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Multi-Agent System Engineering

9th European Workshop
on Modelling Autonomous Agents
in a Multi-Agent World, MAAMAW'99
Valencia, Spain, June 30 – July 2, 1999
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Preface

In the ten years since the first MAAMAW was held in 1989, at King's College, Cambridge, the field of Multi-Agent Systems (MAS) has flourished. It has attracted an increasing amount of theoretical and applied research.

During this decade, important efforts have been made to establish the scientific and technical foundations of MAS. MAAMAW publications are testimony to the progress achieved in key areas such as agent modelling and reasoning, multi-agent interaction and communication, and multi-agent organisation and social structure. Research results have covered a wide range of inter-related topics in each area including agent architectures, reasoning models, logics, conflict resolution, negotiation, resource allocation, load balancing, learning, social behaviour and interaction, languages and protocols, interagent and agent-human communication, social models, agent roles, norms and social laws, and static and dynamic organisational structures.

The feasibility and the viability of the proposed models and techniques have been demonstrated through MAS applications in heterogeneous domains including electronic commerce, co-operative work, telecommunications, social and biological systems, robotics, office and business automation, public administration, social simulations and banking.

As the applicability of the technology became understood, the multi-agent paradigm has been progressively accepted by product managers and system developers, giving rise to a considerable amount of business expectation from industry. These expectations do not rest on the concept or metaphor of agent, but on the development of MAS useful in an industrial setting, with real-time systems presenting the biggest challenge.

The choice of MAS engineering as the central theme of the MAAMAW'99 underlines the need of workable solutions for incorporating the scientific and technological knowledge on MAS into useful systems, according to industrial and customers' demands.

The need for pragmatic approaches that allow for the rapid development of large MAS applications and services will continue to increase in the first decades of the next century, when most of the economical and social activity can be carried out over the global networks. It seems natural to imagine this emergent world of services and "virtual" goods populated by organisations of intelligent and mobile agents managing resources and services, carrying out tedious, repetitive and laborious tasks, negotiating with other agents for finding cost-effective solutions, helping service providers to get new clients, performing security tasks and achieving trading, commerce and information task on behalf of users.

Building this complex virtual world with its organised inhabitants will only be possible if there is a solid engineering discipline for agent development. This will require tight collaboration between researchers and engineers in order to know what the real problems are. Feedback from engineering will raise two related challenges to the MAS research community. First to extend existing models to large scale MAS applications, and second to elaborate and validate new techniques and theories considering a variety of new MAS aspects such as stability, robustness, reliability,

scalability, reusability, security, performance, life-cycle, cost-effectiveness efficiency, and usability.

In software engineering, practical development of large complex systems have been much faster than in the research community. However, when scientific knowledge contributes to improve the production process or the quality of products, this knowledge is quickly assimilated by engineers into routine development.

The last MAAMAW of this millennium aims at providing the environment and the rich atmosphere needed for presenting innovative contributions and for debating new ideas for MAS engineering and other related topics. The city of Valencia will host this meeting, giving to the workshop participants the opportunity of enjoying the richness of its historical and cultural atmosphere. This book contains the seventeen papers selected by the program committee for presentation during the workshop. It also includes an invited text by Nick Jennings, who kindly accepted to participate as MAAMAW'99 keynote speaker. The volume is structured into five thematic groups according to the topics addressed by the papers.

The section on the engineering aspects of MAS starts out with the contribution by Jennings. The paper develops the concept of agent-oriented software engineering, addressing its advantages, as well as the limitations that must be overcome.

Three more papers then address engineering issues such as the specification of behavioural requirements, agent-oriented design, and analysis of experiences in the development of software agents in different domains. The MAS framework section comprises three papers. The first contribution presents an open environment based on FIPA recommendations. The second addresses the modelling of real-time agents, and the third discusses mobile agent co-operation and co-ordination issues on the Internet. Four papers in the Languages and protocols section address several related topics: MAS engineering, the design of agent communication languages, the definition of a temporal agent communication language, and the use of multi-paradigm languages for MAS development. The section on negotiation and co-operation contains four papers, two of which describe different models of agent negotiation. The first paper proposes a model based on argumentation, while the second is based on generic negotiation architecture to automate the agreement between parties. The two remaining articles focus on co-operation models. The first addresses plan selection in BDI-like agents, and the second presents an extension of existing reasoning mechanisms to cope with multiple partner coalition in MAS. The last group contains four papers addressing formal aspects of MAS. The first paper focuses on clarification and systematisation of mental attitudes in agents, proposing an integrated and coherent model. The second paper describes a doxastic logic based on subjective situations, to avoid logical omniscience. A formal framework for the analysis and specification of models for the dynamics of trust based on experiences is presented in the last paper.

Acknowledgments

We would like to thank all the people who helped bring about MAAMAW'99. First of all, thanks to the contributing authors for ensuring the richness of the workshop and for their co-operation in the preparation of this volume.

Special thanks are due to the members of the program committee, aided by the auxiliary reviewers, for their professionalism and their dedication in selecting the best papers for the workshop.

Thanks also to the MAAMAW Advisory Board for their guidance and their continuous support.

We owe particular gratitude to the invited speakers for sharing with us their experiences and most recent research results.

Nothing would have been possible without the initiative and dedication of the organising committee at the DSIC Department in the Universidad Politecnica de Valencia. The chair Vicente Botti and his team did a great job.

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