

# **2024 12th RSI International Conference on Robotics and Mechatronics (ICRoM 2024)**

**Tehran, Iran  
17-19 December 2024**



**IEEE Catalog Number: CFP24RSI-POD  
ISBN: 979-8-3315-2974-1**

**Copyright © 2024 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:	CFP24RSI-POD
ISBN (Print-On-Demand):	979-8-3315-2974-1
ISBN (Online):	979-8-3315-2973-4
ISSN:	2377-679X

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

Title	Page NO.
Machine Learning based Multiple Impedance Control of a Space Free-Flying Robot	1
Development of a Lower Limb Gait Asymmetry Index with Cyclogram Analysis Using Image Processing	8
Stochastic Path Planning in Partially Observable Environments via Temporal-Difference Learning	14
Adaptive Neural Network-Based Control and Fault Detection for Soft Bending Pneumatic Actuators	20
Formation Control of Networked Autonomous Aerial Robots Subject to False Data Injection	28
Development and Experimental Evaluation of an Endoscopic Capsule Robot Equipped With a Fail-safe Biopsy Mechanism	34
A Machine Learning Approach for Visionless Determination of Safe Release Time in Robot to Human Object Handover	40
Distributed Observer Design for Tracking Platoon of Connected and Autonomous Vehicles	45
Fully Distributed and Quantized Algorithm for MPC-based Autonomous Vehicle Platooning Optimization	51
Modular Design of a Fused Deposition Modelling Based Device for Constructing Structures on Mars	57
Generating Optimized and Smooth Path for Two-Body Vehicle Reverse Motion: Initial Guess for NMPC Solver	63
Decentralized Mobile Target Tracking Using Consensus-Based Estimation with Nearly-Constant-Velocity Modeling	70
Contact Force Estimation and Control in Soft Fin-Ray Grippers Using FEM and Experimental Approach	76
Development of a Cost-Effective Flex Sensor-Controlled Robotic Hand with Independent Finger Control	83
New Approach to EV Battery Thermal Management, using Ionocaloric Cooling Effect	89
Novel Design of Helical Storage and Planting Mechanism for Coral Reef Restoration Using Opto-Acoustic and Image Processing Methods	95
All-terrain System for Underground Cable Installation using Multi-modal Sensing and Adaptive Drilling	101
Design, Fabrication, and Control of a Soft Robotic Wrist Sleeve for Wrist Rehabilitation	107
GA-Based Optimization of Control Strategies for a 3R Nonplanar Robotic Manipulator	113
Modeling of Gaze Behavior in Children Using Deep Neural Network and Robot Implementation	119
Enhanced Optimal Control of a Magnetically Actuated Capsule Endoscope Using Electromagnetic Coils Considering Small Intestine Dynamics	125
Sim-to-Real Deep Q-Learning with Human-Aided Demonstrations for Vision-Based Precision Landing of Multirotors	131
Novel Autonomous Tennis Ball Shooter Robot: Design And Mechanical Analysis	137
Design and Experimental Evaluation of an Adaptive Landing Gear Mechanism for Safe UAV Landings on Inclined Surfaces	143
Path Planning and Obstacle Avoidance of a Climbing Robot Subsystem Using Q-learning	149

Title	Page NO.
Customized Biomimetic Tendon Pulley in Cable-Driven Robots: A Parametric Approach	156
Waypoint Generation based on Crop Row Detection Using Unet and Hough Transform	161
Motion Planning of a Rehabilitation Robotic Arm using Brain data & Deep Learning	167
Data-Driven SOH Early Prediction of Lithium-ion Batteries	173
Automated Sewer Pipe Defect Classification Using Inspection Robot Imagery and Deep Neural Network	181
Intelligent Filament Production: Real-Time Control and Optimization of Recycled Plastic Extrusion for 3D Printable Filaments	187
A Novel Bio-Intelligent Real-Time Redundancy Resolution Method for Cable-Driven Parallel Manipulators	193
Hybrid Control of Advanced Quadruped Locomotion: Integrating Model Predictive Control with Deep Reinforcement Learning	201
Utilizing a Solar Pond and Earthenware Water Tank in Wood Drying with a Smart Solar Kiln	209
Virtual Reality Music-based Game as a Co-Tool to Diagnose Autism in Young Children	214
Stabilization of Nonlinear Multiple Time Scale Systems by Nonlinear Control Based on Cyclic-Small-Gain Theorem	220
Control and Simulation of Autonomous Navigation of a Self-Balancing Robot	226
Manufacturing and Simulation of a Tracked Mobile Robot for Harsh Terrain and High-Impact Conditions	233
Robot Finger Detection and Joint Angles Estimation Using DeepLabCut	240
Using VR in Adaptive Teaching the Optimal Use of Water and Energy to Children	244
Human Force Observer Design for Adaptive Robust Control of a Haptic Simulation System	250
Identification of Nonlinear Air-Bearing System Using Particle Swarm Optimization Technique	256
Adaptive Control of a Transtibial Prosthesis via Metaheuristic Optimization of a PD Controller	262
Classifying Car Crash Types to Enhance Airbag Performance: A Machine Learning Approach	269
Robust Adaptive Sliding Mode Control of Virtual Tool-tissue Interaction for Use in Surgery Simulation	275
Control of Bilateral Teleoperation Systems with Observer-based Detection of Data Injection Attack	281
A Deep Reinforcement Learning Method for Multi-Load AGVs Scheduling with Task Priority	288
Bio-Inspired Quadruped Robots: Autonomous Navigation In Dynamic Environments	294
Comparison of Three Nonlinear Control Methods for a Permanent Magnet Stepper Motor	300
Objective Assessment of Navigation Trajectory in Walking Corsi Test Using Pose Estimation Algorithms	307

Title	Page NO.
Intelligent Gait Mode Detection in Wearable Robots	313
Optimizing the Integration of Inertial Navigation Systems and Air Data for Enhanced Vertical Channel Stability in Autonomous Ground Vehicles	319
Design and Fabrication of a Microinjector to Conduct Columnar Injection of Stem Cells for Treating Parkinson's Patients	325
A Centralized Adaptive Neuro-Fuzzy Controller for Multi-Lateral Telerehabilitation Systems	331
Back-stepping Prescribed-Time Sliding Mode Control of a Quadrotor UAV	338
PPO and SAC Reinforcement Learning Based Reference Compensation	344
Mobile Robot Navigation Using Twin Delayed Deep Deterministic Policy Gradient and Fuzzy Logic	351
Shape Estimation of Continuum Arms Based on Inverse Kinematics Data-Driven Modeling	356
Improved Probabilistic Roadmap Path Planning Algorithm	362
Finite Rigid Elements Based Modelling of a Soft Bending Actuator Considering Hysteresis Effect	368
Design and Implementation of a Two-Axis Position Control Mechanism with Experimental Data Analysis	376
3-Dimensional Path Planning and Movement Control of Red Blood Cell Immersed in Plasma Medium Among Moving Obstacles	382
Variational Autoencoders: Tackling Imbalanced Data Through Generative Modeling	388
Bridging Complexity and Interpretability: A Two-Phase Clustering Framework	394
Enhancing Human Motion Imitation in Humanoid Robots: A Comparative Study of ANN, ANFIS, and GA-Optimized ANFIS for Inverse Kinematics of the Surena-V Humanoid's Arm	400
Self-Updating LightGBM Clustering: A Hybrid Approach for Managing Data Intermittency, Noise, and Missing Values	406
Enhancing Microrobot Manipulation in MEMS-Devices Through Tailored Polydimethylsiloxane: Numerical and Experimental Analysis	413
AI-powered Framework for Cataract Surgery Video Optimization	419
Development and Integration of an Advanced GUI with Real-Time Data Logging for RCM-Based Robotic Surgery Devices	426
Path planning of mobile robot based on reinforcement learning to reach faster training	431
Machine Learning for Human-Robot Interaction using EMG Signals to Control the Grip Force	437
Development of A Two-Degree-of-Freedom Magnetic Levitation Laboratory Setup	443
Kinematic Control of a Mecanum Mobile Robot using Time-Varying Model Predictive Control	449
Robust Internal Model Control (IMC) for a Quadrotor with a Top-Mounted Manipulator	455
Design and Characterization of a Soft Rehabilitation Glove Structure to Optimize the Interaction Forces	461

Title	Page NO.
Dimensional Synthesis and Design of a Finger Exoskeleton for Rehabilitation	467
Adaptive Continuous Predictive Control of Wheeled Robots based on Extended State Observer	473
Passive Biped Gait Stabilization: From Proportional Control to Deep Reinforcement Learning	480
Real-Time Face-Tracking Control of a 4 DOF Manipulator Using Deep Learning Detection	486
Comparing the Performance of Quaternion, Rotation Matrix, and Euler Angles Based Attitude PID Controllers for Quadrotors	492
Deep learning methods for detecting and classifying brain hemorrhages with different preprocessing approaches	498
Modeling and Experimental Validation of a Tension Control System for Wire Winding Machines	505
Physics-Informed Deep Learning-Based Monocular Vision and IMU Fusion for Extracting Position and Heading Data of Multirotors	511
Employing Convolutional Neural Network for Real-time Detection and Localization of Physical Contact in a Redundant Manipulator Body	517
Consensus Sliding Mode Control for Multi-Agent Systems Considering Communication Delays and Uncertainties	523
Predicting Customer Behavior in Autonomous Retail Application: A Classification-Based Approach	529
Dynamic Analysis of a Quasi-serial Planar Manipulator with Spring and Counterweight Gravity Compensation Considering Joint Reaction Forces	537
Coverage Path Planning of Agricultural Spraying Drones with Graph Convolutional Network	543
Integrating Persian Lip Reading in Surena-V Humanoid Robot for Human-Robot Interaction	549
Dynamic Model-Free Reinforcement Learning Strategies for Achieving Nash Equilibrium in Graphical Games with Communication Challenges	555
Graph-Based Simultaneous Localization and Calibration for Planar Cable-Driven Parallel Robots	562
Motion Control of a Mini-quadcopter Using a Fuzzy-PD Controller	567
Control of Cable Driven Parallel Robots Through Deep Reinforcement Learning	573
DILP: Diverse Iranian License Plate Detection and Recognition Dataset	579
Hybrid Vision Transformer-Boosting Model for Skin Lesion Classification on SLICE-3D	586
Vibration-Reduction Mechanism Based on Layer Jamming for Hand Tremors in Parkinson's Patients	593
Dual-Stream Networks for Human Activity Recognition and Interaction With Surena-V Humanoid Robot	599
Static Modeling of a Soft Robotic Manipulator Using Neural Networks and Computer Vision Techniques	607
Reducing Hand Tremors Using Active Controller	613
Design of a Remote Controlled Puppet Robot Imitating a Manual Driven Puppet Using Deep Learning Pose Detection	619

Title	Page NO.
Arastronaut: An Open Source UWB/IMU Hardware and Software for Indoor Positioning	625
Control of Continuum Manipulators with Shape Constraints via Deep Reinforcement Learning	631
Control of a Biomimetic Robotic Finger Using Antagonistic Twisted and Coiled Polymer Actuators: Simulation and Experimental Validation	637
Gait Trajectory Prediction of Lower Limb Exoskeleton in Multiple Conditions Using a Convolutional Transformer Network and Contrastive Learning	643
Control of a Robotic System Undergoing Transition from Free Motion to Interaction with Soft Tissue	649
Path Following of a Tractor-Trailer System via Dynamic Extension in Forward and Backward Motion	657
Autonomous Rearrangement Planning Using Object Similarity Learning	663
Energy-Based Analytical Modeling of Pneumatic Network Actuators	672
Workspace Calculation of the 2(6-UPS) Hybrid Manipulator	678
Assist-As-Needed Control of Soft Ankle Orthosis for Walking in Patients with Foot Drop	684
An Innovative Interface Approach to Real-Time Control of the Phantom Omni Robot	690
Iterative Learning Control for Friction Compensation of a Lorentz Actuator for Periodic References	697
Kinematic and Kinetic Analysis of 3-RRS Parallel Manipulator	703
Enhancing Aerial Cinematography: Robust Visual-Inertial Tracking for Agile Subjects with Novel Data Integration	709
Sound Source Localization in a 3D Multi-Surface Environment Using Learning-Based Methods	717
Detection and Classification of Internal Leakage in Hydraulic Cylinders	725
Model-Free Dynamic Control of Five-bar Mechanism via Subchain Assembly and Reinforcement Learning	731
Monitoring of Four Vital Signs Using Video Processing Based on Machine and Deep Learning Approaches: A Review	738
Kinematic-Sensitivity Indices for Double Gough-Stewart Platform	745
Dynamic Modeling of Double Segment Redundant Gough-Stewart Hybrid Manipulator based on the Principle of Virtual Work	752