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## Editorial

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**Biographical notes:** Lihua Jiang received her PhD from Okayama University, Japan, in 2009. She is currently a Lecturer with State Key Laboratory of Synthetical Automation for Process Industries, Northeastern University, China. She is also a 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.

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

The paper by Susanto, Matsunaga, Ishitobi and Kunimatsu entitled 'A full order observer-based guaranteed cost controller for uncertain linear systems' introduces a design scheme of a full order observer-based guaranteed cost controller for uncertain linear systems, in which all state variables cannot be known. The perturbations in system states and input are assumed to be described by structural uncertainties. An iterative linear matrix inequality (ILMI) approach is used to design the observer-based controller since the problems contain inverse relations. A numerical example is given to illustrate the proposed method.

In 'Modular reinforcement learning for control problems with multi sensors' by Nakama and Yamada, the modular reinforcement learning system which is composed of some control modules and a selection module, was developed to apply to the task where the second order correlation of two different types of sensors must be discriminated. To discriminate between the target and other objects, the 'AND' condition of the light sensor and camera information

must be distinguished. Since the learning efficiency was low, the iterative learning and the initial learning were proposed. As a result, the appropriate module selections and action selections were trained by the modular reinforcement learning.

'A neural network based ensemble forecasting method for financial market prediction' by Xu, Zuo, Zhang and He presents a neural network (NN) based ensemble forecasting method for financial market prediction. Each of predictors is firstly constructed by training on a set of samples produced by bootstrapping using NN. The constraint conditions are offered to select competitive predictors in order to improve the forecast performance. Several ensemble strategies are suggested to combine the results of single predictors. During the process, the network structures of NN are discussed, and the optimal network structure and appropriate parameters of the proposed model are determined by grid search method. The stock price data is used for evaluation. The results show that the proposed method outperforms traditional bagging forecasting method and single NN predictor.

'Robust design of suspension parameters for high speed railway vehicle based on uniform design and kriging interpolation' by Cheng and Lee discusses the integration of uniform design and kriging interpolation to the optimisation of suspension parameters of a high speed railway vehicle. The vehicle's non-linear coupled differential equations of motion with 20-DOF are created based on Kalker's linear

theory and the heuristic non-linear creep model. The critical hunting speed of the vehicle is the optimisation function and is evaluated by Lyapunov's indirect method. The effects of suspension parameters on critical hunting speeds are discussed with various wheel conicities. It shows that the proposed method can advance the robustness of critical hunting speed against the noise factor.

In 'Edge detection and feature extraction of gastrointestinal radiographs using adaptive differential filter and level set method' by Nagano and Matsuo, the computer image processing methods of radiographs of gastric cancer lesions are discussed for improving the detectability of the gastric lesions in the X-ray examinations. An adaptive differential filter is proposed for the edge detection. The level set method is adopted for the segmentation. The numerical examples are carried out by using the case radiograph of the gastric intestines medical picture database produced by National Kyushu Cancer Center. It shows that the number of iterations in the level set method can be reduced using the binary image obtained by the adaptive differential filter.

The paper by Fujii and Shimizu entitled 'A development of signal control system for congestion length along arterials' demonstrates the signal control system of the congestion length, which is described by a non-linear time-varying discrete dynamic system and synthesised by using the feedback control based on the volume balance at each signalised junction. Two signal control algorithms are presented to balance congestion lengths which cross each other on a road; one is at single signalised junction, the

others along arterials. The sum of congestion lengths along each approach is minimised by using parameter optimisation methods. The signal control system is developed systematically according to the procedure ranging from the road analysis to the simulation, it work effectively with its development procedure to control congestion lengths along an arterial in Hiroshima city, Japan.

In the paper 'Operator-based non-linear control system design for unstable plants with input saturation' by Umemoto and Deng, a new control system design for non-linear unstable plants with input saturation is proposed. Based on the robust right coprime factorisation, an operator-based switching controller is designed, which avoids the unstable region. Moreover, based on the proposed design scheme, the output tracking performance is also realised, and the effectiveness of the proposed method is verified by simulation.

### **Acknowledgements**

The guest editors would like to thank all the authors for their contributions. The guest editors wish that the readers can benefit from the above seven papers. The guest editors 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, the guest editors would also like to thank the reviewers for their excellent job on evaluating these papers.