Editorial

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Biographical notes: Sundarapandian Vaidyanathan is Professor and Dean at the Research and Development Centre, Vel Tech University, Chennai, India. He earned his DSc in Electrical and Systems Engineering from Washington University, St. Louis, USA in 1996. His current research focuses on linear and nonlinear control systems, chaotic and hyperchaotic systems, chaos control and synchronisation, FPGA, backstepping control, sliding mode control, intelligent control, mathematical models of biology, computational science and robotics. He has published three text-books on mathematics and six research books on computational intelligence, chaos and control systems. He has published over 330 Scopus-indexed research publications. He has delivered plenary lectures on control systems and chaos theory in many international conferences around the world. He has also conducted many workshops on computational science using Matlab and Scilab.

The second International Conference on Automation, Control, Engineering and Computer Science (ACECS-2015) was conducted during 22–24 March 2015 at Sousse, Tunisia. The conference provided an excellent forum for professionals, academics, and researchers to share knowledge and results on automation, control, engineering, computer science and information technology. Broad areas of ACECS-2015 were classified as computer science and IT, signal processing and communication, robotics, control and instrumentation, engineering and automation, and innovation and engineering management.

Computer science is a scientific and systematic study of computation and its applications. Theoretical computer science involves areas such as computation, information and coding theory, algorithms and data structures, programming language theory, formal methods, etc. Applied computer science involves areas such as artificial intelligence, computer architecture, computer graphics, visualisation, security, cryptography, computational science, software engineering, computer networks, etc. Information technology (IT) is the application of computers and telecommunication equipment to store, retrieve, transmit and manipulate data for enterprises. IT consists of essentially three categories, viz. techniques for processing information, the application of statistical and mathematical methods to decision making, and the simulation study through computer programs.

In this special issue of the *International Journal of Computer Applications in Technology* (*IJCAT*), we are delighted to select nine research articles reporting on some important applications of computer science and information technology. These papers were presented in the ACECS-2015 and have been expanded in line with the reviewer recommendation and audience questions.

It is hoped that this special issue will provide a useful reference for informing recently developed applications of computer science and IT. The contents of the selected nine articles are described briefly as follows.

The paper titled 'BDI-agent-based quantum-behaved PSO for shipboard power system reconfiguration', by Wei Zhang, Weifeng Shi and Jinbao Zhuo, presents a BDI-agent (Belief-Desire-Intention agent) based quantum-behaved particle swarm optimisation (QPSO) reconfiguration method for shipboard zonal power systems. Shipboard zonal power systems are found on navy ships, and are desired to be highly reconfigurable. Since shipboard power system reconfiguration may change its topology, and load priority should be taken into consideration, this makes shipboard reconfiguration into a nonlinear distributed optimisation problem. Specially, switches in the shipboard zonal power system are modelled as intelligent BDI agents. This paper uses swarm intelligence to realise BDI-agent reasoning and optimise its reconfiguration objective. To verify the effectiveness of the proposed approach, comparative simulations are conducted on the method without reconfiguration and reconfiguration method based on PSO/QPSO optimisation. Simulation results are shown to illustrate the advantages of the proposed BDI-agent based QPSO optimisation reconfiguration method.

The paper titled 'A constructive heuristic for the two-dimensional bin packing based on value correction', by Yi Yao, Chaoan Lai and Yaodong Cui, proposes a heuristic approach for two-dimensional bin packing problems with guillotine-cut constraint to minimise bin usage by maximising space efficiency given fixed dimensions. The packing sequence is determined by item value with this algorithm, and the optimal solution is realised through repeated iterations. Simulation results suggest that the

proposed approach rivals existing packing methods with potential for use in the two patterns of both RG and OG.

The paper titled 'State and fault estimation based on interval type-2 fuzzy inference system optimised by genetic algorithms', by Imen Maalej, Donia Ben Halima Abid and Chokri Rekik, proposes an optimisation method for state and fault estimation in nonlinear systems that are described by an interval type-2 fuzzy model. The method concerns the development of an optimised interval type-2 fuzzy Kalman observer (IT2 FKO). A local fuzzy observer is associated with each fuzzy rule. As the main advantage is to obtain an unbiased estimation, the membership functions (MFs) parameters of IT2 fuzzy logic system are adjusted using genetic algorithms. These MFs are interval type-2 fuzzy sets that represent an extension version of typical type-1 fuzzy sets and provide additional degrees of freedom to directly handle uncertainties and external disturbances. Simulation results are provided to describe the effectiveness of the proposed method with an application to a three tank system for estimating their states under faults.

The paper titled 'Modelling and identification of an irrigation station using hybrid possibilistic c-means and fuzzy particle swarm optimisation', by Jaouher Chrouta, Abderrahmen Zaafouri and Mohamed Jemli, proposes a hybrid fuzzy clustering method based on PCM (Possibilistic C-Means) and Fuzzy Particle Swarm Optimisation (FPSO) that makes use of the merits of both algorithms. Experimental results demonstrate that the hybrid method (PCM-FPSO) is able to generate efficient and robust TS fuzzy models with better generalisation ability.

The paper titled 'Disturbance influence on neuronal system modelling', by Ines Mahmoud, Ayachi Errachdi and Mohamed Benrejeb, focuses on the neural modelling of a system in the presence of disturbances. In this paper, an offline and online identification of the inputs of a disturbed mobile robot is proposed using artificial neural networks. When meeting strong disturbances, the deviations between the predicted signal-based model and the real signal of the system may become large because usually the disturbances are not measurable and not included in the predictive model. As a disturbance, this paper uses a random signal added to the output signal. The effectiveness of the proposed algorithm applied to modelling the behaviour of a CHAR robot is verified by simulation experiments with two strategies, online and offline modelling of robot CHAR inputs. Simulation results demonstrate the effectiveness of the proposed method.

The paper titled 'Robust fault detection and isolation in bond graph modelled processes with Bayesian networks', by Walid Bouallegue, Salma Bouslama Bouabdallah and Moncef Tagina, proposes a new method for fault detection and isolation (FDI) of nonlinear uncertain parameters systems modelled by bond graphs (BG) with Bayesian networks (BN). From the BG model of a process, residuals, which are fault detectors, are determined directly from the Diagnostic Bond Graph (DBG). In ideal conditions, those residuals are equal to zero, but in practice, owing to uncertainties, perturbations and measurement noises, residuals are different from zero. Classical approaches used thresholds to deduce whether the process is in normal operating mode or faulty mode. In the proposed approach, a statistical decision procedure is generated to detect the operating mode. For isolation, a Bayesian network is generated by covering the causal paths of the DBG and the method proposed by Weber et al. in 2006 is used. A simulation example on a three tanks system is provided to show the efficiency of the proposed FDI procedure.

The paper titled 'An enumerative biclustering algorithm based on greatest common divisor: application to DNA microarray data', by Haifa Ben Saber and Mourad Elloumi, proposes a new algorithm called BestBinBicluster for biclustering of binary microarray data. The proposed algorithm extracts a group of biclusters from the binary matrix Mb. This algorithm adopts the strategy of one bicluster at a time. It is a novel alternative to extract biclusters from binary datasets. The proposed algorithm is based on the use of polynomial function to search for the Greatest Common Divisor (GCD) and the use of Galois lattice. This paper proposes to generate the Enumerative BinBicluster lattice. The performance of the proposed algorithm is evaluated using both synthetic and real DNA microarray data. The biological significance using a gene annotation web tool is also tested to show that the proposed algorithm is able to produce biologically relevant biclusters.

The paper titled 'Identification and development of a real-time motion control for a mobile robot's DC gear motor', by Noura Ayadi, Manel Turki, Rania Ghribi and Nabil Derbel, investigates a real time motion control of a wheeled mobile robot. The paper proposes an effective proportional-integral-derivative controller for the robot's speed. In the process, owing to the shortage in the chosen gearmotor characteristics, this paper proposes an effective model of the robot's gearmotor. Most of identification and computation techniques presented in this research use intelligent tools in order to obtain the best desired performances of the closed loop system. Simulation experiments are conducted to test the speed response of the gearmotor using a digital signal processor of Texas Instruments integrated in a digital development tool.

The paper titled 'Simulation model of pedestrians swarm in evacuation situations', by Olfa Beltaief, Sameh El Hadouaj and Khaled Ghedira, proposes a pedestrian crowd simulation model E-PHuNAC (Evacuation-Personalities' Human Nature of Autonomous Crowds) that processes emergency situations and describes its effectiveness. The model takes into account three main perspectives for understanding the behaviour of crowds in an evacuation, *viz.* normative affiliation, social identity and panic. The proposed model aims to demonstrate the effectiveness of the E-PHuNAC model and also prove that the swarm behaviour of pedestrians' agents in this model allows the emergence of these global patterns. The simulation experiments conducted in this work are shown to be consistent with reality and can reproduce evacuation phenomena.

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