

ISSN 1671—4598
CODEN JCYKAR



● 第三届国家期刊奖百种重点期刊

● 中国科技核心期刊

计算机
测量与
控制

计算机测量与控制

COMPUTER MEASUREMENT & CONTROL

2022年4月 第30卷 第4期

Vol. 30 No. 4 Apr. 2022



第三十卷
第四期

二〇二二年四月

主管单位：中国航天科工集团有限公司
主办单位：中国计算机自动测量与控制技术协会
出版单位：《计算机测量与控制》杂志社

目 次

● 综述与评论 ●

计算机辅助骨科手术机器人技术发展及应用综述·····张新星,赵英杰,陈超(1)

● 测试与故障诊断 ●

基于5G的运载火箭无线测发控系统·····黄兴,朱亚明,张元明(8)

基于深度学习的航空发动机滑油磨粒检测研究·····侯媛媛,李江红,薛军印(14)

FPGA互连测试中的反馈桥接故障覆盖问题·····毛志明,张颖,姚嘉祺,华屹峰,杨济中,陈鑫(23)

基于多尺度残差网络优化的工业品表面缺陷检测·····陈昕卓,李建军,张超(29)

基于形式验证的多周期路径检测技术·····朱秋岩(35)

基于STK的运载火箭测控链路电平仿真分析·····何谦(40)

高速数字信号测试完整性分析与研究·····王莹,王燕,曹子剑(45)

基于EEMD模糊熵和PSO-KELM的NPC三电平逆变器故障诊断·····马子旻,张朝龙,何怡刚(50)

基于FPGA的运动目标实时检测系统设计·····刘汝卿,李锋,蒋衍,朱精果(56)

Levy噪声下基于自适应级联三稳随机共振的4FSK信号检测·····张亚麟,王辅忠(60)

基于改进FoveaBox的废杂塑料检测·····文生平,陈敬福,冯泽锋,朱珂郁(66)

一种超低功耗自守时环境监测模块的设计·····高晓冬,李祺,刘彦君,李旺(72)

中子吸收法硼浓度监测系统自动标定方法研究·····

·····代航阳,邓圣,崔璨,王璨辉,付国恩,王红波,踪训成,郭燕(79)

● 控制技术 ●

基于大数据聚类的移动机器人运动跟踪控制系统设计·····卞悦旭,倪伟,王展旭(86)

全向重载AGV多轴协同运动控制研究·····张德政,汪步云,杨鸥,陈龙(91)

基于窄带物联网的巡检机器人目标跟踪控制系统设计·····申丽芳,李莹(98)

程控双轴姿态转台伺服控制系统设计及应用·····肖支才,侯鹏森,刘玄冰,代飞扬(103)

摆轮式快递分拣机控制系统设计·····张自强,程科(109)

基于行人安全的交通信号灯智能控制算法研究·····张乾隆,胡智群,肖海林(114)

基于CFD的仿鲹科机器鱼动力学建模与运动控制·····张宜阳,汪明,杜晓彬,王昆仑(121)

基于Fluent的旋流器分级控制系统设计·····李慧姝(128)

● 军事装备测控技术 ●

地效飞行器的纵向控制系统研究·····罗瑜,樊赫(134)

基于ADC方法的炮射导弹系统效能评估·····李春臻,刘婵媛,高文霞,班伟,杨煜(142)

● 设计与应用 ●

一种星载多功能可重构终端设计·····范占春,董世林,鲁帆,智国平,马超,韩运忠(149)

基于VxWorks和FPGA的授时系统设计与实现·····胡广浩,张昊楠,阮福明(155)

基于区块链技术的工控数据安全传输系统设计·····薛中伟(161)

基于校验和法比较法与夹角余弦公式的变形病毒检测算法·····朱俚治(165)

基于改进RBPF算法的轮式机器人SLAM导航系统设计·····王险峰,邱祖泽,丁子琳,赵通,杨浩伟(172)

基于三次B样条曲线的叉车型AGV路径规划研究·····钱东海,孙林林,赵伟(177)

基于残差连接LSTM的雷达目标分类识别方法·····袁浩,张军良(182)

消防机器人底盘热防护多通道温度采集系统设计与试验·····

·····张慧贤,张学贺,马利民,郭哲锋,梁莉,郭兆锋,王文豪,范一赢(190)

基于三维定位技术的水文地质测绘方法研究·····仲跻文(197)

基于AGVs路径规划的物流智能调度系统设计与实现·····宋颖颖(202)

基于STM32的铁路运输站内NB-IoT可视化云BAS系统设计·····贾婷,安璐,廖明,刘莹(209)

往复式涡流C扫描行间错位图像复原校正方法在项目制教学中的应用·····汪步云,程军,梁艺(216)

结合多尺度与可变形卷积的自监督图像特征点提取网络·····张少鹏,周大可,杨欣(222)

基于双单向安全传输的移动警务请求服务总线平台的设计与实现·····

·····张雷,樊志杰,张冰,张丹丹,曹志威(229)

● 试验与评价技术 ●

基于组合赋权-改进可拓云的装甲车辆PHM系统性能评估·····秦涛,鲁冬林,曾拥华(237)

面向散斑纹理图像的相机聚焦评价算法·····苑文楠,贾彦翔,蒋大伟,欧阳铜,雷春,邱旭阳(244)

基于Z语言和贝叶斯网络的存储系统可靠性评估方法·····王颖颖,庄毅,孙逸帆(249)

● 智能仪器与传感技术 ●

基于FPGA和PCIe总线的电子星模拟器设计·····唐永学,朱桂梅,聂瑞千(258)

多路视频流边缘智能识别设备设计·····王兴涛,廖道,邱镇,靳敏,徐凡,张晓航,李文璞(263)

一种电子负载模拟器方案设计·····王骞,王领华,吕建伟,余群,王思峰(267)

行人导航状态识别与传感器优化选择·····杨秀莲,李娟,王梦杰,吕杨,孙秀慧,戴洪德(273)

期刊基本参数: CN11-4762/TP*1993*m*16*300*zh+en*P*¥45*1500*45*2022-04

本期责任编辑: 任旺芳

COMPUTER MEASUREMENT & CONTROL

Vol. 30 No. 4 Apr. 2022

Contents

• Summary and Comment •

Review on the Development and Application of Computer Assisted Orthopedic Surgery Robots.....
.....ZHANG Xinxing,ZHAO Yingjie,CHEN Chao(1)

• Test and Fault Diagnosis •

Wireless Vehicle Test and Launch Control System Based on 5G Technology.....
.....HUANG Xing,ZHU Yaming,ZHANG Yuanming(8)
Research on Abrasive Detection of Aero-engine Lubricating Oil Based on Deep Learning.....
.....HOU Yuanyuan,LI Jianghong,XUE Junyin(14)
Coverage Problem of Feedback-bridging Fault in the FPGA Interconnection Test.....
.....MAO Zhiming,ZHANG Ying,Yao Jiaqi,HUA Yifeng,YANG Jizhong,CHEN Xin(23)
Surface Defect Detection of Industrial Products Based on Multi-scale Residual Network Optimization.....
.....CHEN Xinzhuo,LI Jianjun,ZHANG Chao(29)
Formal Verification Based on Detection Technology of Multicycle Path.....ZHU Qiuyan(35)
Simulation Analysis of Tracking and Control Link Level in Launch Vehicle Based on STK.....HE Qian(40)
Analysis and Research on Integrity of High-speed Digital Signal Test.....WANG Ying,WANG Yan,CAO Zijian(45)
Fault Diagnosis of NPC Three-Level Inverter Based on EEMD Fuzzy Entropy and PSO-KELM.....
.....MA Ziyang,ZHANG Chaolong,HE Yigang(50)
Design of Real-Time Target Recognition System Based on FPGA.....
.....LIU Ruqing,LI Feng,JIANG Yan,ZHU Jingguo(56)
4 FSK Signal Detection Based on Adaptive Cascaded Tristable Stochastic Resonance under Levy Noise.....
.....ZHANG Yalin,WANG Fuzhong(60)
Detection of Waste Plastic Based on improved FoveaBox.....
.....WEN Shengping,CHEN Jingfu,FENG Zefeng,ZHU Keyu(66)
Design of an Ultra-Low-Power Self-timed Environmental Monitoring Module.....
.....GAO Xiaodong,LI Qi,LIU Yanjun,LI Wang(72)
Research on Automatic Calibration Method of Boron Concentration Monitoring System Based on Neutron Absorption....
.....DAI Hangyang,DENG Sheng,CUI Can,WANG Canhui,FU Guoen,WANG Hongbo,ZONG Xuncheng,GUO Yan(79)

• Control Technology •

Design of Mobile Robot Motion Tracking Control System Based on Big Data Clustering.....
.....BIAN Yueyu,NI Wei,WANG Zhanxu(86)
Research on Multi-axis Cooperative Motion Control of Omnidirectional Heavy-duty AGV.....
.....ZHANG Dezheng,WANG Buyun,YANG Ou,CHEN Long(91)
Design of Target Tracking Control System for Inspection Robot Based on Narrowband Internet of Things.....
.....SHEN Lifang,LI Ying(98)
Design and Application of Programmable Two-axis Attitude Turntable Servo Control System.....
.....XIAO Zhicai,HOU Pengsen,LIU Xuanbing,DAI Feiyang(103)
Design of Control System of Swing Wheel Express Sorter.....ZHANG Ziqiang,CHENG Ke(109)
Research on Intelligent Control Algorithm of Traffic Light Based on Pedestrian Safety.....
.....ZHANG Qianlong,HU Zhiqun,XIAO Hailin(114)
CFD-based Dynamic Modeling and Motion Control Method for a Carangiform Robotic Fish.....
.....ZHANG Yiyang,WANG Ming,DU Xiaobin,WANG Kunlun(121)
Design of Cyclone Classification Control System Based on Fluent.....LI Huishu(128)

● Military Equipment Technology in Measurement and Control ●

- Research on Longitudinal Control System of the Ground Effect Aircraft.....LUO Yu,FAN He(134)
Effectiveness Evaluation of the Gun-Launched Missile System Based on the ADC Method.....
.....LI Chunzhen,LIU Chanyuan,GAO Wenxia,BAN Wei,YANG Yu(142)

● Design and Application ●

- Design of a Multifunctional Reconfigurable Terminal for Spacecraft.....
.....FAN Zhanchun,DONG Shilin,LU Fan,ZHI Guoping,MA Chao,HAN Yunzhong(149)
Design and Implementation of Timing System Based on VxWorks and FPGA.....
.....HU Guanghao,ZHANG Haonan,RUAN Fuming(155)
Design of Industrial Control Data Security Transmission System Based on Blockchain Technology.....
.....XUE Zhongwei(161)
Deformation Virus Detection Algorithm Based on Checksum Comparison Method and Included Angle Cosine Formula
.....ZHU Lizhi(165)
Design of Wheeled Robot SLAM Navigation System Based on Improved RBPF Algorithm.....
.....WANG Xianfeng, QIU Zuze, DING Zilin, ZHAO Tong, YANG Haowei(172)
Study on Forklift AGV Path Planning Based on Cubic B-spline Curve.....
.....QIAN Donghai, SUN Linlin, ZHAO Wei(177)
Radar Target Classification and Recognition Method Based on Residual Connected LSTM.....
.....YUAN Hao, ZHANG Junliang(182)
Design and Experiment of Multi-channel Temperature Acquisition System for Fire Fighting Robot Chassis Thermal Protection
...ZHANG Huixian, ZHANG Xuehe, MA Limin, GUO Zhefeng, LIANG Li, GUO Zhaofeng, WANG Wenhao, FAN Yiyi(190)
Research on Hydrogeological Mapping Method Based on Three-Dimensional Positioning Technology.....
.....ZHONG Jiwen(197)
Design and Implementation of Logistics Intelligent Scheduling System Based on AGVs Path Planning.....
.....SONG Yingying(202)
Design of NB-IoT Visual Cloud the BAS System in Railway Transportation Station Based on STM32.....
.....JIA Ting, AN Lu, LIAO Ming, LIU Ying(209)
Research on Interline Dislocation Image Restoration Correction Method Based on Reciprocating Vortex C Scan System
for Experiment Teaching.....WANG Buyun, CHENG Jun, LIANG Yi(216)
A Self-supervised Feature Points Extraction Networks Based on Multi-scale and Deformable Convolution.....
.....ZHANG Shaopeng, ZHOU Dake, YANG Xin(222)
Design and Implementation of Mobile Police Request Service Bus Platform Based on Bi-directional Secure Transmission
.....ZHANG Lei, FAN Zhijie, ZHANG Bing, ZHANG Dandan, CAO Zhiwei(229)

● Test & Evaluation Technology ●

- Performance Evaluation of Armored Vehicle PHM System Based on Combined Weighting-Improved Extension Cloud
.....QIN Tao, LU Donglin, ZENG Yonghua(237)
Camera Focus Evaluation Algorithm for Speckle Texture Image.....
.....YUAN Wennan, JIA Yanxiang, JIANG Dawei, OUYANG Tong, LEI Chun, QIU Xuyang(244)
Reliability Evaluation Method of Storage System Based on Z Language and Bayesian Network.....
.....WANG Yingying, ZHUANG Yi, SUN Yifan(249)

● Intelligent Instruments and Sensing Technology ●

- Design of Electronic Star Simulator Based on FPGA and PCIe Bus.....
.....TANG Yongxue, ZHU Guimei, NIE Ruiqian(258)
Design of Edge Intelligent Recognition Equipment for Multiple Video Streams in Transformer Station.....
.....WANG Xingtao, LIAO Xiao, QIU Zhen, JIN Min, XU Fan, ZHANG Xiaohang, LI Wenpu(263)
A Design of Electronic Load Simulator.....WANG Qian, WANG Linghua, Lǚ Jianwei, YU Qun, WANG Sifeng(267)
Pedestrian Navigation Status Recognition and Sensor Optimization Selection.....
.....YANG Xiulian, LI Juan, WANG Mengjie, Lǚ Yang, SUN Xiuhui, DAI Hongde(273)

计算机测量与控制

Jisuanji Celiang Yü Kongzhi

2022年 第30卷 第4期 (总第283期)
月刊 公开发行 1993年创刊

Computer Measurement & Control Vol.30 No.4
Apr.2022 (Series 283) Monthly Started in 1993

资深顾问: 栾恩杰院士 张履谦院士 刘永才院士 于登云院士 付梦印院士

编委会主任: 潘旭东

编委会副主任: 张卫星

编委会委员(按姓氏笔画排序):

于功敬 于大为 马恩云 王军政 王海亮 王海涛 王宪保 王鑫 支超有 凤雷 付平 付梦印 叶廷东
兰智高 任祥顺 许川佩 刘才学 刘广武 刘文怡 刘亚斌 刘业峰 刘小雄 朱纪洪 华更新 乔立岩 吕翔
邢兰昌 李剑 李凯 李祺 张友鹏 张航瑛 张新星 何怡刚 严涛 肖明清 吴响 吴伟 吴亚东
陈建云 汪步云 周德云 庞新富 郭阳明 徐忠东 徐昕 高月红 常天庆 彭进业 温鹏 路辉 蔡小斌
廖熹 潘安君 魏清新

主管单位: 中国航天科工集团有限公司

主办单位: 中国计算机自动测量与控制技术协会

编辑出版: 《计算机测量与控制》杂志社

原刊名: 计算机自动测量与控制

社长: 张卫星

副社长: 肖登伟

主编: 苟永明

英文编辑: 史守峡

编辑部: 任旺芳 唐德生 顾捷 叶靖

通讯地址: 北京市海淀区阜成路甲8号航天科工大厦门四层

邮政编码: 100048

主编室: (010) 68371578

编辑部: (010) 68371556转12-23

广告部: (010) 68372068

传真: (010) 68372068

电子邮箱: ck@chinamca.com

投稿网址: www.jsjcykz.com

印刷: 北京强华印刷厂

总发行处: 北京报刊发行局

订阅处: 全国各地邮局

广告经营许可证: 京海工商广字第8179号(1-1)

帐户: 《计算机测量与控制》杂志社

帐号: 11001085400059612076

开户银行: 建行北京阜成路支行

出版日期: 2022年4月25日

责任编辑: 任旺芳

版权所有 未经同意 不得转载

Competent Authority: China Aerospace Science and Industry Corporation Limited

Sponsor: China Association of Computer Automated Measurement and Control Technology

Edited and Published by: Magazine Agency of Computer Measurement & Control

Senior Consultants: Luan Enjie Academician

Zhang Lüqian Academician

Liu Yongcai Academician

Yu Dengyun Academician

Fu Mengyin Academician

Director of Editorial Committee: Pan Xudong

Publisher President: Zhang Weixing

Deputy Publisher: Xiao Dengwei

Chief Editor: Gou Yongming

English Editor: Shi Shouxia

Address: 4th floor, China Aerospace Mansion, No. a8 Fucheng road, Haidian district, Beijing 100048, China

Code Name: 82-16

Overseas Postal Code Name: M1480

Publishing Date: 25th /Apr. 2022

Domestic Price: ¥45/Each



微信服务号

万方数据



微刊阅读

刊号: ISSN 1671-4598
CN 11-4762/TP

邮发代号: 82-16

国外代号: M1480

定价: 45.00元

ISSN 1671-4598



9 771671 459220

049