



RECENT ADVANCES in COMPUTATIONAL INTELLIGENCE

**Proceedings of the 4th WSEAS International Conference on
COMPUTATIONAL INTELLIGENCE (CI '10)**

**Universitatea Politehnica
Bucharest, Romania, April 20-22, 2010**

**SPONSOR and ORGANIZER:
Facultatea IMST, Universitatea Politehnica, Bucharest, Romania**

Electrical and Computer Engineering Series
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

ISSN: 1790-5117
ISBN: 978-960-474-179-3

RECENT ADVANCES in COMPUTATIONAL INTELLIGENCE

**Proceedings of the 4th WSEAS International Conference on
COMPUTATIONAL INTELLIGENCE (CI '10)**

Universitatea Politehnica, Bucharest, Romania, April 20-22, 2010

**SPONSOR and ORGANIZER:
Facultatea IMST, Universitatea Politehnica, Bucharest, Romania**

Electrical and Computer Engineering Series
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

Copyright © 2010, by WSEAS Press

All the copyright of the present book belongs to the World Scientific and Engineering Academy and Society Press. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Editor of World Scientific and Engineering Academy and Society Press.

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: <http://www.worldses.org/review/index.html>

ISSN: 1790-5117
ISBN: 978-960-474-179-3



World Scientific and Engineering Academy and Society

RECENT ADVANCES in COMPUTATIONAL INTELLIGENCE

**Proceedings of the 4th WSEAS International Conference on
COMPUTATIONAL INTELLIGENCE (CI '10)**

Universitatea Politehnica, Bucharest, Romania, April 20-22, 2010

**SPONSOR and ORGANIZER:
Facultatea IMST, Universitatea Politehnica, Bucharest, Romania**

Editors:

Prof. Mircea Grigoriu, University "Politehnica" of Bucharest, ROMANIA
Prof. Valeri Mladenov, Technical University of Sofia, BULGARIA
Prof. Cornelia Aida Bulucea, University of Craiova, ROMANIA
Prof. Olga Martin, University "Politehnica" of Bucharest, ROMANIA
Prof. Nikos Mastorakis, Technical University of Sofia, BULGARIA

International Program Committee Members:

Wlodek Duch, POLAND
Luis Alexandre, PORTUGAL
Bruno Apolloni, ITALY
Timo Honkela, FINLAND
Thomas Martinetz, DENMARK
Guenter Palm, DENMARK
Alessandro Sperduti, ITALY
Michel Verleysen, BELGIUM
Alessandro E. P. Villa, FRANCE
Stefan Wermter, UK
Rudolf Albrecht, AUSTRIA
Peter Andras, UK
Valeri Mladenov, BULGARIA
Angela Slavova, BULGARIA
Baoding Liu, CHINA
Trevor Martin, UK
Vicenc Torra, SPAIN
Enrique Herrera Viedma, SPAIN
Bo-Hyeun Wang, KOREA
Xiao-Jun Zeng, UK
Plamen Angelov, UK
Robert Babuska, NETHERLANDS
Gleb Beliakov, AUSTRALIA
Hamid Berenji, USA
Michael Berthold, GERMANY
Hamid Bouchachia, AUSTRIA
Quek Hiok Chai, SINGAPORE
Seungjin Choi, KOREA
Gary Feng, HONG KONG
Dimitar Filev, USA
Paul Gader, USA
Masafumi Hagiwara, JAPAN
Isao Hayashi, JAPAN
Francisco Herrera, SPAIN
Richard Jensen, UK
Seul Jung, KOREA
Okyay Kaynak, TURKEY
Euntai Kim, KOREA
Jin Young Kim, KOREA
Kwang Baek Kim, KOREA
Baoding Liu, CHINA
Trevor Martin, UK
Radko Mesiar, SLOVAKIA
Eduard Montseny, SPAIN
Mihail Popescu, USA
Thomas Runkler, GERMANY
Hideyuki Sawada, JAPAN
Mircea Grigoriu, ROMANIA
Pilar Sobrevilla, SPAIN
Woei Wan Tan, SINGAPORE
Nipon Theera-Umpon, THAILAND
Vicenc Torra, SPAIN
Enrique Herrera Viedma, SPAIN
Bo-Hyeun Wang, KOREA
Xiao-Jun Zeng, UK
Erik Goodman, USA
Gilbert Syswerda, USA
Thomas Baeck, GERMANY
Mircea Grigoriu, ROMANIA
Marc Schoenauer, FRANCE
Ian Parmee, UK
Bill Punch, USA
Dave Schaffer, USA
Adina Florea, ROMANIA
Catalin Amza, ROMANIA
Constantin Radu, ROMANIA
Constantin Marius Popescu, ROMANIA

Preface

This year the 4th WSEAS International Conference on COMPUTATIONAL INTELLIGENCE (CI '10) was held at Universitatea Politehnica, Bucharest, Romania, April 20-22, 2010. The conference remains faithful to its original idea of providing a platform to discuss supervised and unsupervised learning, algorithms, neurobiology and neurosciences, neuro-fuzzy systems, takagi-sugeno models and generalizations, information systems, image processing, parallel computing applications in identification & control, financial mathematics, industrial measurement, large scale systems, quantitative methods, robotics, mechatronics, multiobjective programming, game theory, electromagnetics, risk management etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

Table of Contents

Plenary Lecture 1: The Blocking Meta-Heuristics for Combinatorial Problems Solving <i>Zurab Bosikashvili</i>	11
Plenary Lecture 2: Fuzzy Type Set-Valued Integrals <i>Anca Croitoru</i>	12
A Hybrid ANN-Based Technique for Signature Verification <i>Ashraf A. Zaher, Abdunasser Abu-Rezq</i>	13
The Blocking Meta-Heuristics for Combinatorial Problems Solving <i>Zurab Bosikashvili</i>	20
Optimal Sequencing of Orders in the Cases of the Single and Multiple Working-Places <i>Tamar Lominadze, Medea Tevdoradze, Nino Tsiklauri</i>	25
A Takagi-Sugeno Type Controller for Mobile Robot Navigation <i>Ion Iancu, Mihaela Colhon, Mihai Dupac</i>	29
About Unified Model of Safety of Information Systems <i>Zurab Bosikashvili, David Kapanadze, Taliko Zhvania</i>	35
About Conceptual Model of the Test Control Problem <i>Zurab Bosikashvili, David Kapanadze, Taliko Zhvania</i>	39
Stochastic Optimization Algorithm with Probability Vector <i>Jan Pohl, Vaclav Jirsik, Petr Honzik</i>	43
A Fuzzy Logic Based System for Heavy Metals Loaded Wastewaters Monitoring <i>Daniel Dunea, Mihaela Oprea</i>	48
Segmentation of Industrial X-ray Images <i>Catalin Gheorghe Amza, Gabriel Tasca</i>	54
Simulated Annealing based VLSI Circuit Partitioning for Delay Minimization <i>S. S. Gill, B. Aneja, R. Chandel, A. Chandel</i>	60
Interoperability and Ontology for Heterogeneous Systems <i>Michal Sir, Petr Fiedler, Vaclav Kaczmarczyk</i>	64
Analysis and Optimization of Automatic Systems using PID and LQR <i>Paul Ciprian Patie, Luminita Duta</i>	68
Non-Atomic Set Multifunctions <i>Alina Gavrilut</i>	74
Fuzzy Integrability of Multifunctions <i>Anca Croitoru</i>	80

Simulation Software for Transient, Multidimensional Heat Conduction	85
<i>Sorin Ratiu, Gabriel Nicolae Popa, Ana Josan, Vasile Alexa</i>	
A Linear Ultrasonic Motor for Positioning Stages	91
<i>Delia Garleanu, Claudia Borda, Mihaiela Iliescu, Delicia Arsene, Gabriel Garleanu</i>	
Modeling and Simulation of a Positioning-Fastening-Adjusting Device for Laser μ-Machining CNC System	95
<i>Mihaiela Iliescu, Dragos Dumitrescu, Gabriel Velea</i>	
Widening of 10NiCr180 Stainless Steel – Process Simulation and Cutting Torque Mathematical Models	101
<i>Mihaiela Iliescu, Aurelian Vlase, Emil Militaru</i>	
Two-Dimensional Cellular Automata Synchronizers	107
<i>Hiroshi Umeo</i>	
A Simulation-Based Fuzzy Model for Traffic Signal Control	113
<i>Yaser E. Hawas</i>	
Optimized Parallelization Heuristic for Task Scheduling	122
<i>Waheed Aslam Ghumman, Pedro Lopez-Garcia</i>	
New Representation of Data in the Information Processing Systems	129
<i>Jina Gachechiladze</i>	
Cognitive Binary Logic - The Natural Unified Formal Theory of Propositional Binary Logic	135
<i>Nicolai Popescu-Bodorin, Luminita State</i>	
Intelligent Buildings Energy Supply Following Climate Parameters Variation Fuzzy Control	143
<i>Mircea Grigoriu, Marius Constantin Popescu</i>	
Fuzzy Diffused Set Multifunctions	148
<i>Alina Gavrilut, Anca Croitoru, Nikos E. Mastorakis</i>	
Fuzzy Control for Pumps Drivings	154
<i>Marius-Constantin Popescu, Mircea Grigoriu, Nikos Mastorakis</i>	
Integrating Neural Networks and PCA for Fast Covert Surveillance	161
<i>Hazem M. El-Bakry, Mamoon H. Mamoon</i>	
Authors Index	168

Plenary Lecture 1

The Blocking Meta-Heuristics for Combinatorial Problems Solving



Professor Zurab Bosikashvili
Department of Information System
Georgian Technical University, Tbilisi
Georgia
E-mail: zurab.bosikashvili@ugt.ge

Abstract: The majority of the problems represented in the artificial intelligence is of combinatory nature and is characterized with exponential complexity. In the given lecture there are considered the meta-heuristics based methods of coping with dimensions of such problems. In particular, a combinatorial problem is considered as a sorting problem with constraints and is represented by means of a formalization of a searching of solutions in the state space. In the works we introduce a meta-heuristics of blocking, which allows a factorization of a state space and a reduction of an initial problem to a factor problem with a considerably smaller dimensions than it was an initial one. There is considered a mechanism of decomposition of an initial problem into the sub-problems and are represented conditions of correctness of merging sub-problems as well. Also in the lecture there is considered a usage of analogy principles in the process of solving combinatorial problems based on the blocking meta-heuristics.

Brief Biography of the Speaker:

Zurab Bosikashvili is a professor of Software Development and Artificial Intelligence at Information System Department, Georgian Technical University, Georgia. His area of expertise is the automatization of problem solving, pattern recognition, design of programming system and software development methodology. He authored or co-authored more 70 scientific papers published in reviewed journals or presented at local and international conferences. He has developed solutions searching methods and algorithms for combinatorial problems, particularly on their basis have been developed Georgian printed character and cursive script recognition system, logical blocks' control tests generation algorithm, system of conjunction tracing on the plane etc. He has participated more 30 projects in IT area of Georgia. He is a consultant and system architect in the software development company UGT.

Plenary Lecture 2

Fuzzy Type Set-Valued Integrals



Professor Anca Croitoru
Faculty of Mathematics
“A.I. Cuza” University of Iasi
ROMANIA
E-mail: croitoru@uaic.ro

Abstract: Since Aumann introduced in 1965 the integral of a multifunction, the theory of set-valued integrals has become an interesting and important topic due to numerous applications in economics, probabilities, theory of control. The lecture is focused on presenting properties of fuzzy type set-valued integrals for real functions (multifunctions respectively) with respect to a fuzzy multimeasure (fuzzy measure respectively).

Brief Biography of the Speaker:

Anca Croitoru graduated the Faculty of Mathematics at “A.I. Cuza” University of Iasi, Romania and received the Doctoral Degree in Mathematics in 2000 at the same university with a thesis in Romanian: Multifunctii aditive si neaditive de multime (Non-additive and additive set multifunctions), supervisor: prof. dr. Anca-Maria Precupanu. In present she is lecturer at the Faculty of Mathematics, “A.I. Cuza” University of Iasi, Romania.

She is member of AMS, WSEAS, ROMAI, “Al. Myller” Mathematical Seminary

Foundation of “A.I. Cuza” University of Iasi. She is author or co-author of 4 books (in Romanian), over 30 papers in national or international refereed journals and conference proceedings, co-editor of 7 conference proceedings. She is participant at over 40 national or international conferences and participant or coordinator of 4 national and 2 international research projects respectively.

Her research interest includes: continuity, measurability, fuzzyness, (pseudo)atoms, non-atomicity, Darboux property in set-valued analysis, non-additive set multifunctions, convergences of measurable functions, set-valued integrals of different types: Dunford, Gould, fuzzy.

Authors Index

Abu-Rezq, A.	13	Iliescu, M.	91, 95, 101
Alexa, V.	85	Jirsik, V.	43
Amza, C. G.	54	Josan, A.	85
Aneja, B.	60	Kaczmarczyk, V.	64
Arsene, D.	91	Kapanadze, D.	35, 39
Borda, B.	91	Lominadze, T.	25
Bosikashvili, Z.	20, 35, 39	Lopez-Garcia, P.	122
Chandel, A.	60	Mamoon, M. H.	161
Chandel, R.	60	Mastorakis, N. E.	148, 154
Colhon, M.	29	Militaru, E.	101
Croitoru, A.	80, 148	Oprea, M.	48
Dumitrescu, D.	95	Patic, P. C.	68
Dunea, D.	48	Pohl, J.	43
Dupac, M.	29	Popa, G. N.	85
Duta, L.	68	Popescu, M.-C.	143, 154
El-Bakry, H. M.	161	Popescu-Bodorin, N.	135
Fiedler, P.	64	Ratiu, S.	85
Gachechiladze, J.	129	Sir, M.	64
Garleanu, D.	91	State, L.	135
Garleanu, G.	91	Tasca, G.	54, 95
Gavrilut, A.	74, 148	Tevdoradze, M.	25
Ghumman, W. A.	122	Tsiklauri, N.	25
Gill, S. S.	60	Umeo, H.	107
Grigoriu, M.	143, 154	Vlase, A.	101
Hawas, Y. E.	113	Zaher, A. A.	13
Honzik, P.	43	Zhvania, T.	35, 39
Iancu, I.	29		