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Guest editorial

Special issue on integration of methods and hybrid systems

This special issue of the International Journal of Approximate Reasoning on Integration of Methods and Hybrid Systems is devoted to some of the best papers presented at the EUNITE'2002 conference and the workshop on Hybrid Methods for Adaptive Systems, HMAS'2002, which took place in Albufeira, Portugal in September 2002. Both events had been organised as part of the activities of the European Network of Excellence on Intelligent Technologies for Smart Adaptive Systems (EUNITE). The focus of this issue is especially close to the goals and activities of the EUNITE's Research Theory and Development group on Integration of Methods (RTD IM). The RTD IM committee is working on the integration of fuzzy systems, neural networks, evolutionary computation, machine learning and related technologies. One of the main goals of the committee is also to provide a common platform to discuss and exchange research results, to define a common terminology and to disseminate the scientific excellence via publications such as the presented here special issue.

In this edition we have a collection of seven papers which have been selected following the recommendation (votes) of the workshop and conference participants and as such represent their choice of what was deemed interesting both from practical as well as theoretical points of view. We have attempted to group the papers so that the first four concern quite generic problems like function interpolation, adaptive multiresolution search, dealing with missing data in clustering problems and approaches to combining supervised and unsupervised learning techniques, while the remaining three are more application focused with various fuzzy-rule based hybrid methods proposed and applied to modelling, estimation and control in industrial and financial applications.

In the first paper, Galichet et al. propose to use gradual rules for specifying imprecise interpolation, or more specifically, the constraints where the interpolated function may lie between the known points. A refinement of rule-based

representation that enables handling of fuzzy interpolation graphs is also proposed. In the second paper a different though again a very general problem of adaptive multiresolution search using Markov-based and wavelet-based approaches is discussed by Thuillard. The focus is on a class of problems where acceptable solutions are in regions of high average local fitness enabling the proposed methods to “beat” brute force searches. The third paper, from Timm et al., discusses different approaches to fuzzy clustering of data sets with missing values and introduces an approach based on a class specific probability for missing values which can be used when data are not missing completely at random. In the fourth paper, Gabrys and Petrakieva analyse various approaches to handling labelled and unlabelled data in the process of constructing pattern classification systems. The analysis revolves around the questions of potential advantages of using hybrid supervised/unsupervised methods versus importance of the selection and reliability of the labelled data. The remaining three papers are all concerned with variations of fuzzy rule-based approaches and especially Takagi–Sugeno fuzzy systems for modelling, estimation and control in industrial and financial applications. In the fifth paper, Angelov proposes a recursive approach for adaptation of fuzzy rule-based model utilising an on-line clustering and applies it to the modelling, estimation and control of the fermentation process of lactose oxidation. The sixth paper by van den Berg et al. proposes and illustrates the use of Takagi–Sugeno probabilistic fuzzy-rule based system in the analysis of financial time series. And in the last paper, Juuso discusses various possible hybridizations of fuzzy systems with the use of genetic algorithms and neural network based learning approaches for tuning purposes and focuses on the linguistic equations technique as a main tool for developing hybrid systems in the industrial modelling and control settings.

These papers form only a small subset of the papers presented at the conference and the workshop but we hope that similarly to the voting participants of these events the reader of this special issue will find them equally interesting.

We would like to thank Dr. Piero Bonnisone for the opportunity to publish this collection of papers as a special issue of the journal. We would also like to thank everyone who helped to make the conference and the workshop a success.

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