Editorial

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Biographical notes: Jinchuan Zheng is a Senior Lecturer in the School of Software and Electrical Engineering, Faculty of Science, Engineering and Technology, Swinburne University of Technology, Melbourne, Australia. He received his BEng and MEng from the Shanghai Jiao Tong University, China in 1999 and 2002, respectively, and PhD from the Nanyang Technological University, Singapore in 2006. From 2005 to 2011, he was a Research Academic in the ARC Centre for Complex Dynamic Systems and Control (CDSC), The University of Newcastle, Australia. From 2011 to 2012, he was a Staff Engineer in Western Digital Singapore HDD R&D Center. Since January 2012, he has been with Swinburne University of Technology as an academic staff. His research interests are nonlinear control, high-precision motion control with applications to computer disk drives, dual-stage actuation mechatronics, and electric vehicles. He has published 70 papers in refereed international journals and conference proceedings.

Wenjie Ye received his BEng with Second Class Honours in Computer Engineering from the Nanyang Technological University, Singapore in 2007. He is currently working toward his PhD in the Faculty of Science, Engineering and Technology, Swinburne University of Technology, Melbourne, Australia. His research interests are sliding mode control, adaptive control, robotics, neural networks, nonlinear systems, fuzzy system and vehicle dynamics and control.

The Sixth International Conference on Modelling, Identification and Control (ICMIC 2014) was organised and held by Swinburne University of Technology (SUT), in Melbourne, Australia on 3 to 5 December, 2014. The conference provided opportunity for professionals, academics, and researchers to present latest developments in modelling, identification and control.

To meet the requirements of ever-increasing product quality and productivity, innovative and effective control technologies are urgently needed. A key step in achieving those goals is to develop advanced control technologies and applications (ACTA). In this special issue of the *International Journal of Modelling, Identification and Control* (*IJMIC*) on ACTA, we are delighted to select ten research articles reporting on recent advances in control technologies and applications. These papers presented in the conference have been expanded in line with the reviewer recommendation and audience questions. They reflect the efforts to further understand the physical systems by using mathematical modelling methods; develop optimal control algorithms to enable the systems to behave in the desired manner; and implement the controllers in the physical systems.

We believe that this special issue will provide a useful reference for informing recently developed control technologies and applications. The contents of the selected ten articles are briefly described as follows.

The paper titled 'Consensus of linear discrete-time multi-agent systems based on full-dimensional state observer' by Yong Xu, Jinfeng Gao, Ting Shi, Minming Gu and Meizhen Lei proposes a new consensus protocol for linear discrete-time multi-agent systems (MASs) with virtual communication network topology. It is shown that under the new consensus protocol, each agent gets not only its own state through the full-dimensional observer but also the states of its neighbours and instantaneous neighbours to reach consensus. A numerical example is provided to illustrate the effectiveness of the proposed method and extended to directed topology case.

The paper titled 'Design and evaluation of hybrid temperature control for cyber-physical home systems' by Zhuo Cheng, Yasuo Tan and Yuto Lim studies a hybrid temperature control (HTC) system by using the idea of cyber-physical systems (CPS). Through an energy-efficient temperature control (EETC) algorithm, the HTC system enables to maintain the room temperature in the desired interval. Moreover, a fitting function method is proposed to improve the sensing accuracy without increasing monetary cost of the system implementation.

The paper titled 'Robust control design for ball screw system focusing on the friction model' by Takayuki Yamamoto, Gan Chen and Isao Takami proposes a method to solve the friction problems in positioning control systems using ball screws. It is also shown that the viscous friction coefficient varies by some experiments.

Then, a controller is designed to guarantee the robust stability for uncertain parameters, which are the mass of the load and the viscous friction coefficient. The effectiveness of the proposed method is verified by simulations and experiments.

The paper titled 'Path tracking control of non-holonomic wheeled mobile robot with skidding and slipping' by Yasmine Koubaà, Mohamed Boukattaya and Tarak Damak presents an adaptive sliding mode control approach for the trajectory tracking problem of wheeled mobile robot with unknown skidding and slipping. The proposed controller compensates for unknown skidding and slipping and can remove the chattering phenomenon in the sliding mode control. Simulations results are also given to illustrate the effectiveness of the proposed controller.

The paper titled 'Dynamics modelling and predictive control for 6-DOF rotorcraft aerial manipulator system' by Dalei Song and Juntong Qi studies an overall dynamic model for rotorcraft unmanned aerial vehicles (RUAVs) based on dynamic disturbance analysis between the RUAV and the joint 6-DOF robotic arm. Based on the proposed model, a predictive controller is then proposed to minimise the errors of positions and attitudes of the end-effector. Simulation results are finally presented to show the effectiveness of the proposed methods.

The paper titled 'Sliding mode adaptive control for DC motors using function approximation form' by Long Chen, Zhihui Zhang, Hai Wang, Ming Huang, and Xingkun Xu presents a novel sliding mode adaptive controller with function approximation form for the DC motor control system. The proposed controller combines sliding mode control and function approximation techniques for adaptively estimating the unknown bounded uncertainty. Both the simulation and experiment results validate the excellent performance of the sliding mode adaptive controller with Laguerre basis function in terms of robustness, response speed, and anti-jamming.

The paper titled 'Sliding mode learning compensator-based robust control of automotive steer-by-wire systems' by Huifang Kong, Xiaoxue Zhang, Hai Wang, Wei Bao and Kaiwen Jiang proposes a new robust control scheme for automotive steer-by-wire systems, which uses the recently developed sliding mode learning control technique. The numerical simulation results of two driving cases are presented to show good steering performance and strong robustness of the closed-loop system with the proposed control regarding road uncertainties.

The paper titled 'Dual adaptive temperature control of magnesium reduction furnace' by Suping Cao, Xizhen Hu, Wenxia Xu and Jian Huang studies the dual adaptive control problem of magnesium reduction furnace. By using input/output experiment data, the optimal model structure and parameters are identified. The dual generalised minimised variance controller is then developed to cope with the non-minimum phase plants with time delay. The control performance is verified by both simulations and experiments.

The paper titled 'The research of digital-PID and sliding mode control strategy for DC/DC converter' by Qi Zhou, Chu Zhou, Bing Yang and Shaocheng Qu studies a DSP-based digital PID control technology and a sliding mode variable structure control theory for high frequency DC/DC converter based on the fixed frequency PWM control strategy. Experiments are also conducted to show that DC/DC converters with the digital PID controller have fast dynamic response and high accuracy in the presence of the input voltage fluctuation and load variation.

The paper titled 'A finite horizon optimisation-based energy management method for a dual-mode power-split hybrid electric vehicle' by Weida Wang, Hui Liu, Changle Xiang, Shipeng Jia and Yulong Zhao investigates the power-split characteristics for a dual mode power-split hybrid electric vehicle (PSHEV) and its transmission efficiency. A multi-objective optimisation method is used for the energy management of the HEV. The simulation results show that the proposed method can enhance the optimisation effect of the engine operating point and improve the vehicle fuel economy compared with conventional ruled-based energy management strategy.

The guest editors would like to thank all the authors for submitting their manuscripts in this special issue. We would want to acknowledge the reviewers for their contributions in reviewing the papers and providing constructive comments to the authors. The guest editors would also like to thank Professor Quanmin Zhu (the editor of *IJMIC*) for his great support in coordinating the publication of this special issue. Finally, the guest editors would like to express their sincere appreciation to Professor Zhihong Man for his guidance in organising this special issue.