



# A Special Issue of Intelligent Automation and Soft Computing

## DEVELOPMENTS IN INTELLIGENT ADAPTIVE AND ROBUST TECHNIQUES FOR AUTOMATION AND CONTROL SYSTEMS

GUEST EDITORIAL

BY

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### PREFACE

This special issue is compiled mainly from papers presented at *World Automation Congress 2002* ([www.wacong.com](http://www.wacong.com)) held at Orlando, Florida. It focuses on work under the theme “*Developments in Intelligent Adaptive and Robust Techniques for Automation and Control Systems*”. Intelligent adaptive and robust techniques are now important features to inculcate in automation and control systems as modern generation products become increasingly intricate and complex with ever shortening time-to-market constraints, thus requiring a sufficient level of intelligence and robustness in the systems and processes which produce them. A forum, in the form of this special issue, to consolidate recent results in this area should be useful to the vast number of readers and practitioners in control and automation.

Out of the papers presented at WAC 2002, eight papers were selectively accepted for publication in this issue. We would like to take this opportunity to congratulate and thank all the authors involved for their wonderful support and assistance to enable this special issue to be compiled in a timely manner. In what follows, the contributions of the authors in each of these papers will be briefly described.

Pourboghraat and his co-workers will present the design of a dynamic neural network which is used as a model for a class of nonlinear systems which, in turns, serves as a basis for an adaptive control design. Labibi, et al. specifically focus on large-scale systems which require decentralized controllers which can yield robust exponential stability. Tan, Xie and Lee present their work on intelligent servo friction compensation. A self-adapting dual relay construct is used to automatically identify a friction model which is then used in a friction compensator to yield smoother motion control. Du et al. consider the application of robust techniques to vibration control of structures involving cantilever beams. A  $H_\infty$  control design is formulated which uses a mixed eigenstructure assignment and  $H_\infty$  filter. Huang and Lim present their development of a predictive and iterative learning control which is suitable for complex nonlinear discrete systems which operate in a repetitive manner, so that past experience can be used in the improvement of future cycles. Anderson and Cheng describe an oscillator-based controller which is able to adjust its oscillator parameters based on a pattern of sensory feedback. The controller is tested on a two-wheeled mobile robot for exploration of unknown environments. Dai and Gu formulate a singular perturbation method in the control of multiple flexible-joint robots and apply the method to trajectory-tracking control of an industrial robot. Finally, Yamazaki and Gleiter attempt to apply adaptive intelligent control to

economical flow analysis, evaluation and control. This work represents the use of adaptive intelligent techniques in areas outside of engineering and may be refreshing and enlightening to readers.

We hope the issue will be interesting and relevant to many readers of the *Journal of Intelligent Automation and Soft Computing*. Finally, we would like to thank Professor Mo Jamshidi and Ms. Jila Salari for their assistance throughout the editing process. We would also like to thank the international reviewers for providing prompt and professional reviews of the manuscripts submitted, which enable this special issue to be generated and published according to schedule.

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