



# **RECENT RESEARCHES in APPLIED INFORMATION SCIENCE**

**Proceedings of the 5th WSEAS World Congress on Applied  
Computing Conference (ACC '12)**

**Proceedings of the 1st International Conference on Biologically  
Inspired Computation (BIC '12)**

**University of Algarve, Faro, Portugal  
May 2-4, 2012**

Recent Advances in Computer Engineering Series | 2

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Najib Altawell  
Nikos Loukeris  
Noraida Haji Ali  
Nubli Abdul Wahab  
Oguz Arslan  
Oprita Razvan  
Panagiotis Gioannis  
Pedro Nucci  
Perumal Pitchandi  
Petr Hajek  
Petr Mastny  
Poom Kumam  
Priyadarshan Dhabe

Ramin Khodafarin  
Reza Fathipour  
Ricardo Gouveia Rodrigues  
Rodica Badescu  
Roman Mihai Daniel  
Roumiana Kountcheva  
Serban Corina  
Shiang-Yen Tan  
Suzana Yusup  
Theodoros Xanthos  
Thomas Panagopoulos  
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**Preface**

This year the 5th WSEAS World Congress on Applied Computing Conference (ACC '12) and the 1st International Conference on Biologically Inspired Computation (BIC '12) were held at the University of Algarve, Faro, Portugal, May 2-4, 2012. The multiconference provided a platform to discuss programming languages, software engineering, computer graphics, computer vision, computer networks, databases, information retrieval, data mining, genetic algorithms, immune system, bioinformatics, cognitive modeling 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 multiconference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these 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

<b>Plenary Lecture 1: People, Automation, and Complexity Concerns Affecting Enterprise Information Integration</b> <i>Ionel Botef</i>	12
<b>Plenary Lecture 2: On Some General Computation Schemes and Hybrid Optimization Techniques used in Learning Processes</b> <i>Dana Simian</i>	13
<b>Plenary Lecture 3: Parallel Processing of Infrared Images Processing in Thermo Vision Systems</b> <i>Alexander Bekiarski</i>	14
<b>Cost of Mutual Exclusion with Spin Locks on Multi-Core CPUs</b> <i>Sandor Juhasz, Akos Dudas, Tamas Schradi</i>	15
<b>Key Practices for SOA Adoption</b> <i>Duško Vukmanović, Damir Kalpić</i>	20
<b>Engineering Design Concerns Affecting Manufacturing Enterprise Computerised Integration</b> <i>Ionel Botef</i>	26
<b>Multirate Depth Control of an AUV by Neural Network Model Reference Controller for Enhanced Situational Awareness</b> <i>Igor Astrov, Boris Gordon</i>	32
<b>Semantic Complex Event Processing</b> <i>Marc Schaaf, Stella Gatzu Grivas, Dennie Ackermann, Arne Diekmann, Arne Koschel, Irina Astrova</i>	38
<b>Beyond Normal Requirements</b> <i>Ionel Botef</i>	44
<b>Control of Fuel Cell's Reactant of Autonomic Underwater Vehicle's</b> <i>Bogdan Zak, Jarosław Garus</i>	52
<b>Neural Predictive Model in the Estimation Process of Somatic Cell Counts in Milk</b> <i>Aleksander Jędrus, Piotr Boniecki, Jacek Dach, Krzysztof Pilarski, Jacek Przybył</i>	58
<b>Measuring the Efficiency of Portuguese Hospitals with DEA: An Approach using the General Algebraic Modeling System</b> <i>António Xavier</i>	62
<b>Round-Trip Software Engineering with CodeDesigner RAD</b> <i>Michal Bližnák, Tomáš Dulík, Roman Jašek</i>	68
<b>A Control Allocation Method for Over-Actuated Underwater Robot</b> <i>Jerzy Garus, Józef Malecki</i>	74
<b>Heuristic Approach for Estimating the Solar Cell Parameters</b> <i>M. R. AlRashidi, K. M. El-Naggar, M. F. AlHajri</i>	80

<b>Close Approaches for a Cloud of Particles with the Moon</b> <i>Vivian Martins Gomes, Antonio F. B. A. Prado</i>	84
<b>Model Refactoring within a Sequencer</b> <i>Tomaž Kos, Tomaž Kosar, Jure Knez, Marjan Mernik</i>	90
<b>Many Valued Context for Knowledge Evaluation</b> <i>Sylvia Encheva</i>	95
<b>A Closer Look at Authentication and Authorization Mechanisms for Web-based Applications</b> <i>Sharil Tumin, Sylvia Encheva</i>	100
<b>INS and Magnetic Sensor Aided Carrier Phase Differential GPS for Attitude Determination</b> <i>Laszlo Kis, Bela Lantos</i>	106
<b>Implementation of the Synergetic Computer Algorithm on AutoCAD Platform</b> <i>Dmitri Loginov</i>	112
<b>A Study on the Stress Distribution of Chevron Type Plates with Change of Shape by Numerical Analysis</b> <i>Si Pom Kim, Rock Won Jeon, Jae Hun Lee, Du Hui Lim</i>	118
<b>Coil Optimization with Aid of Flat Coil Optimizer</b> <i>Lukas Kouril, Martin Pospisilik, Milan Adamek, Roman Jasek</i>	124
<b>Moving Objects Detection and Tracking in Infrared or Thermal Image</b> <i>Alexander Bekiarski, Snejana Pleshkova</i>	128
<b>Audio Transformers Optimization by Means of Evolutionary Algorithms</b> <i>Lukas Kouril, Martin Pospisilik, Milan Adamek, Roman Jasek</i>	133
<b>Automatic ROI Positioning in Ultrasound TCS Images using Artificial Intelligence to Parkinson's Disease Risk</b> <i>Jiří Blahuta, Tomáš Soukup, Petr Čermák, David Novák, Michal Večerek</i>	139
<b>Comparison of Methods for Passenger Flow Simulation of an Airport Terminal</b> <i>Gabor Kovacs, Istvan Harmati, Balint Kiss, Gabor Vamos, Peter Maraczy</i>	145
<b>Parallelized Cuckoo Search Algorithm for Unconstrained Optimization</b> <i>Milos Subotic, Milan Tuba, Nebojsa Bacanin, Dana Simian</i>	151
<b>Parallelization of the Local Threshold and Boolean Function Based Edge Detection Algorithm Using CUDA</b> <i>Raka Jovanovic, Milan Tuba, Dana Simian</i>	157
<b>Design and Implementation of a Clustering Model for River Sectors based on Biotope Characteristics</b> <i>Dana Simian, Daniel Hunyadi, Angela Bănăduc</i>	162
<b>Direct Access Agent-based Character Recognition Simulator</b> <i>Ieva Lauberte, Egils Ginters</i>	167
<b>Easy Communication Environment on the Cloud as Distributed Simulation Infrastructure</b> <i>Artis Aizstrauts, Egils Ginters, Dace Aizstrauta, Peter Sonntagbauer</i>	173

<b>The Monitoring Computer Systems Applied to Research on Composting Process in Bioreactor</b> <i>Jacek Dach, Krzysztof Pilarski, Piotr Boniecki, Aleksander Jędrus, Dariusz Tomkiewicz, Jacek Przybył, Zbigniew Dworecki</i>	179
<b>A New Risk Management Model using Quantile-Based Risk Measure, with Applications to Non-Normal Distributions</b> <i>Maria Tudor, Silvia Dedu</i>	183
<b>Artificial Neural Network in Gaseous Emissions Prediction with Bioreactor Usage</b> <i>Piotr Boniecki, Jacek Dach, Krzysztof Pilarski, Aleksander Jędrus, Krzysztof Nowakowski, Hanna Piekarska-Boniecka, Jacek Przybył</i>	187
<b>Neural Identification Models of Physical Parameters of Selected Quality Cereal Grain</b> <i>Krzysztof Pilarski, Barbara Raba, Krzysztof Nowakowski, Robert Jacek Tomczak, Sebastian Kujawa, Piotr Boniecki, Jacek Dach, Jacek Przybył</i>	191
<b>An Example of Symbolic Computation of Lyapunov Quantities in Maple</b> <i>O. A. Kuznetsova</i>	195
<b>Expert System for Hospitals' Multi Standard Accreditation Jordanian Study</b> <i>Mohammad Aref Alshraideh, Atef Musa Abu-Arida, Ferial Ahmed Hayajneh</i>	199
<b>Complexity and Similarity Approach Based on Heart Sound Murmurs for Cardiac Pathological Status Analysis</b> <i>Xiali Zheng, Binbin Fu, Xiaolei Fei, Booma Devi Sekar, Mingchui Dong</i>	206
<b>A Hybrid Genetic Algorithm and Particle Swarm Optimization based Fuzzy Times Series Model for TAIFEX and KSE-100 Forecasting</b> <i>Tahseen A. Jilani, Usman Amjad, Nikos Mastorakis</i>	212
<b>A Decision Support System using Classification of the Blood Glucose and HbA1C Level Classes from Palm Perspiration Data</b> <i>Hamdi Melih Saraoğlu, Feyzullah Temurtaş, Sayit Altıkat, Halil Özcan Gülçür</i>	219
<b>An Analysis of the Solution Quality of the Simple Genetic Algorithm</b> <i>Haldun Aytug, Anand Paul</i>	224
<b>Authors Index</b>	229

## Plenary Lecture 1

### People, Automation, and Complexity Concerns Affecting Enterprise Information Integration



**Dr. Ionel Botef**

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**Abstract:** Studies show that enterprise information integration faces complex organisational, technical, and social shortcomings. As a result of these shortcomings, Computer Integrated Manufacturing (CIM), concerned with the integration of commercial, financial, and engineering systems, was merely applied to integration of data, communication, and processes, and a fully computerised integration in the manufacturing system was considered unlikely to be the main model in the near future. Therefore, the purpose of this plenary lecture is to explore how people, automation, and complexity can be effectively and successfully integrated into a manufacturing enterprise information system. Based on the research's qualitative findings supported by authorities, evidence, or logic, essentially, it is argued that the enterprise information integration system development should be a multi-perspective activity focused on a variety of interdisciplinary research areas that should focus, incorporate, and assist the human operator, and that the wisdom of simplicity in order to control complexity should prevail against the attempt to develop complex systems that usually are a consequence of unnecessary requirements. This exploration also leads to the need for an enterprise information architecture framework for problem solving that should be aligned with the business practices and the ways in which the companies are run, and which finally leads to a system of systems which is architectural-centric, process-centric, human-centric, and in line with the IT infrastructure trends.

**Brief Biography of the Speaker:** Ionel Botef graduated in 1977 from the Polytechnic Institute of Bucharest, Romania, with a Masters in Mechanical and Manufacturing Engineering. In the 1980s he worked as a senior engineer with Turbomecanica, a manufacturer of aircraft engines, where, for example, he coordinated the technology for SPEY 512-14 DW aircraft engine, a cooperation programme with Rolls-Royce, UK. In the 1990s he moved to South Africa where he achieved his PhD from the Electrical and Information Engineering, University of the Witwatersrand, Johannesburg. From 1998 he has been a full time academic with the School of Mechanical, Industrial, and Aeronautical Engineering, University of the Witwatersrand, Johannesburg. His research interests focus on interdisciplinary research that include company integration, information systems, manufacturing processes and systems, materials science, software engineering, and computational techniques.

## Plenary Lecture 2

### On Some General Computation Schemes and Hybrid Optimization Techniques used in Learning Processes



**Professor Dana Simian**

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**Abstract:** The aim of this presentation is to introduce two general schemes used in learning processing. The first one is a generic reinforcement scheme and the second one a scheme for building SVMs kernels. Both schemes are parameters dependent and the improvement of their computational performances is dependent on the choice of these parameters. In the case of the generic reinforcement scheme the performance is measured in number of iterations in learning process and in the case of SVM kernels in the classification accuracy and cross-validation accuracy obtained during many classification tasks. Different kind of genetic algorithms are used for learning parameters optimization.

**Brief Biography of the Speaker:** Dana Simian received the diploma. in engineering from the University of Sibiu, Romania, the diploma in Mathematics - Informatics from the University Babes-Bolyai of Cluj-Napoca, Romania and the Ph.D. from Babes-Bolyai University of Cluj- Napoca, Romania. She graduated many courses in Computer Science. She has a great experience in algorithms and numerical methods for modelling and optimization. She published 15 books, more than 60 articles and participated in the editorial board of many scientific publications (proceedings of international conferences and journals).

She organized many special sessions within WSEAS conferences and other international workshops and international conferences on topics related to modeling of intelligent systems, approximation and optimization. She was member of many scientific committees of international conferences. She was involved as director of many research grants.

## Plenary Lecture 3

### Parallel Processing of Infrared Images Processing in Thermo Vision Systems



**Professor Alexander Bekiarski**

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**Abstract:** Thermo vision are used in military, police custom traffic control, industrial and other specific applications for collecting and processing thermo visual information from infrared images. The problems arise in the steps of implementation of the developed methods and algorithms in real time practical applications of thermo vision systems. In surveillance and security thermo visual systems one of the most practical goals is the moving objects detection and tracking in infrared images captured from a thermo vision camera. The input infrared images are usually separated and processed in small blocks with an appropriate and chosen shape (for example rectangular) and size (for example 8x8). In conventional hardware or software implementation of infrared image processing algorithms the blocks are processed consecutively or in series and the achieving the real time processing is not always possible. The advances in powerful parallel computer graphics and image processing for computer vision and computer games applications with the developed graphical processing unit (GPU) and Compute Unified Device Architecture (CUDA) offers for GPU-based computing a powerful development framework integrated with high level parallel programming languages like C or C++ languages. Graphical processing units (GPU) are devices designed to exploit parallel shared memory-based floating-point computation. They provide memory access speeds superior to those of commodity CPU-based systems. These features to update in parallel the model variables every iteration compared to other solutions like programmable logic, integrated circuits, custom shared memory solutions, and cluster message passing computing systems make GPUs attractive in real time image processing and especially in this article for infrared image processing applications. Here is proposed to exploit the ability of parallel processing and the high-speed memory access of graphical processing units (GPU), which is essential in the real time applications with neural networks in most of the infrared image processing applications. In most applications of infrared image processing with neural networks the processed algorithms work sequentially by a CPU, which means only one neuron is updated at a given time. As a result the performance degrades quickly with the increase in network size and connectivity. This is especially the case for large connectivity, since sequential processors need to iterate over every connection for each neuron. To speed up the operation, supercomputers or distributed computers are normally used for large-scale neural network simulation. But these solutions incur high cost. Traditional CPU architectures are not designed for parallel processing. To avoid this problem in real time infrared image processing applications a suitable type of neural network is proposed to use the spiking neural network (SNN) implemented in graphical processing unit (GPU) and Compute Unified Device Architecture (CUDA). The example is presented for real time infrared image processing applications like moving objects detection and tracking in infrared images in surveillance and security thermo visual systems.

**Brief Biography of the Speaker:** Born in 1944, Plovdiv, Bulgaria. He received M.S. degree in Communications in 1969 in Technical University, Sofia. Ph. D in Television and Image Processing in 1975, Assoc. Prof. since 1987 in the same University. Vice-Dean of Faculty on Life-Long Learning Center since 2005, Vice-Dean of French Language Faculty of Electrical Engineering since 2006. The author over 200 research papers in Image Processing Systems Thermal and Infrared Image Processing, Pattern Recognitions, Neural Networks etc. Currently the leader of courses in Basic of Television, Television Systems, Theory of Coding, Digital Signal Processors etc. His scientific interests encompass Video and Audio Processing, Digital TV, Neural Networks, Artificial Intelligence in Video and Audio, Artificial Intelligence Programming Languages Lisp Prolog, Expert Systems, Robotics Camera Eye and Microphone Arrays, Signal Processors, Embedded Systems, Microcontrollers, Programming Languages C++, Java, Matlab etc.

## Authors Index

Abu-Arida, A. M.	199	Garus, Je.	74	Mernik, M.	90
Ackermann, D.	38	Ginters, E.	167, 173	Novák, D.	139
Adamek, M.	124, 133	Gomes, V. M.	84	Nowakowski, K.	187, 191
Aizstrauta, D.	173	Gordon, B.	32	Paul, A.	224
Aizstrauts, A.	173	Grivas, S. G.	38	Piekarska-Boniecka, H.	187
AlHajri, M. F.	80	Gülçür, H. Ö	219	Pilarski, K.	58, 179
AlRashidi, M. R.	80	Harmati, I.	145	Pilarski, K.	187, 191
Alshraideh, M. A.	199	Hayajneh, F. A.	199	Pleshkova, S.	128
Altıkat, S.	219	Hunyadi, D.	162	Pospisilik, M.	124, 133
Amjad, U.	212	Jašek, R.	68, 124, 133	Prado, A. F. B. A.	84
Astrov, I.	32	Jędrus, A.	58, 179, 187	Przybył, J.	58, 179
Astrova, I.	38	Jeon, R. W.	118	Przybył, J.	187, 191
Aytug, H.	224	Jilani, T. A.	212	Raba, B.	191
Bacanin, N.	151	Jovanovic, R.	157	Saraoğlu, H. M.	219
Bănăduc, A.	162	Juhasz, S.	15	Schaaf, M.	38
Bekiariski, A.	128	Kalpić, D.	20	Schradi, T.	15
Blahuta, J.	139	Kim, S. P.	118	Sekar, B. D.	206
Blišnák, M.	68	Kis, L.	106	Simian, D.	151, 157, 162
Boniecki, P.	58, 179	Kiss, B.	145	Sonntagbauer, P.	173
Boniecki, P.	187, 191	Knez, J.	90	Soukup, T.	139
Botef, I.	26, 44	Kos, T.	90	Subotic, M.	151
Čermák, P.	139	Kosar, T.	90	Temurtaş, F.	219
Dach, J.	58, 179	Koschel, A.	38	Tomczak, R. J.	191
Dach, J.	187, 191	Kouril, L.	124, 133	Tomkiewicz, D.	179
Dedu, S.	183	Kovacs, G.	145	Tuba, M.	151 157
Diekmann, A.	38	Kujawa, S.	191	Tudor, M.	183
Dong, M.	206	Kuznetsova, O. A.	195	Tumin, S.	100
Dudas, A.	15	Lantos, B.	106	Vamos, G.	145
Dulík, T.	68	Lauberte, I.	167	Večerek, M.	139
Dworecki, Z.	179	Lee, J. H.	118	Vukmanović, D.	20
El-Naggar, K. M.	80	Lim, D. H.	118	Xavier, A.	62
Encheva, S.	95, 100	Loginov, D.	112	Žak, B.	52
Fei, X.	206	Małecki, J.	74	Zheng, X.	206
Fu, B.	206	Maraczy, P.	145		
Garus, Ja.	52	Mastorakis, N.	212		