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Editorial

Fuzzy Nonlinear Programming with Applications in Decision Making

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Fuzzy set theory provides an intuitive and computationally simple way to deal with uncertain and ambiguous properties. Decisions represented in terms of fuzzy sets also offer flexibility in their implementations. On the other hand, nonlinear programming relaxes the strict assumptions and constraints in linear programming and hence is more practicable to handle many decision making problems, which are better represented in the form of nonlinear programming models. Combining fuzzy set theory with nonlinear programming enables it to address the issue of uncertain parameters; the resulting fuzzy nonlinear programming problem involving fuzzy parameters can be viewed as an even more practicable approach than the conventional nonfuzzy one. In light of advanced computing systems, fuzzy nonlinear programming becomes one of the most promising approaches to solve practical application problems. The purpose of this special issue is to provide recent advances in developing fuzzy nonlinear programming methods and their applications to practicable and flexible decision making. The target audiences are researchers in fuzzy mathematics, operations research, information management, and system engineering, as well as practicing managers/engineers. After a strict review process, ten articles from researchers around the world were finally accepted. A brief summary of each is described below.

J. d. D. M. Silva et al. discussed the properties of p-fuzzy dynamical systems that are variational systems of which dynamic behaviors are regulated by a Mamdani-type fuzzy system. They used a case study to illustrate a 1-dimensional p-fuzzy dynamical system and presented some theorems on the conditions of existence and uniqueness of stationary points.

H.-R. Tsai and T. Chen proposed a fuzzy nonlinear programming (FNLP) approach for optimizing the scheduling performance of a four-factor fluctuation smoothing rule in a wafer fabrication factory. The proposed methodology considered the uncertainty in the remaining cycle time of a job and optimized a fuzzy four-factor fluctuation-smoothing rule to sequence the jobs in front of each machine. The fuzzy four-factor fluctuation-smoothing rule had five adjustable parameters, the optimization of which resulted in a FNLP problem.

Most preferred ordered weighted average (MP-OWA) operators are a new kind of neat OWA operators in the aggregation operator families. It considers the preferences of all alternatives across the criteria and provides unique aggregation characteristics in decision making. X. Sang and X. Liu established the parametric form of the MP-OWA operator to deal with uncertain preference information, including the most commonly used maximum, minimum, and average aggregation operators. A special form of the parametric MP-OWA operator with the power function was also proposed in their study.

The Bonferroni mean (BM) operator is an important aggregation technique which reflects the correlation of aggregated arguments. J. H. Park and E. J. Park studied the desirable properties of the fuzzy Bonferroni harmonic mean (FBHM) operator and the fuzzy ordered Bonferroni harmonic mean (FOBHM) operator. To consider the correlation of any three