

# 计算机测量与控制

2018年 第26卷 第11期 (总第242期)  
月刊 公开发行 1993年创刊

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

资深顾问: 栾恩杰院士 张履谦院士 陈定昌院士

社 长: 奚全生

副 社 长: 肖登伟

编委会主任: 于滨

编委会副主任: 奚全生 杨俊

编委会委员(按姓氏笔画排序):

于功敬 王迎春 王国峰 王军政 王海亮  
王海涛 王 茜 邓璐娟 支超有 孙肖南  
付 平 付梦印 叶廷东 左 毅 史红卫  
兰智高 任喜录 任祥顺 许川佩 刘 嘉  
刘才学 刘广武 刘文怡 刘亚斌 朱纪洪  
朱培灿 华更新 李 杰 李学锋 李绪志  
乔立岩 吕 翔 张友鹏 张 琼 张宏军  
何怡刚 汪祖民 应怀樵 苏 中 严 涛  
肖明清 杨 军 陈建云 陈建辉 王永彬  
周德云 郭阳明 席震东 胡昌华 赵 雯  
徐忠东 莫为铭 夏开建 栾咏红 阎 芳  
常天庆 谢 维 程 进 鲍 斌 路 辉  
蔡小斌 蔡远文 潘安君

主 编: 苟永明

副 主 编: 孟汉城

英文编辑: 杨力生

编 辑 部: 任旺芳 唐德生 白春安 顾捷

广 告 部: 孙颖

通讯地址: 北京市海淀区阜成路甲8号

航天科工大厦四层

邮政编码: 100048

电 话: 主编室: (010) 68371578

编辑部: (010) 68371556转12-23

广告部: (010) 68767886

传 真: (010) 68372068

电子邮箱: ck@chinamca.com

投稿网址: www.chinamca.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

邮发代号: 82-16

ISSN 1671-4598

刊 号: CN 11-4762/TP

国外代号: M1480

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: 2018年11月25日

国内定价: 每期定价40.00元/册

责任编辑: 唐德生

版权所有 未经同意 不得转载

## 目 次

### • 综述与评论 •

机内测试技术与虚警抑制策略研究综述..... 蒋超利, 吴旭升, 高 崑, 孙 盼, 孙 军(1)

### • 测试与故障诊断 •

基于神经网络观测器的卫星姿态控制系统陀螺故障诊断..... 李 磊, 高永明, 吴止媛, 张学波(7)

基于VITE的风洞测量系统自动检测诊断平台..... 范金磊, 邓晓曼, 蔺元臣, 贾 霜, 宋 元(12)

通用信号动态测试系统设计与实现..... 赵 茜, 张修建(17)

一种便携式机载雷达罩外场电性能测试系统... 李宝鹏, 谢洪森, 刘 水, 吴春林(20)

液压抓斗控制器在环仿真系统设计与测试..... 陈晓辉, 龚元明, 曹笑笑, 张启宇, 段明海(25)

基于定性趋势分析的空调系统传感器故障检测..... 宋政辉, 应洪伟, 潘 晓(30)

电动汽车直流充电桩自动检测系统设计..... 闫奇瑾, 何坚强(35)

基于FOA优化GRNN的船用柴油机涡轮增压系统故障诊断... 孙丽娜, 黄永红, 刘涵茜(39)

自动武器射击频率测试技术研究..... 何 涛, 王占选, 王 晴, 王晓龙, 闫丽琴(43)

超声在机测厚接触力控制方法研究..... 刘海波, 应杨威, 廉 盟, 周连杰, 王永青(47)

基于物联网技术的智慧实验室近远程测控系统..... 李 薇, 杨庆华, 赵玉萍(52)

复杂环境下主导干扰来源快速诊断方法... 倪子楠, 张 楷, 石海然, 陈腾博, 李佼珊(58)

基于改进粒子滤波算法的医疗锂电池PHM系统设计..... 何 成, 刘长春, 武 洋(63)

新型配电主站系统消息总线性能分析与测试..... 张五中, 刘仁千, 李国杰, 张超永, 杨丰源(68)

基于卷积神经网络的汽车车轮定位参数自动测量方法..... 陈东皓(72)

柔性喷管六自由度真实摆角测量系统研制..... 李梦雪, 熊 伟, 徐佳佳, 胡逸州, 王继鹏(76)

磨音信号检测与处理方法研究..... 代少升, 张 辛, 杜 江, 张娟娟(80)

基于RT系统的高速液压缸测控系统设计..... 焦 岗, 李雅静(85)

基于RS码的某运载火箭图像测量系统设计与实现... 李芳培, 荣为君, 袁承宗, 庄 玮(89)

### • 控制技术 •

基于推挽式供电和PID温控的半导体冰箱系统设计..... 吴 迪, 曾国辉, 丁倩云(93)

基于参数自整定和模糊前馈的疏浚系统控制..... 王 帅, 王二永, 项恒, 黄宪中(98)

智能高压电网逆变器数字化同步锁相控制技术..... 杜浩良, 郑 燃, 李武龙, 杨 昊(103)

基于线性自抗扰的开关磁阻电机调速控制研究..... 程剑彬, 孙宗海(108)

便携式数据采集器的数据传输控制系统设计..... 钱 军(112)

基于NB-IoT的电梯安全远程监控系统设计..... 张飞雄, 黄 浩, 胡永明, 顾豪爽(117)

多功能调试台控制系统设计与实现..... 刘姗姗, 高 晶, 文 帅, 杨 薇, 张 伟(123)

欠驱动多轴机械节能控制系统误差时域分析..... 白 昀, 郭 巍, 张 鹏(129)

MCU存储器双倍速率控制技术研究..... 郑杰辉(133)

温湿度监控系统设计..... 谈 敏(137)

## • 军事装备测控技术 •

- 反坦克弹光纤惯导嵌入式信号采集系统设计与实现.....刘 琴, 杨鹏翔, 阮 娟, 马悦飞 (141)
- 基于sigmoid函数的高超声速飞行器自适应姿态控制.....黄 聪, 郭佳鑫, 白文艳, 路坤锋 (145)
- 中远程舰空导弹协同制导飞行试验安控方案设计.....张 艳, 张 凯 (150)

## • 测试软件工程 •

- 便携式成像光谱仪的软件设计与实现.....张 敏, 曾延安, 张南洋生, 李 猛 (153)
- 基于LabVIEW的通用且可定制的数据采集处理软件设计.....纳杰斯, 丁明惠 (158)
- 分布式测试系统的软件增量更新设计.....张莹莹 (162)
- 风洞试验流程描述与解析设计.....秦建华, 王博文, 唐 亮, 黄 睿 (167)

## • 设计与应用 •

- 基于协同过滤算法的自动化隐式评分音乐双重推荐系统.....李 涛, 符 丁 (171)
- 基于集合化的装备IETM数据模块快速构建技术研究.....余 容, 陶以政, 李立清, 万正景 (176)
- 深潜救生艇的紧急信息传递装置设计.....唐会林, 孙希勋 (180)
- 基于总线技术的实时通信方法研究与应用.....秦 亮, 张文广, 刘生华, 吴朝华 (185)
- 基于Kinect的上肢康复网络系统的设计与实现.....孙光民, 李 俊, 张俊杰, 闫正祥, 马北川 (190)
- 基于Android系统的人脸识别门禁系统的设计.....江 鹏, 施一萍, 袁建平 (195)
- 一种可应用于载人航天器的无线语音通信系统.....于世强, 陈晖照, 南洪涛 (199)
- 非视距环境下的超宽带室内定位算法.....江 歌, 李志华 (203)
- 面向应用性能管理系统的运行负载预测.....马健钦 (208)
- 基于COTS器件的高费效比商业卫星计算机研究.....刘凯俊, 彭 攀, 王新元 (213)
- 基于时空关联度的视频车祸识别算法.....赵 阳, 李翼超, 李 雪 (218)
- 电传飞机飞行品质低阶等效系统算法研究.....方自力, 韩意新, 袁广田 (223)
- 共享适应度粒子群在双机ETV中的应用.....丁 芳, 宋小静 (228)
- 5.2 km距离无线激光通信跟踪实验.....柯熙政, 严 希, 杨雅淇, 胡 欣 (233)
- 基于优化HOG特征计算的非完整人体特征检测.....李 闯, 陈张平, 王 坚, 张波涛 (238)
- 基于色选技术的建筑垃圾分选系统研发.....马 浩, 毛龙林, 戴厚德, 韩 军, 曾现萍 (243)
- SEDS在星载综合电子系统中的应用设计.....杨丽君, 陈伯翰, 张 睿, 何熊文, 张亚航 (248)
- 小语料库重庆话语音识别的研究.....张 策, 韦鹏程, 石 熙 (252)
- 基于GRA-LSSVM密度法的配电网空间负荷预测方法研究.....刘业峰, 王 婷 (256)
- 用于秸秆燃料热值估计的图像分析系统设计.....郑雅羽, 陈 超, 梁圣浩, 何德峰, 李廉明 (261)
- 果实摘取机械手的果实识别方法与摘取路径规划.....李 莹, 田林琳 (267)
- 舰载遥测与红外电视跟踪一体化设计与实现.....李海鹏, 黎刚果, 吕 瑶 (272)
- 油田安防领域基于改进的深度残差网络行人检测模型.....杨其睿 (277)

## • 试验与评价技术 •

- 基于统计与模式识别的装备健康评估技术研究.....孟祥辉, 朱 遵 (281)
- 航空机载软件测试质量评价方法研究.....刘 涛, 李 娜 (285)

## • 智能仪器与传感技术 •

- 基于STM32的气象数据在线监测仪设计.....黄飞龙, 黄海莹, 何艳丽 (288)
- 基于参数激励的MEMS环式陀螺驱动方法与实践.....钱 磊, 赵鹤鸣, 张晓峰, 徐大诚 (293)
- 智能电阻电容测量仪的设计与制作.....刘俞辰 (297)

**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 Lūqian Academician  
Chen Dingchang Academician

**Publisher:**

Xi Quansheng

**Vice Publisher:**

Xiao Dengwei

**Chief Editor:**

Gou Yongming

**Vice Chief Editor:**

Meng Hancheng

**English Editor:**

Yang Lisheng

**Address:**

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

**Tel:** 010-68372068

**Fax:** 010-68372068

**E\_mail:** ck@chinamca.com

**Http:** www.chinamca.com

**General Issue:**

Beijing Bureau for Distribution of Newspapers  
and Journals

**Domestic Distributor:**

All Local Post Office in China

**Code Name:** 82-16

**Publication Number:**

ISSN 1671-4598 , CN 11-4762/TP

**Overseas Distributor:**

China International Book Trading Corporation,  
P.O.Box 399,Beijing,100044, China

**Overseas Postal Code Name:** M1480

**Publishing Date:** 25th /Nov.2018

**Domestic Price:** ¥40/Each

**Overseas Price:** \$12/Each

# Contents

## • Summary and Comment •

An Overview Review of Built-in Test Technologies and False Alarm Reducing Strategies.....  
.....Jiang Chaoli,Wu Xusheng,Gao Wei,Sun Pan,Sun Jun(1)

## • Test and Fault Diagnosis •

Gyroscopic Fault Diagnosis Method for Satellite Attitude Control System Based on Neural  
Network Observer.....Li Lei,Gao Yongming,Wu Zhihuan,Zhang Xuebo(7)  
Auto Test and Diagnosis Platform for Wind Tunnel Measurement System Based on VITE.....  
.....Fan Jinlei,Deng Xiaoman,Man Yuanchen,Jia Shuang,Song Yuan(12)  
Design and Implementation of Universal Signal Dynamic Test System.....  
.....Zhao Xi,Zhang Xiujian(17)  
A Portable External Field Electric Performance Test System for Airborne Radome.....  
.....Li Baopeng,Xie Hongsen,Liu Shui,Wu Chunlin(20)  
Hydraulic Grab Controller In-loop Simulation System Design and Test.....  
.....Chen Xiaohui,Gong Yuanming,Cao Xiaoxiao,Zhang Qiyu,Duan Minghai(25)  
A Detection Method Based on Qualitative Trend Analysis for Sensor Faults in HVAC Systems  
.....Song Zhenghui,Ying Hongwei,Pan Xiao(30)  
Design of Automatic Detecting System of DC Charging Piles for Electric Vehicles.....  
.....Yan Qijin,He Jianqiang(35)  
Fault diagnosis for Turbocharging System of Marine Diesel Engine Based on GRNN  
Optimized by FOA.....Sun Lina,Huang Yonghong,Liu Hanqian(39)  
Research on Testing Technology of Automatic Firearm Firing Rate.....  
.....He Tao,Wang Zhanxuan,Wang Qing,Wang Xiaolong,Yan Liqin(43)  
Research on Contact Force Control Method of Ultrasonic On-machine Thickness Measurement  
.....Liu Haibo,Ying Yangwei,Lian Meng,Zhou Lianjie,Wang Yongqing(47)  
Implementation of Near-remote Measurement-control System for Intelligent Laboratory  
based on Internet of Things Technology.....Li Wei,Yang Qinghua,Zhao Yuping(52)  
Rapid Diagnosis Method of Dominant Interference Source in Complex Environment.....  
.....Ni Zinan,Zhang Lu,Shi Hairan,Chen Tengbo,Li Jiaoshan(58)  
Electromedical Lithium Battery PHM System Design Based on Improved Particle Filter  
Algorithm.....He Cheng,Liu Changchun,Wu Yang(63)  
Performance Analysis and Test of a New Power Distribution Main Station System Message Bus  
.....Zhang Yuzhong,Liu Renqian,Li Guojie,Zhang Chaoyong,Yang Fengyuan(68)  
Automatic Measurement Method of Vehicle Wheel Alignment Parameters Based on  
Convolution Neural Network.....Chen Donghao(72)  
Design and Experiment of a 6 Dof Launch Angle Measurement Device for Flexibility Nozzle  
.....Li Mengxue,Xiong Wei,Xu Jiajia,Hu Yizhou,Wang Jipeng(76)  
Research on methods of detecting and processing of grinding signal.....  
.....Dai Shaosheng,Zhang Xin,Du Jiang,Zhang Xiaoxiao(80)  
Design of Control System for High Speed Hydraulic Cylinder Based on RT System  
.....Jiao Gang,Li Yajing(85)  
Design and Implementation of a Launch Vehicle Image Measurement System Based on  
RS Code.....Li Fangpei,Rong Weijun,Yuan Chengzong,Zhuang Wei(89)

## • Control Technology •

Semiconductor Refrigerator System Design Based on Push-pull Power Supply and PID  
Temperature Control.....Wu Di,Zeng Guohui,Ding Qianyun(93)  
Control of Dredging System Based on Parameter Self-tuning and Fuzzy Feedforward.....  
.....Wang Shuai Wang Eryong, Xiang Heng, Huang Xianzhong(98)  
Digital Synchronous Phase-locked Control Technology for Intelligent High Voltage Grid In  
verter.....Du Haoliang,Zheng Ran,Li Wulong,Yang Hao(103)  
Research on Speed Regulating Control of Switched Reluctance Motor Based on Linear  
Active Disturbance Rejection Controller.....Cheng Jianbin,Sun Zonghai(108)  
Design of data Transmission Control system for Portable data Collector.....  
.....Qian jun(112)  
Design of Elevator Safety Remote Monitoring System Based on NB-IoT Wireless Network  
.....Zhang Feixiong,Huang Hao,Hu Yongming,Gu Haoshuang(117)

Control System Design and Implementation for Multifunctional Testing Platform.....	
.....Liu Shanshan,Gao Jing,Wen Shuai,Yang Wei,Zhang Wei(123)	
Time Domain Error Analysis of Energy Saving Control System for Underactuated Multi Axis Machinery....	Bai Yun,Guo Wei,Zhang Peng(129)
Research on Double Rate Control Technology of MCU Memory.....	Zheng Jiehui(133)
Design of Temperature and Humidity Monitoring and Controlling System.....	Tan Min(137)

### ● Military Equipment Technology in Measurement and Control ●

Design and Implementation of Embedded Signal Acquisition System for Anti-tank Missile Fiber-optic Inertial Navigation.....	
.....Liu Qin,Yang Pengxiang,Ruan Juan,Ma Yuefei(141)	
Adaptive Attitude Control for Hypersonic Vehicle Based on Sigmoid Function.....	Huang Cong,Guo Jiaxin,Bai Wenyan,Lu Kunfeng(145)

### ● Test Software Engineering ●

Software Design and Implementation of Portable Imaging Spectrometer.....	Zhang Min,Zeng Yan'an,Zhang Nanyangsheng,Li Meng(153)
Design on Safety Control Program of Mid-Long Range Ship-to-Air Missile in the Mode of Collaborative Guidance....	Zhang Yan,Zhang Kai(150)
A Customizable Data Acquisition and Processing Software Design Method Based on LabVIEW.....	Na Jiesi,Ding Minghui(158)
Design of Distributed Test System's Software Incremental Upgrade.....	ZhangYingYing(162)
Design of Process Description and Analysis in Wind Tunnel Test.....	Qin Jianhua,Wang Bowen,Tang Liang,Huang Rui(167)

### ● Design and Application ●

An Automated Implicit Scoring Music Dual Recommendation System Based on Collaborative Filtering Algorithm.....	Li Tao,Fu Ding(171)
Research on Rapid Construction of Equipment IETM Data Module based on Aggregation.....	Yu Rong,Tao Yizheng,Li Liqing,Wan Zhengjing(176)
Design of Emergency Information Transmission Device for Deep Submergence Rescue Vessel.....	Tang Huilin,Sun Xixun(180)
Research and Application of Real-Time Communication Method Based on Bus Technology.....	
.....Qin Liang,Zhang Wenguang,Liu Shenghua,Wu Zhaohua(185)	
Design and Implementation of Upper Limb Rehabilitation Internet System Based on Kinect.....	
.....Sun Guangmin,Li Jun,Zhang Junjie,Yan Zhengxiang,Ma Beichuan(190)	
Design of Face Recognition Access Control System Based on Android System.....	Jiang Peng,Shi Yiping,Yuan Jianping(195)
A Wireless Voice Communication System Applicable for Manned Spacecraft.....	Yu Shiqiang,Chen Huizhao,Nan Hongtao(199)
UWB Indoor Location Algorithm in NLOS Environment.....	Jiang Ge,Li Zhihua(203)
Operational Load Forecasting for Application Performance Management Systems.....	Ma jianqin(208)
Research on Cost-Effective Commercial Satellite Computer Based on COTS Devices.....	Liu Kaijun,Peng Pan,Wang Xinyuan(213)
Video Car Accident Recognition Algorithm Based on Spatio-temporal Correlation Degree.....	Zhao Yang,Li Yichao,Li Xue(218)
Low Order Equivalent System Identification Method to Evaluate Flying Qualities of Fly-by-Wire Aircraft.....	Fang Zili,Han Yixin,Yuan Guangtian(223)
Application of Shared Fitness Particle Swarm in Double ETV System.....	Ding Fang, Song Xiaojing(228)
5.2 km Distance Wireless Laser Communication Tracking Experiment.....	Ke Xizheng,Yan Xi,Yang Yaqi,Hu Xin(233)
Incomplete Human Feature Detection Based on Optimized HOG Feature Computation.....	Li Chuang,Chen Zhangping,Wang Jian,Zhang Botao(238)
Research of Sorting System for Construction Waste Based on Color Selective Technology...Ma Hao,Mao Longlin,Dai Houde,Han Jun,Zeng Xianping(243)	
Application of SEDS in Service and Protocol System.....	Yang Lijun,Chen Bohan,Zhang Rui,He Xiongwen,Zhang Yahang(248)
Study on Speech Recognition in Chongqing Dialect of Small Corpus.....	Zhang Ce,Wei Pengcheng,Shi Xi(252)
Research on Spatial Load Forecasting of Distribution Network Based on GRA-LSSVM Density Method.....	Liu Yefeng,Wang Ting(256)
Image Analysis System for Estimating Calorific Value of Straw Fuel.....	Zheng Yayu,Chen Chao,Liang Shenghao,He Defeng,Li Lianming(261)
Fruit Recognition Method and Path Planning for Fruit Picking Manipulator.....	Li Ying,Tian Linlin(267)
Integrated Design and Implementation of Shipborne telemetry and infrared TV tracking.....	LI Haipeng,Li Gangguo,Lü Yao(272)
Pedestrian Detection Model based on Improved Deep Residual SSD Network in Oilfield Security Field.....	Yang Qirui(277)

### ● Test & Evaluation Technology ●

Research on Equipment Health Assessment Technology Based on Statistics and Pattern Recognition.....	Meng Xianghui,Zhu Lin(281)
Research on Quality Evaluation Method of Airborne Software Testing.....	Liu Tao,Li Na(285)

### ● Intelligent Instruments and Sensing Technology●

Design of Meteorological Data Online Monitor Based on STM32.....	Huang Feilong,Huang Haiying,He Yanli(288)
Improvement of MEMS Gyroscope Driving Method Based on Parametric Excitation.....	Qian Lei,Zhao Heming,Zhang Xiaofeng,Xu Dacheng(293)
Design and Manufacture of Intelligent Resistance and Capacitance Measuring Instrument.....	Liu Yuchen(297)