

Editorial

Guest editorial introduction

This Special Issue of the Knowledge Based Systems journal is devoted to some of the best papers presented at the conference Engineering Intelligent Systems, EIS2000, which was held at the University of Paisley in June, 2000. The EIS conferences are aimed at applications of modern artificial intelligence in its broadest form to any field of engineering. The papers in this edition reflect the breadth of the conference other than the fact that the field of Artificial Neural Networks is not represented. This omission is due to the fact that a Special Edition of the International Journal of Neural Systems is also publishing a selection of papers from the conference all on Artificial Neural Networks. Notwithstanding this omission, the papers in this edition show the strength and breadth of the field of artificial intelligence.

In this edition, we have included 15 papers. It is difficult to know how best to characterise them since, e.g. it seems unwise to group them under their underlying technologies since we often have a synergy between two techniques such as genetic algorithms and case based reasoning. If we group them under their application areas, we may miss the underlying themes that the different papers address in different application area. We therefore make the relatively cowardly decision to simply discuss the papers in the order in which they appear in this journal.

In the first paper, Economakos et al. develop a formal grammar which acts as a meta-language between hardware transformations and their implementations. They illustrate that such language-based designs are a valuable additional method for designing complex systems. The second paper, by Esquivel et al., also deals with scheduling problems but this time uses enhanced evolutionary algorithms for solving these NP-hard problems. The third paper is by Dahlstrand and it uses a graphical language to address the problem of finding the root cause of a failure in a complex system. In the fourth paper, Fournier and Cremilleux consider the problem of pruning decision trees, a necessary operation when the data are uncertain. Their new pruning method is analytically derived and results on a real world database are presented. Golobardes et al. in paper 5, compare case-based reasoning and genetic algorithms on the problem of breast cancer diagnosis with those of standard statistics and human experts. They discuss how a further pre-requisite for machine learning systems is the ability to know when not

to make a judgement. The sixth paper discusses the problem of robot path planning; Autere extends the A* control strategy and shows that the new algorithm finds paths faster than existing algorithms. There has been a great deal of recent work on using the extensible markup language, XML, to bring intelligence to the handling of diverse documents. Turowski and Weng create a formal syntax for fuzzy data types and show how XML may be used to give better integration of business applications. In a paper authored by an academic, a medical doctor and an industrialist, Jones et al. propose the use of the theory of evidence with its belief and plausibility measures for medical diagnosis. In the ninth paper, Weijters and Paredis note the disadvantages of both a totally local search for the best set of symbolic rules and of a totally global search. They thus use a mixed intermediate strategy based on genetic algorithms and present results of their algorithms on standard benchmark problems. Szala creates a two-level expert system combining logical methods with learning and illustrates his method on a simple problem. Graphical models are again used by Larsson who, in the 11th paper, provides an excellent overview of Multilevel Flow Models and provides pointers to new developments in this field. Kruger et al. create an accumulation scheme to deal with the fact that, with respect to any robot's knowledge of the world, there is liable to be incomplete or missing information. The accumulation scheme is applied to a typical tracking problem. As noted in the title, the paper by Marx-Gomez et al. uses a neuro-fuzzy system for forecasting. The fuzzy inferencing method is applied to the data from a simulation model and results are given on a particular product lifecycle. Doncescu et al. use a mixture of logic programming and wavelet transforms on a set of signals to control the reactions in a chemical reactor. Finally, Werges and Naylor introduce meta-learning into software components in order to improve the integration of artificial intelligence into software-controlled systems. They base their techniques on the CORBA distributed object methodology and show the results on standard data sets.

As can be seen from the above brief review, there was an enormous range of methods and application areas at EIS2000. Feedback from the conference was extremely positive and we anticipate that the next conference, EIS2002, to be held in Malaga will be equally successful.

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