

2024 IEEE International Symposium on Safety Security Rescue Robotics (SSRR 2024)

**New York, New York, USA
12-14 November 2024**



**IEEE Catalog Number: CFP24SSR-POD
ISBN: 979-8-3315-1096-1**

**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:	CFP24SSR-POD
ISBN (Print-On-Demand):	979-8-3315-1096-1
ISBN (Online):	979-8-3315-1095-4
ISSN:	2374-3247

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

TABLE OF CONTENTS

A Control Barrier Function Based Visual Servoing Framework for Safe Operation of UAVs in GNSS Denied Settings Using Fiducial Markers.....	1
<i>Angus Lynch, Chen Lyu, Joao Buzzatto, Shahab Heshmati-Alamdari, Minas Liarokapis</i>	
Multicopter Actuator Performance Monitoring in Extreme Environments: (Extended Abstract).....	7
<i>Sesha Charla, Richard M. Voyles, Bin Yao</i>	
An Ultra-Light, Ultra-Fast, Passive Closing Aerial Gripping System Capable of Grasping, Perching, and Aerial Manipulation	12
<i>Shaoqian Lin, Angus Lynch, Minas Liarokapis</i>	
Rapid Quadrotor Navigation in Diverse Environments Using an Onboard Depth Camera.....	18
<i>Jonnthan Lee, Abhishek Rathod, Kshitij Goel, John Stecklein, Wennie Tabib</i>	
Glasgow Coma Score Estimation Module for Deployment on Mobile Robots in Rescue Missions.....	26
<i>Holger Schwegmann, Bernd Kiefer, Tom Plagge, Floris Ernst</i>	
A Framework for Casualty Manipulation with Biomechanical Joint-Level Reaction Analysis	32
<i>Aldrin Padua, Qianwen Zhao, Rajarshi Roy, Chad Spurlock, Kent Butz, Kevin Lister, Long Wang</i>	
A Holistic Concept on AI Assistance for Robot-Supported Reconnaissance and Mitigation of Acute Radiation Hazard Situations	40
<i>Kevin Daun, Frederik Bark, Davide Tateo, Jan Peters, Johannes Heinlein, Janine Wendt, Nils Heidemann, Ivana Kruijff-Korbayová, Stefan Kohlbrecher, Jens Friedrich, Désirée Martin, Michael W. Schmidt, Rafaela Hillerbrand, Oskar Von Stryk</i>	
Robot Path Planning Utilizing Object Recognition for Inspection of Nuclear Material Containers	46
<i>Karthika Balan, Pei Yao Li, Mark S. Bandstra, Kushant Patel, Emil Rofors, Marco Salathe, Thomas D. Macdonald, Ki Park, Edward Godfrey, Brian J. Quiter</i>	
Navigating the Edge: UAS Boundary Tracing for Efficient Volcanic Plume Monitoring	52
<i>John Ericksen, Abir Islam, Carter Frost, Kevin Aubert, G. Matthew Fricke, Varsha Dani, Rafael Fierro, Tobias Fischer, Scott Nowicki, Jared Saia, Melanie Moses</i>	
Sensor Pods and ROS2-TMS for Construction for Cyber-Physical System at Earthwork Sites	58
<i>Ryuichi Maeda, Tomoya Kouno, Kohei Matsumoto, Yuichiro Kasahara, Tomoya Itsuka, Kazuto Nakashima, Yusuke Tamaishi, Ryo Kurazurne</i>	
Analysis of Human Errors in Small Uncrewed Aerial Systems Used During Hurricane Ian	64
<i>Robin R. Murphy, Thomas Manzini, S. Camille Peres</i>	
A Gesture-Based Communication System for Firefighters During Search and Rescue Missions	72
<i>Katiso Mabulu, Ben-Oni Vainqueur, Taşkın Padir</i>	
KRIS: A Robot for Material Transport in Relief Situations.....	78
<i>Martin Mallwitz, Daniel Weissenrieder, Vamsi Krishna Origanti, Tom Becker, Milan Sixt, Malika Navaratna Helapita Ralalagc, Felix Bernhard, Christian School, Miguel Martínez Genis, Fabian Maas Genannt Bermpoh, Mehmed Yüksel, Frank Kirchner</i>	

HERO: A Cross-Domain Human-Enhanced Robot Orchestration Framework for Seamless Multi-Robot Emergency Handling	84
<i>Julia Freytag, Natalia Ogorelysheva, Irfan Fachrudin Priyanta, Stefan Bocker, Jana Jost, Ivana Kruijff-Korabayova, Robert Grafe, Christian Wietfeld, Alice Kirchheim</i>	
Cognitive Workload Estimation Using LSTM and Ensemble Learning on Multimodal Physiological Data	92
<i>Gaganpreet Singh, Serdar Duman, Axel Schulte</i>	
Human-Robot Team Vulnerabilities Under Fatigue During sUAS Disaster Response Simulations	98
<i>Ranjana K. Mehta, Aakash Yadav, Robin R. Murphy, S. Camille Peres</i>	
SIGMA: A Minimalistic 3D Hopping Robot with Parallel 3-RSR Mechanism for Safeguarding Humanitarian Demining	104
<i>C. Y. Ivan Fan, Xiangyu Chu, F. Y. Fiat Wong, Fan Shi, K. W. Samuel Au</i>	
LiDAR-Based Registration Against Georeferenced Models for Globally Consistent Allocentric Maps.....	110
<i>Jan Quenzel, Linus T. Mallwitz, Benedikt T. Arnold, Sven Behnke</i>	
Monte Carlo Tree Search for Behavior Planning in Autonomous Driving.....	117
<i>Qianfeng Wen, Zhongyi Gong, Lifeng Zhou, Zhongshun Zhang</i>	
Reinforcement Learning for Wheeled Mobility on Vertically Challenging Terrain	125
<i>Tong Xu, Chenhui Pan, Xuesu Xiao</i>	
Modular, Tethered, Reconfigurable Hybrid Robotic Vehicles for Aerial Grasping and Package Delivery	131
<i>Masahiro Kobayashi, Geoffrey Huang, Joao Buzzatto, Angus Lynch, Kostas Kyriakopoulos, Minas Liarokapis</i>	
Heterogeneous Multi-Robot Person-Following in Constrained Environments	136
<i>Ori A. Miller, Jason M. Gregory, Christopher Reardon</i>	
Heterogenous Collaboration: A New Approach for Search and Rescue Operations.....	142
<i>Sidney Nimako Boateng, Shashwat Singh, Mustafa Ugur, Sicheng Wang, Max Kramer, Isaac Osei, Olivia Sobek, Melisa Orta Martinez, F. Zeynep Temel, Laura H. Blumenschein</i>	
Development and Validation of a Drone-Deployable Water Depth Sensor for Landslide Dam Monitoring.....	148
<i>Ryosuke Yajima, Keiji Nagatani</i>	
Rapidly Deployable Vine-Like Monitoring Device for Elevated Positions.....	154
<i>Yunhao Feng, Hiroto Kodama, Tohru Ide, Akina Yamamoto, Hiroyuki Nabae, Koichi Suzumori</i>	
Fuel Debris Simulants for the Gripper Design of Decommissioning Robot Manipulator in Fukushima Daiichi (1F).....	160
<i>Shinsuke Nakashima, Alessandro Moro, Ren Komatsu, Angela Faragasso, Nobuto Matsuhira, Hanwool Woo, Kuniaki Kawabata, Atsushi Yamashita, Hajime Asama</i>	
Platform Evaluation of Digital Mock-Up System Utilized for Decommissioning in Fukushima Daiichi NPS.....	166
<i>Tomoki Sakaue, Fumiaki Abe</i>	
Detection and Classification of Small-Sized UAVs and Birds in Sparse LiDAR Point Cloud.....	172
<i>Krisztián Balla, Anita Keszler, Sándor Gazdag, Tamás Szirányi, András L. Majdik</i>	

Forest Biomass Mapping with Terrestrial Hyperspectral Imaging for Wildfire Risk Monitoring	178
<i>Nathaniel Hanson, Sarvesh Prajapati, James Tukupah, Yash Mewada, Taskin Padir</i>	
When to Localize?: A POMDP Approach	184
<i>Troi Williams, Kasra Torshizi, Pratap Tokekar</i>	
Field Insights for Portable Vine Robots in Urban Search and Rescue.....	190
<i>Ciera McFarland, Ankush Dhawan, Riya Kumari, Chad Council, Margaret Coad, Nathaniel Hanson</i>	
Efficient Line-Of-Sight Viewpoint Sampling in Complex Environments for Autonomous Surface Inspection	198
<i>Sangwoo Moon, Sung-Kyun Kim, Oriana Peltzer, Mykel J. Kochenderfer, Shehryar Khattak</i>	
Search and Rescue Base of Operation Prioritization with Aerial Orthomosaics	204
<i>Alyssa Hargis, Ananya Rao, Howie Choset</i>	
Optimizing Start Locations in Ergodic Search for Disaster Response	210
<i>Ananya Rao, Alyssa Hargis, David Wettergreen, Howie Choset</i>	
Development and Performance Validation for Ground Protection Mats of Construction Machinery on Soft Ground	216
<i>Y. Kubota, A. Furukawa, S. Kitahara, T. Amagai, T. Asuma, H. Hatamoto, K. Nagatani</i>	
Leveraging Augmented Reality for Improved Situational Awareness During UAV-Driven Search and Rescue Missions	221
<i>Rushikesh Nalamothu, Puneet Sontha, Janardhan Karravula, Ankit Agrawal</i>	
Real-Time Dynamic Gesture Recognition for Human-Robot Collaboration in Rescue Operations.....	229
<i>Shefali Dewangan, Vamsi Krishna Origanti, Frank Kirchner</i>	
Rapid Soil Surface Reinforcement Method Using Flour for Soft Ground in Disaster Response Robotics.....	237
<i>Shotaro Kojima, Kazunori Ohno, Takaaki Nara, Tomoaki Satomi, Hiroshi Takahashi, Satoshi Tadokoro</i>	
Rescue Robotics: What We Learned from Paramedics, Dentists and Industrial Productions to Develop Robotic en-Route Interventions	243
<i>Christoph A. W. Parhofer Julius Ambros, Maximilian Miller, Tim C. Lueth</i>	
The Radio Degradation Challenge: Fostering a Joint System Design of Robotics and Communication for Better Application Robustness	249
<i>Manuel Patchou, Stefan Böcker, Christian Wietfeld</i>	
Universal Multi-Layer Map Display and Improved Situational Awareness in Real-World Facilities	255
<i>Raimund Edlinger, Andreas Nüchter</i>	
Assessing Ultra-Wideband Technology for Improved Detection of Vulnerable Road Users in Urban Settings	261
<i>Jia Huang, Alvika Gautam, Junghun Choi, Srikanth Saripalli</i>	
Path Planning for the Autonomous Inspection of Voxelized Structures	267
<i>Raphael Hagmanns, Boitumelo Ruf, Rabanus Bockmühl, Max Weißer, Jürgen Beyerer</i>	

Use-Inspired Mobile Robot to Improve Safety of Building Retrofit Workforce in Constrained
Spaces..... 273
*Smruti Suresh, Michael Angelo Carvajal, Nathaniel Hanson, Ethan Holand, Samuel Hibbard,
Taskln Padir*

Author Index