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Preface: Control with softcomputing

Softcomputing techniques such as neural networks, fuzzy logic and genetic algorithms have been actively exploited to develop intelligent control system. Especially, their compensatory properties have prompted many researchers to combine them to produce more powerful systems. Neural networks as brain metaphor provide fundamental structure, fuzzy logic gives a possibility to utilize top-down knowledge from designer, and genetic algorithms as evolution metaphor determine several system parameters with the process of bottom-up development. These techniques have been proposed to develop better systems that can match human ability, but more work is still required to be able to match human performance. This special issue of *Control & Cybernetics* includes extended versions of selected papers on "Control with Softcomputing" from the 4th International Conference on Soft Computing, held in Iizuka, Japan, September 30 - October 5, 1996. The papers in this issue have been thoroughly reviewed and revised to give the readers a variety of recent findings on the softcomputing approach to control problems.

In the article entitled Adaptive Fuzzy Network for the Control of Manipulating Robot Dynamic Behavior, Petrovic and Milacic propose a simple fuzzy model of isotropic impedance in the form of adaptive fuzzy network, and verify the proposed model by computer simulation with 2-d.o.f. manipulating robot. In Learning of Rule Importance for Fuzzy Controllers to Deal with Inconsistent Rules and for Rule Elimination, Pal and Pal extend the ordinary fuzzy controller by incorporating an importance factor for each rule to allow tuning of the system at the rule level. They also show that the proposed method enhances the robustness, flexibility and system modeling capability. In Fuzzy Controller with a Real-time Tuning Algorithm and its Application to a Steam Generator Water Level Control, Jung and Kwon present a real-time tuning algorithm of fuzzy controller based on the scaling factors, and apply it to the steam generator water level control for the nuclear power plant.

In Stability Analysis of Fuzzy Control Systems Simplified as a Discrete System, Hasegawa and Furuhashi propose a new method for stability analysis of fuzzy control system using Petri nets. The proposed method describes the fuzzy control system using matrix based on a bipartite directed multigraph of the Petri net, thereby enabling the analysis the stability of the fuzzy control system. In the article entitled Behavior Analysis of Genetic Fuzzy Controller for an Autonomous Robot, Cho and Lee propose a genetic fuzzy controller for

a mobile robot called Khepera, and analyze the adaptive behaviors of the controller by utilizing automata. The analysis indicates that several strategies to make the robot to navigate the complex space without bumping against walls and obstacles emerge.

In the paper on A Fuzzy Neural Network for Knowledge Acquisition in Complex Time Series, Kasabov, Kim and Kozma investigate the effectiveness of the proposed neuro-fuzzy hybrid architectures for manipulating the future behavior of nonlinear dynamical systems and interpret fuzzy if-then rules. In Design of a Robust Adaptive Fuzzy Controller Globally Stabilizing the Multi-Input Nonlinear System with State-Dependent Uncertainty, Park and Park propose an adaptive fuzzy controller for the nonlinear system with state-dependent uncertainty. They show the effectiveness of the proposed method by applying it to the Burn Control of the Tokamak fusion reactor.

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