Contents

Simulation, modelling and ICT

Time-Domain Regenerative Chatter Analysis of Non-linear Stiffness System 3
Petr Hadraba and Zdenek Hadas

The Method of Semantic Structuring of Virtual Community Content 11
Igor Korobiichuk, Yuriy Syerov, and Solomia Fedushko

Using Linear Matrix Inequalities for Synthesis of Modal Control of Multidimensional Linear Systems 19
Igor Korobiichuk, Oleksey Lobok, Boris Goncharenko, Natalya Savitskaya, Marina Sych, and Larisa Vihrova

Semi-automatic Spine Segmentation Method of CT Data 29
Malgorzata Mateusiak and Krzysztof Mikolajczyk

Stochastic Structure of Inciting Factors of Trivial Gyrostabilized Platform 36
Igor Korobiichuk, Volodimir Karachun, and Viktorij Mel'nick

Coupled Model of Solenoid 45
Filip Musil and Radek Vlach

Monte Carlo Based Detection of Parameter Correlation in Simulation Models 54
Jan Najman, Martin Brablc, Matej Rajchl, Michal Bastl, Tomáš Spáčil, and Martin Appel

Conductive ABS/Ni Composite Filaments for Fused Deposition Modeling of Structural Electronics 62
Bartłomiej Podsiadły, Andrzej Skalski, and Marcin Słoma

Selected Tests of a Control System for an Articulated Vehicle with Innovative Articulation 71
Mateusz Szumilas, Sergiusz Łuczak, and Błażej Kabziński

Sensors, Measurement and Diagnostics

System for Measuring Infrared Radiant Flux with Application of New Methods of Noise Detection and Reduction 81
Maciej Bodnicki and Piotr Sakowicz

Verification of Selected Gait Parameters Derived from Inertial Sensors Using Simple Smartphone Based Optical System 87
Aleksandra Budzyńska, Maciej Jagielski, Marek Żyliński, Gerard Cybulski, and Wiktor Niewiadomski

Distributed Collection of Environmental Data Using IoT Technology 95
Juraj Ďuďák, Peter Fabo, Gabriel Gašpar, Michal Kuba, and Anna Buchholcerová

Vibration Detection and Diagnosis for Civil Aircraft Improved Maintenance 104
Philippe Goupil

Automatic Mechatronic Test Stand Development for Embedded Electronics Using NI LabVIEW 113
Jan Hrbacek, Radek Hrbacek, and Jakub Lesinsky

Wavefront Sensor in Measurements of MEMS Vibrations 119
Michał Józwik and Dinesh Raja Nagarajan

Methods of Joint Stiffness Measurement Using a Manually Actuated Dynamometer 125
Patrik Kutilek, Petr Volf, Jan Hybl, Jan Hejda, Slavka Viteckova, Vaclav Krivanek, Radek Doskocil, and Pavel Smrcka

Electronic Filters Measurement Device 133
Maciej Martyński, Paweł Nowak, and Michał Nowicki

Mechatronics Solutions in Process of Transport Infrastructure Monitoring and Diagnostics 141
Stefan Sedivy, Lenka Micechova, and Pavel Scheber

Laboratory Stand for Fluxgate Level Measurement 149
Kamil Sowiński, Michał Nowicki, and Tomasz Charubin

Test Stand for Studying Flowmeter Performance in Presence of Pulsatile Flow 157
Maciej Szudarek, Mateusz Turkowski, and Grzegorz Twaróg

Pedestrian Indoor Localization Using IoT Sensors RSSI Signal Strength Measurement 164
Stanislav Vechet and Jiri Krejsa

Calibration of Bell Prover Test Stands with Critical Flow Venturi Nozzle 172
Jakub Wildner, Mateusz Turkowski, Maciej Szudarek, and Arkadiusz Zadworny

Magnetic Moment Measurement Stand 178
Weronika Ziarkowska, Michał Nowicki, and Tomasz Charubin

Robotics, Actuators and Control

Identification of Cyclic Changes in the Operation Mode of the Production Facility Based on the Monitoring Data 189
Nina Davydenko, Igor Korobiichuk, Liudmyla Davydenko, Michał Nowicki, and Volodymyr Davydenko

The Application of Hexagonal Grids in Mobile Robot Navigation 198
Piotr Duszak and Barbara Siemiątkowska

Development of Logical Control System for the Purification Department at Molasses Production 206
Igor Korobiichuk, Victor Tregub, Oleh Klymenko, Igor Elperin, Victor Sidletskyi, Yaroslav Smityuh, and Marina Chornovan

Features of Control for Multi-assortment Technological Process 214
Igor Korobiichuk, Anatolii Ladaniuk, and Viacheslav Ivashchuk

Simple and Low-Cost Analog Tactile Sensor for Robot 222
Jan Králík and Vojtěch Venglář

Evaluation of Visual Markers Detection Used for Autonomous Mobile Robot Docking Navigation 229
Jiri Krejsa and Stanislav Vechet

Design and Realization of a Performance and Reliability Evaluation Module for Commercialized Anti-lock Braking Systems 237
Jun-Hong Wu, Shu-Heng Guo, Kuo-Shen Chen, and Mi-Ching Tsai

Model Reference Control for SISO 2-D System with Input Delay 246
Jerzy E. Kurek

Mechatronic System for Weeding 255
Sergiusz Łuczak, Wojciech Credo, Karol Bagiński, Paweł Wnuk, Bartłomiej Fajdek, Krzysztof Bąk, and Michał Majewski

MEMS and Nanotechnology

Advantages of Using Piezoelectric Materials in the MEMS Construction on the Example of AlN and Sc Doped AlN Layers 265
Magdalena A. Ekwińska, Jerzy Zając, Dariusz Szmigiel, Michał Zaborowski, Cezariusz Jastrzębski, George Muscalu, Bogdan Firtat, Silvian Dinulescu, Adrian Anghelescu, and Carmen Moldovan

Monitoring Tilt of Elevated Loads Using MEMS Accelerometers 274
Sergiusz Łuczak and Maciej Zams

Design of Deterministic Model for Compensation of Acceleration Sensitivity in MEMS Gyroscope 285
Tomas Spacil, Matej Rajchl, Michal Bastl, Jan Najman, and Martin Appel

MEMS Accelerometers in Diagnostics of the Articulation of an Articulated Vehicle 292
Mateusz Szumilas, Sergiusz Łuczak, and Błażej Kabziński

Smart Materials and Structures

Design and Construction of System for Controlling Thermal Relaxation Process of Amorphous Ribbons in Liquid Metal Bath 303
Artur Górski, Piotr Gazda, and Michał Nowicki

Seebeck Coefficient Measurement in Amorphous Alloys 310
Dariusz T. Grudziński, Łukasz Jaśkowski, and Michał Nowicki

Electromagnetic Rolling Mass Energy Harvesting Device for Low Frequency Excitation 316
Zdenek Hadas and Ladislav Pincek

Marker Based Optical System for Parametric Rapid Design 324
Mateusz Janowski, Danuta Jasińska-Choromańska, and Marcin Zaczyk

Vision System for Acquiring Results from Analog Gauges 332
Grzegorz Kopeć and Paweł Nowak

Autocompensation Methods of Reducing the Influence of Penetrating Sound Radiation 340
Igor Korobiichuk, Viktorij Mel'nick, and Volodimir Karachun

The System of the Assessment of a Residual Resource of Complex Technical Structures 350
Igor Korobiichuk, Lyudmyla Kuzmych, and Volodymyr Kvasnikov

Homogenized Model of Piezoelectric Composite Structure for Sensing Purposes 358
Filip Ksica, Josef Behal, Ondrej Rubes, and Zdenek Hadas

Lower Limbs Orthosis for Experimental Motion Studies for Designing an Orthotic Robot's Turning Module 366
Dymitr Osiński and Danuta Jasińska-Choromańska

Heat Transfer Model of a Small Size Satellite on Geostationary Orbit in Cold Condition 374
Philippe Preumont, Roman Szewczyk, Pawel Wittels, and Filip Czubaczyński

Modelling the Mechanical Stress Dependence of 2D Magnetic Permeability in Soft Magnetic Materials 381
R. Szewczyk

Biomedical Applications

An Automated Lifting Device for Assisted Walk Physiotherapy 389
Maciej Grabowski and Artur Jędrusyna

Determining the Upper Limb's Intensity of Movement Using a Smart Orthosis for Rehabilitation at the Clinic and Home 397
Patrik Kutilek, Petr Volf, Jan Hejda, Slavka Viteckova, Vaclav Krivanek, Radek Doskocil, Veronika Kotolova, Pavel Smrcka, and Vojtech Havlas

The Influence of Screen-Printing Parameters on Properties of Conductive Layers for Application in Biomedical Electrodes 406
L. Kołodziej, S. Ostrowski, A. Maciejewski, M. Jakubowska, and G. Wróblewski

Anatomic Adaptability of Wearable Elbow Brace for Rehabilitation Applications 414
Patrik Kutilek, Kevin Bancud, Petr Volf, Jan Hybl, Jan Hejda, Slavka Viteckova, Vaclav Krivanek, and Radek Doskocil

Spectral VIS Measurements for Detection Changes Caused by of *Mycoplasma Synoviae* in Flock of Poultry 422
Zofia Lorenc, Sławomir Paśko, Anna Pakuła, Olimpia Kursa, and Leszek Sałbut

Development of Water Based Transient Resistive Screen-Printing Paste with Carbon Nanotubes for Biomedical Applications 430
S. Ostrowski, L. Kołodziej, A. Maciejewski, M. Jakubowska, and G. Wróblewski

Modeling of Sleep Disordered Breathing Using NARMAX Methodology 438
Piotr Piskulak and Krzysztof Lewenstein

Cooling Module for Orthosis 445
Petr Volf, Jan Hejda, Simona Hájková, and Patrik Kutílek

System for Measurement of the Mechanical Impedance of Human Body During Vibration Training 453
Marek Żyliński, Wiktor Niewiadomski, Anna Gąsiorowska, Anna Stępniewska, Adam Becmer, and Gerard Cybulski

Other Problems Connected with Advanced Mechatronics

Application of Dehumidified Air During Spray Drying for the Production of Food Powders 463
Alicja Barańska, Aleksandra Jedlińska, and Katarzyna Samborska

Design of an Antenna Pedestal Stabilization Controller Based on Cascade Topology 469
Michal Bastl, Jan Najman, and Tomáš Spáčil

The Influence of Geological and Anthropogenic Factors on the Change of the Water Quality Parameters in the Kamyanka River Within the City of Zhytomyr 476
Igor Korobiichuk, Iryna Davydova, Valentyn Korobiichuk, Volodymyr Shlapak, and Olena Herasymchuk

Identification of Technological Objects on the Basis of Intellectual Data Analysis 487
Igor Korobiichuk, Yaroslav Smityuh, Vasil Kishenko, Anatoliy Ladanyuk, Dmitriy Shevchuk, Viacheslav Ivashchuk, Regina Boyko, and Igor Elperin

Application of Industrial X-Ray Tomography in Paleontological Studies on the Example of Aurochs Tooth 496
Tomasz Kowaluk, Bartłomiej J. Bartyzel, Filip Rzepiński, and Sławomir Paśko

Use of Methods of Tensor Analysis in the Evaporator Plant Operating System 502
Igor Korobiichuk, Viktor Sidletskyi, Anatolii Ladaniuk, Ihor Elperin, and Mykhailo Hrama

Author Index 513