Editorial

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The Second International Conference on Automation, Control, Engineering and Computer Science (ACECS-2015) was conducted during March 22–24, 2015 at Sousse, Tunisia. The conference provided an excellent forum for professionals, academics, and researchers to share knowledge and results. The 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.

Automation, systems modelling and control are active research areas in the field of control systems engineering. Automation is achieved by various means, including mechanical, hydraulic, pneumatic, electrical, and electronic devices and computer science. Systems modelling are achieved by mathematical modelling of systems in science, engineering, business and other fields. Control is achieved by applying various control techniques available in the literature, such as active control, adaptive control, intelligent control, sliding mode control, etc.

In this special issue of the *International Journal of Modelling, Identification and Control* (*IJMIC*), we are delighted to select eight research articles reporting on recent advances in automation, systems modelling and control. These papers presented in the ACECS-2015 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 technologies in automation, systems modelling and control. The contents of the selected eight articles are described briefly as follows.

The paper titled 'Anti-synchronisation of identical chaotic systems via novel sliding control and its application to a novel chaotic system', by Sundarapandian Vaidyanathan and Sivaperumal Sampath, derives a general result for the anti-synchronisation of identical chaotic systems via sliding mode control method. The general result announced in this paper is established via Lyapunov stability theory. This paper also announces a novel 3D chaotic system with four quadratic nonlinearities and discusses the qualitative properties of the chaotic system, such as symmetry, invariance, stability type of the equilibrium points, Lyapunov exponents, Kaplan-Yorke dimension, etc. As an application of the general result for the anti-synchronisation of identical chaotic systems, a sliding mode controller is derived for achieving anti-synchronisation of the identical novel chaotic systems for all initial conditions. Numerical simulations are shown to illustrate the phase portraits of the novel 3D chaotic system and the sliding mode controller design for the anti-synchronisation of novel 3D chaotic systems.

The paper titled 'Trirotor mechatronic design and reduction of dynamic model inputs by aerodynamic forces identification', by Alaa Chabir, Yassine Bouteraa, and Rahma Boucetta, proposes a mechatronic design and a remote measurement system of a trirotor unmanned aerial vehicle (UAV). Moreover, with particular emphasis on the experimental aspect, this paper also presents a dynamic model with reduced inputs made by experimental aerodynamic forces/torques identification. It is known that the trirotor presents a real control challenge compared with the quadrotor system. Indeed, in contrast with the quadrotor, the trirotor presents a non-symmetric structure and it has an odd number of motors, which causes a yaw moment issue. The mechanical design and the actuator characteristics of the trirotor system are presented in this paper. The effectiveness of the proposed trirotor system is verified by simulations and experiments.

The paper titled 'Observer design and active fault tolerant control for Takagi-Sugeno systems affected by sensors faults', by Wafa Jamel, Atef Khedher, and Kamel Ben Othman, investigates the problem of active fault-tolerant control strategy for nonlinear systems described by Takagi-Sugeno models. The proposed approach is based on the estimation of the faults affecting the system. In order to consider sensors faults as unknown inputs, a mathematical transformation is used. To estimate sensor faults, a proportional integral observer with unknown inputs is used. The stability of the proposed model is studied by Lyapunov stability theory and LMI constraints are provided to design the gain matrices. To validate the proposed method, it is applied to a hydraulic process composed of three columns. Simulation results demonstrate that the proposed fault-tolerant control law compensates the sensor fault considered as unknown inputs and allows normal operation of the system even if a fault occurs.

The paper titled 'Identification of GMS friction model using a new switching function: experimental investigation', by Said Grami, and Yousef Gharbia, proposes a new switching function for the GMS friction model. The switching function guarantees the commutation between the two phases of the friction model. The proposed switching

function is validated experimentally and it is used in the identification of the unknown parameters of the friction model, as well as the friction force. Based on the estimated parameters and the proposed switching function, the estimated friction force is calculated. As the results of the friction identification exhibit a very small deviation between the experimental and the estimated friction force, this paper suggests that the proposed switching function can be used in the experimental identification of friction.

The paper titled 'Modelling and predictive control of an inverted pendulum system by MLD approach: multivariable case', by Essia Saidi, Yosra Hammi, and Ali Douik, describes a methodology of hybrid modelling of an inverted pendulum system in order to perform an efficient control low that maintains the pendulum in the unstable equilibrium position. The modelling methodology is based on mixed logical dynamical (MLD) approach as it appears as a suitable way for modelling hybrid systems and because of its ability to make some models including logical rules solvable by the mathematical programming. On the other hand, the used control strategy is based on model predictive control (MPC) so that the angular position of the pendulum could be optimally controlled, while the different velocities and the cart position respect the given constraints. Simulation results are presented using the HYSDEL compiler to illustrate the efficiency of the proposed model.

The paper titled 'Fuzzy monitoring of stator and rotor winding faults for DFIG used in wind energy conversion system', by Merabet Hichem and Bahi Tahar, proposes a new technique for monitoring and detection of inter-turns short-circuit (ITSC) and open phase circuit in the stator or rotor windings of wind turbine based on doubly-fed induction generator. This paper also deals with the possibility of monitoring and detection of the inter-turns short-circuit in stator or rotor faults and the opening phase fault in the doubly-fed induction generator using fuzzy logic by supervising the amplitudes of the stator and rotor currents phases for calculating the root mean square amplitude values. Simulation results in MATLAB and Simulink describe the effectiveness of the proposed model.

The paper titled 'The dual three-phase open-end stator windings permanent magnet synchronous machine fed by four voltage source inverters', by Abdelmonoem Nayli, Sami Guizani, and Faouzi Ben Ammar, describes a mathematical model in the Park reference frame of the dual open-end stator winding salient-pole permanent magnet synchronous machine. The proposed machine is supplied by its four voltage source inverters based on the PWM technique. Then, the feeding of this machine by four two-level cascaded inverters is presented. A multilevel PWM strategy is carried out to control the cascaded inverters. The simulation analyses using the THD voltage, the THD stator current and the torque undulation are presented to describe the effectiveness of the proposed machine.

The paper titled 'Nonlinear system monitoring using multiscaled principal components analysis based on neural network', by Hanen Chaouch Jebril, Khaled Ouni and Lotfi Nabli, proposes a new method based on multiscaled principal component analysis for nonlinear systems analysis. The proposed approach introduces a five-layer neural network. The proposed neural PCA is applied using the learning algorithm based on the joint algorithm. The proposed approach is applicable on multivariate industrial and biologic processes. Simulations results are shown to illustrate the effectiveness of the proposed method.

The guest editor would like to thank all the authors for submitting their manuscripts in this special issue, and to acknowledge the reviewers for their contributions in reviewing the papers and providing constructive comments to the authors. Finally, the guest editor would like to specially thank Professor Quan Min Zhu (the Editor-in-Chief of *IJMIC*) for his great help and support in organising and coordinating the publication of this special issue.