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Special issue: Guest Editorial [Computational and Mathematical Methods in Science and Engineering 2002 - Best Papers]

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SPECIAL ISSUE: GUEST EDITORIAL

MANUEL OJEDA-ACIEGO, PETER VOJTÁŠ AND SŁAWOMIR ZADROŻNY

The present special issue of *Kybernetika* contains the extended and revised versions of the best papers related to the use of mathematical methods in computer science and the information society issuing from the conferences *Computational and Mathematical Methods in Science and Engineering* (CMMSE) held in Alicante, Spain, in September 2002, *Fuzzy Sets Theory and Applications* (FSTA) held in Liptovský Mikuláš, Slovakia, in January 2002, and *Aggregation Operators* (AGOP) held in Alcalá de Henares, Spain in July, 2003.

The articles were selected by the editors from the papers submitted to the conferences and highly evaluated by reviewers. After the conferences, their authors were invited to prepare extended and revised versions taking into account the discussions during the conferences. The submitted papers were again evaluated and selected by peer reviewers, and their present final form further reflects the reviewer comments from the second reviewing round and *Kybernetika* guidelines. Thus, we are confident of their high quality and significance, making them worthy of this special issue, and of the attention of its readers.

Andrejková and Levický's paper describes an interesting application of a combination of artificial neural networks with Bayesian probability, which provides the training strategy, and Monte Carlo methods, used to provide good approximations to higher dimensional integrals which are needed to be computed during training, to the problem of predictions of geomagnetic storms.

Cordero, de Guzmán, Gutiérrez and Martínez's paper is devoted to the mathematical foundations of automated deduction in temporal logics. The main result in this paper is the introduction of the groupability property for subsets of lattices: it is proved that the existence of *groupable* subsets in a lattice allows to express restricted ideals (filters) as the inductive closure for a binary non-deterministic operator and, consequently, the presence of this property guarantees a proper computational behavior of the set of unitary implicants (implicates).

Crombez's paper deals with the problem of finding a common point of a finite collection of convex sets in a Hilbert space which, usually, leads to slow convergence of the constructed sequence. Such slow convergence depends both on the choice of the starting point and on the monotoneous behaviour of the usual algorithms. A new non-monotoneous method of computing solutions of this problem is presented, which may eliminate considerably the influence of the starting point.

Dopazo and González-Pachón's paper studies the pairwise comparison method, in which an empirical pairwise comparison matrix is turned into a ranking by way of distance-based approximation, with the goal-programming-inspired variable transformation used to reduce the complexity of the resulting problem.

The main topic of Romaguera, Sánchez-Pérez, Valero's paper is metrics on sets of number sequences, together with development of topological properties with applications to complexity analysis. A new (extended) quasi-metric on the so-called dual p -complexity space is introduced, which is suitable to give a quantitative measure of the improvement in complexity obtained when a complexity function is replaced by a more efficient complexity function on all inputs, and show that this distance function has the advantage of possessing rich topological and quasi-metric properties.

Tikk, Yang and Bang address an important problem of the automatic text documents categorization. Text categorization consists in assigning a document to an appropriate category chosen from a predefined set of categories. The authors propose their own algorithm assuming the categories are organized in a hierarchy. Moreover, in their approach the automatic categorization is supported by a fuzzy thesaurus of natural language concepts relevant for a domain of the documents. The authors present the results of some preliminary tests of their algorithm that seem to be promising.

Sicilia, García Barriocanal, and Calvo discuss the usability of man-machine interfaces. They review several possible approaches to design a suitable aggregation operation to summarize experts' opinions, applying the Choquet integral with respect to a set function expressing the interaction among single criteria.

Kolesárová's contribution is devoted to 1-Lipschitz aggregation operators, and especially to quasi-copulas. These operators are important in statistics, preference modelling and other fields where complex objects are described by means of their marginal subitems. A new characterization of 1-Lipschitz operators, and especially of quasi-copulas, as solutions to special functional equations are given.

Saminger and Mesiar have introduced decomposable bi-capacities. The proposed concept reduces the computational complexity and allows to naturally extend the cumulative prospect theory of Tversky and Kahneman.

The last paper of Calvo, Mesiarová and Valášková brings a new composition method for constructing aggregation operators. Especially important consequence is a transparent representation of twofold integral of Torra. Several new types of operators are proposed and their properties are studied.

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