Editorial

Changan Jiang*

Department of Intelligent Mechanical Systems Engineering,
Kagawa University,
2217-20, Hayashicho,
Takamatsu, 761-0396, Japan
E-mail: c.a.jiang@gmail.com
*Corresponding author

Lihua Jiang

Key Laboratory of Integrated Automation of Process Industry (Ministry of Education),
Northeastern University,
No. 11, Lane 3, WenHua Road, HePing District,
Shenyang, Liaoning Province, 110819, China
E-mail: jianglh@mail.neu.edu.cn

Shuhui Bi

Department of Electrical and Electronic Engineering,
Tokyo University of Agriculture and Technology,
2-24-16 Nakacho, Koganei, Tokyo, 184-8588, Japan
E-mail: bishuhui@gmail.com

Biographical notes: Changan Jiang received his PhD from Okayama University, Japan, in 2009. He is currently a Japanese Science and Technology Agency (JST) Researcher with the Department of Intelligent Mechanical Systems Engineering, Kagawa University, Japan. His research interests include non-linear robust control with input non-linearity, vibration control, modelling of smart actuator and haptics device design and applications.

Lihua Jiang received her PhD from Okayama University, Japan, in 2009. She is currently a Lecturer with the Key Laboratory of Integrated Automation of Process Industry (Ministry of Education), Northeastern University, China. She is also the Vice-Secretary-General of Technical Committee on Process Control, Chinese Association of Automation. Her research interests include robotics, pattern recognition and system identification, instrumentation and measuring.

Shuhui Bi received her PhD from Okayama University, Japan, in 2010. She is currently a Visiting Researcher with Department of Electrical and Electronic Engineering, Tokyo University of Agriculture and Technology, Japan. Her research interests include operator based non-linear system robust control and fault detection, MIMO non-linear systems and time-delay systems.

This is the special issue (I) composed of selected papers from the *2010 International Conference on Modelling, Identification and Control (ICMIC'10)*. It was held at the Okayama University, Japan, July 17–19, 2010. From this conference, seven technical contributions of high quality on system modelling and advanced control are selected into this special issue. The contents of these studies are briefly described as follows.

In 'Extensions to experiment design and identification algorithms for large-scale and stochastic processes', Subramanian, Kumar, Patwardhan and Prasad explore extensions of optimal experiment design algorithms for large-scale deterministic catalytic kinetic systems, and of system identification and control techniques for stochastic thin film deposition systems. In the case of optimal experiment design, the authors suggest the use of principal component analysis and clustering to identify similarities in parameters and their sensitivities. In the case of thin film deposition, the authors present modifications to proper orthogonal decomposition methods for non-ergodic systems, and methods for reparameterisation of autoregressive integrated moving average models for identification of compact closed form models and model predictive control.

The paper by Yeh and Sun entitled 'Development of static friction compensation for feed drive motions of machine tools' presents identification and spectral analysis methods for the static friction of a feed drive servomechanism in CNC machine tools. In this paper, the breakaway experiment is performed for obtaining the data values used by the identification processes of static friction.

The spectral analysis using a fast Fourier transformation algorithm is applied to analyse the frequency characteristics of the identified static friction. Several experiments and motion tests are carried out on a three-axis CNC milling machine so as to illustrate the feasibility of the developed identification and analysis methods.

In 'HVAC control strategies for thermal comfort and indoor air quality', Li, Wall and Platt propose two HVAC control strategies to maintain adequate thermal comfort and indoor air quality with least energy consumption. One is based on virtual comfort sensing, while the other is a dynamic indoor air quality control algorithm based on indoor CO_2 concentration versus ventilation rate model with soft real-time indoor occupant prediction. In particular, the paper focuses on the development of adaptive indoor air quality model based on soft real-time indoor occupant prediction for implementing control strategies. This dynamic indoor air quality model is useful for control strategies that require knowledge of the dynamic characteristics of HVAC systems.

In 'A novel power swings blocking scheme verified with a new power swing simulation model' by Xin, Lin, Li and Weng, a new model of power system swings applicable for testing the algorithm digital distance protection is proposed. With this model, the key parameters of power swings can be determined and set to provide enough typical data for the evaluations of the behaviours of all types of relays. Then, a novel fast unblocking scheme for distance protection to identify symmetrical fault occurring during power swings has been proposed. Finally, simulation results show that this scheme is of high reliability and fast time response.

The paper by Lu and Breikin entitled 'Fault detection for stator inter-turn short circuit in doubly fed induction generators using adaptive observers' presents an observer based fault detection approach for inter-turn stator short circuit fault in doubly fed induction generators (DFIG). A state-space model is developed, and two different adaptive observers: asymptotic adaptive observer and exponential adaptive observer are constructed, which are both able to estimate the fraction of short circuited winding online. The case when the rotor speed is immeasurable is also considered. The proposed exponential adaptive observer is reformulated into a new observer, which is capable of estimating the fault level and the rotor speed simultaneously.

In the paper by Ben-Zvi and Aschbacher entitled 'Asymptotic parameter sensitivity for polynomial dynamical systems', a computational scheme for conducting a single and joint parameter sensitivity analysis for systems with multiple steady states is presented. The proposed approach is computationally efficient and relies on algebraic geometric tools to obtain a simplified polynomial representation of the system at steady state. The proposed approach is applied to a model of the human hypothalamic-pituitary-adrenal axis. It is shown that assessing the asymptotic sensitivity of model parameter may be relevant to the development of mechanistic models of chronic diseases.

'Turbofan aero-engine full flight envelope control using H_∞ loop-shaping control technique', by Wang, Wang and Deng. In this paper, a full flight envelope turbofan aero-engine control is developed by H_∞ loop-shaping control concept. In order to meet the maximum robustness of the controller, multi-objective genetic algorithm is proposed creatively to obtain the global optimum loop-shaping weights. Considering the finite robustness of H_∞ loop-shaping controller while implementing the task of flight envelope turbofan engine control, the full flight envelope is divided to eight sub-regions and gain-scheduled control system where the sub-region controller could be switched with the change of the engine Mach number and altitude is constructed as the original work. The performance and applicability of the proposed full envelope control system is tested on the hardware in-the-loop simulation platform.

As guest editors of this special issue, we would like to thank all the authors for their contributions. We wish that the readers can benefit from the above seven papers. We would like to thank the *International Journal of Advanced Mechatronic Systems* for giving us the opportunity to serve as the guest editors for the special issue. Finally, we would also like to thank the reviewers for their excellent job on evaluating these papers.