Guest Editorial

Special Issue on
Novel Fuzzy Computing for Solving Current Engineering and Science Problems

The research on fuzzy systems in combining fuzzy concepts with other scientific disciplines as well as modern technologies has been spread widely to be numerous works. Meanwhile, fuzzy computing play an important role in the development of tolerance for imprecision, uncertainty and partial truth to achieve tractability, robustness and low solution cost. The approaches with fuzzy technologies as we know give the alternative solutions to the areas of engineering, management, medical, economic, environmental, and societal problems. However, the current engineering and science problems have become tough due to its complexity, volatility and vastness. The quick approaches to the above-mentioned problems are necessitated. Hence, novel fuzzy computing could be expected to rise to the challenge of tough problems. The objective of the proposed special issue is to highlight an ongoing research on novel fuzzy computing for solving current engineering and science problems as well as their applications on various domains. This volume contains seven papers for publication only due to the limited space and quality consideration.

The first paper “VLSI Architecture of Fuzzy Logic Hardware Implementation: a Review” by Asim M. Murshid, Sajad A. Loan, Shuja A. Abbasi, and Abdul Rahman M. Alamoud designs and implements VLSI implementation of fuzzy logic hardware to result in small silicon area, high speed of operation and adaptability to different application domains. The real experiment results demonstrate that the design emphasis should be more on inference engine performance and defuzzification units and the optimization in these results in a significant improvement in the overall performance of the system. The next paper “Different Objective Functions in Fuzzy c-Means Algorithms and Kernel-Based Clustering” by Sadaaki Miyamoto applies fuzzy c-means clustering algorithms for classification study where he focus on different objective functions: they use regularized dissimilarity, entropy-based function, and function for the possibilistic clustering. The practical experiments show that two discussions on kernel functions are kernelized validity measures and new kernels derived from basic functions of fuzzy c-means, namely, two kernel functions $g_B$ and $g_P$, which are useful in support vector machines as well. The paper “Fuzzy Multilevel Lot-sizing Problem Based on Signed Distance and Centroid” by Tien-Tsai Huang proposes a new fuzzy approach to the multilevel lot-sizing problem (MLSP) with zero-one formulation which was constructed by Mcknew et. al. The applicability of the multilevel lot-sizing is demonstrated by three coefficients in the crisp case to be considered, that is, the ordering cost of item j in the period i ($S_{ij}$), per unit holding cost of item j ($C_j$) and the size of lot k. With both the signed distance and centroid for defuzzification, two estimates of the total cost in the fuzzy sense are obtained. Comparing these estimates, we can determine which one is better for defuzzification. In “Mining a Complete Set of Fuzzy Multiple-Level Rules”, Tzung-Pei Hong, Chu-Tien Chiu, Shyue-Liang Wang, and Kuei-Ying Lin present a new fuzzy data-mining algorithm for extracting all possible fuzzy association rules from transactions stored as quantitative values. The experimental results illustrate that derive a more complete set of rules but with more computation time than the previous method. Then Trade-off thus exists between the computation time and the completeness of rules.

The paper “Fuzzy Vector Quantization on the Modeling of Discrete Hidden Markov” by Shing-Tai Pan applies fuzzy vector quantization (FVQ) to the modeling of Discrete Hidden Markov Model (DHMM) and
then to improve the speech recognition rate for the Mandarin speech. Experimental results in this paper show that the speech recognition rate can be improved by using FVQ algorithm to train the model of DHMM. In “Hybrid Intelligent Data Fusion Approach to Collision Warning Information Extraction”, Bao Rong Chang and Hsiu-Fen Tsai propose a fast collision warning response to an imminent crash has been successfully developed. The hardware architecture of the mobile robot is addressed. The real experiment of applying a data fusion QT-BPNN/ANFIS to fuse heterogeneous data and then infer the precise collision warning signal shows that the proposed approach outperforms two alternative well-known systems. The last paper “Protein 3D HP Model Folding Simulation Using a Hybrid of Genetic Algorithm and Particle Swarm Optimization” by Cheng-Jian Lin and Shih-Chieh Su propose a hybrid genetic-based particle swarm optimization (PSO) to enhance the procedure performance for predicting protein structures. The method can be applied successfully to the protein folding problem based on the three-dimensional hydrophobic-hydrophilic lattice model.

We would like to give our sincere thanks to all highly qualified peer reviewers that have contributed their time for review and comments. I would also like to express our sincere appreciation to the Editor-in-Chief of the International Journal of Fuzzy Systems, Professor Wen-June Wang, and the Managing Editor, Professor Wei-Yen Wang, for their encouragement and support to publish this special issue. Finally, we wish to thank all the authors for their significant contributions as well. Without their effort and hard work, this special issue would not be possible.

Bao Rong Chang, Guest Editor  
Dept. of Computer Science and Information Engineering, National University of Kaohsiung, Kaohsiung, Taiwan

Shing-Tai Pan, Guest Editor  
Dept. of Computer Science and Information Engineering, National University of Kaohsiung, Kaohsiung, Taiwan

Tzung-Pei Hong, Guest Editor  
Dept. of Computer Science and Information Engineering, National University of Kaohsiung, Kaohsiung, Taiwan