Hot Standby Spare in Time Stamped Fault Tolerant Real Time System <i>Mahmoud Jannesari Ladani and Ahmad Kezemi Gazanchaei</i></p> <p>Research on Construction of Urban Logistics Information Platform <i>Kai Liu, Honghui Dong, Jun Bi, Zhibin Lu</i></p> <p>Real-Time Evaluation Model of Urban Rail Train Communication Network <i>Yin Tian, Honghui Dong, Limin Jia, Yong Qin and Shao huang Pang</i></p> <p>A Guided Wave Based Online Health Monitoring Technique for High-Speed Train Bogie Structures <i>Qiang Wang, Ming Hong, Zhongqing Su, Jing Xu</i></p> <p>Fault Diagnosis for Rail Vehicle Suspension Systems Based on Fisher Discriminant Analysis <i>Xiukun Wei, Sheng Wu, Jianlong Ding, Limin Jia, Qu Sun, Minzhen Yuan</i></p> <p>Research on hazard evaluation of urban rail train Based on the extension theory <i>Guiling Liao, Yong Qin, Yuan Zhang, Xiaoqing Cheng, Zongyi Xing</i></p> <p>The Design and Development of High Speed Railway Infrastructure Detection Data Access System <i>Junqing Tang, Limin Jia, Honghui Dong, Haijian Li, Yong Qin, Shaohuang Pang, Jianxiao Chen</i></p> <p>On Simulation of Urban Rail Vehicle Electro-pneumatic Braking Systems <i>Xiukun Wei, Ming Cheng, Limin Jia, Hai Liu, Minzheng Yuan, Guangwu Liu</i></p>
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<p>分论坛三 Session 3 8:30—15:00 六楼一会议室 F6 NO.1 Meeting Room</p>	<p>Research on Optimization Model of Critical Systems Maintenance Schedule for Urban Mass Transit Train <i>Xijun Chen, Shiyou Zhu, Zhaoxin Li, Zhe Zhang</i></p> <p>WSN Localization Method based Automatic Inauguration Algorithm for WLTB <i>Jun Tang, Jiabo Xiao, Weifeng Yang</i></p> <p>A Safe and Efficient Design of Point Control in Modern Tramway <i>Weiting He, Zhoujun Mi, Hongming Zhao, Xueming Jiang</i></p> <p>Operational Safety Management and Risk Control Practice of Shenzhen Metro Line 3 <i>Li HE, Haiying HOU</i></p> <p>Research on the Risk Management System of Metro Operation <i>Gao Shuang, Jiangyun Xia</i></p> <p>Intelligent Driving Visual Perception Computing Model Based on Attention Dynamics Mechanism <i>Chunhui-Jiao, Yongheng-Jiang, Jingchun-Wang</i></p> <p>Ultrasonic Signal Processing in Rail Flaw Detection <i>Qunlin Tan, Hongliang Li, SiQing Yang, FangKun Wei</i></p> <p>Research on Identification Method of Safety-critical System for Urban Mass Transit Train <i>Lin He, Luming Chang, Zhe Zhang, Ting Yun</i></p> <p>A Modern Tram Signalling System based on BOStrab <i>Hongming Zhao, Weiting He, Ran Zhang, Xiaochun Zhang, Jian Yang, Yingjie Huang</i></p>
<p>分论坛四 Session 4 8:30—15:00 六楼二会议室 F6, NO.2 Meeting Room</p>	<p>分论坛四：轨道交通计算机及自动控制 Session 4: rail transportation Computer Technology and automatic control 主持人：季常旭，北京交通大学教授 副主持：孟学雷，兰州交通大学副教授 Chair: JI Changxu, MENG Xuelei</p>

<p>分论坛四 Session 4 8:30—15:00 六楼二会议室 F6, NO.2 Meeting Room</p>	<p>Information Hiding Based on Morphological Component <i>Linlin Zhang and Jianjun Wang</i></p> <p>Design of urban rail vehicle sensor network data transmission simulation system <i>Xianpeng Xia, Honghui Dong, Yin Tian, Limin Jia, Yong Qin, Shaohuang Pang & Jianxiao Chen</i></p> <p>A Fine-Grained Authentication Model Based on Perceptual Hashing and Grid Descriptor for Remote Sensing Image <i>Kaimeng Ding, Yuhai Wang</i></p> <p>A Track Circuit Signal Simulation System for Interlocking Test <i>WeiQing Li, DingChang Yong</i></p> <p>Overhead Hoist Transporter System Utilization Simulation and Analysis for Computer Integrated Manufacturing in Food Process Business <i>Yu-Chuan Liu, Shih-Ming Yang, Hong-Mei Gao and Chun-Yung Chuang</i></p> <p>A novel family size model by family names study <i>Ying hong Ma, Jian ping Li</i></p> <p>A novel recursive algorithm for training RBF networks <i>Peng Zhou, Zhu Yang</i></p> <p>Design and Development of High-speed Railway Infrastructure Detection Database <i>Na Chen, Li min Jia, Hong hui Dong, Yong Qin, Shao huang Pang and Jian Xiao Chen</i></p> <p>Research on Different Speed Combinations' Influence on Carrying Capacity on Mix Organization Pattern of Passenger Dedicated Line <i>Jiang hua Gao, Jie Xu, Fei Dou, Guoxing Han and Kai Yan</i></p> <p>Optimized Design of Urban Rail Vehicle Grounding System <i>Ling Gao, Ruichang Qiu, Lei Wang and Haijie Jia</i></p> <p>Path Choice for Passengers of Subway Station during Peak Hour <i>Xiaomin Xin, Jie Xu, Jianyuan Guo, Limin Jia, Yong Qin, Yashu Kang</i></p> <p>Subway vehicle bearing fault diagnosis methodology research based on PNN neural network and wavelet package <i>Xi Li, Yuan Zhang and Limin Jia</i></p>
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<p>分论坛四 Session 4 8:30—15:00 六楼二会议室 F6, NO.2 Meeting Room</p>	<p>Analysis of the Property of Heavy Haul Railway's Traffic Flow based on Hybrid Cellular Automaton <i>Wentan Deng, Huibing Zhao</i></p> <p>Vehicles Outward Based on AVI <i>Bing Wang, Dudu Guo, Wenlei Sun and GULBAHAR Tohti</i></p> <p>Process Design and Analysis of Emergency Decision Support System for High-Speed Rail Transport Organization <i>Guoxing Han, Yong Qin, Tao Zhu, Jie Xu, Fei Dou and Kai Yan</i></p> <p>Train Control Management System Safety Assessment <i>Changyuan Liu, Xiaoming Li and Panpan Yang</i></p> <p>Research on Framework and Architecture Design method of Urban ITS <i>Zhenhua Wang, Lijun Lei, Wei Nie, Zhongsheng Hou, Zetao Jing, Shangtai Jin</i></p> <p>Advanced Railway System to create a safe and reliable railway network with high-speed <i>Jean Yang</i></p> <p>Research, Application and Improvement of the Visual Automatic Operating Device for Ground Wire <i>Bin Zeng</i></p> <p>Design and Research in the Echo Program Of the 14th Subway in Beijing <i>DongNingHan</i></p> <p>Analysis and Research for Customer Needs Based on The House of Quality <i>Chunguang Yan, Zhihai Wang, Licheng Tan, Hongxue Hou, Xueyan Tian</i></p>
<p>15:10—17:30 酒店一层大厅 The Hall</p>	<p>酒店一层大厅集合，乘车前往长客股份公司合心园区，参观长客股份公司合心园区。</p>

Keynote Speech

Purposes and configuration of hybrid traction

Satoru SONE

Tokyo University, Japan

This Keynote Speech is not aimed for any single purpose of development such as energy saving, limitation of voltage fluctuation etc. but for overall improvement of the system. It is still difficult to adopt energy storage devices from purely economic point of view because even state of the art technology in electric energy storage devices is still too expensive and too heavy if loaded on-board. In order to escape from the difficulty, the author stresses the importance of multiple purposes and coordination of all energy storage devices located near to each other, wayside or on-board.

Similar lecture has been made recently by the author at a joint IEEJ (the Institute of Electrical Engineers of Japan) meeting of Investigation Committees of On-board Hybrid Traction and Wayside Storage Systems.

Brief Bio: Satoru SONE, Born in 1939 in Tokyo, graduated from the Univ. of Tokyo in 1962, PhD in Electrical Engineering in 1967.

Lecturer, Associate Professor and Professor of the Univ. of Tokyo 1967-1968, 1968-1981 and 1981-2000 respectively. After retiring from the Univ. of Tokyo he joined Kogakuin Univ. to establish a new laboratory in electric railway fields as Professor 2000-2007 and then he is a key organiser of Lecture Series of Railways for continuous education at the same Univ. The Lecture Series of Railways is unique in

Japan and popular to professionals of various fields in railway industries as well as among railway enthusiasts.

He engaged mostly in various electric railway fields including modern power electronic traction systems, development of linear motored metro system, safety aspects of train operation, improved train scheduling/ rescheduling system, and high performance energy saving technologies by using energy storage systems.

Some examples of his contribution to actual railway systems are; development of Shinkansen in early stage especially in stable current collection at booster section of the catenary, development of world first regenerative trainset, Series 300, development of super high speed maglev systems toward practical use, linear motored small profile transit system supported by steel wheels on steel rail, and improved train scheduling of intercity high-speed line and suburban commuter lines.

Author and co-author of books including 'New Railway Systems' (1987 Ohm Publ.), 'Textbook of Modern Electric Railways' (2000 Corona Publ.), and 'Electric Railway Handbook' (2007 Corona Publ.), all in Japanese. Also an occasional contributor to Railway Gazette International.

Recent contribution to RGI related to positive application of energy storage systems appeared in June 2013, July 2007 and June 2003 issues.

Real-time Holistic Monitoring and Safety Warning Technology of Urban Rail Trains

Jia Limin

Beijing Jiaotong University, China

China is in peak period of construction and opening of the urban rail line. Security assurance of the urban rail transit has an important significance on promoting the efficiency of urban rail transit. Holographic of urban rail transit real-time monitoring and security early warning technology turn urban rail transit security mode from passive to active. The intelligent railway transport system construction of China is in a junior to intermediate stage. Many new technical requirements have begun to emerge, such as running state global access and vehicle-mounted detection systems integration, real-time fault diagnosis of urban rail train, large capacity data transmission of train-to-ground, joint monitoring of train and base, train maintenance base on train state and etc. This lecture presents the key technology of train safety monitoring sensor network, based on which the real-time fault diagnosis technology of urban rail train key equipment is formed. Data transmission technology of urban rail train large capacity provides a bridge for data mining in huge amounts of information, hidden information extracting and train safety status evaluating. Another aspect of the discussion describes a general frame work of a subway operation and maintenance system based on planned maintenance model with train state. The demonstration project in Guangzhou Metro is described as an illustration.



Brief Bio: Jia Limin: Dr. Limin Jia, received Ph.D. degree from China Academy of Railway Sciences 1991 and EMBA from Peking University 2004. After a three year stay with China Academy of Railway Science, he was promoted as a researcher. He is now a chair Professor at the State Key Lab of Rail Traffic Control and Safety, Beijing Jiaotong University, China. Dr. Jia is also a distinguished expert of Ministry of Communication Information Leading

Group, expert consultant of Capital traffic management technology, the group leader of experts group about high-speed train technology development key projects of China's 12th Five-Year Plan and the deputy head of experts group about China's High Speed Train Innovation Joint Action Plan. He participated in compiling national science and technology plan of China's 11th Five-Year Plan and China's 12th Five-Year Plan about transportation, as well as several major national science and technology plan or key projects planning and organizing the implementation.

His research interests include Intelligent Control, System Safety, Fault Diagnosis and their applications in a variety of fields such as Rail Traffic Control and Safety, Transportation and etc. Dr. Jia has published over 240 papers, and edited over 8 books. He has served as director, commissioner or editorial of more than 20 academic institutions, such as Systems Engineering Society of China, China Railway Society, Operations Research Society of China, China Railway Science and etc.

Challenges in high speed, multi system train control

Buchheit Karlheinz

Experts of Siemens, Germany

In Europe there is an increased demand for cross-border railway connections. In order to make these journeys as comfortable as possible, vehicles are needed which can be operated in several countries and railway networks. For historical reasons, the railway infrastructures in the individual countries were developed independently from each other. As a consequence, a very heterogeneous infrastructure, e.g. different power systems and various automatic train protection systems, has come into existence.

Multi-system trains have to cope with the requirements resulting from this heterogeneous infrastructure. The diverse requirements that apply to vehicles in cross-border railway operation are shown and the body of the presentation illustrates how these challenges were answered in the Velaro Platform.

Train control is a key technology in order to fulfill these requirements. The presentation will give an overview of the control of high-speed multi-system trains. The basic properties of train control, e.g. control unit, bus communication and diagnosis are described. Furthermore, the integration of multiple automatic train protection systems is stressed. Finally, the presentation illustrates the engineering process with respect to safety-relevant control systems.

The presentation closes with an outlook on future developments in train control.



Brief Bio: Dr.-Ing. Karlheinz Buchheit

Born: 1964 in Germany

Education

1985 – 1990 Study of electrical engineering at University of Kaiserslautern Germany

Major subject: drive and control technology

1994 – 1994 PHD-Study at University of Kaiserslautern Germany Institute of control systems and signal processing

1994 Doctor degree in electrical engineering PhD thesis: Iterative learning control systems

Professional experience

Since 1994 Siemens AG, Erlangen Rail Systems division Working in several areas of railway engineering Mainly dealing with engineering of high-speed trains

1994: Development of drive systems Development of on board power supply systems Development of control systems for tilting trains

1997 Section leader in the drive system department

2002 Engineering project management Complete engineering responsibility for the Spanish project Velaro E Complete engineering responsibility for the Chinese project CRH 3

Since 2008: Head of department for electrical engineering high speed trains

Engineering responsibility for:

- Train control systems
- Bus communication
- Diagnosis
- Circuit technology
- Display systems
- High-tension equipment
- Electromagnetic compatibility
- Earthing systems

燃料电池混合动力现代有轨电车

Modern Fuel Cell hybrid Trams

陈维荣

西南交通大学电气工程学院

国家轨道交通电气化与自动化工程技术研究中心

报告介绍了现代城市有轨电车的发展现状，提出了一种基于燃料电池和超级电容器的混合动力现代有轨电车设计。该设计结合了燃料电池能量密度高、超级电容功率密度大的特点，具有清洁、环保、美观等优点。报告给出了系统的总体设计方案，包括主要技术指标、系统总体结构、关键技术研究以及目前存在的问题，并给出了具体的研究规划。



陈维荣博士简介，工学博士，教授，博士生导师。现为国家轨道交通电气化与自动化工程技术研究中心常务副主任、西南交通大学电气工程学院副院长、新能源研究所所长，四川省学术技术带头人、四川省教学名师、IEEE 会员、中国电子学会高级会员、中国能源学会常务理事、四川省电机工程学会副理事长、四川省铁道学会电气化专委会主任委员、四川省电子学会电子测量与仪器专委会副主任委员。

一直从事工业远程监控、电力系统及其自动化、智能图像监控、智能信息处理、群体优化算法、燃料电池（氢能源）技术及其应用等领域的科研和教学工作，曾先后主持、主研国家、省部级科技攻关项目和重大工程项目三十余项。其中，获

省部级科技进步一等奖 3 项、二等奖 1 项、三等奖 2 项；主持或主研国家自然科学基金、国家科技支撑计划、铁道部科技计划项目等国家、省部级科研项目及工程项目 40 多项，在 IEEE Trans. on Power Systems、IEEE Trans. On Industrial Electronics、Electrical Power System Research、Journal of Power Sources、中国电机工程学报等国内外重要学术刊物或国际会议上发表学术论文 220 余篇，SCI、EI 收录 80 多篇，参编教材两部。

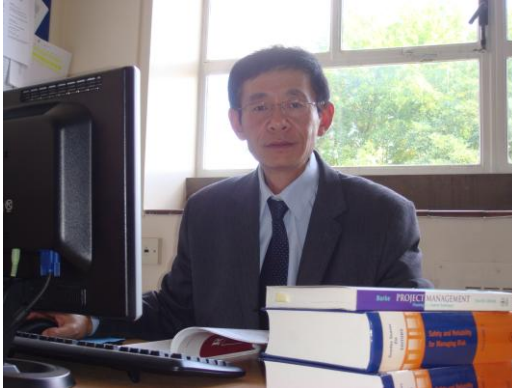
主持、主研教改项目多项，获 2009 年国家优秀教学成果一等奖 1 项、四川省优秀教学成果一等奖 2 项，是“轨道交通电气化与自动化”国家级教学团队骨干教师、“电气工程及其自动化”国家级特色专业建设点骨干教师、“运动监控技术”国家精品课程负责人。

Current Status of Railway Safety and Risk Management in the UK

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Railways are by far one of the safest means of ground transportation, especially for their passengers and employees. There are serious issues involved in both maintaining this position in reality and sustaining the public perception of railway safety excellence. Britain's railway system was restructured and privatised between during 1990s. The industry now consists of separate companies including infrastructure controllers, train and freight operating companies, rolling stock companies and contractor companies to maintain and renew the infrastructure. However, the railway finds itself in a situation where actual and perceived safeties are real issues, to be dealt with in a new public culture of rapid change, short-term pressures and instant communications. Until Hatfield rail accident, the railway safety is now changed to safety case approach in which operators and builders of installations have to have an approved safety case for their activities before they are allowed to operate. This keynote presents an overview of current status of railway safety and risk management and a focused discussion on the lesson learned from Hatfield rail accident, main changes, current railway safety and risk management system, safety case approach framework, problems in safety and risk assessment and management with a aim to improve railway infrastructure safety management.



Brief Bio: *Min An, BEng(Hons), MSc, PhD, CEng, MIMechE, MCICE, MIEngD*, is a Reader Professor in Project and Transport Risk Management at the University of Birmingham, UK, the Leader of the Safety, Risk & Reliability Management Research Group, the Director of MSc in Civil Engineering and MSc in Civil Engineering

& Management, the Leader of the Birmingham Centre for Railway Research and Education on Safety and Risk, and a member of staff in Rail Research UK Association. He is an Editor/an Associate Editor/a Member of Editorial Boards for 10 international journals. His research and consultant works, especially in the context of transportation and railway industry, are mainly in the fields of (1) development and application of more rational and sustainable safety, risk, reliability and decision-making techniques and methods to facilitate railway safety, risk and reliability analysis and (2) development of the advanced procedures for minimizing risks by improved design aspects, construction and maintenance strategies based on safety and reliability assessment. His research work has been financially funded from a variety of sources including research councils (EU and UK), government agencies and industry. He has been involved in organization or as a member of the International Advisory Board for many of international conferences and has been invited to give many keynote lectures at the international conferences and seminars. He has collaborated with many of railway industrial major players internationally and nationally including London Underground, Rail Safety & Standard Board, Network Rail, Tube Lines, Metronet SSL, Serco Assurance, Balfour Beatty, TACO, Eurostar (UK) Ltd, Amey Plc, BAE System, Sir Robert McAlpine, Scott Wilson, and British Highways Agency etc. He has delivered many workshops to transfer his research results to industry. The outcomes of the research and consultancy activities can be broadly described as providing new or improved design, operation and maintenance related processes and strategies, resulting in the development of appropriate safety risk assessment and decision making methods and tools, particularly, in railway transportation.

轨道车辆智能化研究

赵明花

中国北车长春轨道客车股份有限公司，总工程师

在长客股份公司现有成熟技术基础上，开展轨道车辆智能化研究，构建以智能控制为核心，以全息化列车状态感知和动态数字化运行环境为基础，以信息智能处理与交互为支撑，具有自检测、自诊断、自决策能力的智能化车辆系统。

研究将着重在“智能控制、智能检测诊断、智能传输、智能信息服务和智能维修维护”等五方面展开，实现轨道列车的安全可靠运行和全生命周期能力保持与优化，全面提升运用服务品质。

赵明花简介：长客股份公司总工程师、教授级高级工程师，是国内知名轨道车辆电气专家，是科技部“863”计划现代交通领域专家，科技部高速磁悬浮专家组专家，建设部城轨标准专家委员会成员，电力机车与城轨车辆杂志编委会成员，北车公司首席专家，吉林省第三批高级专家，享受国务院颁发的政府特殊津贴。“十二五”高速列车专项专家组专家，“高速列车产业技术创新战略联盟”第一届专家技术委员会委员。

一直从事轨道交通领域新技术、新产品科研开发工作，她主持完成了国家“863”计划“高速磁浮车”、国家科技支撑计划“100%低地板轻轨车”，承担了国家科技支撑计划“混合动力动车组”等10项国家重大专项研究工作以及“和谐号”CRH5及CRH380系列高速动车组研发工作，为我国铁路客运的快速发展做出了重要的贡献。其中获省部级科技进步一等奖2项、二等奖1项，在 Vehicle Power and Propulsion Conference, IEEE ; The 3rd International Conference on Computational Intelligence and Industrial Application; 铁道车辆; 城市轨道交通研究等国内外重要学术刊物或国际会议上发表学术论文10余篇。

先后获得“詹天佑铁道科学技术青年奖”、“中国经济女性十大创新年度人物”、中国北车集团“优秀科技工作者”等称号。

CRH3A 城际间轨道列车用主变换装置・辅助电源装置的开发

寺泽 清(Kiyoshi Terasawa)

日立公司, 日本

概要:开发应用在城际间轨道列车上的 IGBT 模块的变换装置 (CI) 及辅助电源装置 (APS)。该系统是通过从 CI 的中间直流回路 (DC2600V) 向 APS 供电的系统构成, 实现了在分相区间内通过逆变器的再生工作使 APS 仍可持续工作。本论文就系统的概要、装置的特征和车辆行驶试验结果进行说明。



寺泽 清(Kiyoshi Terasawa)简介, 日立公司专家。

1993 年入职于株式会社日立制作所。现在就职于株式会社日立制作所交通系统公司水户交通系统本部的车辆电器系统设计部。入职以来, 一直从事电车的驱动设备用逆变器及辅助电源装置系统的设计工作, 曾担任日本 JR 原有铁路线直流电车/交流电车/交直流电车及中国高铁车辆/地铁车辆的牵引系统设计工作。

Entered Hitachi, Ltd. in 1993, and currently works at Rail Systems Company Mito Rail Systems Product division. He is engaged in design of propulsion inverters and auxiliary power supplies for electric multiple units.

State-of-Art and Application of Power Electronic Technique for Traction Power and Drive Systems in Rail Transit

LIU Zhigang

Beijing Jiaotong Univ., China

Abstract: Developing of power electronic techniques has been always playing so an important role for rail transit, but the high speed development of rail transit give so much chances for power electronics, and vice versa. As the most important power electronic equipments in the rail transit, traction power supply and drive systems adopt nearly the mature but also newest techniques of power electronics, and this keynote speech will give a view for the state-of-art and the application examples.



Brief Bio: Pro. LIU Zhigang was born in 1961 in P.R. China, he received all his BE, ME, PHD in Beijing Jiaotong University and now is a professor and Supervisor of PhD Candidates of the school of electrical engineering, Beijing Jiaotong Univ..

His research has focused on rail transit traction drive and control, Intelligent Fault Diagnosis, reliability of power electronic circuits, Vehicle Operation Engineering . Proposed the method of Traction drive life estimation based on the cumulative assessment of the degree of damage, the system reliability

evaluation theory Based on component reliability and overall system reliability associated with. Research and completed a new energy fed traction power supply device based on high-power PWM rectifier technology. Research and completed the first column of 100% low-floor light rail vehicles traction drive system . developed the "A type vehicle traction and auxiliary systems. He has got a series of research projects both from National natural science foundation committee and national ministries and commissions such as Ministry of Railway (MOR)and Ministry of Finance. These projects cover not only basic theory of Safety Prediction、 Fault Diagnosis and key control theory of Rail transport control system, but also key technology research, including: key technology of Urban rail transit fed traction power supply system and Traction drive system, key technology of the Fault Diagnosis technology of Traction power supply and transmission system, key technology of Rail transport network communication system .

He is now the executive director of Beijing Institute of Higher Education Graduate Education Research. He is also member of experts Group of High Technology Research and Development Program of China (863 Program), Chinese Ministry of Education Master of Engineering Education Steering Committee. And the direct of Power Electronics Professional Committee of China Electrotechnical Society, vice chairman of the Rail transit Electrical Equipment Professional Committee of China Electrotechnical Society.

机车车辆牵引控制技术研究

李砾工

大连电牵公司，总设计师，教授级高工

In-situ Guided-wave-based Health Monitoring for Train Bogie Structures: Technique Development and Application to Beijing-Shanghai High-speed Railway

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2Nanjing University of Posts and Telecommunications

Abstract: Based on the team's research efforts over the years, an *in-situ* structural health monitoring (SHM) technique taking advantage of guided elastic waves has been developed, and deployed via an online diagnosis system. The technique and the system were recently installed on China's latest high-speed train model (CRH380CL) operated on Beijing-Shanghai High-Speed Railway (BSHSR), the world's longest high-speed line constructed in a single phase. The system incorporated modularized components including active sensor networks, wave generation, data acquisition, signal processing, data fusion, and results presentation. The sensor network, inspired by a concept of "decentralized standard sensing", was integrated into bogie frames during train final assembly, to generate and acquire guided ultrasonic waves, from which a wide array of signal features were extracted. Mock-up damage affixed to the bogie was identified quantitatively, and visualized in images. This in-situ testing has demonstrated the feasibility, effectiveness, sensitivity, and reliability of the developed SHM technique and system in real-world applications.

Keywords: structural health monitoring; guided waves; high-speed train; train bogie;

damage detection; Beijing–Shanghai High-Speed Railway; CRH380CL



苏众庆 (Zhongqing SU) 简介: 博士 (澳大利亚), 现为香港理工大学机械工程学系 (**The Department of Mechanical Engineering, The Hong Kong Polytechnic University**) 副教授。

主要研究方向包括结构健康监测、弹性波传导、智能材料与结构、传感器及传感器网络技术。

于北京航空航天大学分别获得航空学学士和硕士学位。随后考取澳大利亚政府全额奖学金赴澳大利亚留学, 2004 年于澳大利亚悉尼大学航空、机械与机电工程学院获得博士学位。同年获得澳大利亚联邦博士后研究员奖, 于 2005-2006 年在悉尼大学从事博士后研究, 直至 2007 年加入香港理工大学任助理教授。2011 年破格晋升为副教授 (tenured)。目前在香港理工大学领导一个团队致力于结构健康监测技术的研发, 并主持结构动态实验室的工作。已经和正在指导六名博士生, 以及十余名包括博士后在内的科研人员。

在过去的几年里, 发表了超过 150 篇的科技文献 (均为英文出版物), 其中包括超过 85 篇的高水准 SCI 期刊文章。于 2008 和 2009 年出版了两本专著。其中由国际著名出版商 Springer-Verlag 出版的: “Identification of Damage Using Lamb Waves: From Fundamentals to Applications” 为该领域第一本全面阐述该技术的专著。文章至今获得了超过 1200 次的 SCI 引用 (至今 H-index 为 19)。其中三篇分列著名 SCI 期刊 NDT&E International, Journal of Sound and Vibration, 以及 Structural Health Monitoring 全球排名第一、第二以及前十的“最被引用文章”。

自 2004 年以来, 以申请人的身份成功地从政府机构, 工业机构, 以及大学获得科研资助。现为 SCI 国际期刊 Structural Engineering and Mechanics 以及 Coupled Systems Mechanics 副主编。是 SCI 期刊 Smart Materials and Structures 以

及 *Journal of Mathematical Problems in Engineering* 的客座主编。

2010 年当选为欧洲结构健康监测执委会会员，以及亚太结构健康监测会议执委会委员。于不同国家和地区做特邀报告 30 余次，其中包括国际会议主题报告。曾担任澳大利亚复合材料协会执行秘书,是诸多国际会议的执委、组委会委员或秘书。

2011 年获得香港理工大学“校长特设卓越成就奖（研究）”。2012 年荣获结构健康监测领域最为著名的奖项：“结构健康监测-年度成就奖”（Structural Health Monitoring - Person of The Year (SHM-POY) Award），为该奖项自 2004 年设立以来第一位获此殊荣的华人。

Web: <http://myweb.polyu.edu.hk/~mmsu/index.htm>

王强简介，博士，南京邮电大学自动化学院副教授。2009 年博士毕业于南京航空航天大学智能材料与结构航空科技重点实验室；2011 年 4 月~2012 年 8 月为香港理工大学访问研究员（Research Fellow），开展非线性 Lamb 波结构损伤检测、集成结构健康监测系统设计等方面的研究和交流。目前主要从事测试计量技术及仪器方面的科研和数字信号处理方面的教学工作，研究方向为 Lamb 波结构健康检测及相关信号处理方法、计算机测控系统，主持在研和参与国家自然科学基金、教育部高等学校博士点专项科研基金、江苏省科技支撑计划以及江苏省高校自然科学基金项目等国家、省部级项目多项。曾获江苏省科技进步三等奖（排名第二）、航空学会科学技术奖（排名第二）、南京航空航天大学科技进步三等奖（排名第二）和二等奖（排名八）各 1 项；近年来共发表相关论文二十余篇，其中被 SCI、EI 及其源刊收录十余篇，申请国家发明专利 10 项，并获授权 5 项。

The trends and applications of rail transit system operation safety and emergency management

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With the rail transport taking more part in the public transport, its core competitiveness-operation safety is getting more attention than ever before. But the operation safety of modern rail transportation system is facing more severe challenges, due to its complex technology, high-speed, high-density, large-scale operations and the variable operating environment. To meet this challenge, we proposed a concept of proactive operation safety and security, and also built its models and technical framework. In the proactive operation safety technologies hierarchy, we conducted in-depth researches on the comprehensive assessment of rail network operation safety, online safety-state identification and fault diagnosis based on security domain, preventive maintenance based on the state and life prediction, the passenger impact analysis and train scheduling optimization under emergency, and some other core theories and methods, in order to achieve the safety-state acquisition, identification, warning, and system fault diagnosis, preventive maintenance and emergency response functions. Besides, we also proposed train sensor network, operation safety comprehensive monitoring(CMS-T), emergency collaborative response techniques. These methods and technologies have been applied to the urban rail network operating safety guarantee, urban rail train online monitoring and early warning, data

analysis of high-speed rail testing system, optimization design of high-speed train operation plans, and achieved remarkable results.



Brief Bio: Dr. Qin's full name is Qin Yong, who has received the undergraduate degree in traffic control engineering from Shanghai Railway University, Shanghai, China, the M.S. degree in transportation automation and control engineering from Shanghai Railway University, Shanghai, China, and the Ph.D. degree in traffic information engineer and control from China Academy of Railway Sciences, Beijing, China.

He is a Professor with State Key laboratory of Rail Traffic Control and Safety (Beijing Jiaotong University). His research interests are in the area of intelligent transportation systems, rail safety guard and emergency management, rail network management and traffic model. He has authored or coauthored more than 100 publication papers and 5 books, also won 7 science and technology progress award of ministry.

Dr. Qin is the vice dean of Beijing Research Center of Urban Traffic Information Intelligent Sensing and Service Technologies, the vice dean and secretary general of Rail Transportation Electrotechnical Committee of China Electrotechnical Society, a member of the Intelligent Automation Committee of Chinese Automation Association, also a member of Fuzzy Mathematics and Systems Committee of Systems Engineering Society of China.

论文摘要 Normal Paper Abstracts

Study on Moment of Inertia and Modal Analysis of Track Wheel for Roller Test Rig

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Abstract This paper introduces the effect of track wheel in rolling test of railway vehicle, and puts forward a method of moment of inertia check based on inertia matching. According to coupled vibration between track wheel and wheel of car, normal model analysis was proposed in this paper by using FEM of PATRAN/NASTRAN. Through analyzing the result of first 10 order model was obtained. The analysis shows that the first inherent vibration frequency is 12.634Hz. In this frequency and corresponding speed of 257km/h of railway vehicle in the rolling test, the coupled vibration occurred between track wheel and wheel. During the test, avoiding running in 257km/h for a long time will be useful for test precision.

Keywords: Roller test rig Track wheel Moment of inertia Model analysis

The Evaluation for Tianjin Metro Operation

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Abstract At present, underground line 1, line 2 and line 3 are running in Tianjin. In recent years, Tianjin railway experiences a rapid development, especially in 2012; the opening of line 2 and 3 pushes Tianjin railway life into a brand-new platform. This paper established a subway operator service quality evaluation model, using AHP to evaluate the operation of the underground line 2 and 3 in Tianjin, then make specific countermeasures and suggestions to improve the quality of service in Tianjin subway operations.

Keywords: Tianjin subway Operation evaluation Passenger satisfaction AHP

The evaluation method and index system for high-speed railway train operation plan

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Abstract The evaluation index system of train operation plan is a very important reference to high-speed railway management. With high-speed railway being rapidly into the net, the study on evaluation index system of train operation plan has been put on the agenda. However, there is no comprehensive experience could be directly followed. Based on this background, this paper established a comprehensive assessment system for management and designed new calculation methods for new indicators which include the equilibrium of train diagram, the balance of EMU operation, the adaptability of station operation.

Keywords: high-speed railway train operation plan evaluating indicator

The Optimization Model and Algorithm for High-speed Railway Station Operation Based on Lagrangian Relaxation

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Abstract In this paper, with the theory of Job-Shop scheduling, we apply this theory to station operation optimization for high-speed railway, take station equipment capacity, conflicts in inbound road and outbound road, station dwell time as the space and time constraints, minimize the train dwell time as the optimization goal, build the high-speed railway station operation optimization model and establish the corresponding Lagrangian relaxation model of station operation, and design the optimization algorithm for high-speed railway station technique operation.

Keywords: Station operation optimization Job-Shop Lagrangian relaxation Subgradient

Research on fault detection method and device of EMU traction motors

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National Engineering Laboratory for System Integration of High-speed Train (South), CSR Qingdao SIFANG Co., Ltd., 266111, Qingdao, China.

AbstractA study based on EMU traction motor failure in this paper. The fault detection method was combination of Hilbert transform and Wavelet packet energy analysis. DSP and ARM dual-CPU and its peripheral devices for the hardware platform. An on line monitoring of EMU traction motor fault detection device can be applied to the stator winding fault and broken rotor bars, air gap eccentricity. Fault detection instances in laboratory demonstrate that the approach is valid effective and feasibility.

Keywords: EMU Tractionmotor Fault detection device Hilbert transform Wavelet packet energy

Primary permanent magnet linear motors for rail transit

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AbstractPermanent magnet (PM) linear motor having magnets and armature windings in the primary mover (the so-called primary-PM machines) have attracted more and more attention due to its definite advantages of robust structure, high power density, high efficiency, and low cost in long stator application. In this paper, the structure, operation principle, characteristics, and electromagnetic performance of two kinds of the primary-PM motors in the application of the rail transit will be presented. Also, some experiment results are given to validate the study.

Keywords: Linear motor doubly salient flux-switching primary permanent magnet motor urban rail transit

Fluid and Thermal Analysis of Power Li-ion Battery Pack and Experimental Verification

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Abstract Fluid flow and heat transfer of a power li-ion battery pack which adopts the air cooling method with an electric fan are predicted using a computational fluid dynamics(CFD) software. The air flow rate distributions at coolant passages are analyzed quantitatively, which will affect temperature distribution of the battery pack. Temperatures at the center of battery surface that located in middle of each battery modules are monitored using thermal couples under the same driving cycle as simulation. The simulation results are closed to the experimental ones, which indicated that the calculated results can use as the basis of developing thermal management strategy of battery pack and optimization scheme of fluid flow.

Keywords: Power li-ion battery pack thermal analysis fluid flow analysis

Analysis of Related Factors Influencing Reliability of Railway Signaling Systems Based on Fuzzy Analytical Hierarchy Process

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Abstract A signalling system is a safety-critical part of railways. Most of railway signalling systems currently used today are intelligent and automatic high performance systems, which the high level of reliability is required. However, there are many factors including those uncertainties affect system reliability performance. In this paper, fuzzy analytical hierarchy process is further developed by using hierarchical structure to determine weights of contributions of each factor and sub-factor to the reliability performance of the system. By using the proposed methodology the results of reliability analysis indicate that the reliability of a signalling system can be assessed effectively and efficiently.

Keywords: Railway signalling system Fuzzy analytic hierarchy process Influencing factor Reliability

Analysis of Moore's Law on Intel Processors

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Abstract Moore's law is a famous law in the field of computer hardware, stating that the number of transistors on integrated circuits doubles approximately every two years. In this report, we do an analysis of Moore's law on consumer-class Intel processors to see how well Moore's law has been doing on predicting the number of transistors of Intel processors, and whether this trend will continue in the future. We take a statistical approach by using linear regression and extrapolation. By matching actual data against the model of Moore's law and calculating r-square, we are able to conclude that although Moore's law has made close predictions for single-core processors, the time interval for a double in multi-core processors is actually longer than Moore's law, thus Intel will fall behind Moore's law in the future.

Keywords: Moore's law Transistor Processor

Design and Development of High-speed Railway Infrastructure Detection Database

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Abstract All parameters necessarily relevant to ensure the high-speed railway infrastructure (HSRI) to be safe has been known in our project. To meet the need of further study about the evolutionary mechanism of service state of high-speed railway infrastructure, a HSRI detection database is needed. This paper based on the research achievement of sensors applied in rail infrastructure mainly analyzes entities and attributes in the detection processing, and then finishes the design of HSRI detection database conceptual structure. It associates the physical characteristics of high-speed railway detection data to determine the data type and value range of each field in database table, accomplishing the logical and physical structure design of database. This paper uses SQL Server 2008 as database management system (DBMS) and windows as a development environment to develop HSRI detection database.

Keywords: High-speed Railway Infrastructure Service State Database Detection data

Research on Beat-less Control in Traction Drives

Yizhou Chen, Ruichang Qiu, Kan Dong, Lijun Diao

AbstractThe DC-link voltage contains a ripple component with a twice power line frequency while the major traction system in high-speed EMU is operating. And this leads to beat phenomenon. In this paper the model following the traction system is established and the origin of beat phenomenon effect is analyzed in detail. The causes of the influence on torque and current by the secondary voltage ripple is explored through the analysis of working mechanism while the system is operating. Then a beat-less control scheme based on the frequency modulation and vector control is discussed in detail to eliminate voltage ripple in traction control. The hardware secondary resonant circuit will be cancelled to realize the lightweight and low-cost. Simulation and experimental results on matlab/Simulink confirm the effectiveness and validity of the adopted scheme.

Keywords:Fluctuating DC link beat phenomenon beat-less control vector control

Relationship Between Meteorological Factors and Accidents of Traction Power Supply System of High-speed Railway

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AbstractSome equipment of traction power supply system of high-speed railway are equipped outside, their state influenced by external environmental meteorological factors, some occurred accidents of traction power supply system relate to meteorological factors closely. Time distribution feature of traction power supply system is proposed on the basis of statistics and arrangement of accident occurred nearly three years, summer is the peak period of traction power supply system's failure; the relationship between accident and temperature, humidity, precipitation, wind speed, lightning strikes is proposed, and their correlation have been analyzed, it is found that temperature, wind speed and lightning are correlation with failure times significantly. Meteorological composite index is proposed to early warning the state of traction power supply system.

Keywords: traction power supply system accident time distribution meteorological composite index correlation analysis

Control Modeling & Signal Processing of a Library

Self-delivery Robot and its applications

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Abstract Nowadays, the cost of human labor is increasing dramatically in modern society in turn the time in which demands for certain tasks are to be completed is also decreasing. Meanwhile, most people do not have the patience to find out a book from a great number of bookshelves within a vast collection; even if the title of the book has been given. Fortunately, all of books in a library must be collated and organized according to a structure that distinguishes certain topics or genres. As this is a standard procedure for most libraries, this provides the fundamental structure for designing a robot to assist humans in acquiring the books they need. This paper outlines the theories, structure and model of the robot called “library self-delivery robot (LSDR)”, and especially focuses on the signal processing module. Additionally, applicable implementation methods and application aspects will also be discussed briefly.

Keywords: Self-Delivery Control Modeling Signal Processing

Analysis of the Property of Heavy Haul Railway’s Traffic Flow based on Hybrid Cellular Automaton

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Abstract According to the property of heavy haul transportation on Da-Qin line, this paper, based on hybrid cellular automaton, proposes a traffic flow model to simulate the operation of the train on Da-Qin line and to analyze the property of traffic flow. It investigates the relationship between the original speed and the braking distance of 20,000t heavy haul trains on horizontal line, and analyses the relationship between the slope and the braking distance of the trains on sloping line. The simulation results are compared with the theoretical results to verify the feasibility and availability of the model.

Keywords: Heavy Haul Railway Hybrid Cellular Automaton Traffic Flow

A Fine-Grained Authentication Model Based on Perceptual Hashing and Grid Descriptor for Remote Sensing Image

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AbstractIn this paper, a fine-grained authentication model for remote sensing image based on perceptual hashing and grid descriptor is proposed. Most perceptual hashing algorithms generate the hash value from an image's global features, while remote sensing images are generally of huge amount and large size, so they are not suitable for remote sensing images authentication applications with high security demand. In this work, we apply grid descriptor to divide an remote sensing image, then generated the perceptual hash value of each region, and organizing these hash values by embedding them into the corresponding region with watermarking technique. The grid descriptor is applied to detect and represent the tamper of the image. Compare with other authentication algorithms, the model can authentic remote sensing image with different granularity.

Keywords:Authentication Remote sensing image Perceptual hashing Grid descriptor

Research on Beat-less Control Strategy Based on Frequency Domain Analysis

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AbstractBecause of the configuration of the single-phase PWM converter in the traction system of EMU, there exists a voltage ripple in the DC-link, which is twice the frequency of the grid. The DC ripple voltage will impact the characteristic of the motor, and cause torque and current pulsation, which is called beat phenomenon. In this paper, the origin of the fluctuating DC voltage is analyzed first, and the relations among the torque ripple, the current ripple and the DC voltage ripple are derived from the analytical model of the traction system. A beat-less control scheme based on the frequency domain analysis is proposed, a compensation loop is applied to modify the slip frequency of the motor, thus minimum the torque and current ripple. The algorithm is verified by simulation.

Keywords:EMU Beat phenomenon Beat-less control Frequency domain

Study and Implementation of Closed Loop Control Based on Double Synchronous Rotating Frame for EMU Auxiliary Inverter with Unbalanced Load

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Abstract As one of the EMU auxiliary inverter's important performances, the symmetry of three-phase voltage puts forward high requirement in the inverter's topologies and control strategies. Based on the method of symmetrical component, this paper builds positive-, negative- and zero-sequence mathematical model of the three-phase inverter system with unbalanced load, and then analyses the generation mechanism of asymmetry output voltage. Afterwards it is proposed a double-loop SVPWM control strategy based on double synchronous rotating frame, and further analysis of the working mechanism and realization mode is raised. Finally, it turns out to be reliable and feasible to apply the control strategy after being tested with virtual DSP simulation model with MATLAB, and on a 3kVA experimental prototype.

Keywords: Auxiliary inverter Unbalanced load Method of symmetrical component Double-loop control Double synchronous rotating frame

Research and Analysis of Transient Process of Locomotive Passing Neutral Section Based on Habedank Arc Model

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Abstract Over-voltages frequently happen when locomotive passes the neutral section via articulated phase insulator, which is aggravated by arcing phenomenon. In this paper, Habedank arc model built in MATLAB/SIMULINK is introduced into the process of locomotive passing the neutral section. The electrical transient process is analysed in different conditions considering and not considering the arc model and compared to the statistical results of over-voltage tests. The simulation results show that generation of over-voltages is related to the phase angle of A phase contact line, the voltage phase angle difference between contact lines of A and B phases and the time of locomotive getting into and out of the neutral section, a certain rule is presented. The arc model built in this paper can describe the arcing

phenomenon well when locomotive passing the neutral section, and the simulation results of over-voltage are consistent with the theoretical analysis.

Keywords: Neutral section Over-voltage Handed arc model Electric locomotive

Design and Research for the Low-loss Passive Snubber Circuit Used in the Metro High Frequency Auxiliary Converter

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Abstract In view of the secondary rectifier diode overvoltage damage problems in the DCDC link during the operation process of the metro auxiliary converter, this paper analyzes the mechanism of overvoltage and a novel way of RCD snubber is proposed. Different from the traditional snubber circuits, it has the characteristics of less resistor heat, high energy utilization rate and good voltage spike suppression effect etc. On the basis of metro auxiliary converter circuit topology, this paper has carried on the detailed research in the energy flow during the snubber circuit voltage clamped process and put forward the snubber parameter calculation method. Then experimental verification is made by a simulation model based on SABER and 77kVA prototype platform, which proves the rationality of the RCD snubber circuit design.

Keywords: Auxiliary converter Resonance RCD snubber circuit Voltage clamped

Research on Different Speed Combinations' Influence on Carrying Capacity on Mix Organization Pattern of Passenger Dedicated Line

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Abstract Mix Organization Pattern fits the development demand on the present stage in China. The paper just considers factors that affect Carrying Capacity of Different Speed Combinations on Mix Organization Pattern. Firstly, analyzing the drawing methods of Train Operation Diagram and the calculation means of Deduction Coefficient. Furthermore, through analyzing the Train Operation Diagram of Beijing-Shanghai High-Speed Railway, it can be known that the drawing methods of single Middle-Speed Train with multiple stops and overtakings by High-Speed Trains is so viable that was applied. Additionally, this article analyzes the difference among several parameters such as the additional time of starting and stopping the train etc. on Different Speed Combinations. At last, taking an example, through drawing the Train Operation Diagram, the Carrying Capacity can be calculated, and making the conclusion that the Speed Combination between 250 km/h and 300km/h is superior to the Speed Combination between 250 km/h and 350km/h in the aspect of elevating Capacity.

Keywords: Mix Organization Pattern Carrying Capacity different Speed Combination Passenger Dedicated Line

Application of Affinity Propagation Clustering Algorithm in Fault Diagnosis of Metro Vehicle Auxiliary Inverter

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Abstract Auxiliary inverter is one of the most important electrical equipments of metro vehicle, its complex structure cause kinds of faults frequently. In this paper, the fundamental of the Affinity Propagation algorithm is introduced, and its application on fault diagnosis of metro vehicle auxiliary inverter is studied. Fault signals including voltage frequency variation, pulse transient and power interruption are simulated by using MATLAB software; clustering center matrix is calculated on the basis of AP algorithm, and the fault samples are classified by calculating the similarity degree between samples and clustering center. The simulation results show that the AP algorithm without initial clustering center can be used in the field of fault diagnosis, and even has better results than FCM algorithm.

Keywords: Affinity Propagation Fault diagnosis Auxiliary Inverter Clustering Analysis

Application of GA-LSSVM in Fault Diagnosis of Subway Auxiliary Inverter

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AbstractFocusing on the fault diagnosis precision of subway auxiliary inverter, the diagnosis method based on genetic algorithm (GA) and least squares support vector machine (LSSVM) is proposed in this paper. Firstly, the optimal parameters of LSSVM are obtained by GA with global search capability and the diagnosis model of the optimized LSSVM is established, then the empirical mode de-composition (EMD) is introduced to decompose the fault signal into several intrinsic mode functions (IMF), finally we will extract the approximate entropy of each IMF as the fault feature which will be applied to test the performance of the diagnosis model. Simulation results have proved that the proposed diagnosis method is feasible to recognize each fault and has achieved higher precision.

Keywords:Fault diagnosis Subway auxiliary inverter LSSVM Genetic algorithm EMD Approximate entropy

Optimized Design of Urban Rail Vehicle Grounding System

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AbstractFor most of the metro operation within the narrow underground space, personnel and equipments highly dense, a large number of electrical and electronic equipments and their strong and weak electrical lines cross layout, electrical engineering safety issues have drawn increasing attention,and the grounding is an important protective measure to ensure the normal working of electrical equipment and personal safety, so do a good job in metro weak current system, distribution system and grounding protection is an important measure to ensure the personal safety.Based on grounding system in practice, combined with Shenzhen Metro problems in actual operation, this paper expounds the metro electrical equipment grounding types, principles, grounding device settings, and so on, puts forward the improvement program of the grounding system, and make a reasonable verification.

Keywords:Urban rail vehicle Grounding system Grounding protection Shenzhen Metro

Research on the Relation between the Wind Direction of Vehicle Air Condition and Cooling Efficiency of the Cab

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AbstractApplying the computer aided optimization platform Isight to integrate computational fluid dynamics software FLUENT with DOE components. The DOE components automatically call the values of fluid simulation, and treat the heat flux of front and back seats as the cooling efficiency of the cab, Fluent adopts the PBCS algorithm and switches the RNG two equations model as the three-dimensional turbulence model of the cab. Through DOE it can analyses how the direction of the air-condition inlet impact the heat flux of the front and back seats significantly.

Keywords:Design of Experiment Isight Fluent Direction of Inlet Air Cooling Efficiency

Research on the Coordination Control on Phase Designing and Timing Setting ofthe Close-Continuous Intersections

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AbstractThe Close-Continuous intersections in the network of urban roadseriously affected the traffic efficiency of urban traffic. This paper, according to the special circumstances of close-continuous intersections in network of urban road, studied the method of signal control from the angle of the phase designing and timing setting of coordination control, and conducted case studiesand VISSIM simulation which shows that this method can improve the travel efficiency of close-continuous intersections.

Keywords:Coordination Control Close-Continuous Intersections • Timing Setting • Phase Designing

Research of Passenger Train Spare Parts Procurement Model

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Abstract Since government functions are separated from enterprise management of China railway, 18 railway administrations merged into several subsidiary companies, the railway company will pay more attention to the efficiency and service quality to improve their own competitiveness. Therefore, inventory management as one part of the railway enterprise management, it is particularly important to optimize the inventory management of spare parts, to ensure that the spare parts of high turnover rates, and lower operating costs for the subsidiary railway companies. But the theories and models on this aspect of are still a blank, so, this article is mainly focused on the railway passenger train spare parts inventory.

Keywords: Passenger train The Inventory management Spare parts procurement model Continuous random storage model

Risk-based Maintenance Optimization of Metro Vehicle Door System

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Abstract: Traditional maintenance of door system has not taken the risk of operating failure into consideration so a Risk-based maintenance strategy is developed and applied to maintenance decision of door system. Firstly, the EDCU unit is identified as the key subsystem of door based on the FMEA method. Then, risk assessment of the EDCU is carried out in accordance with cost. Finally, the rule of age reduction and increasing failure rate are applied to establish the model of the maintenance cycle optimization. The experiment result shows that optimal maintenance cycle of the door system is 57 days, which is verified by expert engineers.

Keyword: Maintenance cycle optimization Door system Risk-based Maintenance Age reduction factor

A Study of the Three-dimensional Visualization of Soil Microstructure Based on Mat Lab

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Abstract At present, qualitative and quantitative analyses of the soil microstructure are mainly made on the two-dimensional level. The present study makes possible the three-dimensional visualization of soil microstructure by transforming the SEM photos into the DEM ones with such abundant information as their inherent particles and apertures; it also makes available 2.560 as the fractal dimension for the DEM image of the sample soil by conducting a quantitative analysis of its microstructure with the projective covering method, a surface fractal measurement method.

Keywords: Microstructure DEM image Fractal dimension Projective covering method

Process Design and Analysis of Emergency Decision Support System for High-Speed Rail Transport Organization

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Abstract The paper analyses the emergencies which affect the rail transport organization and explores the causal relationships among the basic emergencies, abnormal phenomena, equipment fault and dispatching orders. After that, defines the causality of these concepts. Secondly, based on the principle of "safety-oriented", we establish a Causal Mapping Relationship Network (CMRN) model to describe the expression. The relationships based on CMRN model lay a solid foundation for the emergency warning and disposal theoretical system of rail transport organization. Thirdly, designs the progress of emergency decision support system (EDSS) based on the theoretical system to reflect the dynamic evolution of emergencies during different period. Finally, models the system process with petri net, and analyses its performance to prove the rationality of the process.

Keywords: Transport organization Emergency decision support Causal mapping Safety-oriented

Discussion on the Application of Energy-saving Traction Power Supply Device

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AbstractThe energy of traditional traction power supply rectifier unit, which is based on the diode rectifiers, can only be transmitted in one-way, so the regenerative braking energy generated by train has to be consumed with resistance.It not only affects the regenerative braking capacity of the train,but also brings about a huge waste of energy, and leads to some problems like the rise of tunnel temperature, increase of the burden of environmental control system and corresponding energy consumption. A new energy-saving traction power supply device, which is installed in Beijing metro line 10 (two engineering), can not only make regenerative braking energy of the train back to the grid, but also has the function of traction power supply, can reduce the fluctuation of DC voltage, as well as can achieve reactive power compensation to the medium-voltage ring network. Its application prospect is pretty good. The features, working principle, key technology and engineering applications of the energy-saving traction power supply device are introduced in this paper and field test data is given.

Keywords:Urban rail transit Traction power supply Braking energy feedback Rectifier

The Control Strategy Research of Hybrid EMU Energy Storage System

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AbstractBecause of its environmentally friendly, high efficient and multifunction, that the new hybrid EMU will have a broad space for development. Hybrid EMU ESS links lithium battery and intermediate DC bus together, bi-directional energy flow, its load is nonlinear, time-varying and other characteristics. This work establishes the equivalent small signal model of ESS based on the Thevenin equivalent circuit model of the power lithium battery. On this basis, choose a right charge and

discharge control strategy according the complicated working condition of the hybrid EMU ESS, and the voltage and current double closed loop controller is designed. The simulation shows that the system controller is robust and suitable for the complex working condition application of the ESS.

Keywords: hybrid EMU Energy Storage System (ESS) Lithium Battery Small-signal model Double-loop control

Formal Modelling and Analysis of Radio Block Center (RBC) Handover

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Abstract Radio Blocking Center (RBC) is one of the main factors that affect the control system of CTCS-4 level series of train. An in-depth analysis has been about the differences of RBC Handover process between one onboard mobile terminal and two onboard mobile terminals. Based on this particular analysis, a timed CPN formalizing model has been set by using CPN tools, which are the supporting tools of Colored Petri Net. Also emulation and verification has been made on this model. Though the comparison and analysis between this two Handover modes, people can get a more profound reorganization on how to improve the RBC Handover equipments and how to perfect the RBC Handover agreements.

Keywords: Radio Blocking Center (RBC) Formal Modelling RBC Handover

The Computation Model of ATO Operation Level Profile

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Abstract The computation function of operation level profile is one of the most important function of the onboard ATO. The paper analyzes the automatic speed control function of onboard ATO, confirms design demand of operation level profile. According to the design requirement and the transition model of train operation state, this paper considers punctuality, comfort and energy saving as the speed control goals, establishes computational model of operation level profile of onboard ATO for different

train operation plan. By the simulation testing, the computational model of operation level profile can meet the design demand of onboard ATO automatic speed control function, provides control target profile for automatic speed control module.

Keywords:ATO Automatic speed control function Transition model of train operation state Operation level profile

Research on Determination of High-speed Rail Operation

Mode

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AbstractA complete high-speed rail operation mode defines several elements including train speed levels, transfer or non-transfer organization mode for cross-line passenger, night trains and maintenance time window schedule, cyclic running mode and train stop mode. It determines train type, train path, passengers' organization pattern, night train and maintenance time window scheme, running pattern and stop schedule setting. Taking into account the interactions among the mentioned five aspects, the paper analyzes the determination process and methodology comprehensively, by which, the high-speed rail operation mode scheme generated proves more scientific and reasonable. The methodology proves feasible by taking Beijing-Shanghai high-speed rail network as the case study.

Keywords:High-speed rail Operation mode Beijing-Shanghai high-speed railway Determination method

Topological Structure Analysis Focusing on Riding Comfort

Detection Network

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AbstractAt present, study on on-board wireless sensor network of trains has not drawn sufficient attention. Existing wireless sensor network is still flawed in aspects such as topological structure, construction environment and routing protocol thus is not desirable for riding comfort detection. A new

double-level mixed topological structure which is oriented to high speed train is illustrated in this paper. This structure is designed based on analysis on the topological structure of wireless sensor network with the consideration of the complex riding environment of the high-speed railway in China. Analysis indicates that this multi-level topological structure increases the bandwidth of data transmission path. In addition, it increases the stability of network, especially for highly reliable section, by a range from 6.9% to 37.5% than traditional structure. This structure fulfills the requirement for fast and stable transmission of on-board detection network and is provoking in communication network structure design of on-board equipment.

Keywords: Wireless sensor network Topology Comfort Sum of disjoint products

Vocational skills comprehensive evaluation method of track maintenance workers

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AbstractThe traditional personnel quality evaluation currently are subjective or objective evaluation method, However, objective evaluation methods for investigating dynamic indicators are mainly restricted to equipment maintenance capabilities ,and static evaluation methods can not represent a subjective evaluation of the long-term changes in personal qualities of the track maintenance workers. This paper proposes a comprehensive evaluation method for vocational skills of maintenance personnel based on the static and dynamic evaluation results, mechanic skills evaluation can be divided into comprehensive quality evaluation and the level of job evaluation, the ratio of static and dynamic evaluation results is proposed based on the two-stage comprehensive evaluation method and evaluation procedure, so the comprehensive evaluation method is more diverse and flexible. Experimental results show that this method can overcome the static or dynamic unity of evaluation result, the accuracy of the evaluation method is effectively improved for considering the subjective and objective factors, which makes the evaluation results more reasonable.

Keywords:Comprehensive evaluation Fault diagnosis Static and dynamic evaluation Two-stage method

Clamped Three-level Inverter Midpoint Potential Control Method

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Abstract In this paper, from the perspective of the current relationship, the reason of midpoint potential fluctuations for three-level inverter was analyzed. And based on redundant small vectors compensation, the action time correction methods for the basic voltage vectors and the original fundamental voltage vector have been proposed. Finally a simulation model was built in MATLAB for analysis, which showed that the three-level neutral point potential fluctuations can be suppressed effectively by the midpoint potential compensation algorithm.

Keywords: Three-level inverter Midpoint Potential Control Method

Research of the Lithium Battery Based Energy Storage System for Light-Rail Vehicle

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Abstract Light rail is developing very fast in China. With the help of battery based energy storage system, the light rail vehicle will perform much better than before. Light rail vehicle energy storage system links lithium battery and DC-link together, and energy flow two-way through it. The topology of the energy storage system is studied and its working principle is analyzed. The lithium battery is a very suitable energy storage device for the energy storage system for its good charging and discharging characteristics. A double closed-loop including a voltage loop and a current loop is developed to control the energy storage system. The simulation in the MATLAB shows that the energy storage system coordinates very well with the other subsystems in the light rail vehicle in all working conditions.

Keywords: Light rail vehicle · Energy Storage System · Lithium Battery · Double-loop control · MATLAB Simulation

The Control Strategy of Network-side Converter in Dual-power Electric Multiple Units

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Abstract In this paper, the network side converter of dual-power Electric Multiple Units (EMU) is the research object. First of all, the basic working principle is analyzed. And then, three control methods, which are transient current control, the traditional PI control based on the dq synchronous rotating coordinate system and the improved PI control based on the dq synchronous rotating coordinate system, are introduced. Finally, the different characteristics of the three control methods are summarized.

Keywords: Network-sideconverter Control strategy Single-phase PWM rectifier Direct current control Proportional integral control

A Soft-switching Control Method of Isolated LC Series Resonant Transformer Full Bridge DC-DC Converter

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Abstract For the different characteristics of non-resonant and resonant isolated bidirectional full bridge DC-DC converter, a unified expression of power transmissions is derived from the two DC-DC converters. The power transfer characteristics could be unified described through the power expression. The problem of isolated bidirectional DC-DC converter is that the switching loss increases and the converter efficiency declines with the forced turn-on or turn-off of switch devices in high frequency situation. In this paper, to solve this problem, an isolated LC series resonant transformer full bridge DC-DC converter is taken as research object, a phase-shift control strategy which could realize zero voltage turn-on and decrease the turn-off current of the power devices to decrease switching loss and increase the efficiency is proposed. The validity of proposed control strategy is verified through simulation and experiment results.

Keywords: Bidirectional Full Bridge DC-DC Converter . Series Resonant . Soft-Switching Technology . First Harmonic Analysis . Voltage Gain

Adaptive Tuning Algorithm Used in Multi-join Query Optimization

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Abstract Multi-join query optimization problem is hot and difficult in the dataquery optimization research field. Based on the study at cost estimation methods and the theory of multi-join queries, the paper gives an improved cost estimation model and a new search algorithm of query execution strategy space. The proposed optimization method uses adaptive genetic algorithm based on cloud theory in searching query strategy space. Simulation results demonstrate the effectiveness of the algorithm.

Keywords: Multi-join • Query optimization • Cost model • Adaptive genetic algorithm • Cloud theory

Research on application of on-line UPS topology in novel energy-storage traction converter

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AbstractThis paper analyzed the on-line UPS topology, compared the similarities and differences with the existing traction converter topology. Meanwhile, research on the bi-directional DC/DC converter, which is the key component of the topology, in three aspects (topology selection, the inductance parameter selection and control model) were conducted. A simulation model were built based on Matlab/Simulink to be the validation of Bi-directional DC/DC converter, simulation results achieved desired design goals. A novel possible topology of energy- storage traction converter was proposed, several advantages of the novel topology were also enumerated. Finally, some prospects for future developments of the energy-storage electronic vehicles were briefly discussed.

Keywords:On-line UPS energy-storage topology traction converters bi-directional DC/DC converter Matlab/Simulink

Using Asynchronous Hot Standby Spare in Time Stamped Fault Tolerant Real Time System

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Abstract Failure in a Real Time system has different definition from failure in other general-purpose systems so that in addition of functional failures may have some time dependent failures. In a Real Time system an output must be produce after Threshold and before deadline. So missing the Deadline is a kind of failure. In [3] by using Artificial Neural Networks (ANN) a special TMR model is proposed to provide Fault Tolerance in Real Time systems. Inclusion of Time for decision mechanism in this model makes it useful for Real Time systems.

According to mentioned model system continues to operate until all nodes fail; but since missing the Deadline is considered as a failure in a Real Time system and there is probability of missing the Deadline by all of three nodes simultaneously, we have a scenario in which system will fail just because of MISSING the Deadline. In this paper a more comprehensive Method is proposed by which a Real Time system is capable to tolerate such a scenario. This model is derived from the proposed model in [3] by adding an Asynchronous Hot Standby Spare for covering time dependent faults in a Real Time system.

Keywords: Real Time • Fault Tolerant • Time Stamped • Standby Spare

Contribution Rates Calculation for Regulations about Urban Rail Vehicle Inspection and Repair Based on AMSAA Model

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Abstract Various regulations about urban rail vehicle inspection and repair can ensure the safety of vehicle. This paper proposes an effective calculation method for the contribution rates of regulations based on the decline of the average failure rate. Firstly, the reliability growth mathematical model named AMSAA is introduced. Then the fault time series are used to estimate the model parameters and tests are given to estimate the goodness of fit. According to AMSAA model, the failure rate functions and the average failure rates are calculated. The declines of the average failure rates are used to calculate the contribution rates. Finally, the subway fault time series are used for experimentation. The results show that the method has a high feasibility.

Key words: AMSAA; reliability; contribution rate; failure rate;

Research for Algorithm of the Super Low Delay Image Coding in Airborne Photo-Electricity Survey Equipment

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Abstract. In order to solve the problem that the wireless channel bandwidths undertake the huge pressure, which caused by load product the large amounts of data in the airborne photoelectric survey equipment. A low complex image coding algorithm has been proposed based on the theory of the wavelet analysis. This algorithm has an ability that is very adaptive ultra-low delay realized by the VLSI, and draw a conclusion that is ultra-low delay image coding is implemented by VLSI requirements what feature to coding algorithm. The related redundancy between the pixel of the image has been removed by the integer lifting wavelet of the Le Gall(53) in the algorithm, and then the visual redundancy has been removed by the technique of the optimal quantity for the image, which has been transformed. Lastly, the probability redundancy has been removed by the zero-run-length coding joint index coding of the Columbus. Simulation results show that the algorithm proposed has better quality of the image coding than traditional coding algorithm based on the wavelet analysis, and the structure of the algorithm is simple, and very adaptive ultra-low delay realized by the hardware. Another, the conclusion of the analysis can provide the principal evidence for the algorithm of image coding high speed and ultra-low delay realized based on the hardware

Keywords: Wavelet analysis • Ultra-low delay compression • Optimal quantity • Zero-run-length Exp-Columbus

Study on Express-slow Routes Mode of Foreign Subway

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Abstract By taking the routes of express-slow train mode in New York and Tokyo as main research object, express line only and express-slow routes is selected as two different express-slow train schemes. Making a comparison about applicable characteristics between two express-slow train design schemes, considering features of infrastructure of urban rail transit in our country and the demand of passenger flow, as well as learns from related construction projects abroad and operating experience. Based on this, inspiration of operation plan of express-slow train in the regional urban rail line of our country is drawn.

Keywords: Urban rail transit. Express-slow train. Transfer and joint. Crossing stations setting. Features of passenger flow

Calculations of leakage impedance of rail to earth in ballastless track by finite element method

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Abstract The leakage resistance of rail to earth is an important parameter of electrified railways, which directly affects the characteristics of traction return current and railway signal track circuit. The ballastless track usually has a much larger value for the leakage resistance of rail to earth compared to ballasted track. In addition, its distributed capacitance effect of rail to earth should not be ignored. The rail has an anharmonic cross section, and is installed on the spacing support of the concrete integrated ballastless bed in ballastless track structure. The leakage impedance of rail to earth can't be calculated using a practically simple theory or method, such as the model of thin circular conductor of overhead transmission lines. This paper presents the test and calculation results of the rail leakage impedance in Jin-Qin (Tianjin city - Qin huangdao city) high speed railway of China. The finite element model is established by using the Comsol Multiphysics simulation software. Comparison of the calculated and measured results shows that, the finite element model for calculating the leakage impedance of rail to earth is an effective approach. The field measured data can be used in the future for the related analysis and calculation of traction networks and track circuits.

Keywords: Electrified high speed railway, ballastless track, leakage impedance of rail to earth, finite element model

A Track Circuit Signal Simulation System for Interlocking Test

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Abstract The simulation system for interlocking test emulated track circuit signals, transmitted signals to interlocking system, to exam the track circuit relays' connection. According to the integration of chart-module method, a database of primitive elements was built, the station yard was decomposed to these primitive elements. When assembling these components together, the topology of station yard model was set up automatically, and the consistency was checked. All these components was combined into logical hierarchical models, finally to compose the station yard. The binary tree structure of station yard layout was designed, and a route arrangement method was proposed by the binary tree searching algorithm. Driving simulation was carried out to simulate the track circuit signals' changing. These signals were transmitted to interlocking system's relays. The simulation system was verified in Longtan station of the Shanghai-Nanjing Railway, and it worked fine.

Keywords: Track circuit • Interlocking • Simulation • Test

Subway vehicle bearing fault diagnosis methodology research based on PNN neural network and wavelet package

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Abstract In order to diagnose different kinds of subway vehicle rolling bearing fault, a new method of fault diagnosis methodology based on improved wavelet packet and PNN (Probabilistic Neural Network) was put forward. Vibration signal of subway vehicle rolling bearing was collected by

Piezoelectric Accelerometer. The collected signal was de-noised by wavelet, and then decomposed by the improved wavelet packet, construct the eigenvector. The signal was taken as fault samples to train the improved PNN neural network. The whole process finally recognizes fault types and realizes intelligent fault diagnosis. Test results show that the application of fault diagnosis method can effectively diagnose rolling bearing faults such as fatigue, peeling and crack which occurred in inner ring, outer ring and the rolling body surface during subway vehicle operating. The fault diagnosis method has high application value in subway operation process.

Keywords: fault diagnosis wavelet analysis PNN neural network subway bearing

Research on hazard evaluation of urban rail train Based on the extension theory

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Abstract Running gear, as the key equipment of metro vehicles, its hazard evaluation is important for metrooperation. But the most existing evaluation methods lack entire evaluation and over-reliance on subjective experience. Therefore, acomplete hazard evaluation index system of running gear was establishedbased on the inspection data and expert assessment. And for considering both quantitative and qualitative aspects, the hazard state of running gear was assessed by extension theory and entropy weight method. Andspecific application to a running gear at different time proved that the proposed method is practicable.

Keywords: Running gear Extension theory Hazard evaluation Urban rail train

The Research on Distortion Correction Algorithm of Unwrapping the Cylinder Image of Panoramic Annular Lens(PAL)

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Abstract Panoramic Annular Lens (PAL) is a new type of optical imaging system, achieving one-time image formation without scanning. It has more incomparable advantages than the traditional panoramic imaging optical system in large field of view. However, since PAL is based on the principle of FCP (Flat Cylinder Perspective), so the cylinder image of PAL has inevitably distortion in both tangential and radial image. This article has a profound study on the image formation principle of the PAL system, and unwraps it in tangential image. Because PAL is based on the principle of $f-\theta$ optical lens, there exists the compression in the radial image. This article adopts the least squares estimate algorithm to make revision, and the results of experiments showed that the effect was satisfactory.

Keywords: Panoramic Annular Lens (PAL) Flat Cylinder Perspective (FCP) The least squares estimate algorithm Distortion correction

Train Control Management System Safety Assessment

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Abstract TCMS (Train control management system) is responsible for the real-time transmission of monitoring the running state of train operation, TCMS system safety assessment is an important means to ensure the quality of the products, this document described the various stages of TCMS system in the whole life cycle assessment activities, define a complete audit process, to carry out the train control management system has certain guidance the significance of the system safety assessment.

Keywords: Software; Safety; Assessment; TCMS

Single Face Image Super Resolution Reconstruction Based on Block PCA

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Abstract A novel single face image super resolution reconstruction framework based on block PCA is presented in this paper. The critical issue is to reconstruct a high-resolution face image from a low-resolution image based on a set of high- and low- resolution training image pairs. The proposed method divides the test face image and the training image pairs into many overlapping blocks, and then operates PCA to obtain the optimal weights of the training image blocks and the high-resolution image blocks are reconstructed using the same position image blocks of training image pairs and the weights. The final high-resolution face image is formed by integrating the high-resolution image blocks. Experiments indicate that proposed method produces higher quality images than other methods.

Keywords: Face image • Super resolution • PCA • Block

A Novel Iris Verification System Based on Feature Extraction

Jin Liu, Tint ting Liu and Bin ru Chen

Abstract The paper presents a novel algorithm for iris segmentation in eye images taken under visible and near infrared light. Then, a novel iris feature extraction technique is proposed for high performance iris recognition. We use one dimensional circular profile to represent iris features. The reduced and significant features afterward are extracted by Sobel operator and 1-D wavelet transform.

Keywords: Iris segmentation • iris feature extraction • wavelet transform

Research on Construction of Urban Logistics Information Platform

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Abstract The construction of urban logistics information platform has become one of urban logistics development strategy with the rapid development of information technology and urban logistics. This paper defines the logistics information platform construction principle through the analysis of the significance of construction of urban logistics information platform. Meanwhile, the overall framework, functional requirements and construction policy of urban logistics information platform

have been study in detail. This paper establishes a theoretical foundation for the final implementation of the urban logistics information platform.

Keywords: Urban logistics•Logistics information platform•Construction

Reliability analysis of metro door system based on fuzzy reasoning Petri net

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Abstract Door system greatly affects the vehicle's safety and operational performance, so it is necessary and urgent to carry out reliability analysis of door system. The methodology proposed in this paper involves FTA and FRPN (Fuzzy Reasoning Petri Net) method. Firstly, fault tree model of door system is established on the basis of failure causality analysis; secondly, the FRPN model is converted from a fault tree model through graphical transformation rule, and the reasoning algorithm is used to calculate the failure rate of target event. Finally the importance degree of initial events is calculated to evaluate the influence of different faults. The results show that the EDCU failure, DLS breakage, Screw/nut clamping are the most critical faults. The result is helpful for the technical personnel to assess the systems' behavior and to improve their performance by adopting suitable maintenance strategies.

Keywords: Sliding Plug Door •Reliability analysis •Fuzzy reasoning Petri net •FTA

Research on Applicability of Lithium Titanate Battery for Low-Floor Vehicles

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Abstract Based on the application characteristics of lithium battery for low-floor vehicles, lithium titanate battery has advantages of application over other types of lithium batteries. The reasonable test

scheme of lithium titanate battery can be formulated on the basis of existing test platform of single battery. Rate characteristics and low temperature characteristics of lithium titanate battery can be obtained through charge & discharge tests of two lithium titanate batteries in different temperatures and rates. Combined with characteristics of lithium titanate battery and operation characteristics of low-floor vehicles, the applicability of lithium titanate battery for low-floor vehicles is analyzed.

Keywords: Lithium titanate battery Low-floor vehicles Rate characteristics Low temperature characteristics

Delay-range-dependent stability for stochastic systems with time-varying delay

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Abstract This paper is concerned with the stability analysis for stochastic systems with time-varying delay in a range. Some new delay-dependent stability criteria are devised by taking the relationship between the terms in the Leibniz-Newton formula into account. The present results may improve the existing ones due to a method to estimate the upper bound of the derivative of Lyapunov functional without ignoring some useful terms and the introduction of additional terms into the proposed Lyapunov functional, which take into account the range of delay.

Keywords: delay-range-dependent stochastic systems LMI(linear matrix inequality) stability

Overhead Hoist Transporter System Utilization Simulation and Analysis for Computer Integrated Manufacturing in Food Process Business

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Abstract Computer integrated manufacturing, CIM, has attracted many interests both in academic research and practical implementation. Design and implementation of a CIM project involves the massive modeling, simulation, and verification of production operations, machines, and operators. Overhead hoist transporter, OHT, is one of the effective tools for the automated material handling system that often applied in CIM projects to ultimate the utilization of footprint of a factory. This paper presents a case study for the OHT system design in a CIM project for automated food processing production line. The effectiveness of the number of OHTs installed for the production line and the proper operation scenarios for different production planning are studied. Modeling and simulation results are performed to suggest an efficient OHT system design for the CIM project.

Keywords: Computer integrated manufacturing · Overheadhoist transporter · System modeling and simulation.

The Catenary Vibration Response of High-speed Electrified Railway considering Horizontal Wind

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Abstract The vibration performance of catenary considering wind is one of important factors of catenary dynamic characteristics in high-speed railway. Through the deduction of catenary/contact line dynamics differential vibration equations considering horizontal wind, and with simultaneous catenary and contact line vibration equations, the catenary dynamics differential vibration equation is derived. Through giving different wind load and using the Newmark method, the horizontal wind vertical vibration response is solved and the results were analyzed.

Keywords: Electrified railway· Catenary· Vibration formula· Horizontal wind

Study on Real-time Vehicle Scheduling Problem to Rescue Victims in Chemical and Biological Terrorist Attacks

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Abstract Considering the real-time information (the number of new infection victims, the changed treatment capacity of hospitals and so on), we study the real-time vehicle scheduling problem to rescue victims with constraint of prime rescue time in multi-location Chemical and Biological Terrorist Attacks (CBTAs) and propose a mathematical model. Then an algorithm with an event-time vector is designed to solve the mathematical model. We take computational experiments under small-scale CBTAs and large-scale CBTAs, and obtain the optimal vehicle scheme. Experimental results show the model and solution algorithm could be useful in practical CBTAs.

Keywords: chemical and biological terrorist attacks (CBTAs) · prime rescue time · vehicle scheduling problem · real-time information · event-time vector.

Improved delay-dependent stability criterion for T-S Fuzzy systems with time delay

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Abstract This paper addresses the stability problem of fuzzy systems with time delays. The stability conditions, which are less conservative than the existing results, are derived by a new Lyapunov–Krasovskii functional method and expressed in terms of linear matrix inequalities (LMIs). Numerical examples are given to illustrate the effectiveness of the proposed method.

Keywords: Lyapunov–Krasovskii functional · T-S Fuzzy systems · Time delay · Linear matrix inequalities (LMIs)

Learning Distance Metrics with Feature Space Performance for Image Retrieval

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Abstract Learning from samples in cases where many high dimensional vectors but only few samples are available is commonly considered a challenging problem in CBIR. In this paper, we propose an algorithm for metric learning based on spatial distribution of image features. The optimal distance metric is then found by minimizing the divergence between the two distributions. The key idea is to construct a global metric matrix that minimizes the cluster distortions, namely, one that reduces high variances and expands low variances for the data to make a spherical form as good as possible in the high dimensional data spaces. Experimental results show that our approach is effective in improving the performance of CBIR systems.

Keywords: CBIR • Image feature space • Cluster geometry • Learning distance metric

Analyzing Railway Accidents Based on Complex Network and Cascading Failure

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Abstract The increasing complexity in high-speed railway system is leading to potentially disastrous failure modes and new kinds of safety issues, which requires modern accident modelling approaches. In this paper, a new accident causation model is proposed for railway accident analysis based on the complex network and the cascading failure theory. The key causation factors and key causation factor chains that lead to the final accident are investigated, and the severity of the accident are evaluated based on the proposed accident causation network model. All these can support the government or associations with recommendations for accident prediction and prevention.

Keywords: Accident causation network • Complex network • Cascading failure • Network efficiency

Modeling and Prediction of Using Process Reliability of Wire Rope

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Abstract The dynamic stress-strength interference theory is used in predicting reliability of the wire rope by putting nondestructive testing message damage message and state testing message together. The reliability modeling methods are put forward according to the structure characteristic of wire rope. This is a new method for the reliability evaluation design. Prediction and renewal policy of wire rope. Not only there is a important signification for the reliability of wire rope. But also putting forward a new studying method for mechanical system reliability.

KeyWords: reliability ·strength interference theory ·stress ·strength ·wire rope

A novel family size model by family names study

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AbstractComplex networks research has been increasingly applied to social net-works. In this paper, we undertake a case study of the top 1000 family names in the 2000 U.S. census as a database. Topological structure shows a right-skewed power-law distribution. A social family-size model is presented which is based on the birth-and-death process, the model describe a distribution on the evolving of family names whose patterns are demonstrated globally by power-law distribution. The numerical simulations of the model for structural properties fit well with the top 1000 family names.

Keywords: Complex network ·family name ·power-law distribution

The Design of Traction Power Battery System for Dual Power Urban Rail Metro

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Abstract Combined with traction and braking characteristics of urban rail metro and the analysis of the battery system demand which is in traction power of dual power urban rail metro, the energy and power demand of traction power battery system in the dual power urban rail metro is determined, through the simulation and calculation of the specific line condition of the Beijing western suburbs. Taking the energy and power demand, the axle load limit and installation size restriction into account, the battery system configuration is certain with the selection of lithium titanate battery. Besides, the feasibility of battery selection and configuration is verified by calculation and analysis.

Keywords: Urban rail transit Traction power supply Traction power battery system Lithium titanate battery

Reliability Analysis of the Sliding Plug Door System Based on Bayesian Network

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Abstract The metro door system is one of the high failure-rate systems of metro vehicles, and the failure of driver motor is the major cause of the door-failure, so the Bayesian network (BN) is applied to analyze the reliability of drive motor. Firstly, the BN of the drive motor is established according to its fault tree, and the failure probability of drive motor is calculated by the method of bucket elimination. Then the fault diagnosis of the drive motor is made through the posterior probability. Finally, the key links of door system are affirmed based on the sensitivity of each basic event, which can provide support and reference for the maintenance of door system.

Keyword: Reliability · Metro door · Bayesian network · Fault diagnosis

Fault Diagnosis of PWM Rectifier Based on Wavelet -neural Network

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Abstract In order to diagnose the PWM rectifier's fault switch tube efficiently and accurately, output voltage of the control circuit is analyzed by three layers wavelet decomposition. When all the wavelet coefficients are obtained, the band's wavelet energy spectrum is calculated. Then the energy spectrum as a set of input variables is input into the improved BP neural network after normalization. The simulation results show that the method is accurate, efficient, and the learning convergence speed is better than the traditional wavelet analysis or neural network diagnosis method. The diagnosed accuracy rate is 86.7%.

Keywords: Fault diagnosis · PWM rectifier · Wavelet decomposition · Improved BP network

A novel Real-time Tension Monitoring Method for Overhead Contact System

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Abstract This paper presents a novel real-time tension monitoring method (RTMM), based on angular displacement of gear wheel and vibration of concrete weights, and used to detect the service state of catenary without physical contact with the contact line. The classical detection of contact wire which relies on the inspection vehicle is not suitable for real-time monitoring. The method chooses the characteristic parameters which could reflect the tension of catenary with noncontact to determine whether the wire could still work normally or not. The paper also gets a test result which uses the new method to detect the tension of catenary. The result shows the method could monitor the catenary force safely and effectively.

Keywords: Overhead Contact System · Tension Monitoring · Iterative Calculation

Hybrid Timed Event Graph Model for Networked Train Operation Simulation and Timetable Stability Optimization

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Abstract To improve the possibility for recovering the status that the trains are running as arranged by the timetable, a hybrid timed event graph model is presented. We analyze the discrete and continuous events, determining two kinds of discrete positions, two kinds of discrete transfers, a kind of continuous position and a kind of continuous transfer for the hybrid timed graph model. We construct the hybrid timed event graph model for simulating train operation process, distributing trains on the different paths on the railway network. Then the networked timetable stability is defined. Based on the definition, we give the method to optimize the networked timetable stability, repeating the simulation, till the satisfying results are attained. The computing case proves the feasibility of the model and the efficiency of the algorithm. The method presented in this paper can be embedded in the networked train operation dispatching system.

Keywords: Train operation • Simulation • Timetable stability • Railway network • Hybrid timed event graph

A study on parking problems and countermeasures of urban central commercial district

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Abstract Parking facilities are very important to the construction and development of urban central commercial district. With the increase of urban economy and people's living standards, more and more cars, followed by more and more city parking is not convenient. Especially in the city center business district, "parking difficult" problem is particularly serious. In order to solve the parking problem, take Yuan Yang-Cheng in T city commercial district as the object, according to the investigation on the parking behavior. The survey results show that the key factors affecting the behavior of parking is price and the parking is interested in the convenient parking of parking guidance system. Also, the reasonable use of price lever parking supply and demand has great room for adjustment.

Keywords: central commercial district • parking behaviour • Static traffic • parking management

Design and Verification of Hybrid Power Box of 100% Low-floor LRV

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Abstract The hybrid technology is one of the key technologies of the 100% low-floor light rail vehicles. Based on technology needs of hybrid power box, a set of power battery and super capacitor adapted to different working conditions was designed, and energy control strategy in non-catenary areas was put forward, taking the dynamic performance requirements including the target vehicle speed, mileage, acceleration, gradient and dynamic performance requirements of the target vehicle into consideration. Ventilation cooling, dynamic performance and energy control strategy test results show that the hybrid system could satisfy the requirements of security and dynamic performance of the target vehicle, and also ensure higher energy use efficiency.

Keywords: Hybrid power technology ·Power battery ·Super capacitor ·Parameter matching

Optimizing slack time allocation in train timetable: a two-stage stochastic recourse model

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Abstract Slack time allocation, heterogeneity of train paths and capacity utilization have great impact on the reliability of train timetable. Aiming at the factor of slack time allocation, we proposed a two-stage stochastic programming with recourse model to optimize slack time allocation in train timetable on high-speed passenger dedicated lines, in which the first-stage model formalize the slack time allocation in the train timetabling phase, while the second-stage model simulates the execution of train timetable with consideration of “train dispatching” behaviours. A genetic algorithm was designed and implemented to solve the mathematical model. Numerical experiments were conducted to test effects of the proposed method. The results show that slack time allocation has great impact on the train timetable reliability and the presented method in this paper could improve the quality of slack time allocation by 10% on average.

Keywords: slack time allocation optimization robust train timetabling railway stochastic programming

The city rail train safety detection sensor network platform's using on online track detection

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Abstract The corrugation is a common rail damage phenomenon in all over the world, delays in processing will directly leads to the deterioration of the subway train wheel rails' relationship and affect traffic safety. We can get the real-time kinetic data by use of the similar urban rail train sensor network platform which researched in part five of "863" project, through discrimination operation, exclude the wheel, bearing and other factors and get the track's real-time status information, in this way, we can find the track's bad state and locate the accurate position, and promptly repair the track in polish method, truly achieve the track's repair according the condition. If configure 2~3 trains with this function in each line, we can finish all tracks' monitoring effectively, and this has practical significance for promotion.

Keywords: Train safety detection network Track detection Corrugation

The research on BEV-based urban passenger transport environment

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Abstract In view of the mass severe pollution and frequent haze encountered by cities, to find a solution to the bottleneck in the urban passenger transport environment, environment-friendly battery electric vehicles (BEVs) are proposed for urban public transit as a substitute for high-energy consumption high-pollution traditional buses. The immense emission reduction potential and superior overall performance of battery electric buses were yielded after years of follow-up analysis and online measurement, offering scientific guarantee for the coordination

between the urban transport environment and resources.

Keywords: BEV ·urban passenger transport ·effect of emission reduction ·transport environment

Fault Criticality Evaluation of Metro Door Based on WLSM and FWGM

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Abstract The reliability of Metro Door is directly related to the safety of passengers. The Failure mode and effects analysis (FMEA) method based on the weighted least squares model (WLSM) and the fuzzy weighted geometric mean (FWGM) is proposed to evaluate metro door fault criticality. Firstly, WLSM is used to collect individual judgments to form the final aggregated judgment. Then, fuzzy risk priority numbers (FRPNs) are defined as FWGM of the fuzzy ratings for the three risk factors for prioritization of failure modes. Finally, the FRPNs are defuzzified using the centroid defuzzification method. The experiment results show that three failure modes including ‘EDCU function is broken’, ‘Limit switch S1 wears out’ and ‘Nut component wears out’ have greater damage on door than other failure modes.

Keywords: Metro door ·FMEA ·FRPN ·WLSM FWGM

Research on Harmonic Suppression of High-speed Railway Traction Power Supply System Based on A LC Filter Branch

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Abstract With the development of high speed-railway, harmonic amplification and resonance problems of traction network caused by high-speed locomotive are getting more serious. In order to study the harmonic transmission characteristic of the traction network, the equivalent circuit model of traction network was built in this paper. The suppression method of harmonic current amplification by installing a LC filter branch in the auxiliary winding of traction transformer was proposed in this paper. The parameter selection method of the LC filter branch was also given. At the end of this paper, results from theoretical calculations and simulations are presented, demonstrating the validity and practicality of the proposed suppression method. And this research has reference value for reducing and avoiding the harm of traction resonance.

Keywords: High-speed railway · Traction network · harmonic transmission characteristic · LC filter branch

Measurement and Simulation of the Electromagnetic Transients of Lifting Pantograph for an Electric Multiple Units Train

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Abstract The electric sparks and arcs occurred at the contact of a pantograph and an overhead contact wire are the emission source of electromagnetic interference in electric railways. It has been noticed by the train operators that CRH₂ EMU train has denser electric sparks more frequently than other EMUs when lifting its pantograph. The electromagnetic transients in the high voltage circuit may produce overvoltage and disturb the onboard electronic equipment, as well as emit high frequency electromagnetic interference. Some measurements of the charging transients when CRH₂ EMU lift the pantograph were conducted in the depot. Using PSCAD/EMTDC, a simulation circuit that includes external power source, the pantograph and the high voltage cable on the car roof is established. The simulations to analyze that how the circuit element parameters can affect the electromagnetic transients are given. The calculated results are compared with the measured data to validate the simulation model. One solution is put forward to improve CRH₂ charging transient performance.

Keywords: Electromagnetic transients Electric railway Overvoltage High frequency oscillation

Research of Fault Location Method for Metro Traction Power Supply System

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Abstract Accurate fault location is significant to the city metro catenary fault investigation process. A theoretical analysis of the fault location method based on impedance calculation has been performed, using the voltage and current quantities from both end of the line, and the error sources were thoroughly studied. However, in practice the double-terminal electrical quantities used in the calculation may not be synchronous to one another, due to the different protection operating times at either ends of the fault. Another new location algorithm was proposed, which uses genetic algorithm to solve the problem. The simulation results show that the proposed new method has improved location accuracy.

Keywords: DC traction system · Fault location method · Impedance calculations · Genetic algorithm

An Empirical Study of Evaluation of Urban Rail Transit Operation Efficiency in China

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Abstract Urban rail transit, as the important component of urban public passenger transportation, plays a significant role in the process of urbanization in China. This thesis, based on the detailed analysis of urban rail transit operation features, evaluates urban rail transit operation efficiency from 2009 to 2011 in 9 provinces in China by using DEA and SUPERR-SBM DEA. Besides, combined with slack variables of input factors and adjustment target diversity analysis, the author puts forward suggestions and solutions such as the emphasis on the reasonable collocation of human capital and the optimization of the framework of transportation line.

Keywords: Urban rail transit•SUPER-DEA model•Efficiency evaluation

The Allocation of the Impedance Transformer Capacity of Passenger Dedicated Lines

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Abstract Impedance transformer is an important equipment of track circuit. Appropriate selection of its capacity not only has a significant influence on the reliable operation of the signal system under high voltage interference but also affects the safety of the facility and the cost of the program. Analysis of the distribution of traction return current can provide reference data for the allocation of impedance transformer capacity. This paper adopts multi-conductor transmission line model, and according to the structural characteristics of auto-transformer (AT) traction power supply system, the distribution characteristics of traction return of passenger dedicated line is shown, then proposes rational allocation of the impedance transformer capacity under the design of track circuits and transverse connections.

Keywords: Passenger dedicated line • AT power supply • Traction return current • Impedance transformer

Design of a 6kW Battery Charger Based on Full-Bridge Phase-Shifted ZVZCS PWM Converter

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Abstract This paper presents the design procedure of a 6kW battery charger based on full-bridge phase-shifted zero voltage and zero current switching (FB-PS-ZVZCS) PWM converter. In the converter, one blocking capacitor and two diodes are added in the primary side of the transformer to realize ZVS for the leading leg and ZCS for the lagging leg. The very detailed analysis of the operation principles is proposed. According to the results, some simplification work is done and the design procedure of the main parameters, including the value of the switches snubber capacitor, the blocking capacitor and the delay time between gate drive signals, also is shown. At last, a 6kW battery charger prototype is built. The simulation and experiment results verify the parameters as well as the proposed design procedure.

Keywords: battery charger ·ZVZCS ·simplification ·design procedure

The Design and Development of High Speed Railway Infrastructure Detection Data Access System

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AbstractThis paper present a proposal of a data access system based on Wireless Sensor Networks for railway infrastructure detecting. Combined with the current domestic and abroad research status, against the business processes of the detection of the rail infrastructure, this paper introduces railway infrastructure detection technology to design and develop data access system from three aspects: the system analysis, the system design and system development of rail infrastructure.

Key words:High-speed railway•Infrastructure•Data access system•Design and development

Real-Time Evaluation Model of Urban Rail Train Communication Network

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Abstract In addition to the traditional TCN, both the train communication network based on Ethernet and WSNs are also applied, to some extent, in metros. The Real-Time is a decisive indicator of communication network in metro trains. To address such index, this paper develops an evaluative model to comprehensively analyze it, and compares the Real-Time of different communication networks. Supported by practical examples, we conclude that this model functions effectively and accurately.

Keywords: Train communication network ·Real-Time ·MVB ·Ethernet

Harmonic Power Flow Calculation for High Speed Railway Traction Power Supply System

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Abstract This paper describes a harmonic analysis model for CRH2 EMU(Electric Multiple Unit) and provides a harmonic power flow algorithm for its traction power supply system. This algorithm gives full consideration to coupling influence between the traction network (harmonic voltage), the fundamental wave results is used as the final convergence condition, aiming to determine modulation characteristics and harmonic current characteristics of SPWM converter for EMU based on results of harmonic power flow, and to calculate harmonic power flow and update fundamental power of harmonic source for fundamental power flow calculation. Analysis of harmonic power flow with single harmonic source and multi-harmonic sources shows that the algorithm is applicable to traction power supply system of high-speed rail with single harmonic source, multi-harmonic sources and background harmonic.

Keywords: Locomotive and network coupling system • Harmonic power flow • EMU harmonic model • Harmonic coupling admittance matrix

Research on Structural Modeling Technique of Vehicles Outward Based on AVI

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Abstract This paper realized the reconstruction of vehicle complex curved surface through the application of reverse engineering method. This technology can establish 3D entity model of vehicles outward which was helpful to identify and judge vehicles of the automatic vehicles identification area in the intelligent transportation system.

Keywords: The Automatic Vehicle Identification • Vehicles Outward Structure • Reverse Engineering • Reconstruction Technique • 3D entity model

Argumentation pattern – an approach to issuing software reliability case

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Abstract Software is a major component of most important system applications. Because the software component typically provides critical functions, faults in the software may cause the system to fail in a significant way. Such system failures due to direct software faults are what we classify as “software failures”. Thus, it is important to use methods and techniques that provide evidence that the software component has been designed, implemented, tested, installed, and, as necessary, updated without faults that might result in undesirable system failures. Originate from safety case, which has been used in the aerospace and nuclear industries, reliability case is one method to make sure that the software’s reliability has been reached. This paper briefly reviews some of the previous research in the area of safety case. And then introduce the concept of reliability case. This is followed by a discussion of the approach to issuing reliability case – argumentation pattern. Finally we draw the conclusion and discuss related future works.

Keywords: Software reliability Reliability case Argument Argumentation pattern

A Guided Wave Based Online Health Monitoring Technique for High-Speed Train Bogie Structures

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Abstract: Safety of high speed trains is a key concern from the design process to operation. Considering the limitations of traditional offline nondestructive testing methods, an active guided Lamb wave-based online damage detection technique was investigated, and a damage detection system built with the technique was implemented online to ensure the safety of bogie frames of running high speed trains. Miniaturized standard PZT sensors were developed to compose a pitch-catch based active sensor network for wave excitation and acquisition in the bogie. As a part of the new conformance testing of China’s latest high-speed train model, experiments on a bogie frame of the train were carried

out, and the results from different damage conditions demonstrated high reliability and accuracy of the technique and the system.

Keywords: High-speed train online damage detection guided Lamb waves structural health monitoring

Hardware-in-the-Loop Simulation for Subway Applications With Onboard Supercapacitor

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Abstract This paper proposes the hardware-in-the-loop (HIL) simulation for subway applications with onboard supercapacitor. The studied subway train is modeled in detail and the HIL simulation is designed. An experimental platform using the HIL simulation method is developed and experimental results are carried out to verify the effectiveness of the hardware-in-the-loop simulation.

Keywords: Hardware-in-loop simulation • Subway • Supercapacitor.

The Impact of Contact Lines Wear on Current-Collecting Reliability of Pantograph and Security of Catenary

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Abstract A theoretical analysis is made on the impact of contact lines wear on reliability of current-collecting and security of catenary. And a two-dimensional vertical coupling vibration model of pantograph/catenary is established by Ansys. An analysis is made on pantograph/catenary interaction when contact lines wears for 0%, 10%, 15% and 20%. The result shows that with increasing wear of contact lines, contact force changes violently, the dynamic displacement and stress increase, which has a severe effect on current-collecting reliability of pantograph and security of catenary. And the locomotive can't run normally and safely when contact wires wear over 15%, so it need take some measures.

Keywords: Contact lines wear · Ansys simulation · Contact force · Dynamic stress · Dynamic uplift displacement

Research on Transport Capacity of Urban Rail Transit Based on RailSys

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Abstract The paper establishes a simulation model to study transport capacity of urban rail transit based on RailSys software and illustrates the core principle and quantitative standard of the method "UIC 406" and the modeling process of dynamic simulation. A concrete example is analyzed by application of RailSys dynamic simulation model. Then find out an effective way to improve transport capacity and put forward the corresponding optimization. The results indicate that RailSys software which is applied to the analysis of dynamic simulation of transport capacity of urban rail transit provides feasible suggestions for the actual operation and management.

Keywords: Urban Rail Transit · Transport Capacity · RailSys simulation · UIC 406

A Simplified SVPWM Method for T-type Three-level Inverter Applied to Traction Drive

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Abstract Based on the conventional traction drive three-level inverter SVPWM complexity, a simplified SVPWM method is proposed based on the intrinsic relationship between two-level inverter and t-type three-level inverter. To begin, it analyses the working of t-type topology. In addition, it simplifies the t-type three-level inverter control method based on sine theorem and mapping relationship of two-level inverter and traditional SVPWM method. Meanwhile, feedback neutral point potential voltage control is discussed. It is proved that the simplified method can be applied to the t-type three-level inverter based on traction drive by the simulation analysis.

Keywords: Three-level inverter · Simplified SVPWM method · T-type topology · Neutral-point potential control · CRH2 traction drive

On Simulation of Urban Rail Vehicle Electro-pneumatic Braking Systems

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Abstract Braking system plays an important role in urban rail vehicle, its performance directly affect the safety and reliability of the train operation. To analyze the performance of braking system, AMESim is applied in this paper, due to the establishment of a physical model is time-consuming and money-wasting. In the light of the structure and mechanism, every functional block of the braking system is set up utilizing AMESim. Several simulating scenarios are investigated in this paper. The simulation results show that the model built by using AMESim can simulate the dynamical behaviour and it can be used for analysing the braking system fault and etc.

Keywords: Urban rail vehicle Electro-pneumatic braking system AMESim Simulation

Fault Diagnosis for Rail Vehicle Suspension Systems Based on Fisher Discriminant Analysis

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Abstract In this paper, fisher discriminant analysis (FDA) is used for fault isolation and diagnosis in rail vehicle suspension systems. The suspension systems are equipped with acceleration sensors in the corners of the car-body and the two bogies. The faults considered are the lateral damper faults and the lateral spring faults in suspension systems. FDA provides an optimal projection space on the base of the training data including the fault data and normal data to classify the test data. A vehicle model is built by SIMPACK/MATLAB software with real parameters to obtain the simulation data and the effectiveness of the proposed method is demonstrated by simulation.

Keywords: Rail vehicle suspension systems Fault diagnosis Fisher discriminant analysis · Fault isolation

Extensible Software Architecture for Simulating Cockpit Display and Control System

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Abstract To meet the various military requirements of educational training and flight simulation at the same time, a generic extensible software architecture is developed to simulate Cockpit Display and Control System for multi-type of aircrafts simultaneously in both 2D and 3D mode. To acquire variety and modularity, the software uses object-oriented virtual panels to dynamically assemble various human-aircraft interface; to reduce development difficulty, cost and time, it applies simplest Windows GDI-based drawing technique to produce complex and dynamical display graphics that will represent critical information show in all displays; to enhance immersion and visual effect in flight, it employs Vega Prime and OpenGL-based dynamic texture technology to generate additive and removable 3D scenes; and it adopts multi-threading technology to improve the real-time performance. The simulation results demonstrate its generality, extensibility and real-time performance.

Keywords: Cockpit Display and Control System · Extensibility · Visual Software Simulation · Code-reusability

A Novel Control Strategy of Permanent Magnet Synchronous Machine Drive Under Field-weakening Operation

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Abstract Field-weakening technology is important for permanent magnet synchronous machine (PMSM) control in wide speed range applications. This paper presents a novel field weakening control method for permanent magnet synchronous motor to improve maximum speed range and power range, based on discrete-time complex current control and voltage control. The effectiveness of the proposed method is confirmed by computer simulations and experiments.

Keywords: permanent magnet synchronous machine, weakening-field control, discrete-time complex current control, voltage control

Fault Diagnosis Method of Generator Based on Mutative Scale Chaos Combined Clustering and Feature Fusion

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Abstract Aiming at the uncertainty of fault diagnosis in turbine generator based on single fault information, a diagnosis system of multi-sensors fusion characteristics based on kernel principle component analysis (KPCA) and mutative scale chaos combined clustering is proposed. Firstly, the vibration features of generator's stator and rotor and the circulation features of stator winding parallel branch were combined and then with which used KPCA to carry out dimensionality reduction fusion, obtained complementary features and selected nonlinear principal components as fault analysis data, finally used the MSCOA-FCM algorithm to realize fault identification. The fault diagnosis example of generator shows the validity and practicability of the algorithm, compared to a single signal source it has a considerable improvement in the accuracy of fault diagnosis and is more suitable for fault identification.

Keywords: Kernel principle component analysis (KPCA) Mutative scale chaos algorithm (MSCOA) Clustering algorithm Information fusion Fault diagnosis

Failure Mode Criticality Analysis of Metro Door System

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Abstract Implementing failure mode criticality analysis on metro door system could help to find the failure modes which have great criticality on door system, and it can be helpful for perfecting door maintenance decision. A criticality analysis method which is based on fuzzy evidential reasoning and grey theory is proposed. Firstly, fuzzy belief structure is employed to assess failure modes; secondly, grey theory is used to calculate the degrees of grey relation of failure modes, that The experiment results show that three failure modes, including ‘EDCU function is broken’, ‘Limit switch S1 wears out’ and ‘Nut component wears out,’ have great damage on door system. The results can be used for optimal design and maintenance of the metro door system.

Keywords: Metro door · Criticality Analysis · Fuzzy evidential reasoning · Grey theory

Design of urban rail vehicle sensor network data transmission simulation system

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Abstract Using sensor networks technology, sensors are installed in the key parts of urban rail vehicles to collect real-time information of train status and achieve fully monitoring of trains, it is important for protecting the safe of train. Firstly in order to select a reasonable transmission policy and ensure real-time and reliable transmission of sensor information, this paper designs and develops sensor networks data transmission simulation system for urban rail vehicles. Data transmission simulation system which is described in this article includes data collection subsystem, data storage subsystem, and data transfer subsystem. This system completely implement the function simulation of sensor networks collecting data ,transferring data and storage data in the process of train running. At the same time, considering the actual needs of the train monitoring, this paper also defines the data format and the way to code data and decode data. Secondly, based on the hardware platform described in this paper, this paper set up an urban rail vehicles on-board distributed data processing system.

Keywords: Urban Rail Vehicles • Sensor Networks • Data Transmission • Simulation System

DC600V Power Supply Design and Control Redundancy Improvement

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Abstract DC600V rectifier power supply provides DC power for the auxiliary power equipment (such as the air conditioning, water heater etc.) of the electric locomotive. Because of its reliability and stability, DC600V rectifier power supply is widely used. This article focuses on the design of the main circuit of DC600V and the improvement of the control redundancy.

Keywords: DC600V Half controlled rectifier •Redundancy control

Research on Disruption Management of Single Machine Scheduling

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Abstract Based on common due date, this paper discusses the disruption management problem in the middle of JIT. If a hardware has been finished ahead of schedule, measures have to be adopted to arrange the hardware over again in order to reach the optimization. In addition, this paper discusses the paradox that we do not punish but encourage the hardware ahead of schedule. Corresponding to such disruption management problem, this paper gives two types of algorithm and an example.

Keywords: scheduling disruption management JIT dynamic planning algorithm

A Study on the Temperature Relationship between Electrical Connecting Clamp and Dropper Clip in Overhead Contact System

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Abstract To ensure the safety of high-speed railway, the temperature variations of overhead contact system (OCS) is crucial. This paper simulated and analyzed the temperature variations of dropper clip in OCS by using finite element analysis. Firstly, a 3D clamp with contact wire, electrical connection and dropper clip is modeled on the platform of Solidworks, and its finite element model is setup by adopting HyperMesh. Next, the transient heat transmission of this model is analyzed in the environment of ANSYS by considering different temperatures of the electrical connecting clamp and external conditions. With the analysis of simulation results, the relations between the temperatures of the dropper clip and electrical connecting clamp are discussed. Since the temperature of dropper clip can be easily detected in practical applications, the temperature of electrical connecting clamp under different conditions can be found out accordingly.

Keywords: FEM • Heat Conduction • Electrical Connection clamp • Temperature Field

Path Choice for Passengers of Subway Station during Peak Hour

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Abstract Urban railway is used widely because of its big capacity, little pollution, safety and speediness. The volume of passengers is still increasing constantly and subway become overcrowd. Especially in the morning and evening peak period, the number of passengers increased sharply, accidents may happen easily, for example, congestion and trample. In order to guarantee the safety of passengers and the efficient operation of the train, to improve the quality of urban railway service, some measures should be used to control the passenger flow in large stations, especially in transfer stations. This article analyses the characteristics of urban railway transfer station and discusses deeply

about the principles of passengers path, then put forward the model of passenger flow control on peak through analyzing the model of passenger path.

Keywords: Transfer subway station • Path network of station • Passenger volume control • model

Multi-tracking Channels Hardware Simulation for GNSS Integrity Receiver Design in Transport Field

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Abstract More satellite navigation signals enhance the integrity and availability for GNSS transport field application. However, receiver computation ability face challenges. Effectively analyses for channels working are needed for receiver design. Channels structure, running mechanisms and hardware behavior are analyzed for “FPGA+DSP” receiver. Multi-tracking channels hardware models are established, signals source generation, NCOs for code and carrier running and overflow in FPGA, computation for DLL and PLL, are all researched. Simulations for multi-channels running in parallel are realized in MATLAB, though M-code executed in serial. How observation measurements are affected by the refreshing time delay of code NCO and carrier NCO are simulated and researched. The conclusions drawn by the paper are meaningful to designs of high precision, integrity, multi-mode satellite navigation receivers for transport field application..

Keywords: Multi-mode GNSS receive • Integrity • intelligent transport • tracking channel • simulation

Research on Dual Series and Parallel Control Schemes for Three-phase Voltage-sourced PWM Rectifier

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Abstract In this paper, the mathematical model of three-phase voltage-sourced PWM rectifier and double closed loops control method are introduced. Particularly, the series and parallel control schemes, as well as the detailed method of implementation are analysed based on the dual

series-connected and parallel-connected PWM rectifiers. Then the control strategies of series voltagesharing and parallel currentsharing are proposed and simulated. To confirm the effectiveness of the proposed two control methods, some simulation results are shown.

Keywords: PWM rectifier Dual series and parallel control Voltage sharing Current sharing

Statistical model's application in the gross error recognition of deformation monitoring data of Dam

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Abstract Dam deformation is affected by many factors and its abnormal observed value is not surely the gross error. In order to effectively identify the gross error in the safety monitoring data of dam, the statistical model used in safety monitoring of dam and its bases is introduced into the gross error recognition of monitoring data on the basis of analyzing the statistical model theory and the reason that the gross errors are generated. First of all, the data containing the gross error is used to establish the statistical model, and then according to the residual error between the fitting results of statistical model and the real measured value, the quartiles method is used to set threshold and recognize the gross errors. For some concrete gravity dam, after the gross errors are added into the monitoring data of tension wire on the top of dam, the actual situation is simulated. Through this method, the added gross errors are completely recognized.

Keywords: Dam safety monitoring•statisticalmodel•gross error recognition•quartile method

Middleware-based Distributed CTCS-3 Simulation Platform

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Abstract Recent years, with the rapid development of the high-speed railway, the safety and efficient operations are increasingly higher requirements. Railway accidents are caused by many factors, such as human factors, technical factors, natural factors and sometimes the result of several factors working together. This paper aims to build scalable CTCS-3 simulation platform in the open environment for fault analysis and safety verification, using JMS and RMI heterogeneous interconnect middleware. Finally, given in the mudslides, rain, snow and other natural environmental factors, with the application of Wulongquandong Station-Xianningbei Station actual line data, we simulate three trains. The results indicate that the platform can easily extend and obtain the safe operation of trains.

Keywords: Rail vehicle suspension systems Fault diagnosis Fisher discriminant analysis • Fault isolation

Diagnostics of Transformer Windings Deformation Based on Transfer Function

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Abstract The deformation of transformer windings after a short circuit was analyzed by studying the criterion for the transfer function. First, the lumped parameter method was used to establish the equivalent circuit of transformer winding, the losses and mutual inductance was added in it. Second, a single layer continuous transformer winding was used as an example to calculate the changes in equivalent circuit parameters due to the changes of the structure and geometry size of the transformer winding, when the transformer windings occurred different forms and degrees deformation. Finally, the common axial and radial deformations of transformer winding was studied to calculate the transfer function of the deformed winding, with the degree of winding deformation judged by the mean square root of the spectrum difference, a diagnostic criterion was given to judge the deformation degree

Keywords: transformer; winding deformation; transfer function; deformation diagnostic

A Spatial Domain Error Concealment Method Based on Statistical

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Abstract Error concealment technique is an important method for video coding in error-prone channel. To improving the problem of accuracy of the estimated lost block edge direction and complexity of the algorithm in spatial error concealment method. We puts forward an improved method through statistical the edge points and direction according to the message of correctly received points around its neighbors of lost blocks and then adaptively select the corresponding algorithm and efficiently improves the above problem and also obtain good subjective quality and higher Peak Signal-to-Noise Ratio (PSNR).

Keywords: Edge detection Region division Directional interpolation Error concealment

The Prediction of Derailment Coefficient based on Neural Networks

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Abstract Derailment coefficient is an important criterion to evaluate the operating safety of rail vehicles. A derailment coefficient prediction method based on neural network is proposed in this paper. Firstly, the basic concepts of derailment coefficient are briefly discussed. Then the principle of BP and NARX networks and their related learning rules is presented. BP network is compared to NARX network and their disadvantages are outlined. Finally, BP and NARX neural networks are established to analyze their prediction performances.. The experimental result shows that, compared with BP neural network, NARX neural network offers better predictive performance of the derailment coefficient.

Keywords: Prediction; Derailment coefficient;BP neural network;NARX neural network

Safety Analysis of ZPW-2000A/K Track Circuit System Based on Risk Estimation

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Abstract Track circuit system is an important basis and core of the train control system. The performance of the track circuit directly influences transport efficiency and train operation safety. Accompanied with the constant improvement of the speed, the requirements for the RAMS of track circuit system greatly improved. Given the importance of the track circuit system and the situation of its frequent malfunctions, systematically safety analysis of the track circuit system is very necessary. This paper systematically analyzed the safety of the ZPW-2000A/K track circuit system by safety analysis theory and method. We identified 10 top level hazard events of the system by FFA and FMECA, and get the all possible causes and potential consequences of each hazard event by FTA and ETA method. According to the risk evaluation matrix we obtained the risk level of each hazard event. It provides the basis for the product design and improvement.

Keywords: Track circuit Safety analysis Risk Estimation Hazard

Railway Power Transformer Reliability Evaluation Model Based on Operating Conditions

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Abstract The accurately failure rate model of transformers is the basis to evaluate the reliability of railway power supply system. However, the existing failure rate model can't reflect the effect of the operating environment and maintenance conditions of transformers. We propose a time-varying failure rate model of railway (35)10kV power transformer according to the Weibull distribution, taking the altitude, ambient temperature, and maintenance conditions into account. The proposed model has been improved according to the manufactory correction factor of transformers, which is obtained based on the historical statistical data. The specific example results show that operating environment and the maintenance situations have significant effect on transformer failure rate by using the improved model. The model can be further used in reliability evaluation of the whole railway power supply system, which can provide support for formulating maintenance plan and scheduling field operation.

Keywords: Altitude Ambient temperature · Maintenance situation Equivalent operating time Failure rate model Manufactory correctionfactor

Study on Efficiency Optimization of Medium Frequency Transformers for Rail Transit Traction System

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Abstract Power electronics transformers (PETs) have the advantages of small volume and light weight, so they have promising applications in rail transit traction system substituting traditional transformers. The PET consists of the medium frequency transformer (MF transformer) and power electronic converters on the primary and secondary side. Among these components, the MF transformer efficiency affects overall system power transfer capacity, so the MF transformer plays an important role as it determines whether the PET system could work with high performance. This paper aims at efficiency optimization of MF transformers and studies the relation between efficiency and core materials, operating parameters and geometric parameters to give MF transformers design some useful references.

Keywords: PETs · MF transformer · Efficiency optimization

Application of Fault Tree Analysis in Software Safety Integrity Level (SIL) Allocation of Train

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Abstract According to practical situation of project execution of Rolling stock, detailedly describes a quantitative method and the process with Fault Tree Analysis (FTA) to allocate the software SIL to subsystem of Train. It stated this method is a feasible and comparatively accurate method of SIL allocation.

Keywords: Hazard analysis · Fault tree analysis · Software safety integrity level Tolerable hazard rate (THR) allocation

Information Hiding Based on Morphological Component

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Abstract Steganography in sparse domain has drawn more and more attention in the past few years due to its high security. In this paper, we propose a sparse domain steganography based on morphological component for grayscale images. Images are composed of two morphological components—piecewise smooth (cartoon-like) parts and textures. Complex contents of images are harder to be modeled, such as textures, thus cannot easily be detected when we embed secret data in them. By properly select dictionaries, content-adaptive steganography in sparse domain can have rather large payloads and low statistical detectability. We combine two dictionaries to obtain sparse coefficients of morphological components of an image, separately. When embedding in sparse domain, we give top priority to coefficients of textures. We present two ways to construct these two kinds of dictionaries in our work, dictionaries using mathematical models as well as dictionaries wisely learned by K-SVD algorithm. Experiments show better visual quality of stego-images and undetectability of secret messages in comparison with other methods in sparse domain.

Keywords: steganography dictionary sparse decomposition morphological component

Dynamic Energy-efficient Virtual Machine Placement Optimization for Virtualized Clouds

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Abstract A virtual machine placement strategy based on the trade-off between energy consumption and SLA is presented. Aiming at dynamical changes of workload requirements, a self-adaptive placement strategy RLWR based on robust local weight regression is presented, which could decide the overload time of hosts dynamically. After detecting overloaded hosts, one virtual machine migration selection algorithm MNM is proposed. The MNM's objective is to get minimal migration number. The migrated virtual machines are deployed using bin-packing algorithm PBFDP. The experimental results show that our algorithm has obvious advantages than other algorithms.

Keywords: cloud computing · virtual machine placement · energy consumption

Research on the Balise Up-link Signal Process Method Based on the Noise Feature Extraction and Adaptive Noise Cancellation

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Abstract In this paper, the Balise Up-link signal noise feature and noise process method are researched. The model of the transmission channel for Up-link signal is established, and the AR power spectrum model is used to extract the noise feature. Then an adaptive noise cancellation is proposed based on the noise feature extraction. This method improves the SNR of the Up-link signal so that Balise Up-link signal transmission is more reliable.

Keywords: BaliseUp-link signal Noise feature extraction Adaptive noise cancellation

Research on Parallel Characteristics of Lithium Iron Phosphate Batteries for Dual Electric Multiple Units

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Abstract The performance of power lithium-ion battery pack in parallel will be further degraded due to the inconsistency of the cells. Under different working conditions, battery pack in parallel reflects different charging and discharging characteristics. In this paper, based on the series-parallel simulation platform, the actual current of parallel battery pack was obtained from the power characteristic of dual electric multiple unit (DEMU). The charging and discharging characteristics of parallel connection for Lithium iron phosphate (LiFePO₄) battery batteries with constant current and the loop current phenomenon under different state of charge (SOC) were investigated combining with the practical charging and discharging tests in the laboratory, which are helpful to get the main causes of aging of

battery pack in parallel. An optimized usage range of SOC is proposed which provides basis for battery management and prolonging the battery cycle life.

Keywords: Dual electric multiple unit Lithium iron phosphate battery Parallel connection Disequilibrium currents

A Reliable QoE-aware Framework for Cloud Service Monitoring and Ranking

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Abstract With the popularity of cloud services, consumers are faced with the optimal selection among a diversity of services from federated clouds. Since the consumers might have individual requirements on applications, the selection of service has become embarrassed. To solve this problem, the research on effective approaches of ranking service to ensure the selection has been put forward as a demanding work. In this paper, we present a reliable QoE-aware cloud service ranking framework based on Markov chain model, which integrates QoE metrics to optimize the rank results. Our approach not only focuses on the individual rank, but also introduces the prediction model to assure the reliability of rank.

Keywords: QoE Rank Reliability Cloud Service.

Research on AC Drive Test System Based on Vector Control

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Abstract In this paper, we give a further analysis on mechanical model for metro vehicle and propose a “twin inverter-motor” reciprocal power-fed AC drive test system in order to simulate the various driving characteristics of metro vehicle. High performance of vector control as well as torque-closed loop control is applied to this test system and the results have verified its good steady and dynamic performance.

Keywords: AC drive Vector control Mechanical model Twin “inverter-motor” AC drive test

system

An algorithm of highway network optimization problem Based on the maximal clique mining

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Abstract In view of the realistic site and distance information of the highway network and its complex topological structure, a new degree-based maximal clique mining algorithm which containing a series of pruning strategies and dictionary ordering strategies is proposed in this paper according to the top-down method to optimize the expressway network information reasonably. The efficiency of searching and clustering the highway network is improved further. In this paper, a simplified model of the highway network is designed, and based on the example of Shandong province highway network database, the new algorithm shows better results.

Keywords: Mining maximal clique Degree-based algorithm Highway network optimization

The Vector Analysis of the Traction Motor's Rotor Flux in EMU

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Abstract In this paper, the hybrid model of rotor flux was proposed based on a established in traction motor measurable quantities such as voltage, current and rotating speed and according to the measurement noise characteristic the kalman filtering model is set up at the same time for problems of traction motor vector controlling of the emu and the technical difficulties in direct measurement on traction motor rotor flux. The results of test show that the algorithm can accurately get the rotor flux

linkage and satisfy the demands of the vector control in the emu traction system and has good robustness.

Keywords: Traction motor Rotor flux kalman filtering EMU

A Multi-objective Timetable Optimization Model for Subway Systems

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Abstract This paper proposes a multi-objective optimization model to optimize the timetable in subway systems, where the objective of overlapping time is the measure of the utilization of regenerative braking energy and the objective of total passenger-time is the measure of satisfaction of the passengers. Furthermore, a simulated annealing method is designed to solve the optimal timetable. Finally, we combine the two objectives into one by applying the weight coefficients and conduct experimental studies are presented based on the operation data from Island Line of MTR. The results show that the optimal multi-objective solution can increase the overlapping time by 21.9% and meanwhile shorten the total passenger-time by 4.3% compared with the current timetable.

Keywords: Subway system Regenerative braking Timetable Passenger-time

A New Control Method of Automatic Train Operation (ATO) in Urban Rail Transit based on Improved Generalized Predictive Control Theory

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Abstract Automatic Train Operation control algorithm is developing very fast, providing a stage for the application of advanced control algorithm. Generalized predictive control (GPC) is widely concerned in recent years, which uses multi step prediction, rolling optimization and feedback correction control strategy to get a good control result. In this paper, the improved generalized predictive control algorithm is applied, the optimized target of which is added an overshoot-reduced item to optimize multiple objectives. By using input saturation constraints strategy, passenger comfort is ensured. The simulation results show the effective-ness of this method.

Keywords: ATO Generalized Predictive Control (GPC) Overshoot-Reduced Optimized Target Input Saturation Constraints

Research of Subway Tunnel Crack Recognition Algorithm based Image Processing

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Abstract The paper proposes a recognition algorithm based on image processing for tunnel crack by collecting the subway tunnel images and makes the tunnel surface cracks recognition and information extraction come true. Meanwhile, according to the extracted information of tunnel surface cracks, we can take some corresponding maintenance and repair measures to meet the need of quick and safe detection for cracks, which can ensure the safety of subway operation.

Keywords: image processing subway tunnel · crack recognition · information extraction

A novel recursive algorithm for training RBF networks

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Abstract A recursive learning algorithm is presented for basis selection of radial basis function (RBF) neural network. It is based on an adaptive kernel width algorithm, which can select basis functions

recursively in the non-orthogonal space and assign an appropriate number of hidden units of RBF network. This also makes the model structure independent of the selected term sequence and assures an optimal RBF network even if the RBF original basis is non-orthogonal. Its effectiveness is demonstrated by the simulated results.

Keywords: radial basis function Bayesian information criterion recursive

Fault Modeling and Fault Diagnosis of Three-phase Inverter Circuit

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Abstract As in the non-normal factors the switches and diodes of electronic power circuits prone to failure, three-phase inverter circuit, for example. In this paper, make some simulation for the open-circuit of the switches and diodes of three-phase inverter circuit on MABLAB/Simulink platform. Besides analysis the fault waveform and extract the feature quantity characterizing the open-circuit fault of switches and diodes. At last, we achieve the accurate detection and location for the fault using normalized dc-component method, and make the simulations to verify the above-mentioned theory.

Keywords: fault diagnosis three-phase inverter circuit normalized dc-component method SVPWM

城市轨道交通列车关键系统的维修计划优化模型研究

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摘要: 为了实现城市轨道交通运营企业的可持续发展, 在保障行车安全可靠的同时, 也要科学控制车辆设备的维修成本。文章通过分析城市轨道交通列车故障数据, 确定列车关键子系统; 考虑了行车设备性能退化以及有限修复能力的实际, 研究了城市轨道交通列车关键子系统的可靠度动态劣化模型; 以列车安全关键系统最大平均可靠性为目标, 以维修费用、关键子系统最低可靠度和可用度为约束条件, 建立了列车安全关键系统的维修计划优化模型, 为科学编制维修计划提供方法借鉴。

关键词：城市轨道交通；可靠；动态劣化；维修计划优化

电气化铁路接触悬挂吊弦和电连接的电气负荷计算

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摘要：研究目的：吊弦和电连接是电气化铁路接触悬挂的重要组成部分，其电气负荷是接触网安全运行的主要保证。目前世界上电气化铁路主要采用载流型铜合金绞线整体吊弦和软铜绞线电连接。本文从耦合平行导线电路计算原理出发，结合工程实际对接触悬挂吊弦和电连接的电气负荷能力进行了仿真计算，得出了吊弦和电连接的电气负荷能力需求，提出了接触悬挂电连接的设置原则。

研究结果：(1) 载流型整体吊弦具有显著的多点并联分流作用，仅在变流点附近的3~5个吊弦和1个电连接参与了接触悬挂的电流分配，其余吊弦和电连接均不参与，电流为零；(2) 由于吊弦的载流能力十分有限，在供电线上网、绝缘锚段关节等持续变流点处的吊弦不能满足持续载流要求，应设置电连接，而其余部分无需设置电连接。

关键词：接触悬挂，吊弦，电连接，电流分配

建立地铁运营风险管理体系的探讨

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摘要：参考国际上地铁风险管理经验，结合国内地铁运营安全管理现状，提出了地铁运营风险管理体系建立的要点和注意事项，重点探讨了风险管理体系策划、危险源辨识与评价、危险源辨识与评价成果应用、动态管理制度，从而实现预防安全事故的目标。

关键词：地铁；运营；风险管理

北京 14 号线城铁车回送方案设计与研究

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摘要：在城铁车回送过程中，可以使用公路运输或铁路运输。由于公路运输到达目的地后，需重新编组连挂，工作比较繁琐所以大部分运输采用铁路运输方案。本文就从北京 14 号线地铁车辆编组连接，回送测试、强迫缓解装置的使用进行阐述，及运送过程中的注意事项发表自己的见解。

关键词：回送车；城铁车；回送转换装置；强迫缓解装置

中压能馈型再生制动能量利用装置应用效果分析

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摘要: 充分发挥列车再生制动能力, 对于减少列车闸瓦磨耗、降低牵引系统能耗具有重要作用。本文分析了影响列车再生制动能力发挥的因素, 对比了几种典型的再生制动能量利用装置优缺点, 介绍了北京地铁 10 号线(二期)工程采用的中压能馈型再生制动能量利用装置功能特点和应用方案, 并结合大量的现场试验数据, 完成了初步应用效果分析。

关键词: 城市轨道交通, 牵引供电, 再生制动, 节能

深圳地铁 3 号线运营安全管理与风险控制实践

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摘要: 深圳地铁 3 号线在线路设置及运用双层车辆段、滑触线引车出入库等创新技术方面具有特点, 本文针对这些特点给运营安全管理带来的特殊要求, 通过对运营的关键环节进行深入分析, 找出安全管控的薄弱环节, 提出了合理对策进行风险控制。

关键词: 地铁; 运营安全; 风险控制

城市轨道交通列车安全关键系统的鉴别方法研究

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摘要: 通过对我国某地铁列车子系统故障统计资料的分析, 提出了城市轨道交通列车安全关键系统的鉴别方法-累计频率法。在应用过程中, 分别采用故障数和当量故障数累计频率方法进行安全关键系统的鉴别, 通过两种不同方法的结果的对比分析, 得出当量故障数累计频率法在安全关键系统的鉴别方面更为精确合理, 既为城市轨道交通设备维修提供理论指导, 也考虑了城市轨道交通安全防护的经济性, 在安全关键系统的鉴别方面更具现实意义。

关键词: 安全关键系统; 鉴别; 累计频率方法

现代有轨电车道岔控制的安全高效设计

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摘要: 现代有轨电车是未来城市轨道交通发展的重要方向。信号系统是有轨电车的重要组成部分, 保障列车的安全和运营的效率。而道岔控制子系统作为信号系统不可或缺的部分, 在安全高效方面扮演着重要的角色。本文介绍了道岔控制子系统的的功能特点, 并通过对几种典型设备布置方案的阐述, 说明信号系统合理的设备布置可有效提高有轨电车的行车安全和运营效率。

关键词: 有轨电车; 信号系统; 道岔控制; 设备布置; 安全性

行车调度指挥系统中人为失误分析及对策研究

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摘要: 安全是地铁的生命线, 是地铁永恒的主题, 行车调度的安全指挥是地铁安全运营的根本保障。应用 Reason 教授提出的 HFACS 人为失误分析方法, 结合具体的案例对调度员产生人为失误的原因进行分析总结, 并提出具体的措施来减少人为失误, 提高行车调度员的安全指挥能力。

关键词: 安全管理; 行车调度; 人为失误; HFACS 分析方法

基于注意力动力机制的智能驾驶视觉认知计算模型

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摘要: 视觉认知计算的高负荷和驾驶决策的实时性是智能驾驶的突出矛盾。智能驾驶视觉对象的有用性差别和动态性、分布结构性等基本属性为高效认知计算提供了可能。本文在分析其基本属性的基础上, 重点研究了驾驶过程中注意力的动力学特性, 设计了包括注意力转移和集中的动力学机制, 实现了视觉认知计算方法。在缩微智能车道路环境平台上的试验表明所提方法可以有效保障识别率, 提高计算效率, 验证了模型的有效性。

关键词: 智能驾驶; 视觉认知; 注意力动力学; 缩微智能车

从气隙磁场的主导谈永磁同步电机特性仿真

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摘要: 利用有限元分析方法计算 2004 Toyota Prius 驱动电机系统永磁同步电机的静态气隙磁场, 通过对比空载状态和负载状态气隙磁场的分布情况, 确认负载状态时气隙磁场由定子电流主导, 据此进行特性仿真: 根据定子和转子的相对位置影响电机输出转矩的特点, 采用瞬态场计算一个周期的堵转转矩曲线和电磁转矩曲线, 通过后处理得到电机的时空矢量图和其它控制参数。

关键词: 永磁同步电机; 有限元分析; 空载气隙磁场; 负载气隙磁场; 堵转转矩; 电磁转矩; 特性曲线; 时空矢量图; 反电势

列车车载蓄电池组参数在线监测系统的设计与开发

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摘要: 为了保证列车蓄电池安全可靠工作,需要对其运行参数进行在线监测。基于美国国家仪器公司(NI)的软硬件平台,利用基于接口电路的一体化仪器技术和虚拟仪器技术,设计并开发了该在线监测系统,克服了目前列车车载蓄电池监测系统的量程小,精度低等缺点。该系统能够对蓄电池组的温度、电压和电流等参数进行同时监测、保存以及回放。将该测试系统应用于车载蓄电池组的测试,测试结果表明该测试系统具有使用方便、检测精度较高、工作稳定可靠、人机界面友好等特点。

关键词: 蓄电池; 虚拟仪器; 一体化仪器技术; LabVIEW

论高速动车组安全送电

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摘要: 如何保证高速动车组在初始送电状态和故障处理状态下的安全性? 如何才能保证在复杂的工况下实现高速动车组的初始安全送电的操作? 这些已然成为了关系到高速铁路人为安全的全新课题。面对全新课题, 本文就下面几个方面进行了论述: 第一、课题研究的意义。第二、论述了工艺布局对安全送电的影响及处理方法。第三、以动车组制冷系统为例, 分别论述如何通过“五步初始上电法”对动车组进行安全送电。通过本文的论述, 再结合实践操作, 可以得出这样的结论: 通过“五步初始上电法”能够提前发现电气线路中不正常的现象, 使接线错误得到及时的改正, 不至于造成损失和安全事故。保障行车安全, 杜绝安全隐患。

关键词: 动车组; 安全送电; 操作方法; 杜绝安全隐患

基于管轨运输系统的直线电机控制策略研究

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摘要: 本文针对直线感应电机在管轨运输系统运行过程中存在的边端效应、参数变化、负载波动等问题, 建立了直线感应电机矢量控制的数学模型, 提出了采用滑模变结构的间接矢量控制策略, 并通过硬件设计和软件编程实现了基于标幺化均值方法的故障诊断功能。实验结果表明, 该控制系统具有良好的动态、稳态性能, 以及较强的鲁棒性, 完全满足管轨运输系统的各项指标及要求。

关键词: 直线感应电机; 间接矢量控制; 滑模变结构; 故障诊断

CRH380BL 动车组电气连接器安全连接质量控制

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摘要: 本文论述了 CRH380BL 动车组车辆电气连接器(俗称插头, 以下称连接器)安全连接应用中的方法和车辆配置功能组连接器及相关器件连接质量控制要点。经实践验证动车组车辆的功能组连接器连接质量必须达到完全控制, 消除由于连接器

连接、线束节点等因素引起的动车组行车隐患问题和减少故障发生机率，确保实现动车组车辆安全运营。

关键词：380BL 动车组；连接技术；操作方法；插头控制；车辆安全

互联时代下的新型企业能量管理系统初探

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摘要：本文介绍了物联网与云计算的相关概念，探讨了运用物联网技术和云计算技术的企业能量管理系统的系统结构，并提出了相关的关键技术，对未来企业信息化管理有一定参考价值。

关键词：物联网；云计算；企业能量管理系统；关键技术

地铁VVVF中的磁链轨迹控制方式(TLC)研究

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摘要：本文对地铁车辆交流传动系统中直流回路振荡这一问题进行分析，总结DTC控制方式在振荡抑制中的优缺点，并对TLC(Track Length Control)同步控制方式进行了研究，提出DTC结合TLC的方式以优化地铁VVVF控制策略，有效抑制振荡。

关键词：DTC；TLC；振荡

直线感应电机法向力与切向力解耦控制

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摘要：针对直线感应电机，研究其法向力与切向力解耦问题。首先在M-T坐标系下建立其数学模型，其次针对M-T轴模型分析从理论上分析其可解耦性，并基于稳态特性提出一种解耦算法，并对其进行仿真。仿真结果表明，该解耦算法能够有效实现法向力与切向力之间的解耦。

关键词：直线感应电机；法向力；切向力；解耦；静态性能

轨道交通用动力电池电压温度采集系统研究

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摘要：以电动汽车的电池应用技术体系为基础，将大容量动力电池组在无轨电车和新能源轨道交通车辆领域推广应用，可以提高上述车辆的适用性、经济性以及应急安全性。针对动力电池组单体之间的一致性差异，为了准确测得相应的电压和温

度参数,本文提出了一种高精度高同步性动力电池电压温度采集系统。本系统的单体数据采集单元采用单片机 MC9S12D64 作为主控芯片,实现 16 个单体动力电池的电压和温度的采集,可以实现采集的高精度和单元内部电池之间的同步,同时可以扩展单元数量并且实现各单元间的同步。本文以电池电压和温度采集的同步性和精度的提高为目标,提出了具体的硬件和软件方案,并对采集精度进行了理论分析,实验数据验证了该系统的高精度以及高同步特性。

关键词: 轨道交通; 动力电池; 温度采集; 电压采集; 同步性; 高精度

城市轨道交通网络化运营时突发事件“点、线、网、体”应急处置模式探讨与研究

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摘要:城市轨道交通网络化运营已成为各个大城市轨道交通发展的趋势,通过分析总结城市轨道交通网络化运营特点和突发事件处置效率影响因素,从线网“点、线、网、体”四个角度出发,探讨和研究城市轨道交通网络化运营时突发事件的“点、线、网、体”应急处置模式。

关键词: 城市轨道交通; 网络化运营; 应急处置模式

混合动力储能部件在轨道交通行业的应用

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摘要:储能部件在混合动力轨道车辆上的应用日益广泛。本文主要介绍了国内外蓄电池、超级电容、燃料电池等储能部件的技术研究现状、工作原理及特点、目前存在的技术问题及发展趋势。蓄电池和超级电容在车辆上已具备较为成熟的应用技术,而燃料电池仍需解决重量和体积的问题。随着储能部件技术和集成技术的进步,这些储能部件必将会轨道交通行业发挥更重要的作用。

关键字: 轨道交通; 混合动力; 蓄电池; 超级电容; 燃料电池

高速列车综合节能技术讨论

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摘要:随着高速铁路建设的快速发展以及高速列车投入运营,带来了一系列的能源消耗问题。本文重点分析了高速列车的能耗组成以及运行能耗的影响因素,并分析探讨了高速列车综合节能技术,通过列车低阻力、空调综合热管理、轮轨节能、轻量化、高效牵引系统、智能司控辅助驾驶和再生电能利用等节能技术,实现高速列车的综合节能,降低能源消耗水平,提高能源利用效率,从而提高高速列车综合节能水平。

关键词: 高速列车; 能耗分析; 节能技术

钢轨超声波探伤的信号处理

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摘要:从超声波探伤检测系统构成原理出发,以检测系统的信号链作为研究对象,从信号处理角度上提出一种用于高速钢轨探伤的信号处理方法及算法,为自主研发钢轨探伤检测系统提供一套系统解决方案。

关键词: 超声波; 探轮; FPGA; 滤波器; DSP; 钢轨探伤车

基于 WSN 定位的 WLTB 自动初运行算法

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摘要:针对无线列车骨干网无法自动初运行的问题,本文分析了无线传感器网络的节点定位方法,提出了基于定位方法的无线列车骨干网自动初运行算法。理论分析和实际测试数据表明:基于定位方法的自动初运行算法有效地解决了无线列车骨干网无法自动初运行的问题。

关键字: 无线传感器网络; 目标跟踪; 初运行; 无线列车骨干网

城市轨道交通列车辅助供电系统的发展与现状

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摘要:伴随着中国经济的腾飞,立体交通将会成为解决城市交通瓶颈的有效途径。城市轨道交通作为交通网络的重要组成部分,因其运量大、速度快、安全、准时、节能、无污染等特点,受到越来越广泛的重视。本文就轨道交通技术中核心的变流技术进行介绍,主要是针对辅助变流器的拓扑结构、城轨列车辅助系统的供电模式以及其并列方法技术进行探讨分析。

关键词: 拓扑结构; 供电模式; 并联方法

城市智能交通系统框架体系与架构设计方法研究

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摘要:当前我国城市智能交通系统由不同部门分期分批建设,系统存在相互独立、信息共享困难、缺乏顶层设计等问题。为解决上述问题,本文在研究 FEA、GIG 等全球先进信息系统架构技术的基础上,提出了新型的城市智能交通框架体系及架构设计方法。该方法结合了物联网、云计算等先进技术的优点,从物联网的视角提出了感知层、传输层、数据支撑层、应用层四层框架体系,从智能交通系统工程建设的角度提出了绩效、业务、信息系统、技术四方面系统架构设计方法,为城市从总体角度规划设计智能交通系统提供了思路和方法,经实践证明可以有效避免了以往以部门职能划分为主体的系统建设模式的问题。

关键词: 智能交通; 城市交通; 架构设计; 框架体系

ATO 模式下列车冲动的分析与整改措施

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摘要: 本文详细分析了深圳地铁三号线列车在 ATO 运行模式下产生冲动的根本原因, 通过优化牵引制动转换的控制时序, 最大化地提高了电制动的使用率, 减少空气制动的过多投入。因电制动较空气制动具有较大的平滑性, 使得列车冲动明显减少, 显著地提高列车的乘坐舒适度。

关键词: ATO; 列车冲动; 电制动

地铁运营安全风险信息管理信息系统 (MOSRIS) 建设研究

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摘要: 我国现阶段地铁运营安全管理正逐步由被动管理向预前管理转变, 实行安全风险信息管理正成为地铁安全运营一个不可或缺的重要手段。本文结合国内地铁运营体系的安全风险管理特点, 将信息技术应用于风险管理的各项工作, 提出建立涵盖风险管理基本流程和控制内部系统各环节的地铁运营安全风险信息管理信息系统 (Metro Operation Safety Risk Information System, 简称 MOSRIS) 的方法, 以便安全预前管理工作得到更进一步有效实施。

关键词: 地铁; 运营安全; 风险管理; 信息系统

动车组网侧变流器主电路拓扑及参数研究

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摘要: 本文对比分析了网侧变流器的两种主要拓扑结构, 并选择两重两电平结构作为主电路拓扑; 还计算出交流侧电感, 直流支撑电容、二次谐振支路的电感电容理论值, 并搭建仿真模型以验证拓扑和参数选择的可行性, 仿真结果表明本文的选择方案是可行的。

关键词: 网侧变流器; 主电路拓扑; 参数计算; 仿真

基于质量屋的客户需求分析研究

轨道车辆需求分析

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摘要: 随着铁路行业的政企分离, 需要各车辆制造商能更快速、准确、全面的获得、转化、传递市场客户需求, 结合铁路行业及质量功能工具的特点, 建立了一套质量屋客户需求收集处理的流程方法, 本流程从调研、招标技术条件、行业标准几个方面获取用户需求数据开始, 经数据整理分析、需求分类、重要度排序, 达到对公司的市场竞争能力的分析, 最终了解用户真正需要什么样及公司的优劣势, 确保

设计和开发的结果满足客户需求。

关键词：铁路行业；用户需求；质量屋

轨道交通先进系统

打造安全、可靠的铁路高速网络系统

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摘要：人们的生活每天都和交通工具息息相关，而在大众交通工具中，又属轨道交通是与人们的密切度最高。相对的，对于轨道交通的准时性舒适性的要求也日益增加。而在提升铁路先进技术与系统的同时，也要打造一个安全、可靠的高速网络系统，都是所有业者和集成商的致力目标。

关键词：智能铁路；高速；以太网

关于 OD 调查中客流变化对运营组织模式联动机制的研究

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摘要：深圳地铁轨道交通二期工程自 2011 年 6 月 28 日全线开通以来，线网客流激增，由开通前的 50 万人次/日，骤升至目前的 270 万人次/日，增幅达到 440%。本文根据对深圳地铁龙岗线不断变化和攀升的客流及客流分布规律进行分析，结合线路条件与设备系统特点，提出匹配客流变化相符合的运营组织模式联动机制，在成本可控、节能降耗的基础上，通过不断深挖内部潜能，最大限度发挥内部资源优势，以满足客流的上升趋势，解决高峰期乘客出行难的矛盾；同时不断适应客流分布的变化，予以匹配区段运能的提升。在满足生产组织运作需要的基础上，确保运营生产安全有序。

关键词：OD 调查；客流变化；运营组织；联动机制研究

可视化自动地线装置的研发、应用和改进

曾斌

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摘要：在本文中，作者首先阐述了地线保护原理，指出了目前通用的地线挂拆流程中的弊端，提出用可视化自动地线装置替代人工完成挂拆作业，并介绍了该装置的构成、三种操作方式、防误操作设计、目前的应用及改进建议。

关键词：可视化；自动；地线；研发；应用；改进

列车电磁兼容设计与测试研究

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摘要：基于电磁兼容理论，分析列车存在的干扰源。对列车电磁兼容性设计进行

了分析,并通过电磁兼容性测试分析了设备布局和线缆敷设对信号线缆影响,通过试验验证车辆电磁兼容设计的最优措施。

关键词: 列车, 电磁兼容设计, 电磁兼容测试

动车组车顶高压电气系统常见故障分析

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摘要: 随着经济和社会的发展,高速铁路在人们的中长距离出行中占据的比重越来越大,动车组可靠运行的重要性越来越明显。本文根据已掌握的CRH动车组故障报告,分析了动车组车顶高压电气系统常见故障,建立了故障树模型,并提出了提高动车组车顶高压电气系统可靠性的措施。

关键词: 高速铁路; 动车组; 高压电气系统; 可靠性; 故障树模型

符合 BOStrab 规范的现代有轨电车信号系统

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摘要: 现代有轨电车作为新型交通工具已在我国一些城市中获得应用,本文在研究德国有轨电车建设和运营规定BOStrab的基础上,提出了符合BOStrab规范的现代有轨电车信号系统设计,并研究了正线道岔控制子系统、平交路口信号控制子系统、车载子系统、车辆段/停车场联子系统和控制中心调度管理子系统等各子系统的结构和工作原理。

关键词: BOStrab、有轨电车、信号系统、道岔控制器、车地通信、安全性、安全完整性等级

UPS 集中供电在深圳地铁中的应用

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摘要: 针对当前地铁弱电系统UPS分散供电方式,提出将分散到各设备的“后备电源”集中在一起,实现统一供电,这不仅节省了“后备电源”的购置费和占用的空间,减少浪费,减小土建的建设成本,同时也可极大地减少运营期间的维护成本。

关键词: UPS ; 集中供电; 地铁应用

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