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Programming Multi-Agent Systems

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Revised Selected Papers

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Preface

These are the proceedings of the International Workshop on Programming Multi-Agent Systems (ProMAS 2010). It was the eighth of a series of workshops that has the main objective of giving an overview of current research on programming multi-agent systems and providing an interactive discussion forum for agent researchers.

The ProMAS workshop series aims at promoting and contributing to the establishment of multi-agent systems as a mainstream approach to the development of industrial-strength software. More specifically, the workshop facilitates the discussion and exchange of ideas concerning the concepts, techniques, and tools that are important for establishing multi-agent programming platforms that are useful in practice and have a theoretically sound basis.

In its previous editions, ProMAS constituted an invaluable occasion bringing together leading researchers from both academia and industry to discuss issues on the design of programming languages and tools for multi-agent systems. We are very pleased to be able to again present a range of high-quality papers from ProMAS 2010. After seven successful editions of the ProMAS workshop series, which took place at AAMAS 2003 (Melbourne, Australia), AAMAS 2004 (New York, USA), AAMAS 2005 (Utrecht, The Netherlands), AAMAS 2006 (Hakodate, Japan), AAMAS 2007 (Honolulu, Hawai'i), AAMAS 2008 (Estoril, Portugal) and AAMAS 2009 (Budapest, Hungary), the eighth edition took place on May 11 in Toronto, Canada, in conjunction with AAMAS 2010, the main international conference on autonomous agents and multi-agent systems. For ProMAS 2010 we finally accepted six high-quality submissions for presentation at the workshop.

In addition, we invited one distinguished scientist, Sarit Kraus, to give an invited talk on "Human–Computer Negotiation: Learning from Different Cultures."

Following the workshop, we set up a new submission, evaluation and revision process for publishing these proceedings. The authors of the papers accepted for the workshop were invited to submit revised papers. In addition we invited a few more papers from people active in the area. Each paper was reviewed by two members of the Program Committee and by the editors. Authors were then requested to further revise their submissions. After a careful selection, we accepted seven papers plus one invited paper for these proceedings.

The workshop addressed a broad range of mostly practical topics. While two papers deal with the decision component of agent systems, three papers deal with practical examples of programming languages and two papers deal with the interaction with the environment.

We thank the authors whose contributions made this book possible. We also thank the members of the Program Committee for their dedication in successive rounds of reviewing papers.

As for previous editions, we hope that the work described in these proceedings will contribute to the overall goal of stimulating the uptake of agent programming languages and the adoption of agent-based tools for real-world applications.

January 2010   Rem Collier
                                                     Jürgen Dix
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Papers in This Volume

These proceedings contain one invited paper, by Michal Pěchouček, Michal Jakob and Peter Novák, entitled "Towards Simulation-Aided Design of Multi-Agent Systems." This paper gives a vision of how powerful a tool hybrid simulations can become in the future. This is grounded in several case studies done at Michal Pěchouček's lab in Prague.

The first regular paper in these proceedings is the one by Joost Broekens, Koen Hindriks, and Pascal Wiggers on "Reinforcement Learning as Heuristic for Action-Rule Preferences." The authors note that many action selection mechanisms in agent-oriented programming are based on rules and leave a great potential for optimization. However, this is difficult to achieve in BDI-like concepts. The authors propose a learning method for sets of rules based on reinforcement.

The second paper, "Towards Reasoning with Partial Goal Satisfaction in Intelligent Agents," by M. Birna van Riemsdijk and Neil Yorke-Smith presents an abstract framework for representing the partial satisfaction of goals. The representation is not based on logic but on metric functions that represent the progress that has been made toward achieving a goal.

In "Evaluating Agent-Oriented Programs: Towards Multi-Paradigm Metrics," Howell R. Jordan and Rem Collier consider metrics for the software engineering process in multi-agent systems. The paper is an attempt toward multi-paradigm structural metrics, which can be applied seamlessly to both agents and the object-oriented environments in which they live. Applications to Jason written in AgentSpeak and Java are given.

In "Atomic Intentions in Jason+," Daniel Kiss, Neil Madden, and Brian Logan deal with interactions between atomic intentions and plan failures in Jason. Atomic intentions in Jason are normally not atomic when considered in conventional programming or in databases. The authors therefore introduce a new semantics and its implementation, Jason+, and claim that this leads to more robust agent programs.

Hugo Carr, Alexander Artikis, and Jeremy Pitt deal, in "Software Support for Organised Adaptation," with *emergence* as a mechanism for coordinating hundreds of agents. The authors define a new programming environment, PreSage-MS, a rapid prototyping and animation tool designed to facilitate experiments in organized adaptation of metric spaces of agent teams.

In the paper "Action and Perception in Agent Programming Languages: From Exogenous to Endogenous Environments" by Alessandro Ricci, Andrea Santi, and Michele Piunti, the authors discuss action and perception models in agent programming languages and note that they cannot deal well with endogenous environments. They describe models specifically designed for such environments and evaluate them using CArtAgO.

Finally, in "An Interface for Agent-Environment Interaction," Tristan Behrens, Koen V. Hindriks, Rafael H. Bordini, Lars Braubach, Mehdi Dastani, Jürgen Dix, Jomi F. Hübner and Alexander Pokahr treat the problem of how exactly agents and environments interact. While there are many interesting environments available, there is no standard that would enable agents to easily interface with them. The paper is a first step toward an environment interface standard. The standard has been implemented and evaluated in a number of agent platforms.

Organization

The ProMAS 2010 workshop was held on May 11, 2010, in Toronto, Canada. The workshop was part of the AAMAS 2010 Workshop Program.

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