Editorial

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This is the special issue composed of selected papers from the 2011 International Conference on Advanced Mechatronic Systems (ICAMechS 2011). It was held at the Zhengzhou, China, August 11–13, 2011. In this special issue, four technical contributions on advanced control schemes related to adaptive and learning controls, which are selected from ICAMechS 2011, are provided. The contents of these studies are briefly described as follows.

In the paper entitled 'Adaptive control of MI-MO systems with input saturations' by Jinxin Zhuo, Masahiro Oya and Qiang Wang, a stable adaptive controller for systems with input saturations, which can be seen in many actual systems, is presented. In the paper, for multi-input multi-output linear systems with input saturations, an adaptive control scheme was proposed under certain assumptions that that there exist all leading principal minors of the high frequency gain matrix of the controlled object, and that the signs of leading principal minors of the high frequency gain matrix are known and do not vary. In the proposed method, one can develop a stable adaptive controller so that the tracking error can converges to zero even if the controlled objects were unstable. It is also shown in numerical simulations that the control performance of the closed-loop system using the proposed adaptive controller can be easily improved by setting only one design parameter.

The paper entitled 'Design of a multiple linear models-based PID controller' by Shinichi Imai and Toru Yamamoto, presents a novel PID control method for non-linear systems. In this paper, some local linear models on typical equilibrium points are first designed for the considered non-linear system, and linear PID controllers corresponding to these models are designed by identifying the PID parameters individually for each local linear model and adding weight to it. In the proposed method, it is expected that the method enable more accurate parameter tuning for the non-linear system because the controller parameters are determined individually for each linear models, and since the methodology does not require learning, like NN, and is not necessary to build a database that DD requires, it will reduce the time for the system configuration. As a result, it will drastically reduce the load and the processing time, which would be beneficial for its memory capacity and the cost calculation. The effectiveness of the proposed method was confirmed through numerical simulations for a bilinear system.

In the paper by Ikuro Mizumoto, Taro Takagi, Sota Fukui and Kenshi Yamanaka, entitled 'Performance-driven adaptive output feedback control system with a PFC designed via FRIT approach', a design problem of a performance-driven adaptive output feedback control system with a parallel feedforward compensator (PFC) designed for making the augmented controlled system ASPR is dealt with. In the presented paper, in order to obtain a desired PFC which realises an almost strictly positive real (ASPR) augmented controlled system during operation, the PFC parameters are adjusting by the fictitious reference iterative tuning (FRIT) method using online input-output data according to appropriate performance index. Based on the proposed PFC tuning scheme, a performance-driven adaptive output feedback control which ensure a stable adaptive control system is designed for cases where the controlled system may change drastically during operation. The effectiveness of the proposed method is confirmed through a numerical simulation.

The paper entitled 'Exponential stability analysis for the switched stochastic Hopfield neural networks with time-varying delays' by Huimin Xiao and Chunhua Wang, investigates the robust exponential stability analysis for a class of switched stochastic Hopfield neural systems with parameter uncertainties and stochastic perturbations. In the paper, the switched Hopfield neural systems with time-varying delays and stochastic perturbations are considered and based on Lyapunov-Krasovskii functional and linear matrix inequality (LMI) tools, by means of multiple Lyapunov function techniques, a delay-dependent sufficient condition of LMI is given for the switched stochastic neural networks with time-varying delays under an appropriate switching law. Furthermore, the sufficient criteria for uncertain switched stochastic Hopfield neural systems will be given to guarantee the uncertain switched stochastic Hopfield neural systems to be mean-square exponentially stable for all admissible parametric uncertainties. Some numerical examples are provided to illustrate the effectiveness of the proposed theory.

As a guest editor of this special issue, I would like to thank all the authors for their contributions and wish that the readers can benefit from the above four papers. Finally, I would also like to appreciate the reviewers' excellent job on evaluating these papers.