

**2022 Latin American Robotics
Symposium (LARS 2022), 2022
Brazilian Symposium on Robotics
(SBR 2022), and 2022 Workshop
on Robotics in Education
(WRE 2022)**

**Sao Bernardo do Campo, Brazil
18-21 October 2022**



**IEEE Catalog Number: CFP22A78-POD
ISBN: 978-1-6654-6281-5**

**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:	CFP22A78-POD
ISBN (Print-On-Demand):	978-1-6654-6281-5
ISBN (Online):	978-1-6654-6280-8
ISSN:	2639-1775

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

LARS-SBR-WRE 2022

Table of Contents

Acknowledgments	ii
Preface	iii
Committees	v

Latin American Robotics Symposium and Brazilian Robotics Symposium

Assistive Robotics and Human Robot Interaction

A Routing-based Strategy to Socially Approach Multiple Individuals in Cluttered Environments	1
<i>Aline Silva, Douglas Guimarães Macharet</i>	
Virtual Reality Platform to Develop and Test Applications on Human-Robot Social Interaction	7
<i>Jair Augusto Bottega, Raul Steinmetz, Álisson Kolling, Victor Kich, Junior Costa de Jesus, Ricardo Grando, Daniel Fernando T. Gamarra</i>	
Ethics: What is the Research Scenario in the LARS/SBR/WRE?	13
<i>Luiz Paulo Carvalho, Jonice Oliveira, Flavia Maria Santoro</i>	

Aerial and Aquatic Vehicles

Real-Time INS/DVL/PS fusion applied to the navigation of Autonomous Underwater Vehicles	19
<i>Luiz Souza, Adriano Frutuoso, Daniele Silva, Ettore de Barros</i>	
Framework for Biological Control with Unmanned Aerial Vehicles	25
<i>Bruno da Silva, Tauã Cabreira, Bruno Souza, Nicholas Matias, Ricardo Machado, Lucio Jorge, Paulo Ferreira Jr.</i>	
Comparative Analysis of Innovation-Based Adaptive Kalman Filters Applied to AUVs Navigation	31
<i>Daniele Silva, Adriano Frutuoso, Luiz Souza, Ettore de Barros</i>	
Exploring Ground Effect in a Hybrid Aerial-Aquatic Unmanned Vehicle	37
<i>Vivian Misaki Aoki, Paulo Jefferson Dias de Oliveira Evald, Pedro Miranda Pinheiro, César Bastos da Silva, Dayana Cardoso, Mauro Andre Barbosa Cunha, Paulo Lilles Drews Jr.</i>	
A Systematic Mapping Study in Intrusion Detection System for Unmanned Aerial Vehicles Security	43
<i>Leandro da Silva, Isadora Ferrão, Kalinka Castelo Branco</i>	
A-Star Based Algorithm Applied to Target Search and Rescue by an UAV Swarm	49
<i>Guilherme T. T. Bernardo, Luan M. B. Vogas, Sargon D. S. Rodrigues, Thiago G. G. Lopes, Cesar A. C. Marcondes, Denis S. Loubach, Elton F. Sbruzzi, Filipe A. N. Verri, Johnny C. Marques, Lourenço A. Pereira Jr., Marcos R. O. A. Maximo, Vitor V. Curtis</i>	
Thrust Vectored Rocket Landing Integrated Guidance and Control with Proximal Policy Optimization	55
<i>Gabriel Souza, Marcos R. O. A. Maximo, Octávio Mathias</i>	
Prototyping and Construction of a Hybrid Unmanned Aerial Underwater Vehicles	61
<i>Adir Junior, Andressa Cavalcante, Pedro Miranda Pinheiro, Paulo Lilles Drews Jr</i>	
Volume-based Transition Zone Assessment of Hybrid Unmanned Aerial-Underwater Vehicles	67
<i>Vivian Misaki Aoki, Pedro Miranda Pinheiro, Paulo Jefferson Dias de Oliveira Evald, César Bastos da Silva, Dayana Cardoso, Paulo Lilles Drews Jr</i>	

Control and Robotic Systems

Global Elastodynamic Performance Criterion of Manipulators with Flexible Joints	73
<i>Fabian Andres Lara-Molina, Didier Dumur</i>	
Modelling, Control and Applications of Soft Pneumatic Actuators in Upper-Limb Exoskeletons: A Systematic Review	79
<i>Leandro Goia, Alexandre Brincalpe Campo, Diego Colón</i>	
MPC-Based Reference Governor Control for Self-Righting of Quadruped Robots: Preliminary Results	85
<i>Aureo Dobrikopf, Lucas Schulze, Douglas Bertol, Victor Barasuol</i>	
Dynamic Modeling Using the Principle of Virtual Work and Decentralized PD Control of a Stewart-Gough Platform	91
<i>Davi Klein, Daniel Fernando T. Gamarra</i>	
Mobile Robot Control for Agriculture Using Autoencoder Sensor Fusion	97
<i>Maria Letícia Negreiros Ventura, Alysson Mazoni, Diego Colón</i>	
Optimization of Force and Torque Bounds for the Flight Control System of a Quadcopter using PSO .	103
<i>Luiz Giacomossi Jr., Angelo Caregnato Neto, Marcos R. O. A. Maximo</i>	
Tuning of FP-PID controller based on PSO algorithm applied to a human gait	109
<i>Rodrigo de Medeiros, Daniel Mauricio Muñoz</i>	
Navigation and Path Planning	
A Trajectory Deformation Algorithm for Intelligent Vehicles	115
<i>Victor Sillerico Justo, Fernando Osorio</i>	
Collaborative UGV/UAV Path Planning for Inventory Management in Warehouses	121
<i>Caio Conti Guidote Ribeiro, Leonardo dos Santos, Douglas Guimarães Macharet</i>	
Multi-Criteria Decision Method Applied to Path Planning for Mobile Robots	127
<i>Caio do Carmo, Marcos Seruffo, Roberto Célio Limão de Oliveira</i>	
Stand-alone obstacle avoidance controller for image-based navigation	133
<i>Adrien Durand-Petiteville, Viviane Cadenat, Thierry Sentenac</i>	
Autonomous Robot Navigation in Crowd	139
<i>Paulo Afonso, Paulo Roberto Ferreira Jr.</i>	
Comparison between Line-Followers and Free Movement Robots in Tasks Execution in a Simulated Environment	145
<i>Igor Latini, Wilson Barioni, Marco A. Teixeira, Flávio Neves-Jr, Lúcia Valéria Ramos de Arruda</i>	
Path planning for ground robots based on radio signal strength	151
<i>André Cid, Maurício Sathler, Mário César Delunardo, Jacó Domingues, Gustavo Pessin, Hector Azpurua, Gustavo Freitas</i>	
Robot Learning	
A DRL Approach for Object Transportation in Complex Environments	157
<i>Alysson Silva, Paulo Rezeck, Gabriel Luz, Tiago Alves, Douglas Guimarães Macharet, Luiz Chaimowicz</i>	
Epistemic uncertainty estimation with evidential learning on Semantic Segmentation of Underwater Images	163
<i>Gustavo do Nascimento, Paulo Jefferson Dias de Oliveira Evald, Paulo Lilles Drews Jr</i>	
A 3D Q-Learning Algorithm for Offline UAV Path Planning with Priority Shifting Rewards	169
<i>Kevin de Carvalho, Hiago Batista, Iure Rosa Oliveira, Alexandre Brandão</i>	
Deep Neural Network Algorithm to Control a Curved Kicking Mechanism in RoboCup Small Size League	175
<i>Francisco Azevedo, Guilherme Leão, Marcos R. O. A. Maximo</i>	
CNN-Planner: A neuro path planner based on sensor fusion in the bird's eye view representation space for mapless autonomous driving	181
<i>Luis Alberto Rosero Rosero, Junior Anderson Rodrigues da Silva, Denis Wolf, Fernando Osorio</i>	
Application of Reinforcement Learning to the Orientation and Position Control of a 6 Degrees of Freedom Robotic Manipulator	187
<i>Felipe Campos, Aline Xavier Fidêncio, Jacó Domingues, Gustavo Pessin, Gustavo Freitas</i>	

Deterministic and Stochastic Analysis of Deep Reinforcement Learning for Low Dimensional Sensing-based Navigation of Mobile Robots	193
<i>Ricardo Grando, Junior Costa de Jesus, Victor Kich, Alisson Kolling, Pedro M. Pinheiro, Rodrigo Guerra, Paulo Lilles Drews Jr</i>	
Mapless Navigation of a Hybrid Aerial Underwater Vehicle with Deep Reinforcement Learning Through Environmental Generalization	199
<i>Ricardo Grando, Junior Costa de Jesus, Victor Kich, Alisson Kolling, Pedro M. Pinheiro, Rodrigo Guerra, Paulo Lilles Drews Jr</i>	
Memory-based Deep Reinforcement Learning for Humanoid Locomotion under Noisy Scenarios	205
<i>Samuel Chenatti, Esther Colombini</i>	
Robotic Systems and Architecture	
Fault-tolerant architecture and implementation of a distributed control system using containers	211
<i>Gustavo Tamanaka, Rafael Aroca, Glauco A P Caurin</i>	
Running Cooperative Tasks in a Multi-Robot System With Cyber-Physical Features	217
<i>Héber Moraes, João de Almeida, Lucia Valéria de Arruda</i>	
Detecting Data Injection Attacks in ROS Systems using Machine Learning	223
<i>Rodrigo Antunes, Bruno L. Dalmazo, Paulo Lilles Drews Jr</i>	
Order-Controlled Production Employing Multi-Agent and Flexible Job-Shop Scheduling on a Physical Simulation Platform	229
<i>Alex Luiz de Sousa, Andre Schneider de Oliveira</i>	
Cooperative indoor exploration on affordable robots	235
<i>María Victoria Díaz, Sergio Robaudo, Mercedes Marzoa-Tanco, Facundo Benavides</i>	
Project of a Sentinel Robot Controlled with a Tracking Algorithm	241
<i>Ricardo Schirmer, Daniel Fernando T. Gamarra, Thiago Garcia, Rafael Izquierdo, Anselmo Rafael Cukla</i>	
Multiple Digital Twins Competing in Manipulator Tasks	247
<i>Piatan Palar, Jonathan Cerbaro, Andre Schneider de Oliveira, João Fabro</i>	
Dynamic Modeling of a Soft Laparoscope: A Deep Neural Network approach	253
<i>Axel Cespedes, Ricardo Terrosos Gutarra, Sergio Morales Azañedo, Aldair Huamani Huamani, Ruth Canahuire</i>	
Mobile Robot for Debris Removal from High Voltage Power Lines	259
<i>Rogério Sales Gonçalves, Frederico Souza, Rafael Homma, Daniel Tió Sudbrack, Paulo Victor Trautmann, Bruno Cordeiro Clasen</i>	
Towards an Autonomous RoboCup Small Size League Robot	264
<i>João Guilherme Melo, Felipe Martins, Lucas Cavalcanti Santos, Roberto Fernandes, Victor Araújo, Riei Araújo, João Guilherme Monteiro, Edna Barros</i>	
Thermal Modeling of Electric Motors Used in Very Small Size Soccer Robots	270
<i>An Experimental Analysis of Smart Warehouses' Order Flow in Robot Energy Consumption</i>	
An Experimental Analysis of Smart Warehouses' Order Flow in Robot Energy Consumption	276
<i>George Oliveira, Jonata Tyska Carvalho, Patricia Plentz</i>	
Vision, Sensing and Mapping	
DA-SLAM: Deep Active SLAM based on Deep Reinforcement Learning	282
<i>Martin Alcalde, Matías Ferreira, Pablo González, Federico Andrade, Gonzalo Tejera</i>	
Comparison of the YOLOv3 and SSD Models Using a Balanced Dataset with Data Augmentation, for Object Recognition in Images	288
<i>Adriana Carrillo Rios, Anselmo Cukla, Marco Cuadros, Daniel Fernando T. Gamarra</i>	
Semantic SuperPoint: A Deep Semantic Descriptor	294
<i>Gabriel Gama, Nicolas dos Santos Rosa, Valdir Grassi Junior</i>	
Sliding Windowed Optimization Algorithm for Fusion of Redundant Stereo Visual Odometries	300
<i>Elizabeth Viviana Cabrera Avila, Bruno da Silva, Luiz Gonçalves</i>	
Semi-Supervised Learning for Intelligent Surveillance	306
<i>Guilherme Freitas, Marcos R. O. A. Maximo, Filipe Verri</i>	

Dense Prediction Transformer for Scale Estimation in Monocular Visual Odometry	312
<i>André O. Françani, Marcos R. O. A. Maximo</i>	
Navigation Aids based on Optical Flow and Convolutional Neural Network	318
<i>Leonardo Silveira, Matheus Rodrigues, Bruno Faiçal, Alexandre Silva, Cesar Marcondes, Marcos R. O. A. Maximo, Filipe Verri</i>	
AGV detection in industrial environments through computer vision	324
<i>Wilson Barioni, Igor Latini, André Lazzaretti, Marco A. Teixeira, Flávio Neves-Jr, Lúcia Valéria Ramos de Arruda</i>	
Localization of mobile robots through optical flow and sensor fusion in mining environments	330
<i>Jacó Domingues, Héctor Azpúrua, Gustavo Freitas, Gustavo Pessin</i>	
Classification of the scenery using multinomial logistic regression in a sugarcane crop	336
<i>Leonardo Bonacini, Handel Natividade Peres, Vitor Akihiro Hisano Higuti, Vivian Suzano Medeiros, Marcelo Becker, Mario Tronco</i>	
Active Perception Applied To Unmanned Aerial Vehicles Through Deep Reinforcement Learning . . .	342
<i>Matheus Mateus, Ricardo Bedin Grando, Paulo Lilles Drews Jr</i>	
Underwater image enhancement based on fusion of intensity transformation techniques	348
<i>Laura Martinho, Felipe Oliveira, João Marcos Cavalcanti, José Luiz Pio</i>	

Workshop of Robotics in Education

Robotics in Education

Design of a Control Approach to Assist the Performance of a Competitive Line Follower Robot	354
<i>Johann Amorim, Jefferson Fernandes, Matheus Machado, André Canella, Milena Faria Pinto</i>	
Project-based learning activity with robotics: a low-cost case study	360
<i>Aderson Passos, Fabio Luiz Junior, Humberto Arruda</i>	
Case Study of student with neuromotor disability in the Educational Robotics project in Elementary School I	366
<i>Ana Canet, Flavio Tonidandel</i>	
ThinkCarpet: Potentializing Computational Thinking with Educational Robotics in Middle School . .	372
<i>Almir de Oliveira Costa Junior, João Silva, José Anglada, Elloá B. Guedes</i>	
An Experience Using Robotics to Assist in the Learning the Concept of Angles with 8th and 9th Grade Students of Middle School	378
<i>Wanderlei Silva, Almir de Oliveira Costa Junior</i>	
Utilizing Educational Robotics for learning about Sustainability issues	384
<i>Andre Carlos, Almir Silveira, Raphael Oliveira, Lucas Te Tejedor, Giselle Mesiera, João Roberto Quadros</i>	
Development of an Introduction to Robotics Course for 9th-grade Students of Public Schools Using the Flipped Classroom Methodology	389
<i>Gabriel Nascimento Neto, Matheus Silva, Leonardo Teixeira, Cláudia Maia, Eduarda Chiesa, Caio Lima</i>	
Data-Driven Control and Behavior-Based Control Applied to a SISO Mobile Robot	395
<i>Mario Pastrana Triana, Karine R. Santos, Alceu B. C. de Farias, Daniel M. Munoz</i>	
EduBot Project: Post-pandemic remodeling of in-person robotics classes	401
<i>Luísa Frota, Sheila Araújo, Gleyson Brito, Lukas da Silva, Walker Dimitry Andrade, Luiz Rodrigues e Silva, Claudia Diaz, Roberto Baptista</i>	
AstroBot: A robotic platform to enhance the teaching-learning process in basic education	407
<i>Jaqueliney Teixeira, Laryssa Caneschi, Celso Barcelos, Leonardo Alves Fagundes-Júnior, Hiago Batista, Wérikson Alves, Beatriz Miranda, Silvana C. dos Santos, Alexandre Brandão</i>	
The Inclusive Potential of Educational Robotics	412
<i>Ana Canet, Flavio Tonidandel</i>	
RepositORE: A Learning Objects Repository for Educational Robotics	418
<i>Kefton Melo, Clayton Costa, Thalia Gurgel, Sebastiao Alves Filho</i>	

FluxProg 2.0 - Teaching Introductory Programming Using Flowcharts with real and simulated robots for the Brazilian Robotics Olympiad (OBR)	424
<i>João Fabro, Matheus Biscaya Gutierrez, Fernando Henrique Ratusznei Caetano</i>	
A realistic simulation environment as a teaching aid in educational robotics	430
<i>José Lima, Rebeca B. Kalbermatter, João Braun, Thadeu Brito, Guido Berger, Paulo Costa</i>	
Educational robotics with tangible programming: A digital circuit for blocks communication with code and visual feedback transfer capabilities	436
<i>Jessica Salles, Cristiane Pelisolli Cabral, Rosane Aragón, Alexandre Simões</i>	
Study of an Assistive Robotics 5-DoF System Prototype to be Taught in Undergraduate Engineering Classes	442
<i>Mirella Carneiro, Milena Faria Pinto, Ana Medeiros, Pedro Passos Pedrosa, Ana Barros</i>	
A Systematic Review on the Application of Educational Robotics to Children with Learning Disability	448
<i>Maria Silva, Erika Yanaguibashi, Luiz Gonçalves</i>	

Author Index