

# **2022 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR 2022)**

**Cluj-Napoca, Romania  
19-21 May 2022**



**IEEE Catalog Number: CFP22AQT-POD  
ISBN: 978-1-6654-7934-9**

**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:    | CFP22AQT-POD      |
| ISBN (Print-On-Demand): | 978-1-6654-7934-9 |
| ISBN (Online):          | 978-1-6654-7933-2 |

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

**2022 IEEE International Conference on  
Automation, Quality and Testing, Robotics**

**THETA 23<sup>rd</sup> edition**

**19<sup>th</sup>-21<sup>st</sup> May, Cluj-Napoca, Romania**

# Contents

| ID/session code            | Paper title   | Authors and affiliations  | Page |
|----------------------------|---|---|------|
| <b>Quality and Testing</b> |   |   |      |
| 4/QT4                      | An Internet of Things-Enabled Sound Level Meter Using Off-the-Shelf Components              | George Mois ( <i>Technical University of Cluj-Napoca</i> ), Teodora Sanislav ( <i>Technical University of Cluj-Napoca</i> ), Silviu Corneliu Folea ( <i>Technical University of Cluj-Napoca</i> )   | 3    |
| 6/QT1                      | Locate, Execute, Expect Design Pattern  | Andrei M. Vadan ( <i>Porsche Engineering Romania</i> ), Liviu C. Miclea ( <i>Technical University of Cluj-Napoca</i> )  | 7    |
| 10/QT3                     | Security Analysis of Vehicle Instrument Clusters by Automatic Fuzzing and Image Acquisition | Alfred Anistoroaei ( <i>Politehnica University of Timisoara</i> ), Bogdan Groza ( <i>Politehnica University of Timisoara</i> ), Pal-Stefan Murvay ( <i>Politehnica University of Timisoara</i> ), Eugen Gurban ( <i>Politehnica University of Timisoara</i> )   | 13   |
| 11/QT2                     | Quality Enhancement of the SEM Images   | Florin Toadere ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Nicoleta Tosa ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Alin Sebastian Porav ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ) | 19   |
| 21/QT3                     | A Performance Evaluation of Modern Virtualization Techniques                                | Ionut Donca ( <i>Technical University of Cluj-Napoca</i> ), Liviu Miclea ( <i>Technical University of Cluj-Napoca</i> ), Ovidiu Petru Stan ( <i>Technical University of Cluj-Napoca</i> )   | 23   |
| 23/QT3                     | Judicial Surveillance of Cyber-Physical Systems   | Ticovan Ioan Vasile ( <i>Technical University of Cluj-Napoca</i> ), Sebestyen Gheorghe ( <i>Technical University of Cluj-Napoca</i> )   | 29   |

| ID/session code | Paper title  | Authors and affiliations  | Page |
|-----------------|--|---|------|
| 26/QT2          | Computerized Detection of JWH Synthetic Cannabinoids Class Membership Based on Machine Learning Algorithms and Molecular Descriptors   | Catalina Mercedes Burlacu ( <i>Dunarea de Jos University of Galati</i> ), Mirela Praisler ( <i>Dunarea de Jos University of Galati</i> ), Adrian Constantin Burlacu ( <i>Dunarea de Jos University of Galati</i> )  | 35   |
| 31/QT2          | Clustering Consumption Activities in a Water Monitoring System   | Diana-Andreea Arsene ( <i>University Politehnica of Bucharest</i> ), Alexandru Predescu ( <i>University Politehnica of Bucharest</i> ), Ciprian-Octavian Truică ( <i>University Politehnica of Bucharest</i> ), Elena-Simona Apostol ( <i>University Politehnica of Bucharest</i> ), Mariana Mocanu ( <i>University Politehnica of Bucharest</i> ), Costin-Gabriel Chiru ( <i>University Politehnica of Bucharest</i> ) | 41   |
| 41/QT3          | Test Cost-Test Quality Modeling For Adaptive Test  | Bekir Zahit Demiray ( <i>University of Iowa</i> ), Baris Arslan ( <i>Acibadem University</i> )  | 47   |
| 50/QT4          | Studies on the Operation of Electromagnetic Actuators With Potential Use to Reduce the Level of Vibrations Generated in Piping Systems | Vlad Mihai Panainte ( <i>Technical University of Cluj-Napoca</i> ), Sanda Oltean ( <i>Technical University of Cluj-Napoca</i> ), Ana Maria Moldovan ( <i>Technical University of Cluj-Napoca</i> ), Horia Bălan ( <i>Technical University of Cluj-Napoca</i> )  | 53   |
| 51/QT1          | Detect Data Deviation for Temperature and Ambient Light Sensors, and Create a Simple Calibration Method                                | Andrei M. Vadan ( <i>Porsche Engineering Romania</i> ), Liviu C. Miclea ( <i>Technical University of Cluj-Napoca</i> )  | 59   |
| 58/QT2          | Towards Energy Communities: A Multi-Agent Case Study   | Mircea Stefan Simoiu ( <i>University Politehnica of Bucharest</i> ), Ioana Fagarasan ( <i>University Politehnica of Bucharest</i> ), Stephane Ploix ( <i>Grenoble INP</i> ), Vasile Calofir ( <i>University Politehnica of Bucharest</i> ), Sergiu Stelian Iliescu ( <i>University Politehnica of Bucharest</i> )   | 65   |

| ID/session code | Paper title  | Authors and affiliations  | Page |
|-----------------|--|---|------|
| 59/QT1          | Input-Aware Approximate Computing  | Ali Piri ( <i>Lyon Institute of Nanotechnology</i> ), Saeedi Sepide ( <i>Politecnico di Torino</i> ), Mario Barbareschi ( <i>University of Naples Federico II</i> ), Bastien Deveautour ( <i>Lyon Institute of Nanotechnology</i> ), Stefano Di Carlo ( <i>Politecnico di Torino</i> ), Ian O'Connor ( <i>Lyon Institute of Nanotechnology</i> ), Alessandro Savino ( <i>Politecnico di Torino</i> ), Marcello Traiola ( <i>Inria Rennes / IRISA</i> ), Alberto Bosio ( <i>Lyon Institute of Nanotechnology</i> ) | 71   |
| 60/QT2          | Predictive Maintenance Efficiency Study Using Wireless Sensor Clusters (WSCs)        | Ioan Szabo ( <i>University of Pitesti</i> ), Andrei Alexandru Tulbure ( <i>Technical University of Cluj-Napoca</i> ), Dorin Fleseriu ( <i>University of Pitesti</i> ), Adrian Alexandru Tulbure ( <i>University of Alba Iulia</i> )   | 77   |
| 62/QT4          | Using Analog Scrambling Circuits for Automotive Sensor Integrity and Authenticity    | Alessandro Savino ( <i>Politecnico di Torino</i> ), Cristiano Chenet ( <i>Politecnico di Torino</i> ), Stefano Di Carlo ( <i>Politecnico di Torino</i> )  | 83   |
| 72/QT1          | Implementation and Testing of Digital Filters on STM32 Nucleo-64P                    | Sim Simona-Daiana ( <i>Technical University of Cluj-Napoca</i> ), Zsófia Lendek ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 89   |
| 74/QT3          | Ontology Driven High Performance Messaging System for Distributed Software Platforms | Daniela Delinschi ( <i>Holisun SRL</i> ), Rudolf Erdei ( <i>Holisun SRL</i> ), Oliviu Matei ( <i>Technical University of Cluj-Napoca, North University Centre of Baia Mare</i> )  | 95   |
| 76/QT4          | Activity Recognition Using Unsupervised Learning                                     | Anca Alexan ( <i>Technical University of Cluj-Napoca, North University Centre of Baia Mare</i> ), Alexandru Alexan ( <i>Technical University of Cluj-Napoca, North University Centre of Baia Mare</i> ), Stefan Oniga ( <i>Technical University of Cluj-Napoca, North University Center of Baia Mare</i> )  | 101  |
| 77/QT4          | Smartwatch Activity Recognition Feature Comparison Using ML.net                      | Alexandru Alexan ( <i>Technical University of Cluj-Napoca, North University Centre of Baia Mare</i> ), Anca Alexan ( <i>Technical University of Cluj-Napoca, North University Centre of Baia Mare</i> ), Stefan Oniga ( <i>Technical University of Cluj-Napoca, North University Center of Baia Mare</i> )  | 107  |

| ID/session code      | Paper title   | Authors and affiliations   | Page |
|----------------------|---|--|------|
| 79/QT3               | 3D Object Recognition Method using CNNs and Slicing                                   | Razvan Gabriel Dumitru ( <i>Technical University of Cluj-Napoca</i> ), Sebastian Antonio Toma ( <i>Technical University of Cluj-Napoca</i> ), Dorian Gorgan ( <i>Technical University of Cluj-Napoca</i> )   | 113  |
| 84/QT4               | PCB Quality Check: Optical Inspection Using Color Mask and Image Thresholding         | Emilia Sipos ( <i>Technical University of Cluj-Napoca</i> ), Alexandra Ones ( <i>Technical University of Cluj-Napoca</i> ), Laura Nicoleta Ivanciu ( <i>Technical University of Cluj-Napoca</i> )  | 119  |
| <b>Robot Control</b> |   |  |      |
| 48/R1                | Development of a Human Service Robot Application Using Pepper Robot as a Museum Guide | Bogdan Gabriel Draghici ( <i>Technical University of Cluj-Napoca</i> ), Alexandra Elena Dobre ( <i>Technical University of Cluj-Napoca</i> ), Marius Misaros ( <i>Technical University of Cluj-Napoca</i> ), Ovidiu Petru Stan ( <i>Technical University of Cluj-Napoca</i> )  | 127  |
| 54/R1                | Analysis and Preliminary Design of a New Parallel Robot for SILS                      | Ionut-Mihai Ulinici ( <i>CESTER, Technical University of Cluj-Napoca</i> ), Nicolae Crisan ( <i>Iuliu Hatieganu University of Medicine and Pharmacy Cluj-Napoca</i> ), Calin Vaida ( <i>Technical University of Cluj-Napoca</i> ), Iulia Andras ( <i>Iuliu Hatieganu University of Medicine and Pharmacy Cluj-Napoca</i> ), Doina Pisla ( <i>Technical University of Cluj-Napoca</i> )   | 133  |
| 55/R1                | HRI Based Command System of a Modular Parallel Robot for Brachial Monoparesis         | Alin Burz ( <i>Technical University of Cluj-Napoca</i> ), Paul Tucan ( <i>Technical University of Cluj-Napoca</i> ), Nicoleta Tohanean ( <i>Iuliu Hatieganu University of Medicine and Pharmacy Cluj-Napoca</i> ), Bogdan Gherman ( <i>Technical University of Cluj-Napoca</i> ), Calin Vaida ( <i>Technical University of Cluj-Napoca</i> ), Cristian Abrudan ( <i>Iuliu Hatieganu University of Medicine and Pharmacy Cluj-Napoca</i> ), Giuseppe Carbone ( <i>University of Calabria, Cosenza</i> ), Doina Pisla ( <i>Technical University of Cluj-Napoca</i> ) | 139  |
| 61/R1                | MPI Planar Correction of Pulse Based ToF Cameras                                      | Marian-Leontin Pop ( <i>Technical University of Cluj-Napoca</i> ), Levente Tamas ( <i>Technical University of Cluj-Napoca</i> )  | 145  |

| ID/session code        | Paper title  | Authors and affiliations   | Page |
|------------------------|--|--|------|
| 86/R1                  | Underwater Robot Pose Estimation Using Acoustic Methods and Intermittent Position Measurements at the Surface      | Vicu-Mihalis Maer ( <i>Technical University of Cluj-Napoca</i> ), Levente Tamas ( <i>Technical University of Cluj-Napoca</i> ), Lucian Bușoniu ( <i>Technical University of Cluj-Napoca</i> )  | 151  |
| <b>Control systems</b> |  |  |      |
| 7/C2                   | A Case Study for the Optimal Residential Battery Size and Dispatch Control in the Energy Market Context in Romania | Adrian Fratean ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 159  |
| 16/C1                  | Field Orientation Control of a PMSM Electrical Drive System with Application in Hybrid Electric Vehicle            | Helga Silaghi ( <i>University of Oradea</i> ), Viorica Spoiala ( <i>University of Oradea</i> ), Sanda Dale ( <i>University of Oradea</i> ), Claudiu Costea ( <i>University of Oradea</i> ), Tiberiu Barabas ( <i>University of Oradea</i> ), Dragos Spoiala ( <i>University of Oradea</i> ), Andrei Silaghi ( <i>University Politehnica Timisoara</i> )  | 165  |
| 17/C2                  | Approaching Problems with Different Kinds of Petri Net Models  | Octavian Cuibus ( <i>Technical University of Cluj-Napoca</i> ), Tiberiu Letia ( <i>Technical University of Cluj-Napoca</i> )   | 171  |
| 20/C1                  | Model Based Design Controller for Stand-Alone Conversion System with MPPT  | Calin Rusu ( <i>Technical University of Cluj-Napoca</i> ), Iulian Birou ( <i>Technical University of Cluj-Napoca</i> ), Sorin Salcu ( <i>Technical University of Cluj-Napoca</i> )   | 177  |
| 39/C1                  | Efficient Load Forecasting Model Assessment for Embedded Building Energy Management Systems                        | Cristina Nichiforov ( <i>University Politehnica of Bucharest</i> ), Nicoleta Arghira ( <i>University Politehnica of Bucharest</i> ), Grigore Stamatescu ( <i>University Politehnica of Bucharest</i> ), Iulia Stamatescu ( <i>University Politehnica of Bucharest</i> ), Ioana Fagarasan ( <i>University Politehnica of Bucharest</i> ), Sergiu Stelian Iliescu ( <i>University Politehnica of Bucharest</i> ) | 183  |
| 47/C1                  | H <sub>∞</sub> Controller Design and Parametric Identification for a DC Brushed Motor                              | Oliver Janos ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 189  |

| ID/session code     | Paper title  | Authors and affiliations   | Page |
|---------------------|--|--|------|
| 63/C1               | Experimental Control of Thermal Processes inside the Datacenter                                | Jefte Nagy ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Mihail Radu Cătălin Trușcă ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Ștefan Albert ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Felix Fărcaș ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ), Cristian-Andrei Lupșe ( <i>National Institute for Research and Development of Isotopic and Molecular Technologies Cluj-Napoca</i> ) | 195  |
| 68/C2               | Smart Energy Communities Power Capacity Firming and Grid Flexibility Services                  | Mihaela Coroiu ( <i>ENERGOBIT S.A.</i> ), Daniel Dumitrascu ( <i>ENERGOBIT CONTROL SYSTEMS</i> ), Radu Tarau ( <i>ENERGOBIT CONTROL SYSTEMS</i> )  | 201  |
| 78/C2               | Image Processing based System for Detecting and Unloading Billets from a Hearth Rotary Furnace | Cristina-Maria Stancioi ( <i>Technical University of Cluj-Napoca</i> ), Vlad Muresan ( <i>Technical University of Cluj-Napoca</i> ), Mihai Abrudean ( <i>Technical University of Cluj-Napoca</i> ), Iulia Clitan ( <i>Technical University of Cluj-Napoca</i> ), Mihaela-Ligia Unguresan ( <i>Technical University of Cluj-Napoca</i> ), Tiberiu Colosi ( <i>Technical University of Cluj-Napoca</i> )   | 207  |
| 83/C2               | Control Solutions for Anti-lock Braking System   | Bianca Toderean ( <i>Technical University of Cluj-Napoca</i> ), Roxana Rusu-Both ( <i>Technical University of Cluj-Napoca</i> )  | 213  |
| <b>Applications</b> |  |  |      |
| 8/A2                | Extraction of Functional Brain Networks from EEG Signals in the Context of Visual Perception   | Dan Dumitru ( <i>Technical University of Cluj-Napoca</i> ), Emanuela Ceuta ( <i>Technical University of Cluj-Napoca</i> ), Raul C. Mureşan ( <i>Transylvanian Institute of Neuroscience</i> ), Vlad Moca ( <i>Transylvanian Institute of Neuroscience</i> ), Mihaela Dinsoreanu ( <i>Technical University of Cluj-Napoca</i> )   | 221  |
| 25/A2               | Classification of Sessile Oak Leaves Affected by Defoliating Insects                           | Rares Petrisor ( <i>Technical University of Cluj-Napoca</i> ), Honoriu Valean ( <i>Technical University of Cluj-Napoca</i> )   | N/A  |

| ID/session code | Paper title   | Authors and affiliations   | Page |
|-----------------|---|--|------|
| 27/A2           | Road Traffic Analysis Using Unmanned Aerial Vehicle and Image Processing Algorithms | Carmen Gheorghe ( <i>Technical University of Cluj-Napoca</i> ), Nicolae Filip ( <i>Technical University of Cluj-Napoca</i> )   | 233  |
| 37/A4           | A System for Evaluating the Correctness of Physical Exercises Execution             | Codruta Maria Serban ( <i>Technical University of Cluj-Napoca</i> ), Anca Hangan ( <i>Technical University of Cluj-Napoca</i> )  | 239  |
| 40/A1           | A New Exoskeleton Robot for Human Motion Assistance                                 | Ionut Geonea ( <i>University of Craiova</i> ), Cristian Copilusi ( <i>University of Craiova</i> ), Alexandru Margine ( <i>University of Craiova</i> ), Leonard Ciurezu-Gherghe ( <i>University of Craiova</i> ), Nicolae Dumitru ( <i>University of Craiova</i> ), Adrian Sorin Rosca ( <i>University of Craiova</i> ) | 245  |
| 42/A3           | Towards a Self-Describing Gateway-Based IoT Solution                                | Bogdan Iancu ( <i>Technical University of Cluj-Napoca</i> ), Andrei Gatea ( <i>Technical University of Cluj-Napoca</i> )   | 251  |
| 44/A1           | Transforming the University Campus Into an Open-Lab: The SMART-UHA Project          | Jonathan Ledy ( <i>IRIMAS UHA</i> ), Thomas Josso-Laurain ( <i>IRIMAS UHA</i> ), Frédéric Fondement ( <i>IRIMAS UHA</i> ), Sébastien Bindel ( <i>IRIMAS UHA</i> ), Frédéric Drouhin ( <i>IRIMAS UHA</i> ), Françoise Simon ( <i>CREGO UHA</i> ), Michel Basset ( <i>IRIMAS UHA</i> )                                   | 257  |
| 45/A1           | Snake-Like Flexible Mechanical System With Applications in Exploratory Activities   | Leonard Ciurezu-Gherghe ( <i>University of Craiova</i> ), Nicolae Dumitru ( <i>University of Craiova</i> ), Ionut Geonea ( <i>University of Craiova</i> ), Stefan Lucian Bostina ( <i>Softronic SRL Craiova</i> )  | 263  |
| 46/A1           | Telepresence Robot for Exploring Protected Natural Areas                            | Paul Tota ( <i>Technical University of Cluj-Napoca</i> ), Gelu Ovidiu Tirian ("Politehnica" <i>University of Timisoara</i> ), Ligia Chiorean ( <i>Technical University of Cluj-Napoca</i> ), Mircea-Florin Vaida ( <i>Technical University of Cluj-Napoca</i> )  | 269  |
| 49/A3           | Evaluation of the Use of LiDAR Type Systems in Environmental Protection             | Constantin Daniel Oancea ( <i>University Politehnica of Bucharest</i> ), Ciprian Mihai Coman ( <i>Tesagon International SRL</i> ), Bogdan Cornelius Toma ( <i>Tesagon International SRL</i> )  | 275  |

| ID/session code | Paper title  | Authors and affiliations   | Page |
|-----------------|--|--|------|
| 56/A2           | Cyber-Physical Systems Based Business Models   | Eugen Pop ( <i>University "Politehnica" of Bucharest; R&amp;D Institute for Automation-IPA SA</i> ), Daniela Gîfu ( <i>IIT, Romanian Academy – Iași branch &amp; "Alexandru Ioan Cuza" University of Iași</i> ), Mihnea Alexandru Moisescu ( <i>University "Politehnica" of Bucharest</i> )  | 281  |
| 64/A1           | Development of a Neural Network Method to Estimate the Workspace of a Parallel Robot               | Catalin Boanta ( <i>Technical University of Cluj-Napoca</i> ), Cornel Brisan ( <i>Technical University of Cluj-Napoca</i> )  | 287  |
| 66/A3           | Multi-channel Chatbot and Robotic Process Automation   | Claudiu Domuta ( <i>Technical University of Cluj-Napoca</i> ), Alexandra Fanca ( <i>Technical University of Cluj-Napoca</i> ), Adela Puscasiu Pop ( <i>Technical University of Cluj-Napoca</i> ), Dan Gota ( <i>Technical University of Cluj-Napoca</i> ), Ovidiu Stan ( <i>Technical University of Cluj-Napoca</i> ), Honoriu Valean ( <i>Technical University of Cluj-Napoca</i> ), Liviu Miclea ( <i>Technical University of Cluj-Napoca</i> )  | 293  |
| 67/A4           | Gaze Analysis and Concentration Monitoring for Children With Attention Disorder using Eye-Tracking | Claudiu Domuta ( <i>Technical University of Cluj-Napoca</i> ), Ruxandra Miron Onciu ( <i>Riverbed Technology Romania</i> ), Dan Gota ( <i>Technical University of Cluj-Napoca</i> ), Alexandra Fanca ( <i>Technical University of Cluj-Napoca</i> ), Adela Pop Puscasiu ( <i>Technical University of Cluj-Napoca</i> ), Ovidiu Stan ( <i>Technical University of Cluj-Napoca</i> ), Honoriu Valean ( <i>Technical University of Cluj-Napoca</i> ), Liviu Miclea ( <i>Technical University of Cluj-Napoca</i> ) | 299  |
| 70/A3           | Simulation Framework for 6LoWPAN Networks Using Mininet-WiFi                                       | Sorin Buzura ( <i>Technical University of Cluj-Napoca</i> ), Hugo Bertranda ( <i>CESI Engineering School, Computer Science Section, Rouen</i> ), Raphaël Chevalier ( <i>CESI Engineering School, Computer Science Section, Rouen</i> ), Vasile Dadarlat ( <i>Technical University of Cluj-Napoca</i> ), Adrian Peculea ( <i>Technical University of Cluj-Napoca</i> )  | 305  |

| ID/session code | Paper title  | Authors and affiliations   | Page |
|-----------------|--|--|------|
| 71/A4           | Probabilistic Petri Nets Model for Assessing Temporal Variations of the Number of Bikes in Bike-Sharing Stations | Horatiu Florian ( <i>Technical University of Cluj-Napoca</i> ), Camelia Avram ( <i>Technical University of Cluj-Napoca</i> ), Mihai Pop ( <i>Technical University of Cluj-Napoca</i> ), Adrian Mocanu ( <i>Technical University of Cluj-Napoca</i> ), Dan Radu ( <i>Technical University of Cluj-Napoca</i> ), Adina Astilean ( <i>Technical University of Cluj-Napoca</i> )   | 311  |
| 80/A4           | A New Approach for Detection and Analysis of Lung Pleural Line Morphology  | Roxana Both ( <i>Technical University of Cluj-Napoca</i> ), Alexandra Popa ( <i>Technical University of Cluj-Napoca</i> ), Bianca Toderean ( <i>Technical University of Cluj-Napoca</i> ), Romeo Ioan Chira ( <i>University of Medicine and Pharmacy Cluj-Napoca</i> )   | 317  |
| 81/A4           | Romanian Coins Recognition and Sum Counting System From Image Using TensorFlow and Keras                         | Alexandra Fanca ( <i>Technical University of Cluj-Napoca</i> ), Adela Pop Puscasiu ( <i>Technical University of Cluj-Napoca</i> ), Dan Ioan Gota ( <i>Technical University of Cluj-Napoca</i> ), Flavius Madalin Giurgiu ( <i>Technical University of Cluj-Napoca</i> ), Maria Magdalena Santa ( <i>Technical University of Cluj-Napoca</i> ), Honoriu Valean ( <i>Technical University of Cluj-Napoca</i> ), Claudiu Domuta ( <i>Technical University of Cluj-Napoca</i> ), Liviu Miclea ( <i>Technical University of Cluj-Napoca</i> ) | 321  |
| 82/A2           | Ab Initio Gene Identification Using Apache Spark   | Tatar Simion-Daniel ( <i>Technical University of Cluj-Napoca</i> ), Gheorghe Sebestyen ( <i>Technical University of Cluj-Napoca</i> )  | 329  |
| 85/A3           | Automatic Tests Correction System in Education   | Ovidiu Buza ( <i>Technical University of Cluj-Napoca</i> )   | 335  |

### Special Sessions

#### SS1 - Transdisciplinary Approaches in Emerging Engineering Problems

|        |   |  |     |
|--------|---|--|-----|
| 12/SS1 | Control of a T1DM Model Using Robust Fixed-Point Transformations Based Control With Disturbance Rejection | Bence Czakó ( <i>Óbuda University</i> ), Dániel András Drexler ( <i>Óbuda University</i> ), Levente Kovács ( <i>Óbuda University</i> ) | 343 |
|--------|---|--|-----|

| ID/session code | Paper title  | Authors and affiliations  | Page |
|-----------------|--|---|------|
| 14/SS1          | Survey on Applying 3D Printing in Manufacturing the Cooling Systems of Electrical Machines | Lorand Szabo ( <i>Technical University of Cluj-Napoca</i> )   | 349  |
| 15/SS1          | Utilization of IMU-Based Gesture Recognition in the Treatment of Diabetes                  | Marcell Szántó ( <i>Óbuda University</i> ), Gergő Strasser ( <i>Óbuda University</i> ), László Szász ( <i>Óbuda University</i> ), Lehel Dénes-Fazakas ( <i>Óbuda University</i> ), György Eigner ( <i>Óbuda University</i> ), Gábor Kertész ( <i>Óbuda University</i> ), Levente Kovács ( <i>Óbuda University</i> ) | 355  |
| 18/SS1          | Novel Defect Tracking Using DeepSORT, ScaledYOLOv4 and the Clip Model                      | Andrei A. Tulbure ( <i>Technical University of Cluj-Napoca</i> ), Cosmin Covaciu ( <i>University of Pitesti</i> ), Adrian A. Tulbure ( <i>University "1 December 1918"</i> ), Eva-Henrietta Dulf ( <i>Technical University of Cluj-Napoca</i> )   | 361  |
| 36/SS1          | LMI Conditions for CNC Cascade Controller Design - A State Feedback Approach               | Dora Morar ( <i>Technical University of Cluj-Napoca</i> ), Vlad Mihaly ( <i>Technical University of Cluj-Napoca</i> ), Mircea Susca ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 367  |
| 53/SS1          | Optimization and Control of a Perfusion Bioreactor System in Tissue Engineering            | Ioana Nascu ( <i>Technical University of Cluj-Napoca</i> ), Ioan Nascu ( <i>Technical University of Cluj-Napoca</i> ), Wenli Du ( <i>East China University of Science and Technology</i> )  | 373  |

#### SS4 - New Trends and Challenges in Modeling and Control for Industry 5.0

|        |  |   |     |
|--------|--|---|-----|
| 24/SS4 | Use of Intelligent Digital Twin for Dynamic Calculation of the Reliability of Industrial Automation Systems    | Nasser Jazdi ( <i>University of Stuttgart / IAS</i> ), Baran Gül ( <i>University of Stuttgart</i> ), Manuel Müller ( <i>University of Stuttgart / IAS</i> ) | 381 |
| 29/SS4 | A Systematic Framework for Design and Evaluation of Control Strategies for Continuous Manufacturing of Tablets | Dana Copot ( <i>Ghent University</i> )  | 389 |

| ID/session code | Paper title   | Authors and affiliations  | Page |
|-----------------|---|---|------|
| 33/SS4          | Closed-Loop System Sensitivity Analysis for Passivity-Based Controller Parameters                 | Vlad Mihaly ( <i>Technical University of Cluj-Napoca</i> ), Mircea Susca ( <i>Technical University of Cluj-Napoca</i> ), Dora Morar ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 395  |
| 35/SS4          | Worst-Case Execution Time Estimation for Numerical Controllers                                    | Mircea Susca ( <i>Technical University of Cluj-Napoca</i> ), Vlad Mihaly ( <i>Technical University of Cluj-Napoca</i> ), Dora Morar ( <i>Technical University of Cluj-Napoca</i> ), Petru Dobra ( <i>Technical University of Cluj-Napoca</i> )  | 401  |
| 38/SS4          | Optimization of the Wastewater Treatment Plant Recycle Flowrates Using Artificial Neural Networks | Norbert-Botond Mihály ( <i>Babeş-Bolyai University</i> ), Alexandra-Veronica Luca ( <i>Babeş-Bolyai University</i> ), Melinda Simon-Várhelyi ( <i>Babeş-Bolyai University</i> ), Vasile-Mircea Cristea ( <i>Babeş-Bolyai University</i> )   | 407  |
| 73/SS4          | Fractional Order Controller for the <sup>13</sup> C Isotope Separation Process                    | Roxana Motorga ( <i>Technical University of Cluj-Napoca</i> ), Vlad Muresan ( <i>Technical University of Cluj-Napoca</i> ), Mihail Abrudean ( <i>Technical University of Cluj-Napoca</i> ), Iulia Clitan ( <i>Technical University of Cluj-Napoca</i> ), Mihaela Unguresan ( <i>Technical University of Cluj-Napoca</i> ), Mihai Marusciac ( <i>Technical University of Cluj-Napoca</i> ) | 413  |