Editorial

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Biographical notes: Tielong Shen received a PhD in Mechanical Engineering from Sophia University, Tokyo, Japan. From April 1992, he has been a Faculty Member of the Chair of Control Engineering in the Department of Mechanical Engineering, Sophia University, where he currently serves as an Associate Professor. Since 1996, he also served concurrently as a Professor in the Department of Automatic Control, Yanshan University, China. His research interests include robust control theory, non-linear and adaptive control, motion control, robotics, control of mechanical systems, power systems, electrical motor and vehicle control. In these areas, he has authored/co-authored over 80 journal papers and 6 textbooks in Japanese, English and Chinese, respectively. From 1997, he has been serving as a Chief Editor in Control Technique, Vice Chief Editor in Control, *Transaction of the Society of Instrument and Control Engineers*, and Guest Editor of *International Journal on Robust and Non-linear Control*, during 2002–2003. Currently, he is an Associate Editor for the *IEEE Control System Society* Conference Editorial Board and is serving as an Associate Editor of *Journal of Control Theory and Applications*, Guest Editor of *Asian Journal of Control* and Asia-Pacific Regional Editor of *International Journal of Modelling, Identification and Control*.

Yongji Wang received an undergraduate degree in Electrical Engineering from Shanghai Railway University, Shanghai, PR China, and an MS and a PhD in Automation from Huazhong University of Science and Technology, Wuhan, PR China, in 1982, 1984 and 1990, respectively. Since 1984, he has been with Huazhong University of Science and Technology, Wuhan, PR China, where he is currently a Professor of Control Engineering. His main research interest is in intelligent control and autonomous mobile robots, and he has also done research on neural network control, predictive control, adaptive control and so on.

1 Introduction

In recent years, modelling and control of dynamic systems with uncertainties is a major ongoing topic that targets the complexities caused by non-linearities, time-varying properties or unavoidable uncertain physics and so on. This worldwide trend has been driven by the need of wealth creation to bridge the gap between the richness in advanced control theory and the applications in practical engineering and other relevant fields. It is well-known, in the last two decades, that various theoretical methods have been proposed such as adaptive control, switching control, intelligent control, etc. However, there have not been many effective applications reported so far, since the complexities encountered in practice do not satisfy the mathematical assumptions embedded in the advanced theoretical results.

This trend in control community can also be found in the 24th Chinese Control Conference (CCC), which is the annual event organised by the Technical Committee on Control Theory (TCCT) of the Chinese Association of Automation (CAA). The conference was held in Guangzhou, 16–18 July 2005. About 400 technical papers were presented in the conference, and most papers focused on the keyword, control of uncertain systems. This Special Issue consists of seven contributions that were selected (in expanded version) from the CCC 2005.

- Wu Zongze proposed a new fast rate control algorithm, which provides an interesting alternative to control system design methodology for image processing problems.
- Two papers studied some typical analysis and synthesis issues in power systems. Guojun Ji discussed the elimination of harmonic resonance over-voltage using an anti-bifurcation approach. Non-linearity and bifurcation have been the essential characteristics encountered in power

systems. These contributions brought up the brightness in solving the problems via advanced control theory. Xiaohong Jiao and Yuanzhang Sun proposed a non-linear adaptive control approach to improve the transient stability of a synchronous generator with uncertainty in physical parameters.

- Control of the ball and plate system is an old problem in control community. Yantao Tian, Ming Bai and Jintao Su challenged this problem again using advanced non-linear control theory. A non-linear switching control approach was given and some interesting experimental results were obtained for the trajectory tracking control of the system.
- Another theoretical contribution is from Shuanghe Yu, Zi Ma and Jialu Du. They proposed a novel design approach by combining the sliding mode control and the fuzzy modelling technique in order to improve the conservativeness in tracking control of non-linear systems.
- Tengfei Liu and Cong Wang applied a similar advanced adaptive control technique to permanent magnet synchronous motors. Adaptive neural control was introduced in this contribution to cope with the uncertain resistance, friction, load torque and the complexity in non-linear coupling systems.
- Rui Zhang, Yu Yao, Songlin Chen and Kemao Ma addressed the H_∞ design problem under the regional stability constraints for high-speed sampling uncertain systems.

We hope the inclusion of these papers and the references therein will motivate readers from the community of control theory and applications to challenge some of these research needs and to bridge methodology development and applications. As reflected from some of the papers, the control issues for uncertain systems are still needed to be investigated to provide more feasible schemes from the viewpoint of the practice, and there is a compelling need to provide more effective experimental results for the approaches developed with some physical background.

Finally, the guest editors would like to thank all authors for the contributions to this Special Issue.