

2023 9th International Conference on Automation, Robotics and Applications (ICARA 2023)

**Abu Dhabi, United Arab Emirates
10 – 12 February 2023**



**IEEE Catalog Number: CFP2398E-POD
ISBN: 978-1-6654-8922-5**

**Copyright © 2023 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:	CFP2398E-POD
ISBN (Print-On-Demand):	978-1-6654-8922-5
ISBN (Online):	978-1-6654-8921-8
ISSN:	2767-7737

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

2023 9th International Conference on Automation, Robotics and Applications (ICARA 2023)

Table of Contents

Preface.....	ix
Conference Committee.....	x

✧ Robot Structure Design and System Analysis

A Model-Based Approach for Robotics Education with Emphasis on Embedded Systems	1
---	---

Roman Beneder, Patrick Schmitt, Clemens Környefalvy

Preoperative Personalized Vascular 3D Simulator of the Intelligent Robotic Ecosystem LevshAI for Endovascular Neurosurgery	6
--	---

Ivan Menshikov, Kirill Orlov, Vadim Berestov, Alexandra Bernadotte

Measurement Pose Optimization for Joint Offset Calibration with a Hand-Eye Camera	11
---	----

Xiaotian Zhang, Hiroki Goto, Shouhei Shirafuji, Keiji Okuhara, Noritaka Takamura, Naoya Kagawa, Hiroyasu Baba, Jun Ota

CART-II: Development of Collision Avoidance Robotic Tether with Soft Sensing Capabilities for Underwater Nuclear Inspection Vehicles	15
--	----

Ammar K. Al Mhdawi, Nick Wright, Simon Benson, Maryam Haroutunian

Towards Self-Configuring Plug & Produce Robot Systems Based on Ontologies	23
---	----

Christian Eymüller, Julian Hanke, Alexander Poeppel, Wolfgang Reif

✧ Robot Motion Planning and Control

MQTT Enabled Simulation Interface for Motion Execution of Industrial Robots.....	28
--	----

Alberto Sartori, Ralf Waspe, Christian Schlette

Extending the Target-Search Algorithm for Kilobots by Adding Random Walk Behavior	33
---	----

Michael Troxler, Rolf Dornberger, Thomas Hanne

NU-Biped-4 a Lightweight and Low-Power Consumption Full-Size Bipedal Robot.....	38
---	----

Michele Folgheraiter, Sharafatdin Yessirkepov, Timur Umurzakov, Rizabek Korabay

Toward Computationally Efficient Path Generation and Push Planning for Robotic Nonprehensile Manipulation	44
---	----

Armagan Elibol, Nak Young Chong

Collision Avoidance of Multiple Moving Agents by Adapting the A* Algorithm.....	49
<i>Kevin Neuschwander, Rolf Dornberger, Thomas Hanne</i>	
Experience-based Problem Solver for Robot System Design.....	55
<i>Jiaxi Lu, Ryota Takamido, Jun Ota</i>	
Cooperative Collision Avoidance in Mobile Robots Using Dynamic Vortex Potential Fields.....	60
<i>Wayne Paul Martis, Sachit Rao</i>	
Cyber Security for Surgical Remote Intelligent Robotic Systems.....	65
<i>Alexandra Bernadotte</i>	
Autonomous Navigation of Quadrotors Using Tactile Feedback.....	70
<i>N. Borkar, P. Krishnamurthy, A. Tzes, F. Khorrami</i>	
✧ Robot Motion Control and Obstacle Avoidance Technology	
Software Model for Robot Programming and Example of Implementation for Navigation System.....	75
<i>Samira Chaychi, Denis Zampunieris, Sandro Reis</i>	
Modified Bug Algorithm with Proximity Sensors to Reduce Human-Cobot Collisions	80
<i>Anran Li, Hakan Gurocak</i>	
RL-DWA Omnidirectional Motion Planning for Person Following in Domestic Assistance and Monitoring.....	86
<i>Andrea Eirale, Mauro Martini, Marcello Chiaberge</i>	
Photogrammetry-based Dynamic Path Tracking of Industrial Robots Using Adaptive Neuro-PID Control Method and Robust Kalman Filter.....	91
<i>Jianyu Tang, Tao Zhou, Ehsan Zakeri, Tingting Shu, Wen-Fang Xie</i>	
Correlation Analysis of Factors Influencing the Motion Planning Accuracy of Articulated Robots	97
<i>Oguz Kedilioglu, Markus Nikol, Jonas Walter, Jörg Franke</i>	
Robot Locomotion Control Using Central Pattern Generator with Non-linear Bio-mimetic Neurons.....	102
<i>Vijay Shankaran Vivekanand, Shahin Hashemkhani, Shanmuga Venkatachalam, Rajkumar Kubendran</i>	
Introduction of A Row-Skip Pattern in Complete Coverage Path Planning for Agricultural Fields.....	107
<i>Danial Pour Arab, Matthias Spisser, Caroline Essert</i>	
✧ Humanoid Robot Design and Modeling	
Impact Force Location and Intensity Identification Using Joint-Position Sensors in Humanoids.....	112
<i>Samia Choueiri, Hassan Diab, Michel Owayjan, Roger Achkar</i>	
An Elastic Shoulder Joint for Humanoid Robotics Application.....	117
<i>Sharafatdin Yessirkepov, Timur Umurzakov, Rassul Shaimerdenov, Michele Folgheraiter</i>	

Design and Development of a Prototype Upper-limb Rehabilitation Robot Based on Multi-body Dynamics Analysis.....	123
<i>Hsiu-Hsien Sung, Chih-Kun Hsiao, Cheng-Kang Lee, Chin-Yu Wang</i>	
A Cable-Driven Robotic Eye for Understanding Eye-Movement Control.....	128
<i>Akhil John, John Van Opstal, Alexandre Bernardino</i>	
Comparative Modeling Study of Pneumatic Artificial Muscle Using Neural Networks, ANFIS and Curve Fitting	134
<i>Mohammed Abu Mallouh, Walaa Sameer Araydah, Basel Jouada, Mustafa A. Al-Khawaldeh</i>	
JUST TELL ME: A Robot-assisted E-health Solution for People with Lower-extremity Disability	139
<i>Alexander Coutras, Omar Obidat, Michelle Zhu, Weitian Wang</i>	
◇ Intelligent Robot Design and System Testing	
A Discrete-time Distributed Optimization Algorithm for Multi-robot Coordination Target Monitor	145
<i>Yanling Zheng, Qingshan Liu, Guoyi Chi</i>	
Emergency Stop System of Computer Vision Workstation Based on GMM-HMM and LSTM.....	150
<i>Muhuan Wu, Fangrui Guo, Junwei Wu, Yuliang Xiao, Mingyu Jin, Quan Zhang</i>	
Automatic Generation of Robot Actions for Collaborative Tasks from Speech	155
<i>Manizheh Zand, Krishna Kodur, Maria Kyrarini</i>	
Hierarchical Reinforcement Learning for In-hand Robotic Manipulation Using Davenport Chained Rotations	160
<i>Francisco Roldan Sanchez, Qiang Wang, David Cordova Bulens, Kevin McGuinness, Stephen J. Redmond, Noel E. O'Connor</i>	
Design and Feasibility Test of an Automatic Scraping Robot.....	165
<i>Zhenmeng Cui, Liang Han, Guancheng Dong, Yingze Lin, Yangzhen Gao, Shuaishuai Fan</i>	
Reinforcement-Learning Based Robotic Assembly of Fractured Objects Using Visual and Tactile Information	170
<i>Xinchao Song, Nikolas Lamb, Sean Banerjee, Natasha Kholgade Banerjee</i>	
Inflatable Robotic Manipulator for Space Debris Mitigation by Visual Servoing	175
<i>Pierpaolo Palmieri, Mario Troise, Matteo Gaidano, Matteo Melchiorre, Stefano Mauro</i>	
Oblivious Robots Performing Different Tasks on Grid without Knowing Their Team Members.....	180
<i>Satakshi Ghosh, Avisek Sharma, Pritam Goswami, Buddhadeb Sau</i>	
Studying Worker Perceptions on Safety, Autonomy, and Job Security in Human-Robot Collaboration	187
<i>Gurpreet Kaur, Sean Banerjee, Natasha Kholgade Banerjee</i>	

An Effective Method for Creating Virtual Doors and Borders to Prevent Autonomous Mobile Robots from Entering Restricted Areas	192
<i>Karameldeen Omer, Andrea Monteriù</i>	
✧ Machine Vision and Unmanned System Design	
Mantis: Enabling Energy-Efficient Autonomous Mobile Agents with Spiking Neural Networks	197
<i>Rachmad Vidya Wicaksana Putra, Muhammad Shafique</i>	
Contextual Autonomy Evaluation of Unmanned Aerial Vehicles in Subterranean Environments	202
<i>Ryan Donald, Peter Gavriel, Adam Norton, S. Reza Ahmadzadeh</i>	
UAV-Navigation Using Map Slicing and Safe Path Computation	208
<i>Halil Utku Unlu, Dimitris Chaikalis, Athanasios Tsoukalas, Anthony Tzes</i>	
Design of an Energy-Efficient Self-Heterogeneous Aerial-Ground Vehicle	213
<i>Abdussalam A. Alajami, Lucas Damian Santa Cruz, Rafael Pous</i>	
A Deep Reinforcement Learning Visual Servoing Control Strategy for Target Tracking Using a Multirotor UAV	219
<i>Andreas Mitakidis, Sotirios N. Aspragkathos, Fotis Panetsos, George C. Karras, Kostas J. Kyriakopoulos</i>	
Densifying SLAM for UAV Navigation by Fusion of Monocular Depth Prediction	225
<i>Yassine Habib, Panagiotis Papadakis, Cédric Le Barz, Antoine Fagette, Tiago Gonçalves, Cédric Buche</i>	
Mechatronic Design of an Amphibious Drone	230
<i>Nikolaos Evangeliou, Dimitris Chaikalis, Nikolaos Giakoumidis, Anthony Tzes</i>	
3-D Trajectory Tracking in the Image Frame for Autonomous Navigation of UAV in UAV-AGV Multi-Agent System	234
<i>Ashok Kumar Sivarathri, Amit Shukla, Ayush Gupta</i>	
✧ Control System and Model Design	
Offline Task Assignment and Motion Planning Algorithm Considering Agent's Dynamics	239
<i>Tomoaki Shimizu, Kosuke Taneda, Ayumu Goto, Tomoya Hattori, Toyokazu Kobayashi, Ryota Takamido, Jun Ota</i>	
Vehicle Motion Control with Jerk Constraint by Nonlinear Model Predictive Control	244
<i>Kyoshiro Itakura</i>	
Choosing Solutions for Current Problems in Operational Logistics Featuring Self-Learning Systems	249
<i>Wuddi Philipp, Fottner Johannes</i>	
Kinematic Error Model for Trolley-type PUU	254
<i>J. D. Ke, Y. J. Wang</i>	

Design and Implementation of a Locomotion Suspension System for a Desert Terrain UGV.....	259
<i>Thani Althani, Rufaidah Salim, Mohammed Minhas Anzil, Prashanth Subramaniam, Khuloud Almaeeni, Amit Shukla</i>	
Cooperative Optimal Control of UAVs Based on Brain-Attention Mechanism Neural Network.....	263
<i>Ziyuan Ma, Huajun Gong, Xinhua Wang</i>	
Obstacle-surmounting Analysis of a Novel Deformable Wheel-track Composite Walking Platform.....	268
<i>Wang Kun, Liang Huawei</i>	
Multi-UGVs Collaborative Path Planning and Conflicts Eliminating in Emergent Situations.....	273
<i>Linzhi Zeng, Siyuan Feng, Jining Liu, Wenjie Song</i>	
The Estimation of Ocean-current Velocity for AUV Using Optimization-Based Alignment.....	278
<i>Yongjiang Huang, Xixiang Liu</i>	
Simulation Analysis of a Cable-driven Astronaut On-orbit Physical Exercise Equipment.....	284
<i>Lailu Li, Lixun Zhang, Bing Wang, Da Song</i>	
✧ Modern Sensor and Sensor System Measurement	
Modeling of Body Pressure Distribution on Alternative Pressure Mattress.....	289
<i>Masamichi Kosuge, Masaki Takahashi</i>	
SensorClouds: A Framework for Real-Time Processing of Multi-modal Sensor Data for Human-Robot-Collaboration.....	294
<i>Alexander Poepfel, Christian Eymüller, Wolfgang Reif</i>	
Efficient Real-Time Localization in Prior Indoor Maps Using Semantic SLAM.....	299
<i>R. G. Goswami, P. V. Amith, J. Hari, A. Dhaygude, P. Krishnamurthy, J. Rizzo, A. Tzes, F. Khorrami</i>	
✧ Computer Vision and Human-computer Interaction	
Robot-Assisted Orthopedic Surgery Bone Pose Identification Using Task-Specific Capability Maps.....	304
<i>Jay Ryan U. Roldan, Min Yang Jung, Feimo Shen, Dejan Milutinović</i>	
Shiitake Mushroom Semantic Segmentation Method Based on Search Focus Network.....	310
<i>Juan Du, Songxuan Liu</i>	
A Novel Framework for Ground Segmentation Using 3D Point Cloud.....	316
<i>Xu Wang, Huachao Yu, Caixia Lu, Xueyan Liu, Xing Cui, Xijun Zhao, Bo Su</i>	
Frame of Events: A Low-latency Resource-efficient Approach for Stereo Depth Maps.....	324
<i>Shanmuga Venkatachalam, Vijay Shankaran Vivekanand, Rajkumar Kubendran</i>	
Online Surveying System for Experimentally Testing the Human Perception of Visual Gestures.....	329
<i>Márk Domonkos, Ádám Tresó, János Botzheim</i>	

Classifying a Sensorimotor Skill of Periodontal Probing.....	334
<i>Vahan Babushkin, Muhammad Hassan Jamil, Dianne L. Sefo, Peter M. Loomer, Mohamad Eid</i>	
Towards Clear Evaluation of Robotic Visual Semantic Navigation.....	340
<i>Carlos Gutiérrez-Álvarez, Sergio Hernández-García, Nadia Nasri, Alfredo Cuesta-Infante, Roberto J. López-Sastre</i>	
✧ Data Models and Algorithms in Information Systems	
A Warehouse Storage and Retrieval System Using IoT and Autonomous Vehicle	346
<i>Abdulelah Bukhamseen, Mohammed Alabdullah, Khaled Bin Gaufan, Muhammad Mysorewala</i>	
A Model-Based Approach for Remote Development of Embedded Software for Object Avoidance Applications	351
<i>Roman Bener, Patrick Schmitt, Clemens Környefalvy</i>	
A Rapidly-Exploring Random Tree Algorithm with Reduced Random Map Size	356
<i>Aphilak Lonklang, János Botzheim</i>	
Game Design Tools for ML Data Generation in CPS.....	362
<i>Maria Krantz, Niklas Widulle, Oliver Niggemann</i>	
Fused Swish-ReLU Efficient-Net Model for Deepfakes Detection	368
<i>Hafsa Ilyas, Ali Javed, Muteb Mohammad Aljaseem, Mustafa Alhababi</i>	
Developing an Agent-Based Simulation Model for Predicting Technology Acceptance at Border Crossing Points	373
<i>Sarang Shaikh, Sule Yildirim Yayilgan</i>	
Distributed Optimisation under a Weight-unbalanced Digraph	379
<i>Prateek Priyaranjan Pradhan, Arijit Sen, Mangal Kothari, Ketan Rajawat</i>	
✧ Author Index	