Intelligent Autonomous Systems 8

IAS-8

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IOS Press

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INTELLIGENT AUTONOMOUS SYSTEMS 8

Preface

IAS-8 brings the Intelligent Autonomous Systems Conference back to Amsterdam, the city which also hosted the first two IAS conferences. The annual **Euron Meeting** of the European Network of Excellence in Robotics is co-located with and immediately follows the IAS-8 conference. Since 1986, the IAS conferences have been meeting places for researchers on intelligent systems that can directly sense and act in their own environment without demanding detailed supervision from humans. These systems are beginning to enter our daily life in ambient intelligence applications. Many new challenges are emerging to create systems that can operate and interact in human inhabited environments. The goal of the IAS-8 Conference is to exchange and stimulate research ideas about how to bring active, intelligent systems into our daily lives.

The conference will take place at The Grand Hotel in the centre of Amsterdam. Successively a convent in the 15th century, the formal residence of royal guests in the 16th century, headquarters of the Dutch Admiralty in the Golden Age, then City Hall until 1988, it provides all the facilities for exhibitions and conferences close to the cultural activities in the centre of the city.

A total of 155 technical papers were submitted by authors from 33 countries. All the submissions were rigorously reviewed by the Program Committee. Of those submissions 104 were accepted as full papers and 30 as posters. The overall outcome of the revision process is an excellent selection of papers that shows the research of autonomous systems today. We have 3 invited guest speakers at IAS-8: Rolf Pfeiffer from the University of Zurich who will address Designing autonomous agents, Takanori Shibata from AIST, Tsukuba on Artificial Emotional Creatures and Manuela Veloso from Carnegie Mellon University on Multi-Robot Coordination in Highly Dynamic Environments

We would like to take this opportunity to thank everyone involved with the organization of IAS-8. First, we would like to thank the members of the Program Committee who did a thorough and conscientious job in reviewing a large number of papers. Ben Kröse coordinated the local arrangements assisted by Wannes van der Mark and Roel Segerink from the conference office of the University of Amsterdam. Bas Terwijn managed the Website and the electronic submission and reviewing process. The members of the Steering Committee provided invaluable help and support through the process of organizing the conference. It has been with the support of all these people and several others not mentioned here that the conference came into existence. We sincerely appreciate all the hard work they put in to make this conference a success.

Finally, we would like to thank our sponsors TNO-FEL, DECIS and the University of Amsterdam. Their financial support of this conference would not have been possible.

We warmly welcome all to join us in Amsterdam in March 2004!

Frans Groen, Nancy Amato, Eiichi Yoshida and Andrea Bonarini

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Invited Guest Speakers

Designing Autonomous Agents: The Interaction of Morphology, Materials, Control and Environment
Prof. Rolf Pfeifer,.Director, Artificial Intelligence Laboratory, University of Zurich

Human Interactive Robot for Psychological Enrichment and Robot Therapy
Dr. Takanori Shibata, Intelligent Systems Institute, AIST, Japan

Multi-Robot Coordination in Highly Dynamic Environments
Prof. Manuela M. Veloso, Computer Science Department, Carnegie Mellon University USA

Designing Autonomous Agents: The Interaction of Morphology, Materials, Brain and Environment

Rolf Pfeifer, Prof., Dr. sc. techn.
Director, Artificial Intelligence Laboratory
Department of Information Technology
University of Zurich

Abstract
The last two decades in the field of artificial intelligence have clearly shown that true intelligence always requires the interaction of an agent with a real physical and social environment. The concept of embodiment that has been introduced to designate the modern approach to designing autonomous agents has far-reaching implications. Rather than studying computation alone, we must consider the interplay between morphology, materials, brain (control), and the environment.
A number of case studies are presented, and it is demonstrated how artificial evolution and morphogenesis can be used to systematically investigate this interplay. Taking these ideas into account requires entirely novel ways of thinking, and often leads to surprising results.

Human Interactive Robot for Psychological Enrichment and Robot Therapy

Dr. Takanori Shibata
Intelligent Systems Institute, AIST, Japan
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Abstract
We have been developing mental commit robots that provide psychological, physiological, and social effects to human beings through physical interaction. The appearances of these robots look like real animals such as dog, cat, and seal. The dog and cat robots were developed as familiar animals to human, and a seal robot as a non-familiar animal. By results of experiments of subjective evaluation of these robots by public, we found the seal robot was the most acceptable by them, because, in the case of familiar animals, most people compared robots with real animals and became very severe in their evaluation. The experiments of subjective evaluation of the seal robot were conducted in U.K., Sweden, Italy, and Korea, as well as Japan. The results were all good and almost the same. Therefore, there were almost no difference in the results based on countries and cultures. The seal robot has been improved its functions and structure especially for "robot therapy." We have been applied seal robots to assisting therapy of children at pediatric wards, and to assisting activity of elderly people at elderly institutions. In order to investigate the effects of the seal robots to people, we evaluated the people's moods by face scales (which express person's moods by illustration of person's faces). In the case of elderly people, questionnaires and urinary tests were conducted additionally. Moreover, stress of nursing staff was investigated. We evaluated their mental poverty by "Burnout Scale." As the results, feelings of people were improved by interaction with the seal robots. Then, urinary tests of elderly people showed that their restoration abilities to the stress were also improved. Moreover, the nursing staff's mental poverty decreased because the elderly people are motivated and spent their time by themselves with the seal robots. Consequently, the seal robots were useful at pediatric wards and at elderly institutions. The Guinness World Records certified the seal robot as the most therapeutic robot in 2002.

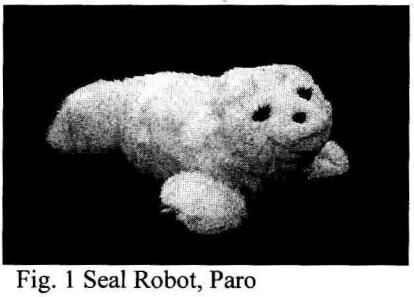

Fig. 1 Seal Robot, Paro

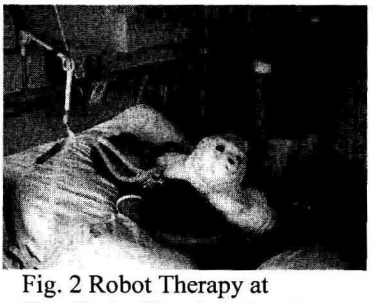

Fig. 2 Robot Therapy at Karolinska Hospital, Sweden

Multi-Robot Coordination in Highly Dynamic Environments

Manuela M. Veloso
Computer Science Department
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Carnegie Mellon University

Abstract

In recent years, many researchers have invested significant effort on investigating multi-robot systems. Robot soccer, as a pioneering multi-robot task, has offered a challenging research testbed. In robot soccer, a team of multiple robots faces an uncertain and dynamic environment created by an opponent team of robots.

We have researched in robot soccer developing single-robot and multi-robot perception, cognition, and action algorithms. To form an effective team of robots, individual robots need to be skilled. We have developed effective object recognition, localization, and behavior-based algorithms. In addition, to achieve a reliable team of robots, we research on team coordination strategies, team response to a dynamic world, behavior recognition, opponent modeling, and multiagent learning.

In this talk, I will present our contributions to multi-robot coordination for our robot soccer teams, in particular a team of small wheeled robots and a team of communicating four-legged Sony AIBO robots. I will also present our skills-tactics-plays architecture for adaptation of team plays to different opponent teams. I will conclude setting my research goals in perspective and discussing some of the fascinating open questions to be addressed towards creating teams of truly autonomous robots.

Contents

Part 2. Cooperative Robotics

Part 3. Distributed Decision Making

Part 4. Learning and Adaptive Systems

Part 5. Mobile Robot Navigation