

2025 8th International Conference on Intelligent Robotics and Control Engineering (IRCE 2025)

**Kunming, China
18-21 August 2025**



**IEEE Catalog Number: CFP25Q44-POD
ISBN: 979-8-3503-5711-0**

**Copyright © 2025 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP25Q44-POD
ISBN (Print-On-Demand):	979-8-3503-5711-0
ISBN (Online):	979-8-3503-5710-3
ISSN:	2770-4823

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2025 the 8th International Conference on Intelligent Robotics and Control Engineering

(IRCE 2025)

Table of Contents

Preface	ix
Conference Committees	x
<hr/> <hr/>	
◆ Robot Multimodal Motion Control and Dynamic Task Allocation	
Double Q-leaning Based of Three-Dimensional Swarm Control in Hybrid Aerial-Ground Robots	1
<i>Tianyi Wang, Shouxing Tang, Yibo Zhang, Wei Fan</i>	
Robust Feedback Control of 7-DoF Robotic Arm Systems Based on Input Delay ESO.....	8
<i>Shenqing Ding, Jian Hu, Jianyong Yao, Xiaoli Zhao, Guoqing Zhong, Yibiao Chen</i>	
Congestion Mitigation for Foraging Robot Swarms Using Spiral Path Strategies.....	14
<i>Arturo Gonzalez, Qi Lu</i>	
Reliable Non-singularity Fixed Time Sliding Mode Control For An Uncertain Robotic Manipulator	20
<i>Van Phuong Pham, Van Tinh Nguyen</i>	
Pipeline crawling robot based on RRT algorithm and PID control	25
<i>Yiming Zhang, Zixuan Shao, Yuyang Liu</i>	
Evolving Adaptive Foraging Robot Swarms with NEAT in Environments with Obstacles	33
<i>Tameem Uz Zaman, Pigar Biteng, Qi Lu</i>	
Fixed-Time ESO-Enhanced MPC Scheme for Kinematically Disturbed Wheeled Mobile Robots	39
<i>Yuhang Sun, Qun Lu, Zili Zhang, Jian Chen, Youyou Xu</i>	
Forecast-Driven MPC for Decentralized Multi-Robot Collision Avoidance.....	44
<i>Hadush Hailu, Bruk Gebregziabher, Prudhvi Raj</i>	
RF power harvesting and communication system for microrobots	52
<i>Daniel Álvarez Carreño, Deepu John, Barry Cardiff</i>	
Sensorless Variable Impedance Control Using a Prescribed-Time Equivalent-Input-Disturbance Method for Robotic Manipulators.....	58
<i>Yu Jia, Junkang Wang, Linglu Chu, Lei Li, Qun Lu, Xiang Wu</i>	
Hybrid Impedance-Iterative Learning Control for Rehabilitation Lower Limb Exoskeleton Robot.....	64
<i>Alrawda Alsaied, Jiashuai Wang, Ke Li</i>	

◆ **Structural Analysis and Intelligent Collaborative Control of Engineering Robots**

Control of a Non-Holonomic Marine Robot for Isoline Tracking in an Unknown Environmental Field..... 69
A. A. Ermolaev, A. M. Popov, A. S. Matveev, A. A. Kapitonov

Data-driven Sliding Mode Control of a Parallel 2D-Robot 75
Sanam Hajipour, Tianyu Zhai, Dieter Bestle

Hybrid force-pose PD control of DR-CDPRs based on the cable speed 81
Xin Zhang, Jingli Du, Yetong Shi, Kaiqing Du

Geometric Parameter Calibration of Industrial Robots Based on Grey Wolf Optimization Algorithm..... 88
Bingzhang Cao, Lei Wang, Peijun Liu, Yifan Zhang, Yi Zhang, Jiuwei Yu

Simultaneous Localization and Mapping Aimed to Indoor Environment by Means Of 4D Millimeter Wave Radar for Firefighting Mobile Robot..... 94
Ziyou Wang, Hongliang Chen, Chunhui Sun, Wanren Hua

LLM-Based Heuristic Task Planning for Robotic Arm Proximity Operations with Non-Cooperative Spacecraft 100
Yifeng Jin, Wenchao Huang, Chaonan Yang, Yanyan Wu, Jianjun Yi

Perceiving Cabin Service Robots: The Impact of Passengers' Sense of Power Across GODSPEED and NARS Dimensions 106
Junyi Shen

The Design of Control System for Flame Wire Spraying Robot 113
Chengjie Zheng, Yuanli Kong, Rong Zhou, Xinhong Xie

Adaptive Repetitive Learning Control for Lower-Limb Rehabilitation Exoskeleton Robots 118
Chunjie Xiao, Qiang Chen, Huihui Shi, Guanbin Gao

◆ **AI-driven Unmanned Intelligent Control Technology and Optimization Algorithms**

Algorithm of Protective System Configuration Optimization to UAV Attacks on GA-BP Neural Network..... 124
Haipeng Pu, Lei Xiong, Jinze Wang, Xiong Yi

An Enhanced Spatial-aware MOPSO Algorithm for Heterogeneous Multi-UAV Area Search Task Allocation..... 131
Haoxuan Cheng, Chunlei Han, Hao Pan, Jianjun Sun, Weixin Han, Qin Liu

Deterministic Policy Gradient for Optimizing UAV Trajectories: A Comparative Reward Function Study 137
Shanbin Li, Kamran Khan

Connectivity Preservation Oriented Collision Avoidance Control for UAV Swarms in Obstacle Environments..... 143
Jiaxin Li, Peng Yi, Zhen Zhang, Hailin Li, Yanzhao Gao

Adaptive Disturbance Observer-Based Fractional-Order Fault-Tolerant Control of X-Tail UAV with Control Surface Dynamics 149
Xiang Cheng, Ziquan Yu, Hao Yang, Xiaozhi Liu

◆ **Unmanned Perception Systems and Control Algorithms**

Research on improving steering sensitivity using steer by wire systems 155
Wentao Ma, Kashima Sota, Jian-Ming Yang

Toward a Holistic Multi-Criteria Trajectory Evaluation Framework for Autonomous Driving in Mixed Traffic Environment	161
<i>Nouhed Naidja, Stéphane Font, Marc Revilloud, Guillaume Sandou</i>	
Enhanced Autonomous Vehicle Localization via A Priori Maps	171
<i>Mohamed Anis Ghaoui, Imeen Ben Salah, Maryem Fadili, Steve Pechberti</i>	
Variable Step Trajectory Prediction for Human-Robot Handover	179
<i>Chengao Jiang, Yukui Zhang, Zhitao Gao, Chen Chen, Fangyu Peng, Xiaowei Tang, Rong Yan</i>	
Multi-LiDAR-Inertial SLAM with Temporally-Coherent Online Calibration	186
<i>Liansheng Wang, Xinke Zhang, Hangbo Ye, Chaojie Wang, Yihan Pan, Jianjun Yi</i>	
Research on high-speed tire blowout stability control based on MPC	192
<i>Dongsheng Yang, Benwei Gang, Wenbo Liu, Chaosheng Huang, Jun Li</i>	
A Deep Reinforcement Learning-Based Tracking Method for Monitoring Tasks with Improved Obstacle Avoidance and Training Strategy	200
<i>Nan Li, Kun Yang, Chen Chen</i>	
PLC Control System Design Based on Sparrow Search Algorithm	208
<i>Jiuqin Zhang</i>	
Fault Detection Method for Multi-Agent Systems Based on Finite Frequency Set Estimation	213
<i>Feihan Wu, Caoyuan Gu, Zehua Ye, Baokang Zhang</i>	
◆ Modern Mechatronic Systems and Intelligent Control Technology	
Research on multi-engine synchronization control strategy of distributed electric propulsion aircraft	219
<i>Junjiang Sha, Dong Cao, Yuyang Qin</i>	
Dynamic Event-triggered H_∞ Control for Markovian Jump Systems with Mode-dependent Time Delays.....	227
<i>Hui Zhao, Yazhe Liu</i>	
Non-Singular Fast Terminal Sliding Mode Control of PMSM Based on Online Parameter Identification Using Variable Step-Size Adaline Neural Network.....	232
<i>Pu Cheng, Xin Hu, Zewen Pan, Yongzhen Zhang, Qing Yang, Tengyao Jiang</i>	
Low-harmonic Feedrate Planning Algorithm Using Trajectory Pattern Method for High-speed and High-Precision Machinery.....	239
<i>Hao Li, Baosheng Wang, Zhuwen Yan</i>	
Intelligent Control Method for Aero-engine Based on NMPC and DDPG	247
<i>Lijun Liu, Zhuyuan Yan, Rong Lu, Chunhui Zhu, Lifeng Cui</i>	
Disturbance Rejection Control of PMSM Based on Fully Actuated System Approach	253
<i>Yu-Meng Shi, Yao-Wei Wang, Cao-Yuan Gu, Qi Wu</i>	

◆ **Advanced Intelligent Control Systems and Measurement Technologies**

A Unified Variable Impedance Control Framework Integrating Compliant Motion and Constant Force Regulation259
Yukui Zhang, Zhitao Gao, Fangyu Peng, Chen Chen, Chengao Jiang, Siheng Zhou, Rong Yan, Xiaowei Tang

Residual Compensation of the Articulated Arm Coordinate Measuring Machine based on Extreme Learning Machine Optimized by Sparrow Search Algorithm..... 264
Xintao Wu, Guanbin Gao, Fei Liu

Dynamic Event-Triggered Semi-Global Consensus for Linear Multi-Agent Systems with DoS Attack under Input Saturation.....270
Yang Cao, Tao Yu, Xin Gong, Dongdong Yue, Jiafeng Yu

Research on a Dual-Branch Feature Fusion Method for Rolling Bearing Fault Diagnosis Based on SENet-SwinT 276
Mingfan Jiang, Zhuorui Li, Jun Ma

Deep Learning-Based Self-Updating Modeling Approach for Electro-Hydrostatic Actuators..... 283
Chengjie Han, Sumu Shi, Jiangnan Ji, Cong Peng

MC Graph: A graph neural network for mining potential relationships in industrial soft sensing 289
Yi Deng, Ke Jiang

Process Monitoring Based on Incremental Independent Component Analysis 295
Ganping Li, Jiahao Kang

Bearing Remaining Life Prediction Based on CNN-Bi-LSTM and Adversarial Domain Adaptation..... 300
Ziyun Nie, Zhuorui Li, Jun Ma

◆ **Power Machinery and System Control Models**

Noise analysis of YB48B feeding transmission gearbox based on Romax 306
Xi Jiang, Qingna Duan, Bingtong Liu, Ruimei Liu, Yinglong Zhang, Yingming Ma

Study on daily optimal scheduling and economic operation of slurry transportation pumping station..... 312
Mao Li, Xin Xiong

ICFA-Backstepping Tracking Strategy Design and Experimental Validations for Multi-rope Quay Crane..... 319
Huapeng Zhang, Weidong Zhang, Wei Xie

Optimized scheduling of cascade pumping station operation in long-distance slurry transportation..... 325
Yixuan Liu, Xin Xiong

Data-Driven Modeling of Magnetic Bearing Rotor Systems Using LCTF-Net 332
Quanzhou Chen, Jinquan Yang, Yan Cheng, Lu Wang, Jiangnan Ji, Cong Peng

Prototypical Card Shuffling Machine Using Unified Convergence Analysis Methods..... 338
Phongchai Nilas

Research on Rolling Bearing Performance Degradation Assessment Method Based on DLMD-ED-VMD and Compensation Distance 343
Kai Guo, Xin Xiong, Jun Ma, Yao Zeng

Plate Division Method for Kinematics of Hybrid Mechanism	349
<i>Longfei Jia, Bohan Lv, Fan Yang, Junning Zhang, Zhiyuan Yu, Pengfei Li</i>	
◆ Machine Vision and Image Processing	
Micro-Expression Recognition Based on RoI Optical Flow Features	356
<i>Lijun Zhang, Yizhong Xin, Linge Shen</i>	
A directional sound delivery system based on active visual tracking	362
<i>Guiyuan Peng, Shiquan Luo, Shuangjiang Huang, Lihui Wang</i>	
A Domain-Regularized and Boundary-Aware Fine-Tuned SAM-Med3D Network for Non-Small Cell Lung Cancer Segmentation in CT Images.....	369
<i>Anping Dong, Bin Li</i>	
Application of Machine Vision for Automated Weeding and Thinning in Broadcast-Grown Vegetables	376
<i>Jyh-Cheng Yu, Hsueh-Yen Min, Chih-Pin Huang, Chih-En Lin</i>	
Research on Adaptive Projection Display Method for Three-dimensional Information.....	382
<i>ChaoYang Zhang, ShengNan Zheng, Shuangjiang Huang, Lihui Wang</i>	
Evaluation of an Uncertainty-Aware Late Fusion Algorithm for Multi-Source Bird's Eye View Detections Under Controlled Noise.....	387
<i>Maryem Fadili, Louis Lecrosnier, Steve Pechberti, Redouane Khemmar</i>	
Multimodal Recognition Network for Finger Based on Perception Optimization and Axial Enhancement	397
<i>Liqing Chen, Hui Ma</i>	
Rock–Paper–Scissors Recognition with a Retroreflection-Based Floating Display for Human–Computer Interaction	403
<i>Jiayu Wang, Jinzhi Zhou, Shuangjiang Huang, Lihui Wang</i>	
Channel-Wise Dual Branch Learning and Mixed Attention Mechanism for Underwater Image Enhancement	410
<i>Guangqi Xu, Xian Wang, Zheng Cui, Xueyan Li, Shubo Wang, Guotao Jia</i>	
De-Conformer: integrated CNN and ViT feature fusion for image dehazing.....	417
<i>Lijun Zhang, Yizhong Xin, Ming Ren</i>	
Cascaded YOLO-LLM-CLIP Model for Robust Multimodal Retrieval in Intelligent Lost & Found System	423
<i>Cunyao Zong, Zezhong Li, Shu Chen</i>	
Real-Time Motion Tracking and Analysis of Kendo Based on High-speed Cameras	428
<i>Xu Gui, Lihui Wang, Shuangjiang Huang, Ganfeng Yang, Qiongyao Wang, Chunhui Zhou</i>	
◆ AI-based Complex System Data Analysis and Control Technology	
Improved Gaussian Process Regression Based on Wild Horse Optimizer for Joint Angles Prediction of Lower Limb Exoskeleton	436
<i>Haisheng Ji, Guanbin Gao, Linzhen Zhong, Jing Na</i>	
Effective Reinforcement Learning with Smooth Policy Update and Informative State Action Representation.....	442
<i>Mohammad Mohammadi, Huilin Wang, Rongdun Lin, Wenjun Huang, Yidong Chen, Yunduan Cui</i>	

Distributed Constrained Optimization for Linear Heterogeneous Multi-Agent Systems Subject to False Data Injection Attacks.....	449
<i>Yanping Yang, Yuxin Xiong</i>	
Analysis of Large Industrial Load Bounce Characteristics and Optimal Scheduling Research Based on Distributed Robust Optimization.....	455
<i>Yilin Jia, Huan He, Lei Gao, Rui Hao, Zhiming Pan, Zhiwei Li, Yue Wang</i>	
A Novel Impedance Control Framework with Soft Tissues Viscoelastic Parameters Identification for Ultrasonography	461
<i>Yong Hong, Zezheng Wang, Chen Chen, Yu Wang, Fangyu Peng, Xiaowei Tang, Rong Yan</i>	
A Relation-Aware Framework for Continual Few-Shot Knowledge Graph Completion	468
<i>Chunting Zou, Yushan Zhang, Gen Chen</i>	
Research on Cloud Edge Collaborative Algorithm for Electricity Safety Inspection Based on Multidimensional Cost Planning.....	477
<i>Yongqi Liang, Baigen Wang, Ou Wang, Qian Zhao, Huizhou Liu, Rongheng Lin</i>	
Multi-Agent Path Planning and Optimization using Q-learning	486
<i>Chirag Rudresh, Maryam Khazaei</i>	
Design and Simulation of MOOS-IvP Integration as High-Level Framework on a ROS-Based Hybrid Autonomous Underwater Glider (HAUG)	496
<i>Muhammad Hanif Hibatullah, Bambang Riyanto Trilaksono, Egi Muhammad Idris Hidayat, Simon Siregar, Yansha Ramadhan Pratama, Yansen Dwiputra</i>	

◆ **Author Index**