Preface

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Biographical notes: Da Ruan obtained his PhD in Math from Ghent University, Belgium, in 1990. After his Postdoc at the Belgian Nuclear Research Centre (SCK*CEN) from 1991–1993, he has been the principal investigator for research projects on intelligent control and decision making for complex (nuclear) systems. His major research interests lie in the areas of mathematical modelling, computational intelligence methods, uncertainty analysis, decision support systems to information management, safety and security related fields. He served as the Regional Editor for Europe of *Int. J. of Intelligent Automation and Soft Computing*, Co-Editor-in-Chief of *Int. J. of Nuclear Knowledge Management*, and Editor-in-Chief of *Int. J. of Computational Intelligence Systems*.

Cengiz Kahraman obtained his PhD in Industrial Engineering from Istanbul Technical University (ITU), Turkey, in 1996. He is now a full time Professor at ITU Industrial Engineering Department. His interest areas are engineering economics, statistical decision making, quality management and control, and fuzzy set theory applications to decision making. He has published about 120 journal papers, 110 conference papers, 50 book chapters, and 4 edited books. He is the present Head of Industrial Engineering Department at ITU.

Modern tools of industrial engineering include soft computing techniques like fuzzy sets, neural networks, tabu search (TS), and ant colony techniques. Soft computing and computational intelligent techniques (SCCITs) are used to obtain the closest solutions to computationally-hard problems. SCCITs are vitally practical tools for many complex problems since they can tolerant of imprecision, uncertainty, partial truth, and

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approximation. However, traditional hard computing methods are often too cumbersome for complex problems. They need a precisely stated analytical model and often a lot of computational time (Zadeh, 1965). Artificial neural networks, genetic algorithms (GAs), fuzzy logic models, ant colony techniques, TS, etc., are the most known soft computing techniques in the literature. The technique of artificial neural networks (ANN) is a computational model and is inspired of biological neural networks. GAs are global search and optimisation techniques motivated by the process of natural selection in biological system (Gen and Cheng, 2000; Kaya, 2009). Ant colony (ACO) is a cooperative search algorithm inspired by the behaviour of ants in finding paths from the nest to food. ACO is used for solving combinatorial optimisation problems (Yang and Zhuang, 2010). TS is another algorithm which is used for the solution of combinatorial optimisation problems like the travelling salesman problem. TS method is based on neighbourhood search procedure such that the algorithm iteratively moves from a solution to another solution in the related neighbourhood, until it reaches any stopping criterion.

In this special issue, modern tools of industrial engineering for decision-making are included with their applications through real case studies. Thus, the papers contained in this special issue represent the latest decision-making techniques used in industrial engineering.

In the first paper of the issue, the authors propose a graphical model to represent linguistic conditional preferences called LCP-nets. LCP-nets are implemented and used in a specific use case of industrial engineering. The authors consolidate this contribution in formalising it through a set of notations and computation rules in order to guarantee its durability and its reusability to other multi-criteria decision contexts. The paper formalises the LCP-net structure, semantics, and validity. It also formalises the dominance testing and optimisation queries in the line of previous CP-nets models.

In the second paper, a fuzzy integrated approach for the selection of academic papers to a special issue is developed. In the first step, the evaluation criteria specific to each journal are determined by the editorial board and then reviewers make judgements whether to accept or reject the submitted manuscript by considering the previously determined evaluation criteria. The last decision of the submitted paper is given by the editor of this special issue by considering the reviewers' evaluations. The purpose of the study is to propose a systematic approach for the selection of academic papers to a special issue. The developed approach integrates fuzzy analytical hierarchy process (FAHP) with fuzzy multi-criteria scoring method (FMSM). The results of the FAHP imply that, through the academic paper evaluation process, the most important criteria are originality of the subject and the methodology proposed in the research study. After these criteria, discussion and conclusion and data analysis have higher importance weights than the other criteria as language, abstract and keywords, literature review and format of the paper.

The third paper uses AHP and preference ranking organisation method for enrichment evaluations (PROMETHEE) to deal with the crop planning problem as a multi-criteria decision-making problem, for governmental lands in Gaza Strip under two conditions: the normal economy condition and the resistant economy condition. These two conditions are studied from the governmental point of view. The goal of the study is to rank crops according to some considered criteria. Crops are divided into eight types that include vegetables, fruits, citrus, olives, palms, export crops, field crops and medical and aromatic crops. The developed AHP and PROMETHEE compare crops with respect to seven main criteria, namely; economical, financial, marketing, environmental, technical,

political and social criteria. AHP is used to obtain criteria weights to be used as inputs for PROMETHEE to outrank alternatives.

The fourth paper fills the need of an overview of business benefits to measure and evaluate purchasing activities. As a result, the motivation of the study is to clarify business benefits of SRP and to develop a model for evaluating purchasing decisions via business benefits of SRP which will support managers in their decision-making processes. A model for evaluating purchasing decisions via concrete business benefits of SRP is developed. The model is applied to a company in the copier industry.

In the fifth paper, a simple robust fuzzy linear regression (RFLR) model is suggested for forecasting the electricity consumption. The proposed RFLR model uses the robust optimisation (RO) technique introduced by Ben-Tal and Nemirovski (2000). The performance of the proposed model is illustrated through a numerical example and is applied for estimating electricity consumption of residential sector in Iran.

In the sixth paper, performance measurement (PM) is transformed to a multi-attribute decision-making (MADM) problem and a PM model based on fuzzy analytical network process (FANP) is proposed. The PM criteria are built with respect to four perspectives of BSC. The proposed model utilises FANP in order to determine the relative importance of perspectives and indicators. The performance scores for each indicator are determined based on the predefined goals. A numerical example, representing PM for two periods, is given for a manufacturing company.

The last paper proposes an α-ordered linear resolution method for lattice-valued logic based on lattice implication algebra to provide an efficient resolution approach for resolution-based mechanical theorem proving. Firstly, some essential concepts for α-ordered linear resolution are given. The α-ordered linear resolution method for lattice-valued propositional logic system LP(X) based on lattice implication algebra is presented. Both soundness and weak completeness theorems are established. Secondly, the lifting lemma is established from LP(X) to LF(X), which is then used for obtaining the weak completeness theorem of α-ordered linear resolution method in LF(X) based on lattice implication algebra. Finally, an α-ordered linear resolution automated reasoning algorithm for lattice-valued logic system based on lattice implication algebra is designed.

We hope that this issue will provide a useful resource of ideas, techniques, and methods for additional research on the applications of modern tools of industrial engineering: applications in decision sciences. We are grateful to the referees whose valuable and highly appreciated works contributed to select the high quality of papers published in this issue.

While accepting this special issue project, we did not know what the future would bring to us. As our project is almost completed, I lost my dear friend and my co-guest editor Professor Da Ruan in July 31, 2011. He was only 50 years old. He was an excellent researcher and wonderful, kind and helpful person. His friends and I will always miss him.

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