

Advances in Intelligent Systems and Computing

Volume 574

Series editor

Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland
e-mail: kacprzyk@ibspan.waw.pl

About this Series

The series “Advances in Intelligent Systems and Computing” contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing.

The publications within “Advances in Intelligent Systems and Computing” are primarily textbooks and proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

Advisory Board

Chairman

Nikhil R. Pal, Indian Statistical Institute, Kolkata, India
e-mail: nikhil@isical.ac.in

Members

Rafael Bello Perez, Universidad Central “Marta Abreu” de Las Villas, Santa Clara, Cuba
e-mail: rbellop@uclv.edu.cu

Emilio S. Corchado, University of Salamanca, Salamanca, Spain
e-mail: escorchado@usal.es

Hani Hagras, University of Essex, Colchester, UK
e-mail: hani@essex.ac.uk

László T. Kóczy, Széchenyi István University, Győr, Hungary
e-mail: koczy@sze.hu

Vladik Kreinovich, University of Texas at El Paso, El Paso, USA
e-mail: vladik@utep.edu

Chin-Teng Lin, National Chiao Tung University, Hsinchu, Taiwan
e-mail: ctlin@mail.nctu.edu.tw

Jie Lu, University of Technology, Sydney, Australia
e-mail: Jie.Lu@uts.edu.au

Patricia Melin, Tijuana Institute of Technology, Tijuana, Mexico
e-mail: epmelin@hafsamx.org

Nadia Nedjah, State University of Rio de Janeiro, Rio de Janeiro, Brazil
e-mail: nadia@eng.uerj.br

Ngoc Thanh Nguyen, Wroclaw University of Technology, Wroclaw, Poland
e-mail: Ngoc-Thanh.Nguyen@pwr.edu.pl

Jun Wang, The Chinese University of Hong Kong, Shatin, Hong Kong
e-mail: jwang@mae.cuhk.edu.hk

More information about this series at <http://www.springer.com/series/11156>

Radek Silhavy · Roman Senkerik
Zuzana Kominkova Oplatkova
Zdenka Prokopova · Petr Silhavy
Editors

Cybernetics and Mathematics Applications in Intelligent Systems

Proceedings of the 6th Computer
Science On-line Conference 2017
(CSOC2017), Vol 2

Editors

Radek Silhavy
Faculty of Applied Informatics
Tomas Bata University in Zlín
Zlín
Czech Republic

Zdenka Prokopova
Faculty of Applied Informatics
Tomas Bata University in Zlín
Zlín
Czech Republic

Roman Senkerik
Faculty of Applied Informatics
Tomas Bata University in Zlín
Zlín
Czech Republic

Petr Silhavy
Faculty of Applied Informatics
Tomas Bata University in Zlín
Zlín
Czech Republic

Zuzana Kominkova Oplatkova
Faculty of Applied Informatics
Tomas Bata University in Zlín
Zlín
Czech Republic

ISSN 2194-5357

ISSN 2194-5365 (electronic)

Advances in Intelligent Systems and Computing

ISBN 978-3-319-57263-5

ISBN 978-3-319-57264-2 (eBook)

DOI 10.1007/978-3-319-57264-2

Library of Congress Control Number: 2017937149

© Springer International Publishing AG 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This book constitutes the refereed proceedings of the Cybernetics and Mathematics Applications in Intelligent Systems Section of the 6th Computer Science On-line Conference 2017 (CSOC 2017), held in April 2017.

Particular emphasis is laid on modern trends in mathematical application in intelligent systems, cybernetics, and automation control theory. New algorithms, methods, and applications of intelligent systems in technological systems are also presented.

The volume Cybernetics and Mathematics Applications in Intelligent Systems brings and presents new approaches and methods to real-world problems and exploratory research that describes novel approaches in the defined fields.

CSOC 2017 has received (all sections) 296 submissions, in which 148 of them were accepted for publication. More than 61% of accepted submissions were received from Europe, 34% from Asia, 3% from Africa, and 2% from America. Researches from 27 countries participated in CSOC 2017 conference.

CSOC 2017 conference intends to provide an international forum for the discussion of the latest high-quality research results in all areas related to computer science. The addressed topics are the theoretical aspects and applications of computer science, artificial intelligences, cybernetics, automation control theory, and software engineering.

Computer Science On-line Conference is held online, and modern communication technology which is broadly used improves the traditional concept of scientific conferences. It brings equal opportunity to participate to all researchers around the world.

The editors believe that readers will find the following proceedings interesting and useful for their own research work.

March 2017

Radek Silhavy
Petr Silhavy
Zdenka Prokopova
Roman Senkerik
Zuzana Kominkova Oplatkova

Organization

Program Committee

Program Committee Chairs

Zdenka Prokopova, Ph.D., Associate Professor, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: prokopova@fai.utb.cz

Zuzana Kominkova Oplatkova, Ph.D., Associate Professor, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: kominkovao-
platkova@fai.utb.cz

Roman Senkerik, Ph.D., Associate Professor, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: senkerik@fai.utb.cz

Petr Silhavy, Ph.D., Senior Lecturer, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: psilhavy@fai.utb.cz

Radek Silhavy, Ph.D., Senior Lecturer, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: rsilhavy@fai.utb.cz

Roman Prokop, Ph.D., Professor, Tomas Bata University in Zlin, Faculty of Applied Informatics, email: prokop@fai.utb.cz

Prof. Viacheslav Zelentsov, Doctor of Engineering Sciences, Chief Researcher of St. Petersburg Institute for Informatics and Automation of Russian Academy of Sciences (SPIIRAS).

Program Committee Members

Boguslaw Cyganek, Ph.D., DSc, Department of Computer Science, University of Science and Technology, Krakow, Poland.

Krzysztof Okarma, Ph.D., DSc, Faculty of Electrical Engineering, West Pomeranian University of Technology, Szczecin, Poland.

Monika Bakosova, Ph.D., Associate Professor, Institute of Information Engineering, Automation and Mathematics, Slovak University of Technology, Bratislava, Slovak Republic.

Pavel Vaclavek, Ph.D., Associate Professor, Faculty of Electrical Engineering and Communication, Brno University of Technology, Brno, Czech Republic.

Mirosław Ochodek, Ph.D., Faculty of Computing, Poznań University of Technology, Poznań, Poland.

Olga Brovkina, Ph.D., Global Change Research Centre Academy of Science of the Czech Republic, Brno, Czech Republic & Mendel University of Brno, Czech Republic.

Elarbi Badidi, Ph.D., College of Information Technology, United Arab Emirates University, Al Ain, United Arab Emirates.

Luis Alberto Morales Rosales, Head of the Master Program in Computer Science, Superior Technological Institute of Misantla, Mexico.

Mariana Lobato Baes, M.Sc., Research-Professor, Superior Technological of Libres, Mexico.

Abdessattar Chaâri, Professor, Laboratory of Sciences and Techniques of Automatic control & Computer engineering, University of Sfax, Tunisian Republic.

Gopal Sakarkar, Shri. Ramdeobaba College of Engineering and Management, Republic of India.

V.V. Krishna Maddinala, Assistant Professor, GD Rungta College of Engineering & Technology, Republic of India.

Anand N. Khobragade, Scientist, Maharashtra Remote Sensing Applications Centre, Republic of India.

Abdallah Handoura, Assistant Prof, Computer and Communication Laboratory, Telecom Bretagne, France

Technical Program Committee Members

Ivo Bukovsky

Mirosław Ochodek

Bronislav Chramcov

Eric Afful Dazie

Michal Bliznak

Donald Davendra

Radim Farana

Zuzana Kominkova Oplatkova

Martin Kotyrba

Erik Kral

David Malanik

Michal Pluhacek

Zdenka Prokopova

Martin Sysel

Roman Senkerik
Petr Silhavy
Radek Silhavy
Jiri Vojtesek
Eva Volna
Janez Brest
Ales Zamuda
Roman Prokop
Boguslaw Cyganek
Krzysztof Okarma
Monika Bakosova
Pavel Vaclavek
Olga Brovkina
Elarbi Badidi

Organizing Committee Chair

Radek Silhavy, Ph.D., Tomas Bata University in Zlin, Faculty of Applied Informatics, email: rsilhavy@fai.utb.cz

Conference Organizer (Production)

OpenPublish.eu s.r.o.
Web: <http://www.openpublish.eu>
Email: csoc@openpublish.eu

Conference Website, Call for Papers

<http://www.openpublish.eu>

Contents

Cost-Effective Computational Modeling of Fault Tolerant Optimization of FinFET-Based SRAM Cells.	1
H. Girish and D.R. Shashikumar	
Application of Risk Theory Approach to Fuzzy Abduction.	13
V.N. Tsypyshev	
Enhanced TDS Stability Analysis Method via Characteristic Quasipolynomial Polynomization.	20
Libor Pekař	
Dissipativity of Multistep Runge–Kutta Methods for Nonlinear Neutral Delay Integro Differential Equations with Constrained Grid	30
Haiyan Yuan and Cheng Song	
Evaluation of Uncertainties of ITS-90 by Monte Carlo Method	46
Peter Sopkuliak, Rudolf Palenčár, Jakub Palenčár, Emil Suroviak, and Jaromír Markovič	
Exploiting Model Continuity in Agent-Based Cyber-Physical Systems . . .	57
Domenico L. Carní, Franco Cicirelli, Domenico Grimaldi, Libero Nigro, and Paolo F. Sciammarella	
Design of Processor in Memory with RISC-modified Memory-Centric Architecture	70
Danijela Efnusheva and Aristotel Tentov	
CARIC: A Novel Modeling of Combinatorial Approach for Radiological Image Compression	82
M. Lakshminarayana and Mrinal Sarvagya	
Torque Characteristics of Antagonistic Pneumatic Muscle Actuator with an Oval Cam.	92
Mária Tóthová and Alena Vagaská	

Adaptive Control System of a Robot Manipulator Based on a Decentralized Position-Dependent PID Controller	100
Jan Cvejn and Jiří Tvrđík	
Possibilities of Process Modeling in Pedagogical Cybernetics Based on Control-System-Theory Approaches.	110
Tomas Barot	
Calibration of Low-Cost Three Axis Magnetometer with Differential Evolution	120
Ales Kuncar, Martin Sysel, and Tomas Urbanek	
The Technique of Multi-criteria Decision-Making in the Study of Semi-structured Problems	131
Alexander N. Pavlov, Dmitry A. Pavlov, Alexey A. Pavlov, and Alexey A. Slin'ko	
AnyLogic-Based Discrete Event Simulation Model of Railway Junction	141
Alexander Lyubchenko, Stanislav Bartosh, Evgeny Kopytov, Alexander Shiler, and Askar Kildibekov	
The Parameters List for Multihop Wireless Networks Cross-Layer Routing Metric.	150
I.O. Datyev, A.A. Pavlov, and M.G. Shishaev	
An Improved Active Queue Management Algorithm for Time Fairness in Multirate 802.11 WLAN	161
Jianjun Lei, Yingwei Wu, and Xu Zhang	
Control Theory Application to Complex Technical Objects Scheduling Problem Solving.	172
Boris Sokolov, Inna Trofimova, Dmitry Ivanov, and Alekcey Krylov	
Protective Correction of the Flow in Mechanical Transport System.	180
Stanislav Belyakov and Marina Savelyeva	
Efficient MapReduce Matrix Multiplication with Optimized Mapper Set	186
Methaq Kadhum, Mais Haj Qasem, Azzam Sleit, and Ahamd Sharieh	
Control of Time-Delay Systems with Parametric Uncertainty via Two Feedback Controllers	197
Radek Matušů and Roman Prokop	
Maze Navigation on Ball & Plate Model.	206
Lubos Spacek, Vladimir Bobal, and Jiri Vojtesek	

AEOC: A Novel Algorithm for Energy Optimization Clustering in Wireless Sensor Network	216
C. Parvathi and Suresha	
Large Networks of Diameter Two Based on Cayley Graphs	225
Marcel Abas	
Integrated S-AODV and DEL-CMAC Algorithm of Spatio Temporal Cross-Layer in Sensor Network	234
Shoba Chandra, Suresha Talanki, and Kiran Kumari Patil	
Robust Constrained Control: Optimization of 1 vs. 2 Closed-Loop Poles.	242
Frantisek Gazdos	
Machine Learning Approaches to Electricity Consumption Forecasting in Automated Metering Infrastructure (AMI) Systems: An Empirical Study	254
A. Jayanth Balaji, D.S. Harish Ram, and Binoy B. Nair	
Simulation of a Single-Component System Using the Trajectories Method Taking into Account the Scheduling Preventive Maintenance	264
Mikhail V. Zamoryonov, Vadim Ya. Kopp, Olga V. Chengar, and Yuri L. Rapatskiy	
Analysis of the IoT WiFi Mesh Network.	272
Piotr Lech and Przemysław Włodarski	
The Experience of Building Cognitive User Interfaces of Multidomain Information Systems Based on the Mental Model of Users	281
M.G. Shishaev, V.V. Dikovitsky, and L.V. Lapochkina	
Implementation of Synthetic Aperture Radar and Geoinformation Technologies in the Complex Monitoring and Managing of the Mining Industry Objects	291
Maria R. Ponomarenko and Ilya Yu. Pimanov	
Lightning Impulse Voltage Evaluation	300
Nopphadon Khodpun and Krisada Vilailak	
Pattern Recognition for Predictive Analysis in Automotive Industry . . .	311
Veronika Simoncicova, Lukas Hrecka, Lukas Spendla, Pavol Tanuska, and Pavel Vazan	
Methodology and Structure Adaptation Algorithm for Complex Technical Objects Reconfiguration Models	319
Anton Pashchenko, Pavel Okhtilev, Semen Potrysaev, Yury Ipatov, and Boris Sokolov	

Characterization of the Current Conditions of the ITSA Data Centers According to Standards of the Green Data Centers Friendly to the Environment	329
Leonel Hernandez and Genett Jimenez	
Game-Based Learning: How to Make Math More Attractive by Using of Serious Game	341
Marián Host'ovecký and Martin Novák	
Intelligent Telemetry Data Analysis of Small Satellites	351
Vadim Skobtsov, Natalia Novoselova, Vyacheslav Arhipov, and Semyon Potryasaev	
A Static Calibration of MEMS Accelerometers	362
Martin Sysel	
A Survey of Optimization Techniques for Distributed Job Shop Scheduling Problems in Multi-factories	369
Imen Chaouch, Olfa Belkahla Driss, and Khaled Ghedira	
Big Data Process Advancement	379
Roman Jasek, Said Krayem, and Petr Zacek	
Proving the Effectiveness of Negotiation Protocols KQML in Multi-agent Systems Using Event-B	397
Ammar Alhaj Ali, Roman Jasek, Said Krayem, and Petr Zacek	
Correlation Analysis of Decay Centrality	407
Natarajan Meghanathan	
Virtual Lab: An Adequate Multi-modality Learning Channel for Enhancing Students' Perception in Chemistry	419
Krishnashree Achuthan and Smitha S. Murali	
LDPC Binary Vectors Coding Enhances Transmissions and Memories Reliability	434
Tomas Knot and Karel Vlcek	
Author Index	445