

2022 19th International Conference on Ubiquitous Robots (UR 2022)

**Jeju, South Korea
4 – 6 July 2022**



**IEEE Catalog Number: CFP22128-POD
ISBN: 978-1-6654-8254-7**

**Copyright © 2022 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:	CFP22128-POD
ISBN (Print-On-Demand):	978-1-6654-8254-7
ISBN (Online):	978-1-6654-8253-0

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

PaGO-LOAM: Robust Ground-Optimized LiDAR Odometry.....	1
<i>Dong-Uk Seo, Hyungtae Lim, Seungjae Lee, Hyun Myung</i>	
Online Telemanipulation Framework on Humanoid for Both Manipulation and Imitation	8
<i>Daegyul Lim, Donghyeon Kim, Jaeheung Park</i>	
Robotic Irrigation Water Management: Estimating Soil Moisture Content by Feel and Appearance.....	16
<i>Marsela Polic, Marko Car, Jelena Tabak, Matko Orsag</i>	
Terrain Recognition Based on the Wheel Contact Angle Measurement Using Laser Scanners for Six-Wheel Mobile Robot.....	23
<i>Nabih Pico, Sang-Hyeon Park, Tuan Luong, Juan Medrano, Hyungpil Moon</i>	
Feasibility Study of LIMMS, a Multi-Agent Modular Robotic Delivery System with Various Locomotion and Manipulation Modes.....	30
<i>Taoyuanmin Zhu, Gabriel I. Fernandez, Colin Togashi, Yeting Liu, Dennis Hong</i>	
Indoor/Outdoor Transition Recognition Based on Door Detection	46
<i>Seohyun Jeon, Minjung Kim, Seunghwan Park, Jae-Yeong Lee</i>	
A Novel Magnetorheological Damper Combining Multi-Disc and Multi-Drum Structures	52
<i>Jiajun Zou, Aibin Zhu, Jiyuan Song, Diyang Dang, Xu Zhou, Yulin Zhang</i>	
Iterative Supervised Learning for Regression with Constraints	58
<i>K. C. Tejaswi, Taeyoung Lee</i>	
Environmental Obstacle Detection and Localization Model for Cable-Driven Exoskeleton	64
<i>Delin An, Aibin Zhu, Xian Yue, Diyang Dang, Yulin Zhang</i>	
Implementation of Robotic Shoulder Complex Actuated by Pneumatic Artificial Muscles	70
<i>Wanju Kim, Geun Young Hong, Emmanuel Vander Poorten, Youngjin Choi</i>	
Sensor-Less Obstacle Collision Detection for Robot Manipulator.....	77
<i>Muhammad Salman, Hamza Khan, Saad Jamshed Abbasi, Jae Hyung Kim, Jin Won Lee, Min Cheol Lee</i>	
Object Inserting Operation with Admittance Control of a 4-DOF Hydraulic Manipulator with Rotary Vane Actuators	82
<i>Chanyong Park, Sangchul Han, Myeongyun Doh, Yoonwoo Ha, Anh Tuan Luong, Hyungpil Moon</i>	
Design of Violinist Robot's Right Hand for Bow Hold with Inflatable Soft Mechanism	88
<i>Koji Shibuya, Daiki Nishida</i>	
Wearable Arm Strength Supporter Based on Adjustable Counterbalance Mechanism Using a Spring Latch Module.....	94
<i>Kyung-Nam Kim, Won-Bum Lee, Do-Won Kim, Jae-Bok Song</i>	
Development of the Load-Balanced Bin Packing System.....	98
<i>Jeong-Won Pyo, Kwang-Hee Lee, Hyun-Su Kim, Tae-Yong Kuc</i>	

M-BRIC: Design of Mass-Driven Bi-Rotor with RL-Based Intelligent Controller	103
<i>Dongkyu Lee, Eungchang Mason Lee, Duckyu Choi, Junho Choi, Christian Tirtawardhana, Hyun Myung</i>	
A Task Teaching Method for Pan-Flipping to Collaborative Robot	109
<i>Dongwoo Ko, Donghyeon Lee, Wan Kyun Chung</i>	
Implementation of a Large-Scale Biped Robot Using Serial-Parallel Hybrid Leg Mechanism	115
<i>Kevin G. Gim, Joohyung Kim</i>	
An Algorithm of Automatic Stair Climbing for a Vision-Driven Hexapod Robot.....	122
<i>Yang Zhang, Shengjie Yang, Yunting Jia, Xuan Xiao, Jianming Wang, Yunhai Gao</i>	
Learning-Based Motion Stabilizer Leveraging Offline Temporal Optimization.....	129
<i>Min Sung Ahn, Hosik Chae, Colin Togashi, Dennis Hong, Joohyung Kim, Sungjoon Choi</i>	
Study on Crack Initiation of Harmonic Gears Based on Extended Finite Element Method.....	137
<i>Yuxin Zhang, Xudong Pan, Yuefeng Li, Guanglin Wang</i>	
Design and Analysis of a Spherical Robot Based on Reaction Wheel Stabilization	143
<i>Cheng Li, Aibin Zhu, Chunli Zheng, Han Mao, Muhammad Affan Arif, Jiyuan Song, Yulin Zhang</i>	
Contact Force Control During Soft Tissue Interaction Using Handheld Robot	149
<i>Ingu Choi, Eunchan Kim, Myo-Taeg Lim, Sungwook Yang</i>	
Neural Network Model of eFAST Target Prediction for Robotic Ultrasound Diagnostics in Austere Environments.....	153
<i>Jaeyeon Lee, Ethan Quist, Stan German, Michael Kim, Nathan Fisher</i>	
Development of Microsurgical Robot Arm Using Spherical Serial RCM Mechanism and Commercial Laparoscopic Surgical Robot Instrument.....	159
<i>Dongeun Choi, Chunwoo Kim, Jae-Bok Song</i>	
Development of mHealth Literacy and Digital Health Equity Assessment Scale to Improve Health Equity	165
<i>Jisoo Na, Sanghyeon Park, Doyon Kim, Yebin Park, Yeoungtae Choi, Jeongeun Kim, Jisan Lee</i>	
Online Path Planning for Aircraft De-Icing Trucks with Dynamic Nonholonomic Constraints	170
<i>Henning S. Hoj, Soren Hansen, Elo Svanebjerg</i>	
An UV Sensor Coverage Algorithm with Place Segmentation for Disinfection Robots.....	177
<i>Ye-Chan An, Sung-Hyeon Joo, Arpan Ghosh, Hyun-Jin Park, T.-Y. Kuc</i>	
A Sensor Fusion Strategy for Indoor Target Three-Dimensional Localization Based on Ultra-Wideband and Barometric Altimeter Measurements.....	181
<i>Le Bao, Kai Li, Wenqi Li, Kyoosik Shin, Wansoo Kim</i>	
Development of Vehicle Detection Method on Water Surface Using LiDAR Data for Situation Awareness	188
<i>Eon-Ho Lee, Hyeon Jun Jeon, Jinwoo Choi, Hyun-Taek Choi, Sejin Lee</i>	
Box Segmentation, Position and Size Estimation for Robotic Box Handling Applications.....	194
<i>Juan Medrano, Francisco Yumbla, Geonuk Lee, Junseup Yi, Minjae Kim, Eugene Auh, Jeongyeol Park, Ilho Oh, Nabih Pico, Hyungpil Moon</i>	

Estimation of Cylinders Parameters from Point Clouds Using Least Square Best Fit Method	200
<i>In-Gyu Park, Jihyun Park, Hyojun Lee, Jeong-Woo Park, Hyogon Kim, Jeong-Hwan Hwang, Jong-Chan Kim, Kyoungseok Noh, Sung-Jo Yun, Youngho Choi</i>	
SPI(Spherical Point Indicator): Point Feature Image Generation for Point-Wise Classification and Dynamic Object Removal	206
<i>Chulhee Bae, Yu-Cheol Lee, Wonpil Yu, Sejin Lee</i>	
A Novel Filter Pruning Algorithm for Vision Tasks Based on Kernel Grouping	213
<i>Jongmin Lee, Armagan Elibol, Nak Young Chong</i>	
Simulation Study on the Locomotion Algorithm of Variable Topology Truss Robot Based on Motion Primitives	219
<i>Yecheol Moon, Jangho Bae, Mark Yim, Taewon Seo</i>	
Development of a Soft Haptic Sensor Capable of Measuring Contact Forces Based on Magnetorheological Elastomers	225
<i>Booyong Im, Jungwon Yoon</i>	
Safe Movement Planning with DMP and CBF for Lower Limb Rehabilitation Exoskeleton	231
<i>Dong-Po Tan, Guang-Zhong Cao, Yue-Peng Zhang, Jiang-Cheng Chen, Ling-Long Li</i>	
System Design and Experimental Research of Cable-Driven Hip Joint Power-Assisted Exoskeleton	237
<i>Peifeng Ma, Aibin Zhu, Yao Tu, Jiyuan Song, Diyang Dang, Yulin Zhang</i>	
Development and Usability Test of IoT-Based Mobile Applications for Persons with Mild Physical Disabilities and Their Caregivers	243
<i>Yebin Park, Doyon Kim, Sanghyeon Park, Jisoo Na, Yeoungtae Choi, Seung Hee Ho, Minyoung Lee, Ju Hee Kim, Ju Han Kim, Jisan Lee</i>	
Limiting Reconstruction Capability of Autoencoders Using Moving Backward Pseudo Anomalies	248
<i>Marcella Astrid, Muhammad Zaigham Zaheer, Seung-Ik Lee</i>	
MASS: Multi-Agent Scheduling System for Intelligent Surveillance	252
<i>Dongki Noh, Junho Choi, Jeongsik Choi, Dasol Byun, Youngjae Kim, Hyoung-Rock Kim, Seungmin Baek, Seunghwan Lee, Hyun Myung</i>	
Considerations of Mounting Method for Wearable Robot Arm	258
<i>Akimichi Kojima, Dinh Tuan Tran, Joo-Ho Lee</i>	
Blockly in a Box: How Children Explore Block-Based Robot Programming.....	263
<i>Craig J. Sutherland</i>	
Impact of Additional Programming Constructs on a Tangible Programming Language for Robots.....	268
<i>Alexander Verkerk, Rawiri Hohepa, Craig J. Sutherland</i>	
Change Detection in Unmanned Aerial Vehicle Images for Industrial Infrastructure Rooftop Monitoring.....	274
<i>Inmo Jang, Suckhyun Lim, Hyunkook Jeon</i>	
Vision-Based Localization Using by Line with Point for Feature Loss	280
<i>Kyu-Hyun Sung, Manzoor Sumaira, Hyun-Jin Park, Tae-Yong Kuc</i>	
Natural Language Representation as Features for Place Recognition	284
<i>Alex Junho Lee, Hyun Myung</i>	

A Semantic Enhancement of Unified Geometric Representations for Improving Indoor Visual SLAM.....	288
<i>Ioannis Asmanis, Panagiotis Mermigkas, Georgia Chalvatzaki, Jan Peters, Petros Maragos</i>	
Touchless Shared-Control for Wheelchair Navigation.....	295
<i>Graham Ching, Hamed Bozorgi, Trung Dung Ngo</i>	
Play Scenarios and Interaction Designs of a Social Robot for the Development of Children’s Social-Emotional Intelligence by Using the Service Design Methodology.....	301
<i>Hyo In Son, Na Rae Kim, Inae Chung, Jaehee Chung</i>	
Impedance Control of Antagonistically Driven SMA Springs	307
<i>Tuan Luong, Chanyong Park, Myeongyun Doh, Yoonwoo Ha, Hyungpil Moon</i>	
Stereoscopic Low-Latency Vision System Via Ethernet Network for Humanoid Teleoperation.....	313
<i>Jaeyong Shin, Junewhee Ahn, Jaeheung Park</i>	
Learning Robotic Rotational Manipulation Skill from Bilateral Teleoperation	318
<i>Joong-Ku Lee, Jee-Hwan Ryu</i>	
Axis Calibration Method of Underwater Electric Field Measurement Sensor for Underwater Robot	326
<i>Jason Kim, Ingyu Lee, Byeongjin Kim, Ki-Woong Bae, Son-Cheol Yu</i>	
Model Predictive Control Using Dynamic Model Decomposition Applied to Two-Wheeled Inverted Pendulum Mobile Robot	332
<i>Junjie Shen, Dennis Hong</i>	
Localization System Through 2D LiDAR Based Semantic Feature for Indoor Robot.....	338
<i>Sang-Hyeon Bae, Sung-Hyeon Joo, Jun-Hyun Choi, Hyun-Jin Park, Tae-Yong Kuc</i>	
Wall Following Navigation Algorithm for a Disinfecting Robot	343
<i>Kyeong-Jin Joo, Sang-Hyeon Bae, Arpan Ghosh, Hyun-Jin Park, Tae-Yong Kuc</i>	

Author Index