



微信公众号

主管单位:天津中环电子信息集团有限公司

主办单位:天津工业自动化仪表研究所有限公司  
天津市自动化学会

编辑出版:《自动化与仪表》编辑部

主 编:张昊

副 主 编:陈兵

责任编辑:朱琳 马丽亚

广告、发行联系:刘凯 斯久莉

网站管理:李迎

编辑部电话:(022)23015608

广告部电话:(022)23016582 23015623

传真:(022)23015614

地址:天津市河西区环湖中道9号

邮编:300060

电子邮箱:zdhyyb@vip.sina.com

网址:www.zdhyyb.com

www.zdhyyb.cn

www.zdhyb.com

微信公众号:zdhybw

#### ——公开发行——

国际标准刊号:ISSN 1001-9944

国内统一刊号:CN 12-1148/TP

国内发行:中国邮政集团有限公司

天津市分公司

国内订阅:全国各地邮局

邮发代号:6-20

国外发行:中国国际图书贸易集团

有限公司(北京399信箱)

国外代号:MO4145

印 刷:天津中铁物资印业有限公司

国内定价:12.00元/期

出版日期:每月25日

## 目 次

### 专题研究与综述

基于深度学习的雷电预警算法 ..... 沈岳峰, 刘冬, 刘银锋, 等(1)

基于虚拟仪器的港口高压岸电变频电源检测系统 ..... 康仲飞(8)

基于核主成分分析的电力变压器故障自动化检修技术 ..... 张嗣铂(14)

无线传感器网络攻击技术分析 ..... 陆浩维, 姜文淇, 李中伟, 等(19)

基于改进麻雀算法的区域综合能源系统优化研究 ..... 丁娅鑫, 熊军华(24)

### 控制系统与智能制造

基于数据驱动的偏航偏差辨识及控制优化 ..... 刘栋, 王景丹, 卢晓光(30)

基于 Moldflow 与 GA-BP 的汽车杯托注塑成型工艺优化

..... 程效锋, 宋崇智, 盛夕军(35)

### 人工智能与机器人

基于混合搜索蜂群算法的机器人轨迹规划 ..... 姚江云, 吴方圆(40)

基于工业互联网平台的工业机器人系统安全问题研究

..... 李梦玮, 巍潇, 赵郑斌, 等(44)

煤矿挂轨式巡检机器人爬坡助力装置 ..... 张海峰(48)

### 检测技术与数据处理

改进 U-Net 算法的路面裂缝检测研究 ..... 史梦圆, 高俊叙(52)

车速表检验台转速在线检测系统的设计 ..... 姚素娜(56)

基于改进 YOLOv4-tiny 的焊点检测方法 ..... 刘毅, 江卫华, 王浩(61)

### 仪表与自动化装置

基于色标传感器的膜式燃气表自动检定系统设计

..... 卢其伦, 张圆明, 霍潇潇, 等(68)

开尔文探针力显微镜非线性电学反馈系统设计

..... 李新宇, 胡晓东, 徐临燕, 等(72)

### 现场总线与控制网络

基于 CAN 总线的商用车智能信号模拟器设计 ..... 陈浩(77)

基于无线传感器网络的校园绿植灌溉系统设计

..... 景洪昌, 汪玲彦, 詹汉彬, 等(82)

### 创新与实践

机车内燃机试验站能量回收系统的研究 ..... 芦昊, 李建盛, 孙林(87)

本质安全电路中的热点燃 ..... 袁港, 郭志佳, 蒋立军(93)

基于嵌入式 Linux 的矿用多协议网关设计与应用 ..... 张先锋(97)

DCS 系统在 VVER1200 堆型中的设计优化改进 ..... 马程耀(101)

期刊基本参数:CN 12-1148/TP \* 1981 \* m \* A4 \* 112 \* zh \* P \* ¥12.00 \* 10000 \* 21 \* 2022-10



微信公众号

# AUTOMATION & INSTRUMENTATION

(Monthly since 1981)

Vol.37 No.10

(Sum 295)

Publishing date: 2022-10

## CONTENTS

### Thematic Studies and Reviews

- Lightning Warning Algorithms Based on Deep Learning ..... SHEN Yue-feng, LIU Dong, LIU Yin-feng, et al (1)  
 Detection System of Port High Voltage Shore Power Frequency Conversion Power Supply Based on Virtual Instrument ..... KANG Zhong-fei (8)  
 Automatic Maintenance Technology of Power Transformer Fault Based on Nuclear Principal Component Analysis ..... ZHANG Si-bo (14)  
 Analysis of Wireless Sensor Networks Attack Technique ..... LU Hao-wei, JIANG Wen-qi, LI Zhong-wei, et al (19)  
 Research on Regional Integrated Energy System Optimization Based on Improved Sparrow Algorithm ..... DING Ya-xin, XIONG Jun-hua (24)

### Control System and Intelligent Manufacturing

- Data-driven Yaw Bias Identification and Control Optimization ..... LIU Dong, WANG Jing-dan, LU Xiao-guang (30)  
 Optimization of Car Cup Holder Injection Molding Process Based on Moldflow and GA-BP ..... CHENG Xiao-feng, SONG Chong-zhi, SHENG Xi-jun (35)
- Artificial Intelligence and Robotics**
- Robot Trajectory Planning Based on Hybrid Search Bee Colony Algorithm ..... YAO Jiang-yun, WU Fang-yuan (40)  
 Research on Safety of Industrial Robot System Based on Industrial Internet Platform ..... LI Meng-wei, GONG Xiao, ZHAO Zheng-bin, et al (44)  
 Climbing Power Device of Rail Hanging Inspection Robot in Coal Mine ..... ZHANG Hai-feng (48)

### Measurement and Data Processing

- Research on Pavement Crack Detection Based on Improved U-Net Algorithm ..... SHI Meng-yuan, GAO Jun-chai (52)  
 Design of On-line Rotating Speed Detection System for Speedometer Inspection Table ..... YAO Su-na (56)  
 Solder Joints Detection Method Based on Improved YOLOv4-tiny ..... LIU Yi, JIANG Wei-hua, WANG Hao (61)

### Instrumentation and Automation Devices

- Design of Automatic Verification System for Diaphragm Gas Meter Based on Color Code Sensor ..... LU Qi-lun, ZHANG Yuan-ming, HUO Xiao-xiao, et al (68)  
 Design of Nonlinear Electrical Feedback System of Kelvin Probe Force Microscope ..... LI Xin-yu, HU Xiao-dong, XU Lin-yan, et al (72)

### Fieldbus and Control Network

- Design of Intelligent Signal Simulator for Commercial Vehicle Based on CAN Bus ..... CHEN Hao (77)  
 Design of Campus Green Plant Irrigation System Based on Wireless Sensor Network ..... JIANG Hong-chang, WANG Ling-yan, ZHAN Han-bin, et al (82)

### Innovation and Practice

- Research on Energy Recovery System of Locomotive Internal Combustion Engine Test Station ..... LU Hao, LI Jian-sheng, SUN Lin (87)  
 Thermal Ignition in Intrinsically Safe Circuits ..... YUAN Gang, GUO Zhi-jia, JIANG Li-jun (93)  
 Design and Application of Mine Multi Protocol Gateway Based on Embedded Linux ..... ZHANG Xian-feng (97)  
 Design Optimization and Improvement of DCS System in VVER1200 Reactor ..... MA Cheng-yao (101)

### Sponsored by:

Tianjin Institute for Process Automation and Instrumentation Co., Ltd.

Tianjin Society of Automation

### Edited by:

The Editorial Office of Automation & Instrumentation

**Chief editor:** ZHANG Hao

**Vice chief editor:** CHEN Bing

**Editor:** ZHU Lin MA Li-ya

**Ad-contactman:** LIU Kai SI Jiu-li

**Network administrator:** LI Ying

### Editorial department phone:

(86 22) 23015608

### Ad department phone:

(86 22) 23016582 23015623

**Fax:** (86 22) 23015614

**Address:** 9 Huanzhongdiao, Hexi District, Tianjin, China

**Post code:** 300060

**E-mail:** zdhyb@vip.sina.com

**http://** www.zdhyb.com

www.zdhyb.cn

www.zdhyb.com

**WeChat official account:** zdhybw

### Distributed in China and abroad

#### Publishing number:

ISSN 1001-9944

CN 12-1148/TP

#### Ad-licence:

Business No. 1201034000061

#### Distributed in China by:

Tianjin Newspaper and Magazine Publishing Bureau

#### Subscribing place:

All the post offices in China

#### Distributed abroad by:

China International Book Trade Co., Ltd.  
 (P.O.Box 399, Beijing, China)

#### Post distributing number:

domestic: 6-20 abroad: M04145

#### Printed by:

Tianjin Zhong-Tie Printing Co., Ltd.

**Price:** 12.00 (US\$) (Foreign)

**Publication date:** 25th of each month