

# 计算机测量与控制

2019年 第27卷 第7期 (总第250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: 李恩杰院士 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: 潘旭东

编委会副主任: 奚全生

编委会委员(按姓氏笔画排序):

于功敬 王军政 王海亮 王海涛 支超有  
付 平 付梦印 叶廷东 左 毅 史红卫  
兰智高 任祥顺 许川佩 刘 嘉 刘才学  
刘广武 刘文怡 朱纪洪 华更新 乔立岩  
吕 翔 邢兰昌 张友鹏 张 雷 何怡刚  
应怀樵 严 涛 肖明清 吴 响 汪祖民  
周德云 郭阳明 赵 震 徐忠东 夏开建  
阎 芳 常天庆 彭进业 路 辉 蔡小斌  
潘安君 魏清新

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: 2019年7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 •

养老服务机器人的技术发展趋势 ..... 刘珊, 兰智高 (1)

## • 测试与故障诊断 •

某型发动机控制器模拟接口电路测试性设计与验证 ..... 高倩, 范利花, 张腾飞, 赵振宇 (7)

基于无人机航拍图像的关键目标点间距测量研究 ..... 黄皓 (11)

基于深度学习的实时图像目标检测系统设计 ..... 李林, 张盛兵, 吴鹃 (15)

面向软面料自主抓取的机器人视觉检测与定位 ..... 高强, 潘俊, 李震 (20)

基于EEMD和GA-BP的列车辅助逆变器开路故障诊断研究 ..... 蔡鹏飞, 郑树彬, 彭乐乐 (25)

家庭太阳能电-热联产联供云监测系统设计 ..... 雷旺, 李鹏, 江海涛, 罗琦, 付亚宇 (32)

基于Qt的软件内存泄漏静态检测技术研究 ..... 匡海燕, 张玉中, 刘仁千, 李国杰, 谷威 (36)

基于STM32的在线绝缘监测装置的设计 ..... 尹强, 王佰超, 甘江华, 刘建鹏, 乔海强 (40)

一种自动飞行控制系统测试系统的设计 ..... 周章勇, 王纬国, 章宁, 胡伟 (45)

基于改进混合高斯模型与阴影去除的目标检测 ..... 王林, 和萌 (50)

基于传感器技术的可穿戴式设备信号频率测量 ..... 程晓芳 (54)

基于LabVIEW的高速多通道航天器通用测试系统设计 ..... 高延超, 梁克, 仪德英 (59)

## • 控制技术 •

转移概率部分未知时滞跳变系统有限时间H<sub>∞</sub>控制 ..... 熊威, 顾德, 刘飞 (63)

上下料机械手通用控制系统的工作原理与设计 ..... 吴祥, 林建波, 董辉, 俞立 (70)

基于动态矩阵的隔振器滞回动力自动控制系统设计 ..... 张璐佳 (74)

基于RBF神经网络的机械臂自适应控制方法 ..... 程林云, 张雷, 宋晓娜 (79)

基于模糊PID的整平机姿态控制算法设计与实现 ..... 曹竞豪, 黄欢, 张帅, 周颖文 (85)

基于RNN编码器的交互式机器翻译平台控制技术 ..... 白瑞芳 (89)

## • 军事装备测控技术 •

基于高性能并行计算的武器装备混合调度控制方法研究 ..... 庞阿源, 刘亚洲 (93)

基于自适应LS-SVM的雷达T/R组件热管冷却故障诊断系统设计 ..... 吴国秋 (97)

## • 测试软件工程 •

基于SiriusXM卫星广播服务的音频播放软件的设计 ..... 邹山花, 方宁生, 冯潇翔 (101)

基于LDRA Testbed的民用机载软件静态测试方法 ..... 周培 (107)

基于VB的UCAM系列应变仪测控软件设计 ..... 潘琼文, 黄进浩 (111)

面向飞行器的自主保障寿命管理软件设计 ..... 张丽晔, 蔡斐华, 褚厚斌, 姜悦, 代京 (115)

## • 设计与应用 •

GM(1, 1)模型的改进在智慧水务中的研究与应用 ..... 张一航, 钱晓群, 彭宏玉 (119)

基于STM32的射电望远镜跟踪系统设计 ..... 陈健康, 王新君 (124)

针对微博的免登录分布式网络爬虫的研究	王林, 刘星辰 (128)
OpenCV下嵌入式轨道检测小车图像采集处理系统研究与设计	张雯柏, 柴晓冬, 叶斌, 彭乐乐 (132)
基于多项式统计的舰船传感器偏差估计算法	张博文, 张昕, 费捷, 朱宁, 燕瑞超 (137)
基于XGBoost的客户所在店铺WiFi定位技术研究	卢一帆, 柳伟, 叶福田 (141)
暗通道去雾技术和聚类算法的优化研究	张鑫, 陈虎越, 翟超, 张俊鹏, 徐斌 (146)
车载数据无线传输及其平视显示设计	吴劲阳, 姚远, 杨刚, 周兴社 (150)
装备虚拟维修培训系统设计与实现	罗一丹, 王南松 (155)
基于目标跟踪与深度学习的视频火焰识别方法	耿梦雅, 张国平, 徐洪波, 张莹莹 (159)
基于DSP和HI-6121的1553B远程终端通讯技术研究	张鹏, 苗晋玲 (164)
基于HLS协议视频监控加密系统优化设计与实现	王林, 石焘 (169)
基于太阳能充电站中风光火多目标优化管理问题的研究	邢毓华, 刘兴, 程绍谦 (174)
单相光伏微网逆变器的建模与电流跟踪数值模拟	罗丹, 廖志贤, 黄国现, 韦笃取, 蒋品群 (180)
基于AGV的智能停车库调度系统设计	张丹丹, 张志龙, 古金茂 (184)
基于无线通信的车辆主动防撞预警系统设计	周奇智, 陶硕文 (190)
改进的KCF算法在车辆跟踪中的应用	王林, 胥中南 (195)
优化视觉聚焦点的手背静脉识别方法	王一丁, 赵晨爽 (200)
警用无人系统与低空安全防范初探	庞峰, 冯登超 (205)
基于SAE J1939的商用车智能车载终端系统设计	董小辉, 胡锦波, 黄浩, 胡永明, 顾豪爽 (209)
机载维护仿真平台的设计与验证	邹会荣, 吕镇邦, 沈新刚 (214)
基于超宽带技术的轨道交通定位算法研究	朱文刚, 常海涛, 薄云览, 江奕辰, 刘志国 (218)
提升小波改进阈值算法在输气管道泄漏信号降噪处理中的应用	高建丰, 周韶彤, 何笑冬 (223)
基于MNSS的医学影像虚拟仿真实训平台设计	孙谦, 胡俊峰, 石曼渝, 肖雪雯, 吴响 (227)
深度学习语义分割方法在遥感影像分割中的性能分析	王俊强, 李建胜, 丁波, 蔡富 (231)
基于拓扑感知节点排序的虚拟网络嵌入	马煜 (236)
人体姿态识别算法在视觉人机交互中的应用	唐彪, 樊启润, 孙开鑫, 卢仕, 万美琳 (242)
基于自发表情数据集预训练的多任务深度网络表情识别方法	彭先霖, 张海曦, 胡琦瑶, 温超 (248)
通信机房蓄电池并联隔离管理器设计与应用	张瑜, 陈皓 (253)
基于形态学滤波结合LOG算法的边缘检测	黄玉蕾 (257)

### • 试验与评价技术 •

基于模糊综合评价的驾驶安全性评价研究	许治琦, 姚远, 周兴社, 杨刚 (261)
飞行试验工程大数据治理思考	党怀义 (266)
基于层次分析法的对接联调综合保障系统评估方法研究	冯楠, 李一 (270)
基于飞参数据的飞机操纵系统故障评估方法	吴祯涛, 李学仁, 杜军, 丁超 (275)

### • 智能仪器与传感技术 •

基于蓝牙通信的阅读视力检查仪设计	陈龙翔, 邱飞岳, 傅攀, 叶思掀 (280)
------------------	-------------------------

# Computer Measurement & Control

Vol.27 No.7 Jul.2019(Series 250)  
Monthly Started in 1993

**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

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 /Jul.2019

**Domestic Price:** ¥40/Each

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

# Contents

## ● Summary and Comment ●

Technology Development Trend of Aged Service Robot.....Liu Shan, Lan Zhigao(1)

## ● Test and Fault Diagnosis ●

Testability Design and Verification of Analog Interface Circuit for an Engine Controller

.....Gao Qian, Jin Xiaobo, Fan Lihua, Zhang Tengfei, Zhao Zhenyu(7)

Research on Spacing Measurement of Key Target Points Based on UAV Aerial Image.....Huang Hao(11)

Design of Real-time Image Object Detection System Based on Deep Learning.....

.....Li Lin, Zhang Shengbing, Wu Juan(15)

Visual Detection and Localization of Robots' Grasps Automatically on Soft Fabric.....

.....Gao Qiang, Pan Jun, Li Zhen(20)

Research on Open-circuit Fault Diagnosis of Train Auxiliary Inverter Based on EEMD and GA-BP

.....Cai Pengfei, Zheng Shubin, Peng Lele(25)

Design of Cloud Monitoring System for Household Solar Power-heat Cogeneration.....

.....Lei Wang, Li Peng, Jiang Haitao, Luo Qi, Fu Yaya(32)

Research on Static Detection Technology of Software Based Qt Memory Leak.....

.....Kuang Haiyan, Zhang Yuzhong, Liu Renqian, Li Guojie, Gu Wei(36)

Research for on-line Insulation Monitoring Devices Based on STM32.....

.....Yin Qiang, Wang Baichao, Gan Jianghua, Liu Jianpeng, Qiao Haiqiang(40)

A Design of AFCS Testing System.....Zhou Zhangyong, Wang Weiguo, Zhang Ning, Hu Wei(45)

Object Detection Based on Improved Gaussian Mixture Model and Shadow Removal.....

.....Wang Lin, He Meng(50)

Wearable Device Signal Frequency Measurement Based on Sensor Technology.....

.....Cheng Xiaofang(54)

Design of a High-Speed Multi-channel Spacecraft Universal Testing System Based on LabVIEW.....

.....Gao Yanchao, Liang Ke, Yi Deying(59)

## ● Control Technology ●

Finite-time  $H_\infty$  Control of Time-delayed Jumping Systems with Partial Unknown Transition Probabilities

.....Xiong Wei, Gu De, Liu Fei(63)

Design and Development of Loading-and Unloading-Manipulator Universal Control System.....

.....Wu Xiang, Lin Jianbo, Dong Hui, Yu Li(70)

Design of Hysteretic Dynamic Automatic Control System for Vibration Isolator Based on Dynamic Matrix.....Zhang Lujia(74)

Adaptive Control Method of Manipulators Based on RBF Neural Network.....

.....Cheng Linyun, Zhang Lei, Song Xiaona(79)

Design and Implementation of Attitude Control Algorithm for Leveling Machines Based on Fuzzy PID...

.....Cao Jinghao, Huang Huan, Zhang Shuai, Zhou Yingwen(85)

Control Technology of Interactive Machine Translation Platform Based on RNN Encoder.....

.....Bai Ruifang(89)

## ● Military Equipment Technology in Measurement and Control ●

Research on Hybrid Scheduling Control Method for Weapon Equipment Based on High Performance Parallel Computing.....Pang Ayuan, Liu Yazhou(93)

Design of Fault Diagnosis System for Heat Pipe Cooling of Radar T/R Module Based on Adaptive LS-SVM.....Guoqiu Wu(97)

## ● Test Software Engineering ●

Design of Audio Play Software Based on SiriusXM Satellite Broadcasting Service.....

.....Zou Shanhua, Fang Ningsheng, Feng Xiaoxiang(101)

Civil Airborne Software Static Testing Method Based on LDRA Testbed.....	Zhou Pei(107)
Design of UCAM Strain Gauge Measuring and Controlling Software Based on VB.....	Pan Qiongwen, Huang Jinhao(111)
Design of the Autonomous Logistics Life Management Software for Aircraft.....	Zhang Liye, Cai Feihua, Chu Houbin, Jiang Yue, Dai Jing(115)

### ● Design and Application ●

Research and Application of GM(1, 1) Improved Model in Smart Water.....	Zhang Yihang, Qian Xiaoqun, Peng Hongyu(119)
Radio Telescope Tracking System Design Based on STM32.....	Chen Jiankang, Wang Xinjun(124)
Research on Distributed Web Crawler without Login for Microblog.....	Wang Lin, Liu Xingchen(128)
Research and Design of Image Acquisition and Processing System for Embedded Track Detection Vehicle Based on OpenCV.....	Zhang Wenbai, Chai Xiaodong, Ye Bing, Peng Lele(132)
Polynomial and Statistical Algorithm of Bias Estimation for Ship Sensor.....	Zhang Bowen, Zhang Xin, Fei Jie, Zhu Ning, Yan Ruichao(137)
A Study on Store Positioning Technology through Customers' WiFi Location Based on XGBoost.....	Lu Yifan, Liu Wei, Ye Futian(141)
Research on Optimization of Defogging and Clustering Algorithm Based on Dark Channel.....	Zhang Xin, Chen Huyue, Zhai Chao, Zhang Junpeng, Xu Bin(146)
Wireless Transmission of Vehicle Data and Its Head Up Display Design.....	Wu Jinyang, Yao Yuan, Yang Gang, Zhou Xingshe(150)
Design and Realization of Equipment Virtual Maintenance Training System.....	Luo Yidan, Wang Nansong(155)
Video Flame Detection Method Based on Target Tracking and Deep Learning.....	Geng Mengya, Zhang Guoping, Xu Hongbo, Zhang Yingying(159)
Study of 1553B bus RT Communication Technology Based on DSP and HI-6121.....	Zhang Peng, Miao Jinling(164)
Optimization Design and Implementation of Video Surveillance Encryption System Based on HLS Protocol.....	Wang Lin, Shi Tao(169)
Research on Multi-objective Optimization Management Problem of Wind Power, Photovoltaic and Thermal Based on Solar Charging Station.....	Xing Yuhua, Liu Xing, Cheng Shaoqian(174)
Modeling and Current Tracking Numerical Simulation of Single-phase Photovoltaic Micro-grid Inverter.....	Luo Dan, Liao Zhixian, Huang Guoxian, Wei Duqu, Jiang Pinqun(180)
Design of Intelligent Parking Garage Scheduling System Based on AGV.....	Zhang Dandan, Zhang Zhilong, Gu Jinmao(184)
Design of Vehicle Active Collision Warning System with Wireless Communication.....	Zhou Qizhi, Tao Shuowen(190)
Application of Improved KCF Algorithm in Vehicle Tracking.....	Wang Lin, Xu Zhongnan(195)
Dorsal Hand Vein Recognition Method Based on Optimal Focus Point.....	Wang Yiding, Zhao Chenshuang(200)
Preliminary Study on Police Unmanned Aircraft System and Low-altitude Safety Precaution.....	Pang Feng, Feng Dengchao(205)
SAE J1939 Based Intelligent Terminal System Design for Commercial Vehicles.....	Dong Xiaohui, Hu Jingbo, Huang Hao, Hu Yongming, Gu Haoshuang(209)
Design and Verification for Simulation Platform of Onboard Maintenance.....	Zou Huirong, Lv Zhenbang, Shen Xingang(214)
Research on Location Algorithms for Rail Transit Based on UWB.....	Zhu Wengang, Chang Haitao, Bo Yunlan, Jiang Yichen, Liu Zhiguo(218)
Application of Lifting Wavelet Improved Threshold Algorithm in Noise Reduction Processing of Gas Pipeline Leakage Signal.....	Gao Jianfeng, Zhou Shaotong, He Xiaodong(223)
Design of Medical Image Virtual Simulation Training Platform Based on MNSS.....	Sun Qian, Hu Junfeng, Shi Wenyu, Xiao Xuewen, Wu Xiang(227)
Performance Analysis of Semantic Segmentation Method Based on Deep Learning in Remote Sensing Image Segmentation.....	Wang Junqiang, Li Jiansheng, Ding Bo, Cai Fu(231)
Virtual Network Embedding Based on Topology-aware Node Sorting.....	Ma Yu(236)
Application of Human Body Posture Recognition Algorithm in Visual Human-Computer Interaction.....	Tang Biao, Fan Qiqun, Sun Kaixin, Lu Shi, Wan Meilin(242)
Multi-task Deep Network Expression Recognition Based on Pre-training of Natural Emotional Data Sets.....	Peng Xianlin, Zhang Haixi, Hu Qiyao, Wen Chao(248)
Design and Application of Battery Parallel Isolation Manager in Communication Room.....	Zhang Yu, Chen Hao(253)
Edge Detection Based on Morphological Filtering Combined with LOG Algorithm.....	Huang Yulei(257)

### ● Test & Evaluation Technology ●

Research on Driving Safety Evaluation Technology Based on Fuzzy Comprehensive Evaluation.....	Xu Zhiqi, Yao Yuan, Zhou Xingshe, Yang Gang(261)
Considering of Flight Test Engineering Big Data Governance.....	Dang Huaiyi(266)
Evaluation Method Research Based on Analytic Hierarchy Process to Synthetical Support System of Combined Adjustment.....	Feng Nan, Yi Li(270)
Fault Evaluation Method of Aircraft Control System Based on Flight Data.....	Wu Zhentao, Li Xueren, Du Jun, Ding Chao(275)

### ● Intelligent Instruments and Sensing Technology ●

The Design of a Reading Acuity Test Instrument Based on Bluetooth Communication.....	Chen Longxiang, Qiu Feiyue, Fu Pan, Ye Sixian(280)
--	--