Editorial

Fuzzy Functions, Relations, and Fuzzy Transforms: Theoretical Aspects and Applications to Fuzzy Systems

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Fuzzy functions, fuzzy relations, and fuzzy transforms are important for their applications to fuzzy systems. In this special issue, all terms are understood in their very general sense. We have received many papers, but the selection limited them to the actual version, which deals with essentially the following topics: fuzzy optimizations with fuzzy functions and relations (including also clustering algorithms), applications of fuzzy relations/transforms to decision making and approximation reasoning, and applications of fuzzy relations/transforms to data mining.

The contents of the papers can be resumed in the following way.

(i) In the paper of M. Shaverdi et al., the goal is to construct an approach based on multiple criteria decision making (MCDM) and balanced scorecard (BSC) for evaluating performance of three nongovernmental Iranian's banks via 21 indexes. The Fuzzy Analytic hierarchy process (FAHP) is adopted for calculating the related weights of each index and three MCDM analytical tools (TOPSIS, VIKOR, ELECTRE) to rank the banking performance.

(ii) In the paper of T. Yamamoto et al., a linear fuzzy clustering model based on the fuzzy C-medoid (FCMdd) concept is proposed. Strictly speaking, a fuzzy C-Means-like iterative algorithm is performed, and, in several numerical experiments, some suitable pre-imputation strategies properly select representative medoids of each cluster.

(iii) In the paper of S. Sachdeva et al., the problem to consume electricity more efficiently in developed and developing countries is performed. Since developed countries do not want to waste electricity and developing countries cannot waste electricity, it becomes important the concept of "Load Forecasting." By moving from daily to hourly basis of load

forecasting, the correlated error increases. To reduce this error, a fuzzy method combined with an artificial network (ANN) and an orthogonal frequency division multiplexing (OFDM) transmission is used, obtaining a considerable reduction of 2-3% error.

(iv) In the paper of M. J. Hossain et al., a simplified fuzzy logic-based speed control scheme of an interior permanent magnet synchronous motor (IPMSM) is presented. A simplified fuzzy speed controller (FLC) for the IPMSM drive is incorporated in the drive system to maintain high performance standards. The efficacy of the proposed controller is verified by simulation at various dynamic operating conditions, and it is found to be robust and efficient.

(v) In the paper of F. Di Martino and S. Sessa, a system of fuzzy relation equations (SFRE) with the max-min composition for solving a problem of spatial analysis is integrated in a geographical information systems (GIS) tool. A precise geographical area is studied and divided in homogeneous subzones with respect to the parameters involved, and an expert settles the system of SFRE with the values of the impact coefficients considered as inputs. The best solutions of this system (considered as outputs) and the related results are associated to each subzone. Among others, an index which evaluates the reliability of these results is also given.

(vi) In the paper of I. Yusuf et al., a genetic algorithm (GA) is given for the design and implementation of a fuzzy logic controllers (FLC) for incubating eggs. It is determined the membership function of the FLC which makes the process as the fastest possible one as well.

(vii) In the paper of M. Hourali and G. A. Montazer, a novel approach for fuzzy ontology generation with two uncertainty degrees is presented. Indeed, the authors com-

bine two uncertain models and propose a new ontology with two degrees of uncertainty, based on the concept expression and relation expression. The generated fuzzy ontology is implemented for expansion of the initial user's queries in the domain's concepts (software maintenance engineering (SME)). Experimental results show that the proposed model has better overall retrieval performance with respect to the keyword-based retrieval systems.

(viii) In the first paper of I. Perfilieva and V. Kreinovich, we underline that the original motivation of the concept of fuzzy transform comes from fuzzy modelling, but it is purely a mathematical transformation, and, hence, it is to be interpreted also in traditional (nonfuzzy) sense. Specifically, the authors show that the probabilistic interpretation of fuzzy modeling by Sanchez et al. (2002) can be modified into a natural probabilistic explanation of the fuzzy transform formulas involved.

(ix) In the paper of M. Yasud, a fuzzy clustering method which combines the deterministic annealing (DA) approach with an entropy is presented. In particular, by maximizing the Shannon entropy, the fuzzy entropy, or the Tsallis entropy within the framework of the fuzzy C-means (FCM) algorithm, the author obtains membership functions which are very similar to the statistical mechanical distribution functions.

(x) In the second paper of I. Perfilieva and V. Kreinovich, the authors discuss about large-scale (averaged) value of the predicted quantities. As example, they point out the impossibility to predict the exact future temperature at different spatial locations, but it is reasonably to predict average temperature over a region. Traditionally speaking, the resulting procedure is based on many differential equations, and, hence, it is very time-consuming. The authors show that similar quality large-scale prediction results can be obtained by applying an appropriate fuzzy transform and using averaged inputs to solve the corresponding discretized differential equations.

We hope that these topics would be captured and significantly pushed forward by interested readers. We hope that this issue will be regarded as the first of many of our future scientific initiatives.

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