1

Editorial

Chee Peng Lim

School of Electrical and Electronic Engineering
University of Science Malaysia,
Engineering Campus,
14300 Nibong Tebal, Penang, Malaysia
E-mail: cplim@eng.usm.my

Robert J. Howlett

School of Engineering,
University of Brighton,
Moulsecoomb, Brighton, BN2 4GJ, UK
E-mail: rjhowlett@kesinternational.org

Lakhmi C. Jain

Knowledge-Based Engineering,
School of Electrical and Information Engineering,
University of South Australia,
Adelaide, Mawson Lakes Campus,
South Australia SA 5095, Australia
E-mail: Lakhmi.jain@unisa.edu.au

Mika Sato-Ilic

Faculty of Systems and Information Engineering,
Department of Risk Engineering,
University of Tsukuba,
Tennodai 1-1-1, Tsukuba, Ibaraki 305-8573, Japan
E-mail: mika@sk.tsukuba.ac.jp

Biographical notes: Chee Peng Lim received the BEng (Electrical) Degree from University of Technology Malaysia in 1992, and both the MSc in Engineering (Control Systems) and PhD Degrees from University of Sheffield, UK, in 1993 and 1997. He is currently a Professor at School of Electrical and Electronic Engineering, University of Science Malaysia. He has published more than 150 papers in books, international journals, and conference proceedings. He has also received six best paper/poster awards in international and national conferences. His research interests include computational intelligence, pattern recognition, fault detection and diagnosis, and condition monitoring.

Robert J. Howlett is currently with the University of Brighton, UK. He is a Chair and Chief Executive of the KES International Research Organisation. The KES is serving international research community mainly in the area

of intelligent systems. He serves as an Editor-in-Chief of the *International Journal of Knowledge-based Intelligent Engineering Systems*.

Lakhmi C. Jain is a Director/Founder of the Knowledge-Based Intelligent Engineering Systems (KES) Centre, located in the University of South Australia. He is a fellow of the Institution of Engineers Australia. His interests focus on the artificial intelligence paradigms and their applications in complex systems, art-science fusion, e-education, e-healthcare, unmanned air vehicles and intelligent agents.

Mika Sato-Ilic is an Associate Professor in the Faculty of Systems and Information Engineering, University of Tsukuba (Japan). She is Editor in Chief of the *International Journal of Knowledge Engineering and Soft Data Paradigms* (UK). Her main research interests are focused on methods of multi-dimensional data analysis based on soft computing.

Advances in knowledge-based systems have paved the way for the establishment of computerised intelligent systems to solve many real-world problems. These systems learn to mimic human behaviours and capabilities in tackling complex tasks. In this special issue, a total of seven extended papers from the *International Conference on Knowledge-Based and Intelligent Information and Engineering Systems (KES2008)* conference are presented. The papers describe advances in knowledge-based intelligent systems and their applications to a variety of domains, ranging from solving multi-objective optimisation tasks to processing semantic representations of text, supporting learning and decision making processes to testing software reliability. A summary of each paper is as follows.

Real-world multi-objective optimisation problems often are complex and dynamic in nature, and it is desirable for the optimisation methods to be adaptive and robustness towards changes in the environment. In the first paper, the authors present an implementation of the two different Non-dominated Sorting Genetic Algorithm-II (NSGA-II) methods for optimisation of load management activities in power systems. The effects of the mutation operator in NSGA-II are analysed. The results indicate that NSGA-II with an adaptive mutation operator performs better that NSGA-II with a traditional (constant value) mutation operator.

In the second paper, another optimisation problem in the domain of intelligent transportation system is described. The authors investigate a vehicle routing problem, i.e., on-demand pick-up problem, using a multi-agent system. Evolutionary approaches for finding an efficient strategy for the drivers in the on-demand pick-up problem are examined. Four types of driver agents in the case of competitive and cooperative behaviours are analysed and compared. The experimental results indicated that the genetic and cooperative agents produce good performance compared with other agents.

In addition to evolutionary techniques, other knowledge-based approaches are useful for handling many real-world applications, as addressed in the subsequent papers. In the third paper, the authors we describe a knowledge-based approach to capture semantic representations from unrestricted natural language for intelligent systems that know the representations of interest in advance. Two evaluations of the approach in the context

of a real-world intelligent system that assist business executives in tracking the maturity of wireless technologies are demonstrated.

Application of novel knowledge-based systems to aid the learning process has also received much attention recently. A computer-aided learning system with a knowledge database for helping students to learn Japanese calligraphy is presented in the fourth paper. The system is equipped with a navigation module that acts as a pen motion guide showing the dynamics of a character from the starting point to the end point. A knowledge database constructed from formal knowledge elicited from a domain expert is also included in the system. The effectiveness of the system in assisting students in learning 'Kana' strings is evaluated and analysed.

In the fifth paper, the author's construct a web-based learning support system for learning English grammar based on fill-in-the-blank exercises. The exercises are classified based on their grammatical knowledge, and are then organised as a knowledge network. According to the learner's answer, the system traverses the knowledge network and gives the exercise containing knowledge that the learner needs to learn. The experimental results indicate that the learning support system is effective for assisting learners in acquiring English grammar knowledge in a systematic manner.

Data mining, also known as knowledge discovery in databases, aims to extract potentially useful information from databases. In the sixth paper, the authors address the problem of mining association rules from the transaction database of a transportation management system. An enhanced AprioriTid algorithm is applied to construct such rules by creating a large set of related items. The constructed rules are then used by a recommender module to provide useful recommendations to users. The applicability is assessed using an agent-based system for transportation transaction management.

In line with the increasing usage of computerised systems in our daily life, it is important to reliably evaluate and test software programs to ensure their functionality and correctness, especially in harsh and safety-critical applications. In the seventh paper, the authors present a novel pairwise test data generation strategy, called Intersection Residual Pair Set Strategy (IRPS), for software testing. The usefulness of IRPS, as compared with other strategies used in software testing, in terms of the number of generated test data and the execution time is demonstrated in the paper.

The guest editors would like to thank the authors for their contributions, the reviewers for their time and effort in reviewing the manuscripts, and the journal production team for their support and help in producing this special issue.