Editorial

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Biographical notes: Jie Zhang is a Senior Lecturer in the School of Chemical Engineering and Advanced Materials, Newcastle University, Newcastle upon Tyne, England. He received his BSc in Control Engineering from Hebei University of Technology, Tianjin, China in 1986 and PhD in Control Engineering from City University, London in 1991. His research interests include: neural networks, neuro-fuzzy systems, fault detection and diagnosis, intelligent control systems, genetic algorithms, optimal control of batch processes and multivariate statistical process control. He has published over 200 papers in international journals, books and conferences. He served as a reviewer for over 50 international journals. He is on the editorial boards of *Neurocomputing*, *Control Engineering of China*, *The Open Artificial Intelligence Journal*, and *The Open Fuels and Energy Science Journal*. He is a Senior Member of IEEE, a member of the IEEE Control Systems Society and IEEE Computational Intelligence Society.

Neural networks have been recognised as an important computational intelligence tool and have found applications in wide areas. There are several international journals and many international conferences devoted to this subject. The annual international symposiums on neural networks have emerged as one of the important research conferences on neural networks. The 6th International Symposiums on Neural Networks (ISNN2009) was held in Wuhan, China, during May 26–29, 2009. This special issue contains four extended papers selected from the papers presented at ISNN2009 on the topics of intelligent control systems. The extended papers have gone through a second round of peer review.

In the paper, ‘Neuro-hierarchical sliding mode control for a class of under-actuated systems’, D. Qian, X. Liu, J. Yi, R. Shi, and C. Li present a neuro-hierarchical sliding mode controller for a class of under-actuated systems with a stable equilibrium point through combining the concept of neural networks and the methodology of hierarchical sliding mode control. Theoretical results on the asymptotic stability of the entire sliding surfaces and the convergence of the network weights are presented. The validity and robustness of the proposed control strategy is demonstrated by simulation and physical experiment results.

In the paper, ‘Dynamic neural-fuzzified adaptive control of ship course with parametric modelling uncertainties’, Y. Wang, C. Guo, F. Sun, Z. Shen and D. Guo present a dynamic neural-fuzzified system (DNFS)-based adaptive control algorithm, aiming at the uncertainties arising from changes of the model parameters in ship course control. The DNFS identifies the inverse dynamics of the nonlinear ship model, which is then connected to a PD controller in parallel to construct an adaptive controller for course control. The weights of DNFS are adjusted by an adaptive law. Simulation results of the course tracking of a 5446 TEU container validated the effectiveness of the proposed algorithm.

In the paper, ‘Modelling of a traffic cell based on a recurrent-neural network’, M.A. Gonzalez-Olvera, Y. Tang, and L. Alvarez-Icaza discussed using a continuous-time recurrent neural network to model a vehicle density-flow relation in a section of a highway. Motivated from previous works in adaptive observers, the training algorithm uses only output measurements and the knowledge of the excitation input signal to generate the entire dynamics of the network. Training is based on the generation of estimates of an ideal network and jointly identifying its parameters. The stability and convergence of the training algorithm are established based on the Lyapunov stability theory. Model validation is carried out through numerical simulation with real data.

In the paper, ‘A novel decentralised adaptive NN tracking control for double inverted pendulums’, T. Li, W. Li, and R. Bu present the adaptive trajectory-tracking control of double inverted pendulums (DIPs) connected by a spring. They developed a systematic procedure for the synthesis of a novel decentralised robust adaptive neural control scheme by incorporating the dynamic surface control approach and the minimal learning parameters algorithm. In addition, the stability in the sense of semi-globally uniform ultimate boundedness of the closed-loop system is established via Lyapunov stability analysis, and the tracking error can be made arbitrarily small. Simulation results for the trajectory tracking of the DIPs demonstrate the effectiveness and good transient performance of the proposed control scheme.

The guest editor wishes to thank Professor Quan Min Zhu (Editor-in-Chief of *International Journal of Modelling, Identification and Control*) for providing the opportunity to edit this special issue on intelligent control systems. The guest editor also wishes to thank the reviewers for their critical evaluation of the selected papers.