

# Lecture Notes in Artificial Intelligence 2927

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

**Springer**

*Berlin*

*Heidelberg*

*New York*

*Hong Kong*

*London*

*Milan*

*Paris*

*Tokyo*

David Hales Bruce Edmonds  
Emma Norling Juliette Rouchier (Eds.)

# Multi-Agent-Based Simulation III

4th International Workshop, MABS 2003  
Melbourne, Australia, July 14, 2003  
Revised Papers



Springer

## Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA  
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

## Volume Editors

David Hales  
Bruce Edmonds  
Manchester Metropolitan University  
Centre for Policy Modelling  
Aytoun Building, Aytoun Street, Manchester M1 3GH, UK  
E-mail: dave@davidhales.com; bruce@cfpm.org

Emma Norling  
The University of Melbourne  
Dept. of Computer Science and Software Engineering  
Victoria 3010, Australia  
E-mail: E.Norling@csse.unimelb.edu.au

Juliette Rouchier  
Greqam (CNRS) - Centre de la vieille Charité  
2 Rue de la Charité, 13002 Marseille, France  
E-mail: rouchier@ehess.vcharite.univ-mrs.fr

## Cataloging-in-Publication Data applied for

A catalog record for this book is available from the Library of Congress.

Bibliographic information published by Die Deutsche Bibliothek  
Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie;  
detailed bibliographic data is available in the Internet at <<http://dnb.ddb.de>>.

CR Subject Classification (1998): I.2.11, I.2, I.6, C.2.4, J.4, H.5

ISSN 0302-9743

ISBN 3-540-20736-8 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag is a part of Springer Science+Business Media  
[springeronline.com](http://springeronline.com)

© Springer-Verlag Berlin Heidelberg 2003  
Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Protago-TeX-Production GmbH  
Printed on acid-free paper      SPIN: 10976586      06/3142      5 4 3 2 1 0

# Preface

This volume presents revised versions of the papers presented at the 4th International Workshop on Multi-agent Based Simulation (MABS 2003), a workshop federated with the 2nd International Joint Conference on Autonomous Agents and Multi-agent Systems (AAMAS 2003), which was held in Melbourne, Australia, in July 2003. In addition to the papers presented at the workshop, three additional papers have been included in this volume (Robertson, Noto et al., and Marietto et al.).

Multiagent Based Simulation (MABS) is a vibrant interdisciplinary area which brings together researchers active within the agent-based social simulation community (ABSS) and the multiagent systems community (MAS). These two communities have different, indeed somewhat divergent, goals. The focus of ABSS is on simulating and synthesizing social behaviors in order to understand observed social systems (human, animal and even electronic) via the development and testing of new models and concepts. MAS focuses instead on the solution of hard engineering problems related to the construction, deployment and efficient operation of multiagent-based systems.

Increasingly however – and this was evidenced at AAMAS 2002 – the MAS and ABSS communities have much to learn from each other. Real human societies are generally self-organizing, highly scalable, robust and open, and the ABSS community has developed a sizable set of techniques, observations and models that give insight into some of the mechanisms that underpin these kinds of systems. However, ABSS has not concerned itself with applying these techniques to solve engineering problems. Conversely, the MAS community is concerned with creating working agent systems that solve real problems. This focus has forced many to abandon experimentation with large-scale systems (thousands of agents) composed of smart autonomous agents (e.g., complex adaptive learners) due to the lack of traditional techniques (and/or computational resources) for managing such complexity.

This difference of emphasis often precludes dialogue between ABSS and MAS researchers and practitioners, but MABS workshops have a track record of providing a major forum for such dialogue to occur. The work presented in various sections of the AAMAS 2002 main conference demonstrated a keen interest in the use of learning and adaptation combined with large-scale agent societies — increasingly, sociological issues such as cooperation, trust and power hierarchies are being broached from the engineering perspective. In light of this, the 2003 MABS workshop returned to its original aim, asking researchers from each community to identify problems and challenges for those in the other community.

The MABS workshop offers a potential linkage (shared vocabulary and methodology) between social scientists and MAS researchers, and at MABS 2003 we attempted to focus on the development of this linkage. To this end, Giovanna Di Marzo Serugendo was invited to open the proceedings with a presentation of her work on utilizing self-organization to produce solutions to software engineering problems. A paper based on this talk can be found in this volume. MABS 2003 was the fourth workshop in the MABS series. The first two were organized as federated workshops of ICMAS 1998 and ICMAS

2000. The third MABS workshop was federated with AAMAS 2002 (which subsumed the ICMAS series). The first MABS workshop, held in Paris at ICMAS 1998, had as its aim “to develop stronger links between those working in the social sciences, for whom agent based simulation has the potential to be valuable research tool, and those involved with multi-agent simulation, for whom the social sciences can provide useful concepts and exemplars”. The proceedings were published by Springer in LNAI 1534, in a volume called *Multi-Agent Systems and Agent-Based Simulation*. The second MABS workshop, held in Boston at ICMAS 2000, extended this development, and provided substantial discussions. The presentations focused on lessons of social simulation for DAI, on the supporting and reporting of social simulation modeling and on social simulation-based software applications. These were published by Springer-Verlag in LNAI 1979, in a volume called *Multi-Agent-Based Simulation*. The third MABS workshop, held in Bologna at AAMAS 2002, continued the aim of developing and supporting links between social science and Multi-Agent Systems practitioners via the medium of multiagent-based simulation. Additionally, the workshop echoed a specific AAMAS 2002 topic: “interactions between people and agent technology.” The workshop proceedings were published by Springer-Verlag in LNAI 2581, called *Multi-Agent-Based Simulation II*.

This fourth MABS workshop continued the tradition of high-quality presentations, discussion and debate coupled with a multidisciplinary approach, and we thank all those who made it possible, including the AAMAS general and local organizers who ran an incredibly professional conference and provided us with excellent workshop facilities.

Finally, we must also thank Alfred Hofmann and the Springer team for again supporting the dissemination of this latest installment of the MABS series.

Manchester, September 2003

David Hales  
Bruce Edmonds  
Emma Norling  
Juliette Rouchier

# Organization

## Organizing Committee

David Hales (CPM, Manchester Metropolitan University, UK)  
Juliette Rouchier (GREQAM/CNRS, France)  
Emma Norling (University of Melbourne, Australia)  
Bruce Edmonds (CPM, Manchester Metropolitan University, UK)  
Roberto Pedone (ICST/CNR, Italy)

## Program Committee

Robert Axtell (Brookings Institution, USA)  
Rafael Bordini (University of Liverpool, UK)  
Francois Bousquet (CIRAD/IRRI, France)  
Helder Coelho (University of Lisbon, Portugal)  
Rosaria Conte (IP/CNR Rome, Italy)  
Paul Davidsson (Blekinge Inst. of Tech., Sweden)  
Nuno David (ISCTE, Lisbon, Portugal)  
Alexis Drogoul (University of Paris VI, France)  
Nigel Gilbert (University of Surrey, UK)  
Nick Gotts (Macaulay Institute, UK)  
Matt Hare (University of Zurich, Switzerland)  
Rainer Hegselmann (Univ. of Bayreuth, Germany)  
Wander Jager (Univ. of Groningen, Netherlands)  
Marco Janssen (Indiana University, USA)  
Scott Moss (University of Manchester, UK)  
Mario Paolucci (IP/CNR Rome, Italy)  
Keith Sawyer (Washington Univ. in St. Louis, USA)  
Jaime Sichman (Univ. of Sao Paulo, Brazil)  
Liz Sonenberg (Univ. of Melbourne, Australia)  
Takao Terano (Univ. of Tsukuba, Japan)  
Klaus Troitzsch (Univ. of Koblenz, Germany)  
Harko Verhagen (University of Stockholm, Sweden)  
Christophe Le Page (CIRAD, France)

# Table of Contents

## MABS Techniques for MAS

Engineering Emergent Behaviour: A Vision . . . . .	1
<i>Giovanna Di Marzo Serugendo</i>	
Employment Decisions Supporting Organizations of Autonomous Agents . . . . .	8
<i>Foster McGeary, Keith Decker</i>	
Towards Verification and Validation in Multiagent-Based Systems and Simulations: Analyzing Different Learning Bargaining Agents . . . . .	26
<i>Keiki Takadama, Yutaka L. Suematsu, Norikazu Sugimoto, Norberto E. Nawa, Katsunori Shimohara</i>	
Weak Interaction and Strong Interaction in Agent Based Simulations . . . . .	43
<i>Fabien Michel, Abdelkader Gouaïch, Jacques Ferber</i>	

## Economics, Exchange, and Influence in Virtual Worlds

Using Qualitative Exchange Values to Improve the Modelling of Social Interactions . . . . .	57
<i>Maira Ribeiro Rodrigues, Antonio Carlos da Rocha Costa</i>	
Bilateral Tradings with and without Strategic Thinking . . . . .	73
<i>Shinji Tomita, Akira Namatame</i>	
Monetary Policy and Banks' Loan Supply Rules to Harness Asset Bubbles and Crashes . . . . .	89
<i>Ichiro Takahashi, Isamu Okada</i>	
Social Change: Exploring Design Influence . . . . .	106
<i>Ricardo Sosa, John S. Gero</i>	
Social Prejudice: Cognitive Modelling and Simulation Findings . . . . .	120
<i>Livio Noto, Mario Paolucci, Rosaria Conte</i>	

## MABS Techniques for Real World Modelling

A Methodology for Eliciting and Modelling Stakeholders' Representations with Agent Based Modelling . . . . .	131
<i>Nicolas Becu, François Bousquet, Olivier Barreteau, Pascal Perez, Andrew Walker</i>	



Modelling a European Decision Making Process with Heterogeneous Public Opinion and Lobbying: The Case of the Authorization Procedure for Placing Genetically Modified Organisms on the Market . . . . .	149
<i>Juliette Rouchier, Sophie Thoyer</i>	
Evaluation of Usability of Dial-a-Ride Systems by Social Simulation . . . . .	167
<i>Itsuki Noda, Masayuki Ohta, Kosuke Shinoda, Yoichiro Kumada, Hideyuki Nakashima</i>	
The Strategy Hypercube: Exploring Strategy Space Using Agent-Based Models . . . . .	182
<i>Duncan A. Robertson</i>	
<b>Understanding and Classifying MABS</b>	
A Classification of Paradigmatic Models for Agent-Based Social Simulation . . . . .	193
<i>Maria Bruno Marietto, Nuno David, Jaime Simão Sichman, Helder Coelho</i>	
<b>Author Index</b> . . . . .	209