

## Editorial

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**Biographical notes:** Pece J. Mitrevski received his BSc and MSc degrees in Electrical and Computer Engineering, and his PhD in Computer Science from the Ss. Cyril and Methodius University in Skopje, Macedonia. He has been on the Faculty of Technical Sciences at the St. Clement of Ohrid University in Bitola, Macedonia, since 1991, where he is currently a Full Professor. His research interests include computer architecture, instruction-level parallelism, computer networks, cloud computing, stochastic Petri nets, performance and reliability analysis of computer systems, discrete-event simulation, behavioural modelling and e-commerce. He is a member of the IEEE Computer Society and the ACM.

Cvetko D. Mitrovski earned his BSc and MSc degrees at the Faculty of Electrical Engineering in Belgrade, Serbia, and his PhD degree at the Faculty of Electrical Engineering and Information Technologies in Skopje, Macedonia. Currently, he is a Full Professor at the Faculty of Technical Sciences at the St. Clement of Ohrid University in Bitola, Macedonia. His current interests include dynamic systems, complex behaviour in nonlinear dynamic systems, signal processing and medical image processing. He has served as a co-Chair of the International Scientific Conference on Information, Communication and Energy Systems and Technologies. He is a member of the IEEE.

Following the long tradition dating back to 1963, at the 50th anniversary of the first ‘Day of the radio’, the Faculty of Technical Sciences at the St. Clement of Ohrid University in Bitola, Macedonia, took its turn to organise the XLVIII International Scientific Conference on Information, Communication and Energy Systems and Technologies (ICEST 2013) from June 26 to June 29, 2013, in joint cooperation with the Faculty of Electronic Engineering at the University of Niš, Serbia, and the Faculty of Telecommunications at the Technical University of Sofia, Bulgaria. The conference was supported by the IEEE Republic of Macedonia Section and took place at the premises of the Faculty of Tourism and Hospitality in Ohrid – one of only 29 mixed properties that are part of UNESCO’s World Heritage, and are both cultural and natural sites.

The main part of the conference program included presentations of the scientific papers with a wide range of topics:

- 1 radio communications, microwaves and antennas
- 2 telecommunication systems and technology
- 3 signal processing
- 4 digital image processing
- 5 computer systems and internet technologies
- 6 informatics and computer science
- 7 electronics
- 8 energy systems and efficiency
- 9 control systems
- 10 measurement science and technology
- 11 remote ecological monitoring
- 12 engineering education.

The peer review process was performed by an international board of conference reviewers, and the final selection was conducted by the Conference Program Committee. The total number of papers selected for presentation was 203, 91 of which were accepted for oral sessions and 112 for poster sessions. In total, there were 12 regular sessions, 12 poster sessions and company presentations.

This special issue of the *International Journal of Reasoning-based Intelligent Systems* pursues to promote research into hybrid approaches to formal modelling, simulation, analysis and evaluation, i.e., the combination of formal and semi-formal methods for system development, covering all the phases from design, through verification, to the integration of different tools and analysis techniques in diverse disciplines of the engineering practice: computer systems, internet technologies, control systems, signal and digital image processing, radio communications, microwaves and antennas. Different aspects of a modelled system under consideration are usually articulated through different paradigms. In other words, different analysis techniques should be used and different formal methods should be applied in order to examine a variety of system interpretations, the variety of system properties, or merely to cope with the system's complexity in itself.

Evolutionary algorithms and machine learning are some of the keywords that intertwine throughout the first two papers, which emerge from the area of informatics and computer science. Leoneed M. Kirilov, Vassil Guliashki, Krasimira Genova, Peter Zhivkov, Boris Staykov and Daniel Vatov propose a reference point hybrid evolutionary algorithm and present an interactive user-friendly environment for solving multiple-objective programming problems (GENS-IM), where the choice of a scalarising method is organised in an implicit way, based on the preferences of a decision maker. In the second paper, Monika Simjanoska, Sasko Ristov, Marjan Gusev and Goran Velkoski turn to cloud computing as a new archetype, where cloud service providers aim to assign the available resources to as many consumers as possible, whereas the consumers intend to maximise the resources' utilisation. As a result of machine learning analysis of various performance measurements obtained from different experiments done in both single and multi-tenant cloud settings, they propose a new performance-based pricing model realised as a service (PPMaaS), targeting both the cloud service providers and the consumers.

Cloud computing plunges us into the area of computer systems and internet technologies, or, more specifically, the gamut of 'e-technologies'. Discovering and understanding users' behaviour attract attention in the research community – but, can human behaviour be modelled, indeed? Different approaches have been proposed for learning and modelling how users search/browse, as well as for predicting future users' behavioural patterns. Driven by this challenge, Vesna Gega and Pece J. Mitrevski focus on the application of stochastic Petri nets to capture search behavioural patterns in the context of query reformulation.

Control systems are particularly thought-provoking in the application of formal methods. Four papers comprise this block, and deal with metaheuristic algorithms, automated guided vehicles, bond graphs, and neuro-genetic algorithms. Stojanche Panov and Saso Koceski present a new metaheuristic method applied to the global path planning for mobile robots in dynamic environments, which combines the search space separation capabilities of the quad-tree method and optimisation capabilities of the harmony search method – results have shown that this approach is effective and gives accelerated convergence. Mitko Kostov, Violeta Kostova and Ramona Markoska deal with the issues and prospects in the area of automated guided vehicles navigation systems. Two types of guidance are analysed and simulated by using Lego Mindstorm NXT package – fixed-path guidance and vision-based guidance, and on the basis of theoretical studies and experience, robot can be programmed in the RobotC programming language in order to demonstrate the functionality of real AGV vehicles. Biljana Samardzic and Bojana M. Zlatkovic present a system consisting of several cascade connected electrical circuits. In consideration to the systems structure and the fact that the tunnel diodes have nonlinear characteristics, one of the properties of this system is the possibility of chaos appearance. The use of Bondsim tools simplifies the modelling and simulation of cascade connected electrical circuits, while the Bondsim library enables direct drawing of MATLAB/Simulink block diagrams from the bond graphs. Hybrid neuro-genetic networks are a subclass of neural networks combining random-search methods with adaptive optimisation with direct analogy of natural selection and genetics in biological systems. Tanya Titova, Veselin G. Nachev and Chavdar Damyanov try to improve the efficiency of automated classifiers in systems for automated quality determination and sorting via hybrid structures.

In a glimpse of an eye, artificial neural networks transfer us in the field of radio communications, microwaves and antennas. An artificial neural network (ANN)-based model for two-dimensional direction of arrival estimation of two coherent sources is the main concern in the paper written by Marija Agatonović, Zoran Stanković, Nebojša Dončov, Bratislav Milovanović and Ivan Milovanović. Datasets for training and testing of the neural model are formed assuming narrowband signal model and rectangular antenna array at the receiver. The ANN model is available to separate two closely spaced coherent sources, and comparison results are presented to show advantages of the neural model both in terms of accuracy and speed of calculation. The second article in this block presents the results of a study of Lidia T. Jordanova, Lyubomir B. Laskov and Dobri Dobrev on the noise immunity of satellite DVB channels. Dependencies which determine the error probability at the decoder output are presented taking into consideration the parameters of the used Reed-Solomon (RS), convolutional, Bose-Chaudhuri-Hocquenghem (BCH) and low density parity check (LDPC) codes and the error probability at the decoder input. BER characteristics of

satellite DVB channels are presented upon using concatenated RS-convolutional and BCH-LDPC codes with optimised parameters and are compared to the standard ones for such systems.

The special issue concludes with a paper on digital image processing, as a subcategory or field of digital signal processing. Antoaneta Popova, Johan Garcia, Nikolay Neshov, Ivo Draganov and Darko Brodić propose a method and associated algorithms for URL and text extraction from images and video frames based on combined processing in the compressed and spatial domains. It includes an improved approach for text detection and extraction in the discrete cosine transform (DCT) domain, adaptive local binarisation with background compensation in the spatial domain, and text recognition and verification performed by matching to an URL dictionary. Automatic and fast detection of overlaid URLs and text in images and video with adult content can be an important aid for children protection in the internet.

We would like to thank all the authors of the papers published in this special issue. We would also like to thank the ICEST 2013 session chairs and members of the ICEST Conference Program Committee who had a difficult task in making an appropriate selection of ICEST papers. Finally, we believe that the papers published in this issue will attract the attention of a wide reading audience of *IJRIS* journal and motivate researchers, especially young ones, to investigate new ideas and present their results in future *IJRIS* issues.