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Editorial

Building Mathematical Models for Multicriteria and Multiobjective Applications 2019

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This is the third special issue (SI) dealing with “Building Mathematical Models for Multicriteria and Multiobjective Applications 2019.” The first one was published in 2016, and based on its success, another one was published in 2018, and now this one in 2019. The ambition is to henceforth publish an annual special issue. This series has been attracting the multicriteria decision-making/aid (MCDM/A) and multiobjective community, researchers, and practitioners.

The focus of this special issue is to demonstrate how MCDM/A and multiobjective methods can be highly useful for decision-makers (DMs) in solving decision problems involving multiple criteria. Many researchers submitted a large number of high-quality papers for consideration in this SI, which went through a rigorous peer-review process, with an acceptance rate of 25%.

This special issue offers 18 original research papers covering a variety of applications for real-world problems while combining theoretical methodology and mathematical analysis. The authors of these papers are from different countries around the world, namely, Brazil, Bulgaria, China, India, Mexico, Taiwan, and Turkey. Six papers bring new methods or methodology to deal with multicriteria problems and also contain different applications in several contexts. Eight papers discuss larger applications of multicriteria decision-making thoroughly, and four papers are focused on multiobjective applications.

Two papers discuss novel aspects of the TOPSIS method. One model is based on distance, similarity, and correlation,

and another is based on the improved grey relational analysis. Other innovative approaches explore, respectively, elicitation processes based on pairwise comparisons, an outranking model for a nominal classification problem, a model for deriving the priority weights from hesitant triangular fuzzy preference relations, and a group decision model with uncertain weights using interval-valued intuitionistic fuzzy reasoning.

Three papers utilize varieties of the analytic hierarchy process (AHP) for the topology of diesel engine cylinder block, suitability analysis for the matching area in underwater geomagnetism-aided inertial navigation, and as a group decision tool combined with Dempster-Shafer Theory (DST). Other multicriteria methods were also applied to various problems. The PROMETHEE method was used for analyzing and suggesting reasonable transport plans for high-speed rails. A multilevel Borda model (MLBM) was the base of a quantitative risk evaluation model for a multilevel complex structure hierarchical system in the petrochemical industry. Furthermore, hybrid multicriteria methods (Fuzzy Delphi, DEMATEL, ANP, and TOPSIS) were used for selecting the location of women’s fitness centers, and intuitionistic fuzzy set theory is applied to risks of mergers and acquisitions by grey relational analysis and evaluation of enterprise learning performance in the process of cooperation innovation.

In relation to the multiobjective applications, this special issue brings four different contexts of applications. One paper presents new product development projects while

applying the evolutionary approach to portfolio optimization. Another paper presents a modern machine learning techniques for univariate tunnel settlement forecasting using particle swarm optimization (PSO) and support vector regression (SVR). In addition, one paper suggests a model for postdisruption recoveries of aircraft and passengers using a loop-based multiobjective genetic algorithm (GA). Finally, we have included a model for multitarget strike path planning based on the aircraft's threat tolerance and the battlefield threat by constraining the balance between mission execution and the combat survival using a multi-objective evolutionary algorithm based on decomposition (MOEA/D).

We hope that the papers presented in this special issue will be useful and stimulating for further developments and applications of multicriteria and multiobjective models and that we again have been able to highlight the extensive range of contexts over which these methods can be used.

Conflicts of Interest

The editors declare that they have no conflicts of interest.

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