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Preface

This supplemental issue selects thirty papers from the 2005 International Conference on Intelligent Computing (ICIC'05) held in Hefei, China, on 23-26 August, 2005.

Intelligent computing is a quiet fluid concept which is seen to embrace a wide range of techniques that have been attracting many active and vibrant researches worldwide. Examples are the evolutionary computing, artificial neural networks, fuzzy inference, co-operative computing, and new bio-inspired computing paradigms like particle swarm optimisation, immune system, ant theory, and DNA computing, etc. In recent years, intelligent computing is witnessing wider engineering applications, and this supplemental issue reflects this trend.

Among the first six intelligent control papers, Wang and Tong develop an output feedback adaptive fuzzy-neural controller for a class of unknown nonlinear systems, and algorithms are proposed for online tuning of the controller with guaranteed stability. Wang, et al, present a neural network based sliding mode control scheme for a class of discrete uncertain dynamic systems, where multiple neural networks are used to achieve improved system dynamics and robustness of the controller. Zhao, et al, combine the internal model control scheme with fuzzy inference to achieve robust position control of a position servo system with improved tracking accuracy. Liu and Zhang apply neural networks to the oxygen replenishment control of an underwater plant with satisfactory experimental results. Kim investigates the tuning of PID controller for multivariable processes using gain/phase margin and bacterial foraging algorithm. Moon and Kim develop a new embedded system for remote control of industrial endoscopes with improved reliability.

Following are the five papers on intelligent system modelling and identification, Li, et al, propose a GA based neural mesh method for the modelling of pollutant emissions in fossil-fired power plants with improved model accuracy and transparency. Pan and Li investigate the modelling and optimisation of a fed-bath process using a recurrent fuzzy neural network and an improved ant algorithm, and their experimental results demonstrate the effectiveness of the proposed method. Wang and Tian develop a mixture autoregressive moving average (MARMA) model for the time series with multimodal conditional distributions. Zhang, et al, apply neural networks to predict the breakdown voltages based on its relation with electrode gap, temperature and pressure of gas. Finally, Bao, et al, combine the neural networks and the SVM to forecast the demands in the supply-chain management systems, and an application study to a nuclear power generation plant demonstrates the effectiveness of their approach.

Among the two robotics papers, Sun, et al, develop a general-purpose application platform for multiple heterogeneous mobile robots. This platform enables task reuse, task planning and hardware abstraction for the coopera-

tion of heterogeneous robots. Jang, et al, proposes a visibility-based geometric reasoning approach for the accessibility analysis of manipulative robotic tasks. The performance and robustness of their proposed approach are evaluated in cluttered indoor environments, and the experimental results show that their method is fast and robust enough to manipulate 3D objects for real-time robotic applications.

There are eight papers on signal processing. Huang, et al, propose a new speckle noise reduction technique in image processing, which can preserve edges and texture information while restraining speckle noise. Zhang, et al, present a new method for the analysis of carrier-to-interference ratio in wireless communication channels, taking into account the joint effect of the transmission channel models, and the geometrical distribution of both the mobiles and the cellular configurations. Hong and Baek propose a robust feature selection method for video data set using the binary classification and regression tree. Kim, et al, develop an abnormal diagnosis algorithm to analyse brain MR images. Du and Gu use a dynamic programming algorithm for automatic recognition and retrieval of closed shapes for plant leaf database. Kim, et al, investigate the iris recognition by defining an iris region for normalisation, then use the wavelet transform for features extraction, and their experimental results show that the proposed method can achieve high level of security. Wang and Zhang investigate the knowledge reduction method based on consistent decision formal context (CDFC) and lattice concept. Finally, Kim, et al, propose a method for content-based image retrieval by image division and comparison. The experimental results demonstrate that their method can improve the retrieval precision.

The rest nine papers report the applications of intelligent computing techniques in solving a wider spectrum of engineering problems. For example, Soonthornphisaj and Kijsirikul use ensemble classifiers to solve the webpage categorization problem. Wang, et al, use genetic algorithms to cluster sensors. Cao, et al, investigate the multi-alternative decision-making problems, and they propose a new TFN (triangular fuzzy number) based fuzzy AHP (analytic hierarchy process) method to tackle these problems. Guo, et al, consider the problem of frequent mining of free subtrees from databases of labelled unrooted unordered trees, and propose a new efficient algorithm for the mining of both closed and maximal frequent free subtrees. Bo and Gu develop a novel decision-making model for the selection of mechanism type in conceptual design of mechanical systems. Feng, et al, propose a shrinking-magnifying approach (SMA) to improve the generalization performance of neural networks. Huang and Chai apply an improved particle swarm optimisation method for ore mixing during the ore dressing process of steel productions. Finally, Zhou, et al, investigate the price spikes in electricity market using a game learning method, and they believe that a set of game models including multi-behaviours of the agents, rather than a single one, will play a prominent role and help people better understand the market.

This collection of papers from the ICIC'05 conference only serve as a brief

introduction on how the intelligent computing theory and methodology can help tackle the problems in a wide range of engineering systems. In addition to presenting new ideas and technological advances in their respective areas, some of the authors may have also raised some interesting issues which might be even controversial, but this is however normal and expected. Finally, we hope that these papers will also serve as a catalyst for further debate on the general direction and research trend in the development and application of intelligent computing theory and methodologies.

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