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Preface

"Intelligent systems must perform in order to be in demand."

Intelligent systems technology is being applied steadily in solving many day-to-day problems. Each year the list of real-world deployed applications that inconspicuously host the results of research in the area grows considerably. These applications are having a significant impact in industrial operations, in financial circles, in transportation, in education, in medicine, in consumer products, in games and elsewhere. A set of selected papers presented at the seventeenth in the series of conferences on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems (IEA/AIE 2004), sponsored by the International Society of Applied Intelligence, is offered in this manuscript. These papers highlight novel applications of the technology and show how new research could lead to new and innovative applications. We hope that you find these papers to be educational, useful in your own research, and stimulating.

In addition, we have introduced some *special sessions* to emphasize a few areas of artificial intelligence (AI) that are either relatively new, have received considerable attention recently or perhaps have not yet been represented well. To this end, we have included special sessions on e-learning, bioinformatics, and human-robot interaction (HRI) to complement the usual offerings in areas such as data mining, machine learning, intelligent systems, neural networks, genetic algorithms, autonomous agents, natural language processing, intelligent user interfaces, evolutionary computing, fuzzy logic, computer vision and image processing, reasoning, heuristic search, security, Internet applications, constraint satisfaction problems, design, and expert systems.

E-Learning

With its ability to reduce operating costs and train more people, e-learning is an attractive option for companies that are trying to balance business and educational goals. Information technology (IT) is rapidly changing the landscape of e-learning with the advent of new intelligent and interactive on-line learning technologies, multimedia electronic libraries, collaborative communities and workspaces, and improving knowledge sharing and education practices.

In particular, with the rapid development of the Internet and the World Wide Web, university and college programs offered in distributed e-learning environments are an alternative form of education for those students who are best served by flexible location and time schedules. The situation in which distance education is primarily used in selective situations to overcome problems of scale (not enough students in a single location) and rarity (a specialized subject not locally available) is being changed. The major trends of e-learning are *multi-mode integration*, *learner-centered environments*, and *service-oriented institutions*.

We selected for this special session a collection of outstanding papers highlighting the work of researchers and practitioners from academia and industry.

Human-Robot Interaction

Recently, humanoid robots such as Honda's ASIMO and Sony's QRIO or pet robots such as Sony's AIBO have become quite familiar and thus the symbiosis of robots and humans

has become an exciting research area. Some of the many research topics being pursued include: expressive interaction with face/voice/gesture; spoken dialogue processing, dialogue modeling, user modeling, personality, and prosody; gesture recognition, face recognition, and facial expression; sound localization and visual localization; tactile and other sensory perception; and multi-modal integration of sensory information

At previous IEA/AIE conferences, low-level interactions were reported. However, this special session focuses on higher-level human-robot interactions. Through interactions with people, a humanoid robot recognizes the emotional states of a human by spoken dialogue or recognizes relationships between people and adapts its behaviors through a dynamic learning system. In addition, design methodology is discussed by observing human-robot interactions. We hope this special session will lead to more human-robot interaction research papers at IEA/AIE conferences.

Bioinformatics

Bioinformatics is an interdisciplinary research area, where computer scientists solve interesting and important problems in molecular biology by building models and manipulating huge amounts of data generated by biologists around the globe. The techniques being used by computer scientists include clever design of data structures and algorithms, machine learning, AI techniques and statistical methods. In the postgenome era, innovative applications of such techniques have been used to solve problems in molecular biology including protein-to-protein interaction, gene discovery and secondary structure prediction. We feel that it is time for the AI community as a whole to embrace bioinformatics with its challenging and interesting problems for the application of AI. Some general problem-solving methods, knowledge representation and constraint reasoning that were originally developed to solve industrial applications are being used to solve certain types of problems in bioinformatics and vice versa. Inclusion of bio-informatics as a special session enriched the conference and also provided an opportunity for other AI practitioners to learn about the ongoing research agenda of bioinformatics, which in turn may foster future collaboration among the participants of this conference.

Acknowledgements

A total of 208 papers from 28 countries were submitted for consideration this year. Of those, 129 (including 4 for the HRI special session, 6 for the bioinformatics special session and 9 for the e-learning special session) were accepted for publication. This required a large effort on the part of many people. We extend our sincerest thanks to all of the committee members, the reviewers and the NRC Conference Services staff for their contribution.

May 2004

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