Editorial

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This special issue contains selected papers from the 2010 International Conference on Modelling, Identification and Control (ICMIC'10), which was held at the Okayama University, Japan, 17–19 July 2010. From this conference, five technical contributions of high quality on advanced modelling, identification and control are selected into this special issue. Recently, many researchers have paid much attention on research of non-linear control systems. In order to improve the performance of control and to guarantee the stability of the system, the authors of the selected studies focused on different aspects, such as minimum error entropy filter for non-linear networked control system, operator based control method for MIMO non-linear system, modelling and sliding mode control for PM actuator, identifying inverse response process with time delay, and fusing multi-sensor data for mobile robot's path planning. The contents of these studies are briefly described as follows.

The paper by Zhang, Du, Wang and Wang entitled 'An entropy approach to filtering for networked control systems' is concerned with minimum error entropy filter design for non-linear networked control systems (NCSs) with multiple-packet transmission mechanism. Since the error of the filter in NCSs is generally non-Gaussian, the filter is designed under the information theoretic learning frame. The convergent condition of the proposed filter is established. A simulation example shows that the proposed approach is feasible and effective.

In 'Operator based robust control of MIMO aluminium plate thermal process' by Bi and Deng, operator based robust control for multi-input multi-output (MIMO) aluminium plate thermal process is considered. In details, a 3-input 3-output aluminium plate temperature control process is demonstrated and the model of the process is given. For considering the robust control of MIMO non-linear system, one class of operator-based MIMO system is described and the control system design is given. Based on the proposed design scheme, the system is robustly stable and the desired output tracking performance can be realised. Finally, the theoretical analysis is applied onto the 3-input 3-output aluminium plate temperature control process and the effectiveness of the theoretical analysis is demonstrated by the simulation and experimental results.

In 'Sliding mode control with fuzzy compensator of pneumatic muscle actuator', by Wu, Wang, Huang and Xing, the pneumatic muscle (PM) as actuator is investigated. The PM model is established by using a phenomenological model consisting of a contractile element, a spring element, and a damping element in parallel. Unlike the previous study, they fully consider the different characteristics of PM model in different pressure ranges, especially in low

pressure range. In order to test the effectiveness of their PM modelling, the sliding mode control (SMC) is applied. For the purpose of improving the tracking accuracy, self-adaptation and robustness of PM control, sliding mode control with fuzzy compensator (FCSMC) is developed to make PM system track a desired trajectory within a guaranteed accuracy even if there are modelling uncertainties, friction, disturbance, and so on. Based on the Lyapunov theory, the stability criterion for PM system under FCSMC control strategy is established. The experimental results demonstrate the validity of PM modelling as well as indicate the effectiveness of the proposed FCSMC method.

In the paper by Esakkiappan and Thyagarajan entitled 'Identification of inverse response process with time delay using relay feedback test', a systematic approach for identification IRPTD process using relay feedback test at the stable oscillation condition is proposed. The model structure is identified using the shape information and the model parameters are estimated by solving the analytical expressions using boundary conditions. A single run of relay feedback test is carried out to estimate all the process parameters without any prior information. Since the identification is done using the information obtained at the stable oscillating condition, the difficulty faced to capture the initial data from the relay test can be alleviated. A procedure to identify the IRPTD process in the presence of measurement noise is also presented. The proposed method uses hysteresis relay feedback test in the presence of measurement noise for estimating the parameters of IRPTD process. The results thus obtained can be used subsequently for autotuning.

The paper 'Mobile robot 3D map building and path planning based on multi-sensor data fusion', by Yan, Zhuang and Wang shows that 3D map building and path planning serve as two essential tasks for mobile robot to work within a complex outdoor environment. An elevation map built from 3D laser points is utilised to extract terrain feature while ground surface character is acquired from visual information by matching characteristics vectors. By projecting the units of the elevation map into the image, the fusion of terrain feature and ground surface character is achieved using statistical method. Then the units which fuse multi-sensor information are evaluated and given traversable weights to extract constraints for autonomous path planning in outdoor scene. After clustering the units into several regions, a hierarchical path planning strategy uses A* and Probabilistic Roadmap Method (PRM) to plan region paths and unit paths, respectively. The PRM is improved by choosing the units with the largest traversable weights in the regions to ensure a uniform distribution instead of random distribution. Experiment results show the validity and practicability of the proposed approaches.

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 five papers. We would like to thank the *International Journal of Computer Applications in Technology* 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.