Theory and Applications of Soft Computing 2004, Selected Papers

Preface

This special issue of *Fundamenta Informaticae* contains final, revised and expanded versions of selected papers presented at the Workshop on Theory and Applications of Soft Computing (TASC04) held at the Polish-Japanese Institute of Information Technology in Warsaw in November 2004.

M. Grochowski, M. Smołka and R. Schaefer consider in their contribution the formal description of a computing multi-agent system (MAS), its architecture and dynamics in terms of the stochastic control theory. The equation of state transition, the set of admissible controls as well as two types of cost functionals are introduced. The optimal scheduling problem for the MAS as well as a way of its verification are presented in terms of such a model. A brief report of test results is also attached.

J. Kozlak, J.-C. Créput, V. Hillaire and A. Koukam focus in their paper on the dynamic Pickup and Delivery Problem with Time Windows (PDPTW). The transport requests should be performed using the available fleet of vehicles. The vehicles move between the nodes of a road network. The aim of this work is to propose a model which allows, during a transport plan creation, to take into account predictable events. Particularly, they consider the frequency of requests at any node in the road network and construction of vehicle routes that will allow new requests to be inserted without any significant route modification. Therefore, they construct routes that pass near the nodes where transport requests are most frequently generated.

J. Jurek and M. Flasiński present two methods of the analysis of distorted (fuzzy) string patterns in their paper. The methods are based on the use of GDPLL(k) grammars generating a large subclass of context sensitive languages. The first one utilizes *error-correcting* approach: a minimum distance measure is used for error-correcting parsing. The second one utilizes *stochastic* approach: the decision about the production to be applied in a derivation step is given according to the probability measure.

E. Nawarecki, M. Kisiel-Dorohinicki and G. Dobrowolski discuss in their contribution a class of intelligent decentralized systems that meet the agent paradigm. Such systems are marked by the possibility of arising in them of critical situations, interpreted here as the threat of loss (partial or complete) of the system functionality. The work is focused on designing an overall architecture of the (sub-)system dedicated to the discovery of crises and the support of anti-crisis activities. The architecture is proposed as a reference one so it is possible to adjust it to the specificity of any particular application. As an illustration, the case of a transportation system is discussed.

L. Polkowski proposes in his paper a formal approach to calculus of vague statements (calculus of perceptions), a recent research problem in Computational Intelligence posed by Lotfi Zadeh. This approach stems from a research in Rough Mereology that has led to rough mereological logics - intensional logics allowing to evaluate the degree of truth of a statement with respect to a given exact set. This approach is applied in order to represent semantically vague statements as fuzzy sets of a higher order.

J. Stefanowski discusses in his paper problems of applying the approach based on rough sets and rule induction to a software engineering data analysis. More precisely, the prediction of software project costs basing on factors coming from the COCOMO model has been chosen as a case study to illustrate methodological discussions. The results of experiments with COCOMO historical data have showed that this approach could be successfully used to identify the most discriminatory cost factors, extract meaningful rule representation of classification knowledge, construct accurate rule based classifiers. Additionally, comparative studies with other approaches have been performed. Besides the application oriented aspects, the other methodological contribution is taking into account semantic information about preference orders of some attribute values and introducing the use of the dominance based rough sets approach in the context of the software cost estimation problem.

Z. Suraj et al. present a set of integrated graphical Petri net tools. This system can be used for constructing, editing and analyzing different classes of classical Petri nets. Moreover, it is enhanced with fuzzy and adaptive fuzzy Petri nets modules which allow to perform fuzzy reasoning process automatically.

Z. Suraj and B. Fryc propose a new model of timed high-level Petri nets. In the paper they consider methods for automated modelling of the approximate reasoning process based on the knowledge encoded in a temporal data table. The timed approximate Petri nets simulate and evaluate real-time systems from different points of view.

Z.Suraj and K. Pancerz provide an approach to the reconstruction of net models of concurrent systems whose descriptions change in time. Out of numerous available variants one is considered. It is concerned with the case when only one new global state of the modelled system occurs. This approach can be used to the effective computation of reducts and components of a new information system, which is a representation of a new description of the modelled system. Moreover, the approach can be applied to the determination of reconstruction cost of the net model.

The editors extend their thanks to all authors of the papers as well to all participants in the Workshop.

Special Issue Editors

Mariusz Flasiński, Jagiellonian University, Cracow

Edward Nawarecki, AGH University of Science and Technology, Cracow

Lech Polkowski, University of Warmia and Mazury, Olsztyn;
                    Polish-Japanese Institute of Information Technology, Warszawa

Robert Schaefer, Jagiellonian University, Cracow

Jerzy Stefanowski, Poznań University of Technology, Poznań

Zbigniew Suraj, University of Information Technology and Management, Rzeszów