

18th IFAC Conference on Programmable Devices and Embedded Systems (PDES 2024)

IFAC PapersOnline Volume 58, Issue 9

Brno, Czech Republic
19-21 June 2024

Editors:

Miroslav Jirgl

ISBN: 979-8-3313-0190-3

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

To the extent permissible under applicable laws, no responsibility is assumed by the Owner, the Publisher or the Licensee for any injury and/or damage to persons or property as a result of any actual or alleged libelous statements, infringement of intellectual property or privacy rights, or products liability, whether resulting from negligence or otherwise, or from any use or operation of any ideas, instructions, procedures, products or methods contained in the material therein.

The publication of an advertisement in the POD Edition does not constitute on the part of the Owner, the Publisher or the Licensee a guarantee or endorsement of the quality or value of the advertised products or services described therein or of any of the representations or the claims made by the advertisers with respect to such products or services.

Copyright© (2024) by the authors
Open access publication under the CC-BY-NC-ND License
<https://creativecommons.org/licenses/by-nc-nd/4.0/>
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact the publisher, Elsevier Limited
at the address below.

Elsevier Limited
The Boulevard, Langford Lane
Kidlington
Oxford OX5 1GB UK

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
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Algebraic Tools in Autotuning Design	1
<i>Roman Prokop, Jiří Korbel</i>	
Multimodal Low-Cost Device for AI Projects Deployment and PoC Validation.	7
<i>Martin Bulín, Petr Neduchal, Jan Švec</i>	
Fault Detection Algorithm for Pneumatic Measuring and Sorting Station	13
<i>Albena M. Taneva, Antoniy P. Petrov, Michail G. Petrov</i>	
From Detection to Action: Implementing Deep Learning Inference in PLC Systems via Docker Services	19
<i>L. Körösi, S. Kajan, M. Berki, J. Skirkaniè, M. Lùèny, A. Melichar, J. Mihálik</i>	
Design and Analyses of Tendon-Driven Continuum Robots for Minimally Invasive Surgery	25
<i>Martin Varga, Peter J. Sinèák, Tomáš Merva, Peter Marcinko, Lubica Miková, Erik Prada, Marek Schnitzer, Ivan Virgala</i>	
Development of an IoT Platform for Wearable Biosignal Monitoring Systems	31
<i>Hizza Waseem, Janina K. Montonen, Abdur M. Rahman, Teemu H. Salo, Aki P. Halme, Jukka J. Vanhala</i>	
A Method of Tactile Resistive Sensor Array Calibration	37
<i>Michal Husák, Ondrej Mihálik, Petr Dvorský, Zdeník Bradáè</i>	
Computer Vision Approaches for Automated Bee Counting Application	43
<i>Simon Bilik, Ilona Janakova, Adam Ligocki, Dominik F. K. Horak</i>	
Neuro-Evolution of Frequency Controllers in the Power-Electricity System Island	49
<i>Filip Zúbek, Martin Ernek, Ivan Kenický, Ivan Sekaj</i>	
Open Source Embedded System Approach for Decreasing Carbon Footprint of Oldtimers	55
<i>Adis Dediæ, Dejan Jokiaæ, Jasmin Kevriaæ, Slobodan Lubura</i>	
Application of Quasi-Fractional Order PI Controller to IPDT Plant Control	61
<i>Igor Bélaï, Igor Bélaï, Pavol Bisták</i>	
Industry 4.0 Demonstrator: COMBED	67
<i>V. Braun, F. Zezulka, P. Marcon, J. Jirsa, P. Fiedler, V. Kaczmarczyk, J. Arm, Z. Bradac, P. Dohnal</i>	
Practice-Oriented Controller Design of a Simple Nonlinear System	73
<i>M. Huba, P. Bistak, P. Apák, D. Vrancic</i>	
Usage of IoT Devices as Progressive Technology in the Era of Digitization: Case Study	79
<i>Marek Vagas, Ondrej Majercak</i>	
KNX-ZigBee Gateway	85
<i>Dominik Grzegorz, David Vala</i>	
Laboratory Tester for Relay Contacts Lifespan	91
<i>Milan Skula, David Vala, Petr Bilik</i>	

A Data-Driven Approach to Reliability and Fault Analysis in Industrial Maintenance.....	97
<i>Petr Semotam</i>	
Assessment of 5G Connectivity for UAV Operations in Urban Environments: An Analysis of Network Performance and UAV Communication Architecture.....	103
<i>Van P. Nguyen, Josef Bajer, Markéta Vršecká</i>	
Enhancing Microcontroller Programming Education with a 3D Virtual Factory Simulator	109
<i>Tomas Buchta, Tomas Martinec, Jaroslav Buchta, Jaroslav Hlava, Petr Tuma</i>	
Advanced Preliminary Screening for PD Detection for Overhead Distribution Lines with Covered Conductors.....	114
<i>Lukáš Klein, David Seidl</i>	
Comparison of Split Computing Scenarios for Object Detection.....	120
<i>Petr Neduchal, Jakub Straka, Matij Sieber, Ivan Gruber</i>	
The Influence of Recursive Filtering Methods on Bluetooth-Based Localization.....	126
<i>Mateusz Sumorek, Adam Idýkowski</i>	
Event Driven Phase-Locked Loop with Application to Atomic Force Microscopy Oscillation Non- Resonant Modes	132
<i>Sergey Belikov</i>	
Road Pavement Monitoring and Analysis Approaches using Gyroscope and Accelerometer Data	138
<i>Y. Boyarchikov, T. Martinec</i>	
A Comparison of Methods Recovering Signals from Non-Uniform Samples.....	143
<i>Ondrej Mihálik, Michaela Mesárošová, Jakub Ěelko, Tomáš Sýkora, Zdeněk Bradáè</i>	
Mechatronics System for Solving SuDoKu Puzzle Based on Cartesian Robot.....	149
<i>Radosław Tomaszewski, Wojciech Walendziuk, Roman Trochimczuk, Adam Wolniakowski, Kacper Jaroszewicz, Zdenek Slanina</i>	
Experimental Kit and Digital Model to Support an Agile Design Process of an Industrial Multihead Weigher	154
<i>Felix Profe, Lucas Kostetzer, Christoph Ament</i>	
Generic Model of IoT Edge Device for Object Monitoring via LoRaWAN.....	160
<i>Peter Peniak, Emília Bubeníková, Peter Holeèko</i>	
Overview of Current Technical Adaptations to the Electro-Mechanical Lung Simulator xPULM for Use as an Alternative Method to Animal Testing	166
<i>Andreas Drauschke, Richard Paštika</i>	
Effects of Binary Similarity Metrics for the Relevance Component of Serendipity-Oriented Clustering Method in Collaborative Filtering.....	172
<i>Edip Senyurek, Jasmin Kevric</i>	
Phase-Based Video Magnification on a Single Board Computer	178
<i>D. Rícanek</i>	
Mecanum Wheel Mobile Platform for Rapid Prototyping of the Autonomous Control Algorithms	183
<i>Kacper Jaroszewicz, Wojciech Walendziuk, Roman Trochimczuk, Adam Wolniakowski, Radosław Tomaszewski, Zdenek Slanina</i>	

Contribution to the Dimensioning of Measurement Station for DC Motors	189
<i>Ján Briežnik, Katarína Žáková</i>	
Advanced IoT-Based Wireless Sensors for Remote Geotechnical Monitoring and Structural Diagnostics	193
<i>Martin Pies, Jan Velicka, Radovan Hajovsky</i>	
Multifunctional Street Lighting Lamp.....	199
<i>Milan Skula, Dominik Grzegorz, David Vala, Veronika Zelenková</i>	
Use of Multi-Agent System for Industrial Production Control	205
<i>J. Jirsa, F. Zezulka, P. Marcoò, T. Peèinka, L. Nováèek, V. Kaczmarczyk, J. Arm</i>	
Design and Implementation of the Reactive Asset Administration Shell using JSON-Based Database	211
<i>J. Arm, P. Cernocky, V. Kaczmarczyk, O. Bastan, F. Rusnak, P. Fiedler</i>	
Model- And Data-Based Control of Self-Balancing Robots: Practical Educational Approach with LabVIEW and Arduino.....	217
<i>Abdelrahman Abdelgawad, Tarek Shohdy, Ayman Nada</i>	
Utilization of G-Programming Language for Educational Control Application: Case Study of Magnetic Levitation of Elastic Beam	223
<i>Abdallah Amr, Mostafa Eshra, Ayman A. Nada</i>	
A Simple State-Space Model of Human Driver Applicable to Windy Conditions	229
<i>Jakub Èelko, Ondrej Mihálik, Michal Husák, Zdenìk Bradàè</i>	
Magnetic Levitation Remote Control Laboratory Based on Matlab and Websockets	235
<i>Pavol Bistak, Mikulas Huba, Peter Drahos, Igor Belai, Damir Vrancic</i>	
Innovative Device for Measuring Energy-Harvesters	241
<i>F. Rusnák, J. Arm, P. Fiedler</i>	
Target-Following Robotic Platform Based on UWB Localization and Depth Camera	247
<i>Petr Janousek, Zdenek Slanina, Wojciech Walendziuk</i>	
The ABMS - Automatic Balancing Mechatronic System	253
<i>Ján Šefèik, Katarína Žáková</i>	
Fuzzy Logic-Based Techniques for Human Driver Behavior Modelling During a Simple Lane- Changing Task	257
<i>M. Jirgl, M. Mesarosova, P. Fiedler, J. Arm</i>	
Evaluating the Effect of Fatigue on Driver's Performance.....	263
<i>M. Jirgl, S. Sediva, Z. Bradac</i>	
Demand Response Method for the Domestic PV System.....	269
<i>Václav Kaczmarczyk, Jakub Arm, Ondøej Baštán, Zuzana Kaczmarczyková</i>	
Asset Administration Shell as the Key Enabler of the Industry 4.0 Phenomenon	275
<i>J. Arm, V. Kaczmarczyk, T. Benesl, P. Marcon, M. Jirgl, Z. Bradac</i>	
Using Visual Odometry to Determine the Position of a UAV	281
<i>Marco Pintér, Jiøí Janouek, Jan Klouda, Petr Marcoò</i>	

Stand-Alone Solar Lighting System with Programmable Logic Controller	287
<i>J. Bešić, E. Ajkunić, J. Hivziefindić, D. Jokić, M. Šarić</i>	
Analysis of Requirements for Teaching Industry 4.0 Topics at Universities	293
<i>Václav Kaczmarczyk, Ondřej Baštán, Petr Marcoò, Jan Jirsa, Jakub Arm, Zdenek Bradac, Zuzana Kaczmarczyková</i>	
CNN Architecture for Posture Classification on Small Data	299
<i>Michaela Mesárošová, Ondrej Mihálik, Miroslav Jirgl</i>	
Mobile Robot Perception System in ROS 2 on Embedded Computing Platforms	305
<i>Tomáš Zemělk, Lukáš Kratochvíla</i>	
Digital Twin of Heat Exchange Station	311
<i>Tomáš Benešl, Michal Husák, Ondrej Mihálik, Radim Vancí, Zdeněk Bradáč</i>	

Author Index