

# **2016 21st International Conference on Methods and Models in Automation and Robotics (MMAR 2016)**

**Miedzyzdroje, Poland  
29 August – 1 September 2016**

**Pages 1-650**



**IEEE Catalog Number: CFP16MMA-POD  
ISBN: 978-1-5090-1715-7**

**Copyright © 2016 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 publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP16MMA-POD
ISBN (Print-On-Demand):	978-1-5090-1715-7
ISBN (Online):	978-1-5090-1866-6

**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)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# MMAR 2016 Table of Contents

## **A1L-A Plenary Lecture I**

Date: Monday, August 29, 2016

Time: 15:10 - 16:10

Room: Room 1

Chair: Andrzej Bartoszewicz

---

**Self-Optimizing Active Control of Narrowband Acoustic Noise .....No Paper**

Maciej Niedzwiecki

*Gdansk University of Technology*

## **A2L-A Robotics I**

Date: Monday, August 29, 2016

Time: 16:30 - 17:50

Room: Room 1

Chair: Krzysztof Kozłowski

---

<b>Solvability of Reactions and Inverse Dynamics Problem for Complex Kinematic Chains .....</b>	<b>1</b>
Marcin Pękal, Janusz Fraćzek, Paweł Tomulik <i>Warsaw University of Technology, Poland</i>	
<b>ArchGenTool: a System-Independent Collaborative Tool for Robotic Architecture Design .....</b>	<b>7</b>
Emanuele Ruffaldi <sup>2</sup> , Giannis Kostavelis <sup>1</sup> , Dimitris Giakoumis <sup>1</sup> , Dimitrios Tzouvaras <sup>1</sup> <sup>1</sup> <i>Information Technologies Institute / CERTH, Greece;</i> <sup>2</sup> <i>Scuola Superiore Sant'Anna, Italy</i>	
<b>Output Robust Control with Anti-Windup Compensation for Robotic Boat .....</b>	<b>13</b>
Oleg Borisov, Vladislav Gromov, Anton Pyrkin, Alexey Bobtsov, Igor Petranevsky, Alexey Klyunin <i>ITMO University, Russia</i>	
<b>Explicit and Implicit Force Control of an Industrial Manipulator - an Experimental Summary .....</b>	<b>19</b>
Alexander Winkler <sup>1</sup> , Jozef Suchý <sup>2</sup> <sup>1</sup> <i>Hochschule Mittweida, Germany;</i> <sup>2</sup> <i>Matej Bel University / Technische Universität Chemnitz, Slovakia</i>	

**A2L-B Signal Processing I**

Date: Monday, August 29, 2016  
Time: 16:30 - 17:50  
Room: Room 2  
Chair: Witold Mickiewicz

---

<b>Signal Fusion of Changes in the Inductive Loop Impedance Components for Vehicle Axle Detection</b> .....	25
Zbigniew Marszalek, Ryszard Sroka <i>AGH University of Science and Technology, Poland</i>	
<b>SoftPOSIT Enhancements for Monocular Camera Spacecraft Pose Estimation</b> .....	30
Jian-Feng Shi, Steve Ulrich <i>Carleton University, Canada</i>	
<b>Implementation of Non-Zero Initial Conditions for Multi-Notch FIR Filter Using Raspberry Pi</b> .....	36
Sławomir Kocoń, Jacek Piskorowski <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Real Time Localization System with Extended Kalman Filter for Indoor Applications</b> .....	42
Sławomir Romaniuk <sup>1</sup> , Leszek Ambroziak <sup>1</sup> , Zdzisław Gosiewski <sup>1</sup> , Pekka Isto <sup>2</sup> <i><sup>1</sup>Białystok University of Technology, Poland; <sup>2</sup>Technical Research Centre of Finland, Finland</i>	

## **A2L-C Control and Systems Theory I**

Date: Monday, August 29, 2016

Time: 16:30 - 17:50

Room: Room 3

Chair: Jerzy Klamka

---

<b>Linearization by Generalized Input-Output Injections on Homogeneous Time Scales .....</b>	<b>48</b>
Monika Ciulkin <sup>1</sup> , Ewa Pawłuszewicz <sup>1</sup> , Vadim Kaparin <sup>2</sup> , Ülle Kotta <sup>2</sup> <i><sup>1</sup>Białystok University of Technology, Poland; <sup>2</sup>Tallinn University of Technology, Estonia</i>	
<b>Dynamic Stabilization of the Pendulum in a Moving Potential Well .....</b>	<b>54</b>
Maciej Ciężkowski <i>Białystok University of Technology, Poland</i>	
<b>Computation of Final Dimension Initial Conditions and Inputs for Given Outputs of Differential-Algebraic Systems with Delay .....</b>	<b>59</b>
Zbigniew Zaczekiewicz <i>Politechnika Białostocka, Poland</i>	
<b>Contribution of a New Matrix H-Inverse to Stabilizing the Perfect Control for LTI MIMO State-Space Systems .....</b>	<b>64</b>
Wojciech Hunek <i>Opole University of Technology, Poland</i>	

**A2L-D Iterative Learning Control**

Date: Monday, August 29, 2016  
Time: 16:30 - 17:50  
Room: Room 4  
Chair: Marcin Witczak

---

<b>Optimal Sensor Selection for Model Identification in Iterative Learning Control of Spatio-Temporal Systems .....</b>	<b>70</b>
Damian Kowalów, Maciej Patan <i>University of Zielona Góra, Poland</i>	
<b>Design of Iterative Learning Control Schemes for Systems with Sector-Bounded Nonlinearities .....</b>	<b>76</b>
Wojciech Paszke <sup>2</sup> , Marcin Boski <sup>2</sup> , Eric Rogers <sup>1</sup> , Krzysztof Gałkowski <sup>2</sup> <sup>1</sup> <i>University of Southampton, United Kingdom;</i> <sup>2</sup> <i>University of Zielona Góra, Poland</i>	
<b>Optimal Iterative Learning Control of a PEM Fuel Cell System During Purge Processes .....</b>	<b>82</b>
Christian Hähnel, Andreas Cloppenborg, Joachim Horn <i>Helmut-Schmidt-Universität, Germany</i>	
<b>Hybrid Repetitive Controller Using a Stochastic Evolutionary Search and a Deterministic Iterative Learning Law .....</b>	<b>88</b>
Bartłomiej Ufnalski, Michał Malkowski, Lech Grzesiak <i>Warsaw University of Technology, Poland</i>	

## **A3P-E Poster Session I**

Date: Monday, August 29, 2016  
Time: 16:30 - 17:50  
Room: Poster Area 1  
Chair: Krzysztof Okarma

---

<b>Transformation of a Fuzzy Interpreted Petri Net Diagram Into Structured Text Code.....</b>	<b>94</b>
Michał Markiewicz, Łukasz Surdej, Lesław Gniewek <i>Rzeszow University of Technology, Poland</i>	
<b>Estimation of the Blood Volume in Pneumatically Controlled Ventricular Assist Device by Vision Sensor and Image Processing Technique.....</b>	<b>100</b>
Krzysztof Murawski <sup>1</sup> , Tadeusz Pustelny <sup>3</sup> , Leszek Grad <sup>2</sup> , Monika Murawska <sup>2</sup> <sup>1</sup> <i>Military University of Technology, Poland;</i> <sup>2</sup> <i>Military University of Technology in Warsaw, Poland;</i> <sup>3</sup> <i>Silesian University of Technology, Poland</i>	
<b>Multiple Models Input-Output Adaptive Controller Applied to Ionic Polymer Metal Composite .....</b>	<b>106</b>
Jakub Bernat, Jakub Kolota <i>Poznań University of Technology, Poland</i>	
<b>Robust Tuning for First-Order Reduced Active Disturbance Rejection Controller .....</b>	<b>112</b>
Paweł Nowak, Jacek Czczot <i>Silesian University of Technology, Poland</i>	
<b>Implementation of Non-Integer PI<sup>λ</sup> D<sup>μ</sup> Controller for the ATmega328P Micro-Controller.....</b>	<b>118</b>
Waldemar Bauer <i>AGH University of Science and Technology, Poland</i>	
<b>Comparison of Real-Time Industrial Process Control Solutions: Glass Melting Case Study .....</b>	<b>122</b>
Wojciech Grega, Andrzej Tutaj, Maciej Klemiato, Witold Byrski <i>AGH University of Science and Technology, Poland</i>	
<b>Recurrent Neural Controller Applied for Two-Mass System .....</b>	<b>128</b>
Marcin Kamiński <i>Wrocław University of Science and Technology, Poland</i>	
<b>Heading Control System with Limited Turning Radius Based on IMC Structure .....</b>	<b>134</b>
Krzysztof S. Kula <i>Gdynia Maritime University, Poland</i>	
<b>Optical PMD 3D Sensor Evaluation for Motion Detection and Tracking Application .....</b>	<b>140</b>
Tomasz Kłopot, Grzegorz Polaków, Ireneusz Parysz <i>Silesian University of Technology, Poland</i>	
<b>Analysis of Inverter-Fed Drive of Hydraulic Pump in Volumetric Control System .....</b>	<b>146</b>
Tadeusz Stefański, Łukasz Zawarczyński <i>Kielce University of Technology, Poland</i>	
<b>Hybrid Excited Claw Pole Electric Machine.....</b>	<b>152</b>
Marcin Wardach <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Microgrid Energy Management System.....</b>	<b>157</b>
Albert Kowalczyk, Adrian Włodarczyk, Jarosław Tarnawski <i>Gdansk University of Technology, Poland</i>	
<b>Efficiency Optimal Control System of Hybrid Excited Machines.....</b>	<b>163</b>
Michał Bonisławski, Ryszard Pałka <i>West Pomeranian University of Technology Szczecin, Poland</i>	



Piotr Muzyka<sup>1</sup>, Marek Frydrysiak<sup>1</sup>, Elzbieta Roszkowska<sup>2</sup>

<sup>1</sup>*Wrocław University of Technology, Poland*; <sup>2</sup>*Wrocław University of Science and Technology, Poland*

**B1L-A Plenary Lecture II**

Date: Tuesday, August 30, 2016

Time: 09:00 - 10:00

Room: Room 1

Chair: Tadeusz Kaczorek

---

**New Results on Switched Systems with Positivity Constraints .....No Paper**

Maria Elena Valcher

*Università degli Studi di Padova, Italy*

**B2L-A Fractional Order Systems I**

Date: Tuesday, August 30, 2016

Time: 10:00 - 11:00

Room: Room 1

Chair: Piotr Ostalczyk

---

**Modeling and Identification of Fractional First-Order Systems with Laguerre-Grünwald-Letnikov Fractional-Order Differences ..... 174**

Rafał Stanisławski, Krzysztof Latawiec, Marian Łukaniszyn, Wojciech Czuczvara,  
Ryszard Kopka  
*Opole University of Technology, Poland*

**Quadrature Based Approximations of Non-Integer Order Integrator on Infinite Integration Interval ..... 178**

Jerzy Baranowski, Marta Zagórska  
*AGH University of Science and Technology, Poland*

**Parameter Identification for Non Integer Order, State Space Models of Heat Plant ..... 184**

Krzysztof Oprzedkiewicz<sup>1</sup>, Wojciech Mitkowski<sup>1</sup>, Edyta Gawin<sup>2</sup>  
<sup>1</sup>*AGH University of Science and Technology, Poland;* <sup>2</sup>*High Vocational School in Tarnów, Poland*

**B2L-B Robotics II**

Date: Tuesday, August 30, 2016

Time: 10:00 - 11:00

Room: Room 2

Chair: Ryszard Beniak

---

<b>Link Length Optimization of a Biomimetic Robotic Fish Based on Big Bang - Big Crunch Algorithm.....</b>	<b>189</b>
Cafer Bal, Deniz Korkmaz, Gonca Ozmen Koca, Mustafa Ay, Zuhtu Hakan Akpolat <i>Firat University, Turkey</i>	
<b>Solving the Inverse Dynamics of a Flexible 3D Robot for a Trajectory Tracking Task.....</b>	<b>194</b>
Arthur Lismonde <sup>1</sup> , Olivier Bruls <sup>1</sup> , Valentin Sonneville <sup>2</sup> <i><sup>1</sup>University of Liège, Belgium; <sup>2</sup>University of Maryland, United States</i>	
<b>Logical Architecture of Medical Telediagnostic Robotic System .....</b>	<b>200</b>
Bartłomiej Stańczyk <sup>1</sup> , Adam Kurnicki <sup>2</sup> , Krzysztof Arent <sup>3</sup> <i><sup>1</sup>Accrea Engineering, Poland; <sup>2</sup>Lublin University of Technology, Poland; <sup>3</sup>Wrocław University of Science and Technology, Poland</i>	

**B2L-C Identification**

Date: Tuesday, August 30, 2016  
Time: 10:00 - 11:00  
Room: Room 3  
Chair: Andreas Rauh

---

**A Random Time-Series Decomposition and its Applications in Time-Series Identification..... 206**  
Jarosław Figwer  
*Silesian University of Technology, Poland*

**Identification of Elastic Boundary Conditions of Light-Weight Device Casing Walls Using Experimental Data ..... 212**  
Stanislaw Wrona, Marek Pawełczyk  
*Silesian University of Technology, Poland*

**Identification of a Multivariable Incremental Model of the Vessel ..... 218**  
Anna Miller  
*Gdynia Maritime University, Poland*

**B2L-D Invited Session: Control and Optimization of Infinite Dimensional Systems I**

Date: Tuesday, August 30, 2016

Time: 10:00 - 11:00

Room: Room 4

Chair: Adam Kowalewski

---

**Sharp Interface Limit in Phase-Field Based Structural Optimization of Variational Inequalities ..... 225**

Andrzej Myśliński, Konrad Koniarski  
*Systems Research Institute, Poland*

**Topological Derivative and Neural Network for Inverse Problems of Coupled Models..... 230**

Marta Lipnicka<sup>2</sup>, Katarzyna Szulc<sup>1</sup>, Antoni Żochowski<sup>1</sup>  
*<sup>1</sup>Instytut Badan Systemowych PAN, Poland; <sup>2</sup>Uniwersytet Łódzki, Poland*

## **B3P-E Poster Session II**

Date: Tuesday, August 30, 2016  
Time: 10:00 - 12:00  
Room: Poster Area 1  
Chair: Przemyslaw Mazurek

---

<b>Design and Implementation of Chaotic System Based Robust Delta Robot for Blending Graphene Nanoplatelets .....</b>	<b>235</b>
Ali Emre Kavur <sup>1</sup> , Sibel Demiroglu <sup>1</sup> , Mehmet Ozgur Seydibeyoglu <sup>1</sup> , Ozgun Baser <sup>1</sup> , Cuneyt Güzelis <sup>2</sup> , Savas Sahin <sup>1</sup> <i><sup>1</sup>Izmir Katip Celebi University, Turkey; <sup>2</sup>Yasar University, Turkey</i>	
<b>Optimal Stopping of Controlled Linear Stochastic Systems .....</b>	<b>241</b>
Edward Kozłowski <i>Lublin University of Technology, Poland</i>	
<b>Active Disturbance Rejection Control of a Heat Integrated Distillation Column .....</b>	<b>245</b>
Fahad Al-Kalbani <sup>1</sup> , Jie Zhang <sup>1</sup> , Thomas Bisgaard <sup>2</sup> , Jakob Kjøbsted Huusom <sup>2</sup> <i><sup>1</sup>Newcastle University, United Kingdom; <sup>2</sup>Technical University of Denmark, Denmark</i>	
<b>Temperature Measurements of Turning with WCCo-cBN Composite Cutting Tools Thermographic and Contact Methods .....</b>	<b>251</b>
Karol Grochalski, Grochalski Jabłoński <i>Poznan University of Technology, Poland</i>	
<b>Comparision of Model Predictive, Input Shaping and Feedback Control for a Lab-Scaled Overhead Crane .....</b>	<b>256</b>
Jaroslaw Smoczek, Janusz Szpytko <i>AGH University of Science and Technology, Poland</i>	
<b>Central Heating Temperature Control Algorithm for Systems with Condensing Boilers.....</b>	<b>261</b>
Piotr Kaczmarek <i>Gdansk University of Technology, Poland</i>	
<b>Adaptive Deadbeat Current Controller for IPMSM .....</b>	<b>267</b>
Rafał Piotuch <sup>1</sup> , Ryszard Pałka <sup>2</sup> <i><sup>1</sup>ABM Greiffenberger Antriebstechnik GmbH, Germany; <sup>2</sup>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>PLC-PIDTuner: Application for PID Tuning with SIMATIC S7 PLC Controllers.....</b>	<b>272</b>
Witold Kolaj <sup>1</sup> , Jakub Możaryn <sup>2</sup> , Michal Syfert <sup>2</sup> <i><sup>1</sup>Siemens, sp. z o.o., Poland; <sup>2</sup>Warsaw University of Technology, Poland</i>	
<b>Simplified Reluctance Equivalent Circuit for Hybrid Excited ECPMS-Machine Modelling .....</b>	<b>278</b>
Piotr Paplicki <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Development of Parallel Manipulator Control System for Simulation of Selected Means of Transport.....</b>	<b>284</b>
Maciej Sajkowski, Tomasz Stenzel, Janusz Hetmańczyk <i>Silesian University of Technology, Poland</i>	
<b>Application of 6-DOF Parallel Manipulator for Simulation of Selected Manoeuvres of Emergency Vehicles .....</b>	<b>288</b>
Tomasz Stenzel, Maciej Sajkowski, Janusz Hetmańczyk <i>Silesian University of Technology, Poland</i>	
<b>An Uncertain Diagnostic System of the Constructional and Technological Preferences .....</b>	<b>294</b>
Anna Bryniarska <i>Opole University of Technology, Poland</i>	

<b>Employment of the MFC/IMC Structure in Robust Velocity Control of BLDC Motor .....</b>	<b>300</b>
Krzysztof Pietrusewicz, Paweł Waszczuk <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>The Modified MFC Structure for Control of Certain Class of Linear and Nonlinear Plants .....</b>	<b>306</b>
Bogdan Grzywacz <i>West Pomeranian University of Technology Szczecin, Poland</i>	



## **B4L-A Stability Analysis**

Date: Tuesday, August 30, 2016

Time: 11:20 - 13:00

Room: Room 1

Chair: Wieslaw Krajewski

---

<b>Stability Analysis of Simple Anti-Windup Compensation in Approximate Pole-Placement Control of a Second Order Oscillatory System with Time Delay.....</b>	<b>312</b>
Talar Sadalla, Dariusz Horla, Piotr Koziński <i>Poznań University of Technology, Poland</i>	
<b>Stability and Stabilization of the Subclass of 2D Systems Modeled as Descriptor Systems .....</b>	<b>316</b>
Bartłomiej Sulikowski <sup>2</sup> , Krzysztof Gałkowski <sup>2</sup> , Eric Rogers <sup>1</sup> <sup>1</sup> <i>University of Southampton, United Kingdom;</i> <sup>2</sup> <i>University of Zielona Góra, Poland</i>	
<b>Stability Analysis and Tracking Performance of Fractional-Order PI Controller for a Second-Order Oscillatory System with Time-Delay.....</b>	<b>322</b>
Talar Sadalla, Dariusz Horla, Wojciech Giernacki, Piotr Koziński <i>Poznań University of Technology, Poland</i>	
<b>Stability Analysis in Non-Integer Order Controller Tuning .....</b>	<b>327</b>
Marta Zagórska <i>AGH University of Science and Technology, Poland</i>	
<b>Structural Stability of Biological Models with Switchings .....</b>	<b>333</b>
Magdalena Ochab, Krzysztof Puszynski, Andrzej Swierniak <i>Silesian University of Technology, Poland</i>	

**B4L-B Robotics III**

Date: Tuesday, August 30, 2016

Time: 11:20 - 13:00

Room: Room 2

Chair: Alexander Winkler

---

<b>Challenges in Creating Long Continuum Robots .....</b>	<b>339</b>
Ian Walker, Dixit Nahar, Siddharth Verma, Michael Wooten, Apoorva Kapadia <i>Clemson University, United States</i>	
<b>A Real-Time Strategy for the Management of Kinematic Singularities: New Progresses .....</b>	<b>345</b>
Marina Raineri, Corrado Guarino Lo Bianco, Marco Locatelli, Simone Perri <i>Università degli Studi di Parma, Italy</i>	
<b>Collision-Free Path Planning in Indoor Environment Using a Quadrotor .....</b>	<b>351</b>
Cosmin Copot <sup>2</sup> , Andres Hernandez <sup>1</sup> , Thoa Mac Thi <sup>1</sup> , Robin De Keyser <sup>1</sup> <sup>1</sup> <i>Universiteit Gent, Belgium</i> ; <sup>2</sup> <i>University of Antwerp, Belgium</i>	
<b>Low-Cost Impedance Controlled Multifinger Gripper .....</b>	<b>357</b>
Mateusz Kubat <sup>1</sup> , Krzysztof Mianowski <sup>2</sup> , Piotr Kmieciak <sup>1</sup> , Grzegorz Granosik <sup>1</sup> <sup>1</sup> <i>Lodz University of Technology, Poland</i> ; <sup>2</sup> <i>Warsaw University of Technology, Poland</i>	
<b>Preliminary Experimental Results of Factitious Force Method Implementation for the Mobile Platform REX .....</b>	<b>363</b>
Mateusz Cholewiński, Alicja Mazur, Wojciech Dowski <i>Wrocław University of Science and Technology, Poland</i>	

## **B4L-C Modelling and Simulation I**

Date: Tuesday, August 30, 2016

Time: 11:20 - 13:00

Room: Room 3

Chair: Jaroslaw Figwer

---

<b>Robust Control of Bicycle Model with CMG .....</b>	<b>369</b>
Maciej Różewicz, Adam Piłat <i>AGH University of Science and Technology, Poland</i>	
<b>Aggregative Modeling of Wiener Systems .....</b>	<b>375</b>
Szymon Łagosz <sup>1</sup> , Przemysław Śliwiński <sup>2</sup> , Paweł Wachel <sup>2</sup> <sup>1</sup> <i>Politechnika Wroclawska, Poland</i> ; <sup>2</sup> <i>Wrocław University of Science and Technology, Poland</i>	
<b>Simplified, Multiregional Fuzzy Model of a Nuclear Power Plant Steam Turbine .....</b>	<b>379</b>
Paweł Sokółski, Tomasz Adam Rutkowski, Kazimierz Duzinkiewicz <i>Gdansk University of Technology, Poland</i>	
<b>Multi-Nodal PWR Reactor Model – Methodology Proposition for Power Distribution Coefficients Calculation.....</b>	<b>385</b>
Bartosz Puchalski, Tomasz Adam Rutkowski, Kazimierz Duzinkiewicz <i>Gdansk University of Technology, Poland</i>	
<b>Motorcycle Lateral and Longitudinal Dynamic Modeling in Presence of Tyre Slip and Rear Traction.....</b>	<b>391</b>
Andrea Bonci <sup>1</sup> , Riccardo De Amicis <sup>1</sup> , Sauro Longhi <sup>1</sup> , Giuseppe Antonio Scala <sup>1</sup> , Andrea Andreucci <sup>2</sup> <sup>1</sup> <i>Università Politecnica delle Marche, Italy</i> ; <sup>2</sup> <i>Visionar srl, Italy</i>	

**B4L-D Signal Processing II**

Date: Tuesday, August 30, 2016

Time: 11:20 - 13:00

Room: Room 4

Chair: Krzysztof Okarma

---

<b>An Orthogonal Wavelet Denoising Algorithm for Surface Images of Atomic Force Microscopy</b> .....	397
Manuel Schimmack, Paolo Mercorelli, Anthimos Georgiadis <i>Leuphana Universität Lüneburg, Germany</i>	
<b>Windowed Local Area Average Reference Filter for Increasing the Spatial Resolution of EEG Signals</b> .....	403
Bartosz Binias, Henryk Palus <i>Silesian University of Technology, Poland</i>	
<b>A Time-Varying Filters Approach in Reducing Measurement Time of Multiple Inertial Sensors</b> .....	409
Piotr Okoniewski, Jacek Piskorowski <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Machine Learning Based Power Quality Event Classification Using Wavelet – Entropy and Basic Statistical Features</b> .....	414
Ferhat Uçar <sup>2</sup> , Ömer Faruk Alçin <sup>1</sup> , Beşir Dandil <sup>2</sup> , Fikret Ata <sup>2</sup> <sup>1</sup> <i>Bingöl University, Turkey</i> ; <sup>2</sup> <i>Firat University, Turkey</i>	
<b>Adaptation in Active Noise Control — a Simulation Case Study</b> .....	420
Małgorzata Michalczyk, Teresa Główska, Jarosław Figwer <i>Silesian University of Technology, Poland</i>	

**B5L-A Sliding Mode Control**

Date: Tuesday, August 30, 2016

Time: 15:00 - 16:20

Room: Room 1

Chair: Wojciech Hunek

---

<b>Tracking Human Upper-Limb Movements with Sliding Mode Control Type-II Fuzzy Logic .....</b>	<b>426</b>
Siti Khadijah Ali, Ahmad Riyad Firdaus Firdaus, M.Osman Tokhi, Ghasaq Al-Rezage <i>University of Sheffield, United Kingdom</i>	
<b>Cascaded Control Design for the Tracking Control of a Hydrostatic Transmission Based on a Sliding Mode State and Disturbance Observer .....</b>	<b>432</b>
Hao Sun, Robert Prabel, Harald Aschemann <i>Universität Rostock, Germany</i>	
<b>A New Reaching Law for DSMC Systems with Constraints .....</b>	<b>438</b>
Paweł Latosiński, Andrzej Bartoszewicz <i>Lodz University of Technology, Poland</i>	
<b>Nonlinear Modelling and Sliding Mode Control of a Piezo-Hydraulic Valve System .....</b>	<b>442</b>
Benedikt Haus <sup>2</sup> , Harald Aschemann <sup>3</sup> , Paolo Mercorelli <sup>2</sup> , Nils Werner <sup>1</sup> <sup>1</sup> <i>Fachhochschule Flensburg, Germany;</i> <sup>2</sup> <i>Leuphana Universität Lüneburg, Germany;</i> <sup>3</sup> <i>Universität Rostock, Germany</i>	

**B5L-B Control Applications I**

Date: Tuesday, August 30, 2016

Time: 15:00 - 16:20

Room: Room 2

Chair: Ewa Niewiadomska-Szynkiewicz

---

**Fractal Measures in Control Performance Assessment..... 448**

Paweł Domański

*Warsaw University of Technology, Poland*

**Auto-Generation of Advanced Control Algorithms' Code for Microcontrollers  
Using Transcompiler..... 454**

Patryk Chaber, Maciej Ławryńczuk

*Warsaw University of Technology, Poland*

**Feedback Linearization of Extended Relative Degree Model of Nonlinear Active  
Magnetic Bearing System..... 460**

Arkadiusz Mystkowski, Ewa Pawłuszewicz

*Białystok University of Technology, Poland*

**Multiple-Input Multiple-Output Laboratory Stand for Process Control Education ..... 466**

Andrzej Wojtulewicz, Patryk Chaber, Maciej Ławryńczuk

*Warsaw University of Technology, Poland*

**B5L-C    Robotics IV**

Date:        Tuesday, August 30, 2016  
Time:        15:00 - 16:20  
Room:        Room 3  
Chair:        Cosmin Copot

---

<b>Power Assistive and Rehabilitation Wearable Robot Based on Pneumatic Soft Actuators .....</b>	<b>472</b>
Hassanin Al-Fahaam, Steve Davis, Samia Nefti-Meziani <i>University of Salford, United Kingdom</i>	
<b>Automated Inspection of Door Parts Based on Fuzzy Recognition System.....</b>	<b>478</b>
Tomasz Winiarski, Włodzimierz Kasprzak, Maciej Stefańczyk, Michał Wałęcki <i>Warsaw University of Technology, Poland</i>	
<b>Design of a Controller for Stabilization of Spherical Robot's Sideway Oscillations .....</b>	<b>484</b>
Kacper Landa, Adam Piłat <i>AGH University of Science and Technology, Poland</i>	
<b>Control System Design Procedure of a Mobile Robot with Various Modes of Locomotion.....</b>	<b>490</b>
Dawid Seredyński <sup>2</sup> , Maciej Stefańczyk <sup>2</sup> , Konrad Banachowicz <sup>2</sup> , Bartosz Świstak <sup>2</sup> , Vitalii Kutia <sup>1</sup> , Tomasz Winiarski <sup>2</sup> <sup>1</sup> <i>National University of Water Management and Nature Resources Use, Ukraine;</i> <sup>2</sup> <i>Warsaw University of Technology, Poland</i>	

**B5L-D Invited Session: Control and Optimization of Infinite Dimensional Systems II**

Date: Tuesday, August 30, 2016  
Time: 15:00 - 16:20  
Room: Room 4  
Chair: Adam Kowalewski

---

**On the Lyapunov Exponents of Infinite-Dimensional Discrete Time-Varying Linear System ..... 496**  
Adam Czornik, Piotr Jurgaś  
*Silesian University of Technology, Poland*

**Controllability Problem of Neutral Equation with Nussbaum Fixed-Point Theorem ..... 500**  
Jerzy Klamka  
*Silesian University of Technology, Poland*

**Approximate Controllability of Stochastic Nonlinear Infinite Dimensional Systems. a Short Survey ..... 505**  
Jerzy Klamka, Janusz Wyrwał  
*Silesian University of Technology, Poland*

**Sensitivity of Optimal Controls for Time Delay Parabolic Systems..... 511**  
Adam Kowalewski<sup>1</sup>, Zbigniew Emirsajłow<sup>4</sup>, Jan Sokołowski<sup>3</sup>, Anna Krakowiak<sup>2</sup>  
<sup>1</sup>*AGH University of Science and Technology, Poland;* <sup>2</sup>*Technical University of Cracow, Poland;* <sup>3</sup>*Université Henri Poincaré, France;* <sup>4</sup>*West Pomeranian University of Technology Szczecin, Poland*



**B6P-E Poster Session III**

Date: Tuesday, August 30, 2016  
Time: 15:00 - 17:00  
Room: Poster Area 1  
Chair: Witold Mickiewicz

---

<b>Identification of the Plant Dynamic Using Genetic Algorithms.....</b>	<b>516</b>
Sławomir Jaszczak, Piotr Nikończuk <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Using the Disjunctive Graph for Vessel Scheduling.....</b>	<b>520</b>
Waldemar Uchacz <i>Maritime Academy of Szczecin, Poland</i>	
<b>Comparison of the Disjunctive Graph Model with the MILP Class Model for Vessel Scheduling Applications.....</b>	<b>525</b>
Waldemar Uchacz <i>Maritime Academy of Szczecin, Poland</i>	
<b>Simulation Model of a Series DC Motor for Traction Rail Vehicles.....</b>	<b>531</b>
Grażyna Barna <i>Rail Vehicles Institute TABOR, Poland</i>	
<b>Neural Network Contour Error Predictor in CNC Control Systems .....</b>	<b>537</b>
Krystian Erwinski <sup>1</sup> , Marcin Paprocki <sup>1</sup> , Andrzej Wawrzak <sup>1</sup> , Lech Grzesiak <sup>2</sup> <i><sup>1</sup>Nicolaus Copernicus University in Torun, Poland; <sup>2</sup>Warsaw University of Technology, Poland</i>	
<b>Selected Properties of the Adiabatic Model of the Stirling Engine Combined with the Model of the Piston-Crankshaft System.....</b>	<b>543</b>
Adrian Chmielewski, Robert Gumiński, Jędrzej Mączak <i>Warsaw University of Technology, Poland</i>	
<b>Evolving Neural Network as a Decision Support System – Controller for a Game of “2048” Case Study .....</b>	<b>549</b>
Arkadiusz Kwasigroch, Michał Grochowski <i>Gdansk University of Technology, Poland</i>	
<b>Mathematical Models Database (MMD ver. 1.0) Non-Commercial Proposal for Researchers.....</b>	<b>555</b>
Wojciech Giernacki, Dariusz Horla, Talar Sadalla <i>Poznan University of Technology, Poland</i>	
<b>Neural Estimators of Two-Mass System Optimized Using the Levenberg-Marquardt Training and Genetic Algorithm.....</b>	<b>559</b>
Marcin Kamiński <i>Wrocław University of Science and Technology, Poland</i>	
<b>An Architecture for a Cached Policy-Based Decision Making Systems .....</b>	<b>565</b>
Mariusz Pelc <sup>1</sup> , Tomasz Stach <sup>2</sup> , Dominika Świerczyńska <sup>2</sup> <i><sup>1</sup>Opole University of Technology, Poland; <sup>2</sup>Politechnika Opolska, Poland</i>	
<b>Jade Environment Performance Evaluation for Agent-Based Continuous Process Control Algorithm.....</b>	<b>571</b>
Grzegorz Polaków <i>Silesian University of Technology, Poland</i>	
<b>Real-Time Simulation in Non Real-Time Environment.....</b>	<b>577</b>
Jarosław Tarnawski, Tomasz Karla <i>Gdansk University of Technology, Poland</i>	

<b>Dynamic Model of a Free-Piston Stirling Engine with Four Degrees of Freedom Combined with the Thermodynamic Submodel.....</b>	<b>583</b>
Adrian Chmielewski, Robert Gumiński, Jędrzej Mączak <i>Warsaw University of Technology, Poland</i>	
<b>L<sup>1</sup> and L<sup>2</sup> Norms in Sensitivity Analysis of Signaling Pathway Models.....</b>	<b>589</b>
Malgorzata Kardynska, Jaroslaw Smieja <i>Silesian University of Technology, Poland</i>	
<b>Modelling of Bike Steered by CMG .....</b>	<b>595</b>
Maciej Różewicz, Adam Piłat <i>AGH University of Science and Technology, Poland</i>	

## **C1L-A Predictive Control I**

Date: Tuesday, August 30, 2016

Time: 16:40 - 18:00

Room: Room 1

Chair: Ryszard Palka

---

### **A Fault-Tolerant Approach to the Control of a Battery Assembly System..... 601**

Paweł Majdzik<sup>3</sup>, Anna Akielaszek-Witczak<sup>2</sup>, Lothar Seybold<sup>1</sup>

<sup>1</sup>RAFI GmbH & Co. KG, Germany; <sup>2</sup>State Higher School in Glogow, Poland; <sup>3</sup>University of Zielona Góra, Poland

### **Model Predictive Control as a Service - Concept and Architecture for Use in Cloud-Based Robot Control ..... 607**

Axel Vick<sup>2</sup>, Jan Guhl<sup>2</sup>, Joerg Krüger<sup>1</sup>

<sup>1</sup>Fraunhofer Institute for Production Systems and Design Technology, Germany;  
<sup>2</sup>Technische Universität Berlin, Germany

### **Supervised Model Predictive Control of Wastewater Treatment Plant..... 613**

Michał Grochowski, Tomasz Adam Rutkowski

Gdansk University of Technology, Poland

### **Secondary Control with Thermostatically Controlled Loads Using MPC Based on Extended Bin State Transition Model ..... 619**

Jaroslav Hlava, Nikita Zemtsov

Technical University of Liberec, Czech Rep.

**C1L-B Ship Modelling and Control**

Date: Tuesday, August 30, 2016

Time: 16:40 - 18:00

Room: Room 2

Chair: Janusz Szpytko

---

<b>Method of Considering the Dynamics of a Ship in the Process of Determining a Safe Trajectory Using an Algorithm Based on Ant Colony Optimization.....</b>	<b>625</b>
Agnieszka Lazarowska <i>Gdynia Maritime University, Poland</i>	
<b>Hybrid Real-Time Way-Point Controller for Ships .....</b>	<b>630</b>
Mirosław Tomera <i>Gdynia Maritime University, Poland</i>	
<b>Computational Intelligence Method for Ship Trajectory Planning.....</b>	<b>636</b>
Mostefa Mohamed-Seghir <i>Gdynia Maritime University, Poland</i>	
<b>The Structure of the Control System for a Dynamically Positioned Ship .....</b>	<b>641</b>
Roman Smierzchalski <i>Gdansk University of Technology, Poland</i>	

**C1L-C Robotics V**

Date: Tuesday, August 30, 2016  
Time: 16:40 - 18:00  
Room: Room 3  
Chair: Janusz Jakubiak

---

<b>Graph-Based Potential Field for the End-Effector Control Within the Torque-Based Task Hierarchy .....</b>	<b>645</b>
Dawid Seredyński, Konrad Banachowicz, Tomasz Winiarski <i>Warsaw University of Technology, Poland</i>	
<b>Multibehavioral Position-Force Manipulator Controller.....</b>	<b>651</b>
Tomasz Winiarski <sup>2</sup> , Konrad Banachowicz <sup>2</sup> , Michał Wałęcki <sup>2</sup> , Jonathan Bohren <sup>1</sup> <sup>1</sup> <i>Johns Hopkins University, United States</i> ; <sup>2</sup> <i>Warsaw University of Technology, Poland</i>	
<b>Towards Control Development for Flexibly Automated Systems in High-Level Programming Environments .....</b>	<b>657</b>
Elzbieta Roszkowska, Kamil Mowinski <i>Wrocław University of Science and Technology, Poland</i>	
<b>Factitious Force Method in Control of Skid-Steering Platforms with Rare Constraints in Motion .....</b>	<b>664</b>
Wojciech Domski, Alicja Mazur, Mateusz Cholewiński <i>Wrocław University of Science and Technology, Poland</i>	

## **C1L-D Distributed Parameter Systems**

Date: Tuesday, August 30, 2016

Time: 16:40 - 18:00

Room: Room 4

Chair: Johannes Reuter

---

### **Optimal Control of a Non-Isothermal Catalytic Packed-Bed Reactor Model..... 670**

Ilyasse Aksikas<sup>1</sup>, Amir Alizadeh Moghadam<sup>2</sup>, Fraser Forbes<sup>2</sup>

<sup>1</sup>*Qatar University, Qatar*; <sup>2</sup>*University of Alberta, Canada*

### **An Easily Trained Neural Model of a Distributed Parameter System ..... 674**

Maciej Ławryńczuk

*Warsaw University of Technology, Poland*

### **Multivariable Trajectory Tracking Control for a Heated Rod Based on an Integro-Differential Approach to Control-Oriented Modelling..... 680**

Harald Aschemann<sup>2</sup>, Georgy Kostin<sup>1</sup>, Vasily Saurin<sup>1</sup>

<sup>1</sup>*Russian Academy of Science, Russia*; <sup>2</sup>*Universität Rostock, Germany*

### **Sensitivity-Based Approaches for an Efficient Design of Feedforward Controllers and Parameter Estimators for a Distributed Heating System ..... 686**

Andreas Rauh, Harald Aschemann

*Universität Rostock, Germany*

**C2L-A Plenary Lecture III**

Date: Wednesday, August 31, 2016

Time: 09:00 - 10:00

Room: Room 1

Chair: Krzysztof Kozłowski

---

**Collaborative Robotics: from Workspace Sharing to Physical Interaction.....No Paper**

Vincent Padois

*Université Pierre et Marie Curie*

**C3L-A Control and Systems Theory II**

Date: Wednesday, August 31, 2016

Time: 10:00 - 11:00

Room: Room 1

Chair: Krzysztof Galkowski

---

**Desensitization of the Time-Optimal Trajectories..... 692**

Andrzej Turnau, Adam Piłat, Dawid Knapik  
*AGH University of Science and Technology, Poland*

**On Assignability of Lyapunov Spectrum of Discrete Linear Time-Varying System  
with Control..... 697**

Artur Babiarz<sup>2</sup>, Irina Banshchikova<sup>3</sup>, Adam Czornik<sup>2</sup>, Evgenii Makarov<sup>1</sup>, Michał  
Niezabitowski<sup>2</sup>, Svetlana Popova<sup>3</sup>  
<sup>1</sup>*National Academy of Sciences of Belarus, Belarus*; <sup>2</sup>*Silesian University of Technology,  
Poland*; <sup>3</sup>*Udmurt State University, Russia*

**Existence of Reachable Pairs (A,B) of Discrete-Time Linear Systems..... 702**

Tadeusz Kaczorek, Kamil Borawski  
*Bialystok University of Technology, Poland*



**C3L-B UAVs**

Date: Wednesday, August 31, 2016

Time: 10:00 - 11:00

Room: Room 2

Chair: Bogdan Kreczmer

---

**Thrust Pulse Control for UAV Control System Reconfiguration..... 708**

Marcin Żugaj, Przemysław Bibik, Karolina Józefowicz

*Warsaw University of Technology, Poland*

**Robust Estimation Algorithm of Altitude and Vertical Velocity for Multirotor UAVs..... 714**

Przemysław Gąsior, Adam Bondyra, Stanisław Gardecki, Wojciech Giernacki

*Poznań University of Technology, Poland*

**Software Environment for Simulation of UAV Multi-Agent System ..... 720**

Zbyněk Obdržálek

*Silesian University in Opava, Czech Rep.*

**C3L-C Signal Processing III**

Date: Wednesday, August 31, 2016

Time: 10:00 - 11:00

Room: Room 3

Chair: Przemyslaw Ignaciuk

---

**Observer and Filter Approaches for the Frequency Analysis of Speech Signals ..... 726**

Andreas Rauh<sup>2</sup>, Susann Tiede<sup>1</sup>, Cornelia Klenke<sup>1</sup>

<sup>1</sup>Independent Contractor, Germany; <sup>2</sup>Universität Rostock, Germany

**Stochastic Filter Approaches for a Phoneme-Based Segmentation of Speech Signals ..... 732**

Andreas Rauh<sup>2</sup>, Susann Tiede<sup>1</sup>, Cornelia Klenke<sup>1</sup>

<sup>1</sup>Independent Contractor, Germany; <sup>2</sup>Universität Rostock, Germany

**A Stochastic Approach to Contrast Detection Autofocusing. a 2D Case Analysis ..... 738**

Adrian Gałęziowski, Przemysław Śliwiński, Paweł Wachel

Wrocław University of Science and Technology, Poland

**C3L-D Biological Modelling and Simulation**

Date: Wednesday, August 31, 2016

Time: 10:00 - 11:00

Room: Room 4

Chair: Jozef Korbicz

---

**Valuable Experimental Model of Contraction Pneumatic Muscle Actuator..... 744**

Alaa Al-Ibadi, Samia Nefti-Meziani, Steve Davis

*University of Salford, United Kingdom*

**Cell Structures Modeling Using Fractal Generator and Torus Geometry ..... 750**

Przemyslaw Mazurek

*West Pomeranian University of Technology Szczecin, Poland*

**A Control-Theoretic Approach for Human Postural Control Modeling ..... 756**

Karim Tahboub

*Palestine Polytechnic University, Palestine*

## **C4P-E Poster Session IV**

Date: Wednesday, August 31, 2016  
Time: 10:00 - 12:00  
Room: Poster Area 1  
Chair: Rafal Stanislawski

---

<b>A Simulation Investigation Into the Signal Reconstruction Accuracy of the Transducer with Pulse Frequency Output.....</b>	<b>762</b>
Eligiusz Pawłowski <i>Lublin University of Technology, Poland</i>	
<b>Bayesian Analysis of EEG Signal Frequency Components .....</b>	<b>767</b>
Jędrzej Chiliński, Waldemar Bauer, Jerzy Baranowski <i>AGH University of Science and Technology, Poland</i>	
<b>Cameras Vibrations Influence on Efficiency of Teleoperated Unmanned Ground Vehicle .....</b>	<b>772</b>
Agnieszka Dąbrowska, Mirosław B. Jaskółowski, Arkadiusz Rubiec <i>Military University of Technology in Warsaw, Poland</i>	
<b>Input Shaping Tuning with Usage of Particle Swarm Optimization .....</b>	<b>778</b>
Maciej Gniadek, Stefan Brock <i>Poznań University of Technology, Poland</i>	
<b>Detection of Facial Gestures Artefacts Created During an EEG Research Using Artificial Neural Networks .....</b>	<b>783</b>
Arkadiusz Kubacki, Lukasz Sawicki, Piotr Owczarek <i>Poznań University of Technology, Poland</i>	
<b>No-Reference Quality Assessment of 3D Prints Based on the GLCM Analysis .....</b>	<b>788</b>
Krzysztof Okarma, Jarosław Fastowicz <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>RT/FPGA Implementation of the IEEE 1451 Standard in Sensors for Machine Conditioning Systems .....</b>	<b>794</b>
Roman Wyżgolik, Dariusz Buchczik, Sebastian Budzan, Marek Pawełczyk <i>Silesian University of Technology, Poland</i>	
<b>Evaluation of Calibration Results Using the Least Median of Squares Method in the Case of Linear Multivariate Models .....</b>	<b>800</b>
Dariusz Buchczik, Witold Ilewicz <i>Silesian University of Technology, Poland</i>	
<b>Particle Filter in Multidimensional Systems .....</b>	<b>806</b>
Piotr Koziński, Talar Sadalla, Adam Owczarkowski, Szymon Drgas <i>Poznań University of Technology, Poland</i>	
<b>Allophones in Automatic Whispery Speech Recognition .....</b>	<b>811</b>
Piotr Koziński, Talar Sadalla, Szymon Drgas, Adam Dąbrowski <i>Poznań University of Technology, Poland</i>	
<b>Digital Filter Design for Compensating the Nonlinear Behavior of Sound Intensity Probe.....</b>	<b>816</b>
Witold Mickiewicz <i>West Pomeranian University of Technology Szczecin, Poland</i>	
<b>Novel Rough Neural Network for Classification with Missing Data.....</b>	<b>820</b>
Robert Nowicki, Rafal Scherer, Leszek Rutkowski <i>Częstochowa University of Technology, Poland</i>	
<b>Reconstructing Method of Nonlinear Dynamic Surfaces .....</b>	<b>826</b>
Volodymyr Khoma <sup>2</sup> , Wojciech Hunek <sup>2</sup> , Anna Khoma <sup>1</sup> <sup>1</sup> National University Lviv Polytechnic, Ukraine; <sup>2</sup> Opole University of Technology, Poland	

**Fractional Order Controller in a Servo Drive - Case of Cogging Moment ..... 832**

Bogdan Broel-Plater, Paweł Dworak, Krzysztof Jaroszewski  
*West Pomeranian University of Technology Szczecin, Poland*

## **C5L-A Fractional Order Systems II**

Date: Wednesday, August 31, 2016

Time: 11:20 - 13:00

Room: Room 1

Chair: Krzysztof Latawiec

---

<b>Extensions of the Cayley-Hamilton Theorem to Fractional Descriptor Linear Systems .....</b>	<b>838</b>
Tadeusz Kaczorek <i>Bialystok University of Technology, Poland</i>	
<b>Implementation Issues in Discretization of Fractional-Order Derivative Using the AI-Alaoui Operator .....</b>	<b>844</b>
Rafał Stanisławski <sup>2</sup> , Marek Rydel <sup>2</sup> , Marcin Gałek <sup>1</sup> <sup>1</sup> <i>Opole University of Opole, Poland</i> ; <sup>2</sup> <i>Opole University of Technology, Poland</i>	
<b>Relative Observability, Duality for Fractional Differential-Algebraic Delay Systems with Jumps Within Riemann-Liouville Fractional Derivatives.....</b>	<b>848</b>
Zbigniew Zaczekiewicz <i>Politechnika Białostocka, Poland</i>	
<b>A New Variant of Adams - Bashforth - Moulton Method to Solve Sequential Fractional Ordinary Differential Equation.....</b>	<b>854</b>
Marek Błasik <i>Częstochowa University of Technology, Poland</i>	
<b>The Second Form of the Variable-, Fractional-Order Discrete-Time Integrator.....</b>	<b>859</b>
Piotr Ostalczyk <sup>2</sup> , Dorota Mozyrska <sup>1</sup> <sup>1</sup> <i>Bialystok University of Technology, Poland</i> ; <sup>2</sup> <i>Lodz University of Technology, Poland</i>	

## **C5L-B Fault Detection**

Date: Wednesday, August 31, 2016  
Time: 11:20 - 13:00  
Room: Room 2  
Chair: Andreas Rauh

---

<b>Fault Monitoring and Fault Tolerant Control in Distillation Columns.....</b>	<b>865</b>
Sulaiman Lawal, Jie Zhang <i>Newcastle University, United Kingdom</i>	
<b>Fault-Tolerant Control and Diagnosis for a Non-Linear System with an Unknown Input Observer.....</b>	<b>871</b>
Marcel Luzar <i>University of Zielona Góra, Poland</i>	
<b>Towards Robust Process Fault Estimation for Uncertain Dynamic Systems.....</b>	<b>877</b>
Marcin Pazera, Marcin Witczak <i>University of Zielona Góra, Poland</i>	
<b>A Quadratic Boundedness Approach to Adaptive Simultaneous Sensor and Actuator Fault Estimation.....</b>	<b>883</b>
Piotr Witczak, Marcin Witczak, Józef Korbicz <i>University of Zielona Góra, Poland</i>	
<b>Towards a Practical Reachability Test for Dynamic Systems Under Process Faults.....</b>	<b>889</b>
Marcin Witczak <sup>2</sup> , Józef Korbicz <sup>2</sup> , Michał de Rozprza-Faygel <sup>2</sup> , Damiano Rotondo <sup>1</sup> , Vicenç Puig <sup>1</sup> <sup>1</sup> <i>Universitat Politècnica de Catalunya, Spain;</i> <sup>2</sup> <i>University of Zielona Góra, Poland</i>	

## **C5L-C Modelling and Simulation II**

Date: Wednesday, August 31, 2016

Time: 11:20 - 13:00

Room: Room 3

Chair: Joachim Horn

---

<b>Adaptive Position-Dependent Friction Characteristics for Electromagnetic Actuators .....</b>	<b>895</b>
Hanna Wenzl <sup>1</sup> , Christian Knöbel <sup>1</sup> , Johannes Reuter <sup>1</sup> , Harald Aschemann <sup>2</sup> <i><sup>1</sup>Hochschule Konstanz für Technik, Wirtschaft und Gestaltung, Germany; <sup>2</sup>Universität Rostock, Germany</i>	
<b>Model of the Air Stream Ratio for an Electromagnetic Mill Control System .....</b>	<b>901</b>
Szymon Ogonowski, Zbigniew Ogonowski, Marek Pawelczyk <i>Silesian University of Technology, Poland</i>	
<b>Dynamic Modeling and Simulation of a Bicycle Stabilized by LQR Control .....</b>	<b>907</b>
Adam Owczarkowski, Dariusz Horla, Piotr Koziński, Talar Sadalla <i>Poznań University of Technology, Poland</i>	
<b>Reproduction of Equipment Wear Characteristics with Kernel Regression .....</b>	<b>912</b>
Karol Koniuszewski, Paweł Domański <i>Warsaw University of Technology, Poland</i>	
<b>Estimation of Internal Exhaust Gas Recirculation and Scavenging Gas in an Engine with Variable Valve Lift.....</b>	<b>918</b>
Daniel Schwarz <sup>1</sup> , Harald Aschemann <sup>1</sup> , Robert Prabel <sup>1</sup> , Thorsten Schmidt <sup>2</sup> <i><sup>1</sup>Universität Rostock, Germany; <sup>2</sup>Volkswagen AG, Germany</i>	



## **C5L-D Robotics VI**

Date: Wednesday, August 31, 2016  
Time: 11:20 - 13:00  
Room: Room 4  
Chair: Ian Walker

---

<b>Simulation-Based Comparison of 2D Scan Matching Algorithms for Different Rangefinders .....</b>	<b>924</b>
Qiucheng Li, Fabian Müller, Andreas Wenzel, Thomas Rauschenbach <i>Fraunhofer IOSB-AST, Germany</i>	
<b>A Hierarchical Global Path Planning Based on Multi—Objective Particle Swarm Optimization .....</b>	<b>930</b>
Thi Thoa Mac <sup>2</sup> , Cosmin Copot <sup>2</sup> , Trung Tran Duc <sup>1</sup> , Robin De Keyser <sup>2</sup> <i><sup>1</sup>Hanoi University of Science and Technology, Vietnam; <sup>2</sup>Universiteit Gent, Belgium</i>	
<b>Saddle Point Detection of the Navigation Function in Nonholonomic Mobile Robot Control .....</b>	<b>936</b>
Wojciech Kowalczyk, Mateusz Przybyła, Krzysztof Kozłowski <i>Poznań University of Technology, Poland</i>	
<b>Distributed NAO Robot Navigation System in the Hazard Detection Application .....</b>	<b>942</b>
Wojciech Dudek, Konrad Banachowicz, Wojciech Szynkiewicz, Tomasz Winiarski <i>Warsaw University of Technology, Poland</i>	
<b>Advanced Control Techniques to Mitigate the Stop-and-Go Waves on a Highway Traffic with Different Vehicles .....</b>	<b>948</b>
Cosmin Copot <sup>3</sup> , Constantin Florin Caruntu <sup>1</sup> , Robin De Keyser <sup>2</sup> <i><sup>1</sup>Technical University of Iasi, Romania; <sup>2</sup>Universiteit Gent, Belgium; <sup>3</sup>University of Antwerp, Belgium</i>	

**C6L-A Nonlinear Control**

Date: Wednesday, August 31, 2016  
Time: 15:00 - 16:00  
Room: Room 1  
Chair: Andrzej Bartoszewicz

---

<b>Nonlinear Robust Backstepping Control Method Approach for Single Phase Inverter</b> .....	<b>954</b>
Elif Kolbasi, Murat Seker <i>Gebze Tehnical University, Turkey</i>	
<b>Design and Implementation of the Air/Water Heat Pump Controller with Increased Coefficient of Performance</b> .....	<b>959</b>
Piotr Tatjewski <sup>2</sup> , Maciej Ławrynczuk <sup>2</sup> , Piotr Marusak <sup>2</sup> , Marian Rubik <sup>2</sup> , Piotr Ziętek <sup>2</sup> , Maciej Szumski <sup>1</sup> , Michał Szumski <sup>1</sup> <sup>1</sup> <i>Plum Ltd., Poland</i> ; <sup>2</sup> <i>Warsaw University of Technology, Poland</i>	
<b>Comparison of Linear and Nonlinear Feedback Control for a Half-Car Model with MR Dampers</b> .....	<b>965</b>
Piotr Krauze, Jerzy Kasprzyk <i>Silesian University of Technology, Poland</i>	

**C6L-B Optimization I**

Date: Wednesday, August 31, 2016

Time: 15:00 - 16:00

Room: Room 2

Chair: Ewa Pawluszewicz

---

**Heuristic Solving Some Discrete-Continuous Project Scheduling Problems with Discounted Cash Flows ..... 971**

Grzegorz Waligóra, Rafał Różycki  
*Poznań University of Technology, Poland*

**Optimal Allocation of Power - Graphical Interpretation of Some Scheduling Problem..... 975**

Rafał Różycki, Grzegorz Waligóra  
*Poznań University of Technology, Poland*

**Multi-Objective Control Optimization for Congestion Avoidance in Computer Networks..... N/A**

Sławomir Grzyb, Przemysław Orłowski  
*West Pomeranian University of Technology Szczecin, Poland*

**C6L-C Predictive Control II**

Date: Wednesday, August 31, 2016  
Time: 15:00 - 16:00  
Room: Room 3  
Chair: Harald Aschemann

---

**Non-Linear System Predictive Control Based on PWARX Models ..... N/A**

Olfa Yahya, Zeineb Lassoued, Kamel Abderrahim  
*National School Engineers De Gabès, Tunisia*

**Embedded Model Predictive Control of Unmanned Micro Aerial Vehicles ..... 992**

Tomás Baca<sup>1</sup>, Giuseppe Loianno<sup>2</sup>, Martin Saska<sup>1</sup>  
<sup>1</sup>*Czech Technical University in Prague, Czech Rep.*; <sup>2</sup>*University of Pennsylvania, United States*

**Complex Manoeuvres of Heterogeneous MAV-UGV Formations Using a Model Predictive Control ..... 998**

Vojtech Spurny, Tomás Baca, Martin Saska  
*Czech Technical University in Prague, Czech Rep.*

**C6L-D Modelling and Simulation III**

Date: Wednesday, August 31, 2016

Time: 15:00 - 16:00

Room: Room 4

Chair: Roman Smierzchalski

---

**Mobile Ad Hoc Network for a Heavy Gas Cloud Boundary Estimation and Tracking ..... 1004**

Mateusz Krzysztoń<sup>1</sup>, Ewa Niewiadomska-Szynkiewicz<sup>2</sup>

<sup>1</sup>Research and Academic Computer Network, Poland; <sup>2</sup>Warsaw University of Technology, Poland

**Application of Sampling-Based Path Planning for Tunnel Detection in Dynamic Protein Structures ..... 1010**

Vojtěch Vonásek<sup>1</sup>, Barbora Kozlíková<sup>2</sup>

<sup>1</sup>Czech Technical University in Prague, Czech Rep.; <sup>2</sup>Masaryk University, Czech Rep.

**On Significance of Second-Order Dynamics for Coupled Tanks Systems ..... 1016**

Rafał Grygiel, Robert Bieda, Marian Blachuta

Silesian University of Technology, Poland

**D1L-A Plenary Lecture IV**

Date: Thursday, September 1, 2016

Time: 09:00 - 10:00

Room: Room 1

Chair: Jozef Korbicz

---

**Intelligent Fault Monitoring of Critical Infrastructure Systems.....No Paper**

Marios M. Polycarpou

*University of Cyprus*

**D2L-A Adaptive Control I**

Date: Thursday, September 1, 2016

Time: 10:00 - 11:00

Room: Room 1

Chair: Maciej Lawrynczuk

---

**Adaptive Control of Torsional Oscillations in Drill Strings Using a Continuous-Discrete Extended Kalman Filter..... 1022**

Farooq Kifayat Ullah, Franklyn Duarte, Christian Bohn

*Technische Universität Clausthal, Germany*

**Comparison of Various Barrier Lyapunov Functions for Adaptive Control of Nonlinear Systems ..... 1027**

Jacek Kabziński, Marcin Jastrzębski, Przemysław Mosiołek

*Lodz University of Technology, Poland*

**D2L-B Control and Systems Theory III**

Date: Thursday, September 1, 2016

Time: 10:00 - 11:00

Room: Room 2

Chair: Tadeusz Kaczorek

---

**Dynamic Quasi-Soft VSC of Discrete-Time Systems with Magnitude-Constrained Inputs ..... 1033**

Przemysław Ignaciuk

*Lodz University of Technology, Poland*

**An Unconditionally Stable Approximation of a Circular Flexible Plate Described by a Fourth Order Partial Differential Equation..... 1039**

Petr Augusta<sup>1</sup>, Blazej Cichy<sup>3</sup>, Krzysztof Gałkowski<sup>3</sup>, Eric Rogers<sup>2</sup>

*<sup>1</sup>Czech Academy of Sciences, Czech Rep.; <sup>2</sup>University of Southampton, United Kingdom; <sup>3</sup>University of Zielona Góra, Poland*

**On the Lyapunov, Perron, Bohl and General Exponents of Discrete Linear Time-Varying Diagonal Systems ..... 1045**

Artur Babiarz

*Silesian University of Technology, Poland*



**D2L-C Control Applications II**

Date: Thursday, September 1, 2016

Time: 10:00 - 11:00

Room: Room 3

Chair: Marian Blachuta

---

**Control and Robust Tower Oscillation Damping for a Wind Turbine Equipped with a Hydrostatic Drive Train and a Synchronous Generator ..... 1051**

Harald Aschemann, Julia Kersten

*Universität Rostock, Germany*

**Time-Optimal Control for Reaction Wheel Pendulum..... 1057**

Maciej Rosół, Adam Piłat, Andrzej Turnau

*AGH University of Science and Technology, Poland*

**Geometric Path Following Control for an Omnidirectional Mobile Robot..... 1063**

Jian Wang<sup>1</sup>, Sergey Chepinskiy<sup>2</sup>, Aleksandr Krasnov<sup>2</sup>, Botao Zhang<sup>1</sup>, Huimin Liu<sup>2</sup>, Yifan Chen<sup>2</sup>, Denis Khvostov<sup>2</sup>

<sup>1</sup>*Hangzhou Dianzi University, China*; <sup>2</sup>*ITMO University, Russia*

**D2L-D Robotics VII**

Date: Thursday, September 1, 2016

Time: 10:00 - 11:00

Room: Room 4

Chair: Przemyslaw Mazurek

---

**Application of Vision Information to Planning Trajectories of Adept Six-300 Robot ..... 1069**

Tadeusz Szkodny

*Silesian University of Technology, Poland*

**Phase Shift Determination for Azimuth Angle Estimation of Echo Arrival Direction ..... 1076**

Bogdan Kreczmer

*Wrocław University of Science and Technology, Poland*

**Three-Dimensional Mapping for Data Collected Using Variable Stereo Baseline ..... 1082**

Zdzisław Kowalczyk, Tomasz Merta

*Gdańsk University of Technology, Poland*

## **D3P-E Poster Session V**

Date: Thursday, September 1, 2016  
Time: 10:00 - 12:00  
Room: Poster Area 1  
Chair: Pawel Dworak

---

- Utilization of Textured Stereovision for Registration of 3D Models of Objects ..... 1088**  
Tomasz Kornuta<sup>1</sup>, Maciej Stefańczyk<sup>2</sup>  
*<sup>1</sup>IBM Research, Almaden/Warsaw University of Technology, United States; <sup>2</sup>Warsaw University of Technology, Poland*
- Stability Analysis of a Tri-Wheel Mobile Robot..... 1094**  
Ryszard Beniak, Tomasz Pyka  
*Opole University of Technology, Poland*
- Semiautonomous Wheelchair Human-Aware Navigation in Crowded Environments Based on Long-Term Pedestrians Motion Prediction..... 1098**  
Krzysztof Skrzypczyk  
*Silesian University of Technology, Poland*
- Comparing Control Algorithms of Quadcopters to Implement Their Atypical Maneuvers ..... 1104**  
Ryszard Beniak, Oleksandr Gudzenko  
*Opole University of Technology, Poland*
- Bilateral Control of Nonlinear Teleoperation System Using Parallel Force/Position Control Approach and Online Environment Estimation ..... 1110**  
Outayeb Adel<sup>1</sup>, Ferguene Farid<sup>1</sup>, Redouane Toumi<sup>2</sup>  
*<sup>1</sup>Université des sciences et de la technologie Houari-Boumediene, Algeria; <sup>2</sup>University of Sciences and Technology Houari Boumediene, Algeria*
- Invasive Weed Optimization Algorithm Optimized Fuzzy Logic Scaling Parameters in Controlling a Lower Limb Exoskeleton ..... 1116**  
Ghasaq Al-Rezage, Hyreil Kasdirin, Siti Khadijah Ali, M.Osman Tokhi  
*University of Sheffield, United Kingdom*
- Robotic Arm Control System for Mars Rover Analogue..... 1122**  
Piotr Czaplicki, Maciej Rećko, Justyna Tołstoj-Sienkiewicz  
*Białystok University of Technology, Poland*
- Manipulator Path Control with Variable Order Fractional Calculus..... 1127**  
Adrian Łęgowski, Michał Niezabitowski  
*Silesian University of Technology, Poland*
- Modelling of Spur Gear Cutting Kinematics for Multipurpose Milling Center..... 1133**  
Rafał Talar, Piotr Jabłoński  
*Poznań University of Technology, Poland*
- Development of a Mobile Platform for a Remote Medical Teleoperation Robot ..... 1137**  
Janusz Jakubiak<sup>2</sup>, Michał Drwięga<sup>2</sup>, Adam Kurnicki<sup>1</sup>  
*<sup>1</sup>Lublin University of Technology, Poland; <sup>2</sup>Wrocław University of Science and Technology, Poland*
- Ballbots Rolling Elements Shape Determination ..... 1143**  
Paweł Żak  
*Lodz Univeristy of Technology, Poland*
- Influence of an EOD Engineer Robot Manipulator Structure on the Effector's Accuracy Using Intuitive Control System ..... 1148**  
Adam Bartnicki, Piotr Krogul, Kacper Spadło  
*Military University of Technology in Warsaw, Poland*

<b>Concept and Preliminary Research of Anthropomorphic Manipulator with Hydrostatic Drive System for Mobile Robot</b> .....	1154
Karol Cieřlik, Stanislaw Konopka <i>Military University of Technology in Warsaw, Poland</i>	
<b>Extreme Learning Machine Based Robotic Arm Modeling</b> .....	1160
Ömer Faruk Alçin <sup>1</sup> , Ferhat Uçar <sup>2</sup> , Deniz Korkmaz <sup>2</sup> <sup>1</sup> <i>Bingöl University, Turkey</i> ; <sup>2</sup> <i>Firat University, Turkey</i>	
<b>Model and Analysis of Pedals Ergonomic Load Torque Angular Distribution in the Pedaling-by-Wire System</b> .....	1164
Bogdan Fabianski, Bartlomiej Wicher <i>Poznań University of Technology, Poland</i>	

## **D4L-A Adaptive Control II**

Date: Thursday, September 1, 2016  
Time: 11:20 - 13:00  
Room: Room 1  
Chair: Krzysztof Latawiec

---

<b>Cascade Balance-Based Adaptive Control of Heating System - Simulation Validation</b> .....	<b>1170</b>
Michal Fraczak <sup>2</sup> , Rafal Czubasiewicz <sup>1</sup> <i><sup>1</sup>Politechnika Śląska, Poland; <sup>2</sup>Silesian University of Technology, Poland</i>	
<b>Adaptive Tracking Control of a Duffing Oscillator with Hard Error Constraints</b> .....	<b>1176</b>
Jacek Kabziński <i>Lodz University of Technology, Poland</i>	
<b>Practical Verification of Adaptive Dynamic Matrix Control with Interpolated Parameters</b> .....	<b>1182</b>
Tomasz Kłopot, Piotr Skupin <i>Silesian University of Technology, Poland</i>	
<b>The Design of Ship Autopilot via Robust Adaptive Feedback Linearization</b> .....	<b>1188</b>
Zenon Zwierzewicz <i>Maritime University of Szczecin, Poland</i>	
<b>Performance Enhancement for GPS/INS Fusion by Using a Fuzzy Adaptive Unscented Kalman Filter</b> .....	<b>1194</b>
Setareh Yazdkhasti, Jurek Z Sasiadek, Steve Ulrich <i>Carleton University, Canada</i>	

## **D4L-B Optimization II**

Date: Thursday, September 1, 2016

Time: 11:20 - 13:00

Room: Room 2

Chair: Andrzej Myslinski

---

<b>PSO Based Feedrate Optimization with Contour Error Constraints for NURBS Toolpaths .....</b>	<b>1200</b>
Krystian Erwinski <sup>1</sup> , Marcin Paprocki <sup>1</sup> , Andrzej Wawrzak <sup>1</sup> , Lech Grzesiak <sup>2</sup> <sup>1</sup> <i>Nicolaus Copernicus University in Torun, Poland;</i> <sup>2</sup> <i>Warsaw University of Technology, Poland</i>	
<b>Lyapunov Matrices Approach to the Parametric Optimization of a Time Delay System with a PI Controller .....</b>	<b>1206</b>
Jozef Duda <i>AGH University of Science and Technology, Poland</i>	
<b>Guaranteed Cost Estimation and Control for Nonlinear System Using LMI Optimization .....</b>	<b>1211</b>
Mariusz Buciakowski <sup>2</sup> , Vicenç Puig <sup>1</sup> <sup>1</sup> <i>Universitat Politècnica de Catalunya, Spain;</i> <sup>2</sup> <i>University of Zielona Góra, Poland</i>	
<b>On Evaluating Hinf and H2 Performance of Uncertain Systems .....</b>	<b>1217</b>
Vladimir Pozdyayev <i>Arzamas Polytechnic Institute of Nizhny Novgorod State Technical University, Russia</i>	
<b>Battery State Observation and Condition Monitoring Using Online Minimization .....</b>	<b>1223</b>
Johannes Reuter <sup>1</sup> , Enrico Mank <sup>1</sup> , Harald Aschemann <sup>2</sup> , Andreas Rauh <sup>2</sup> <sup>1</sup> <i>Hochschule Konstanz für Technik, Wirtschaft und Gestaltung, Germany;</i> <sup>2</sup> <i>Universität Rostock, Germany</i>	

## **D4L-C Modelling and Simulation IV**

Date: Thursday, September 1, 2016

Time: 11:20 - 13:00

Room: Room 3

Chair: Wojciech Hunek

---

- A Concept of a Decision Support System for the Selection of a Knowledge Management Tool for a Manufacturing Company**..... 1229  
Justyna Patalas-Maliszewska<sup>2</sup>, Irene Krebs<sup>1</sup>  
<sup>1</sup>Brandenburg University of Technology Cottbus-Senftenberg, Germany; <sup>2</sup>University of Zielona Góra, Poland
- Adapting State--Space Reduction Techniques to Match Steady--State Responses** ..... 1234  
Daniele Casagrande<sup>2</sup>, Wiesław Krajewski<sup>1</sup>, Umberto Viaro<sup>2</sup>  
<sup>1</sup>Systems Research Institute, Polish Academy of Sciences, Poland; <sup>2</sup>Università di Udine, Italy
- Model of Optimal Maneuver Used in Tactical Decision Support System** ..... 1240  
Petr Stodola<sup>2</sup>, Jan Nohel<sup>1</sup>, Jan Mazal<sup>2</sup>  
<sup>1</sup>53rd Reconnaissance and Electronic Warfare Regiment, Czech Rep.; <sup>2</sup>University of Defence, Czech Rep.
- The Emergence on Isolated Time Scales** ..... 1246  
Ewa Girejko<sup>1</sup>, Agnieszka Malinowska<sup>1</sup>, Ewa Schmeidel<sup>2</sup>, Małgorzata Zdanowicz<sup>2</sup>  
<sup>1</sup>Białystok University of Technology, Poland; <sup>2</sup>University of Białystok, Poland
- Modelling of a Post-Combustion CO2 Capture Process Using Extreme Learning Machine**..... 1252  
Fei Li<sup>2</sup>, Jie Zhang<sup>2</sup>, Eni Oko<sup>1</sup>, Meihong Wang<sup>1</sup>  
<sup>1</sup>Hull University, United Kingdom; <sup>2</sup>Newcastle University, United Kingdom

**D4L-D Signal Processing IV**

Date: Thursday, September 1, 2016  
Time: 11:20 - 13:00  
Room: Room 4  
Chair: Rafal Stanislawski

---

**Development of Electrochemical Measurement System Using Cyclic Voltammetry Method** ..... 1258  
Łukasz Przeniosło<sup>1</sup>, Michał Raczyński<sup>2</sup>, Przemysław Makiewicz<sup>1</sup>, Marcin Biegun<sup>2</sup>, Daniel Matias<sup>1</sup>, Andrzej Biedka<sup>2</sup>, Krzysztof Penkala<sup>2</sup>  
*<sup>1</sup>West Pomeranian University of Technology, Poland; <sup>2</sup>West Pomeranian University of Technology Szczecin, Poland*

**Scatter Measure for Trajectory Estimation of Periodic Signals Using Track-Before-Detect Approach** ..... 1262  
Przemysław Mazurek  
*West Pomeranian University of Technology Szczecin, Poland*

**Evaluation of Copper Ore Granularity and Flow Rate Using Vibration Measurements** ..... 1267  
Oliwia Krauze, Marek Pawełczyk  
*Silesian University of Technology, Poland*

**Research of the Defects in Pet Preform** ..... 1273  
Andrius Laucka, Darius Andriukaitis, Vytautas Markevicius, Mindaugas Zilys  
*Kaunas University of Technology, Lithuania*

**Computer Vision System for Defects Detection in PET Preform** ..... 1280  
Andrius Laucka, Darius Andriukaitis, Algimantas Valinevicius, Dangirutis Navikas  
*Kaunas University of Technology, Lithuania*