

# Lecture Notes in Artificial Intelligence 7068

Subseries of Lecture Notes in Computer Science

LNAI Series Editors

Randy Goebel

*University of Alberta, Edmonton, Canada*

Yuzuru Tanaka

*Hokkaido University, Sapporo, Japan*

Wolfgang Wahlster

*DFKI and Saarland University, Saarbrücken, Germany*

LNAI Founding Series Editor

Joerg Siekmann

*DFKI and Saarland University, Saarbrücken, Germany*

Francien Dechesne Hiromitsu Hattori  
Adriaan ter Mors Jose Miguel Such  
Danny Weyns Frank Dignum (Eds.)

# Advanced Agent Technology

AAMAS 2011 Workshops  
AMPLE, AOSE, ARMS, DOCM<sup>3</sup>AS, ITMAS  
Taipei, Taiwan, May 2-6, 2011  
Revised Selected Papers

## Series Editors

Randy Goebel, University of Alberta, Edmonton, Canada  
Jörg Siekmann, University of Saarland, Saarbrücken, Germany  
Wolfgang Wahlster, DFKI and University of Saarland, Saarbrücken, Germany

## Volume Editors

Francien Dechesne  
Adriaan ter Mors  
Technische Universiteit Delft, The Netherlands  
E-mail: {f.dechesne; a.w.termors@tudelft.nl}

Hiromitsu Hattori  
Kyoto University, Japan  
E-mail: hatto@i.kyoto-u.ac.jp

Jose Miguel Such  
Universidad Politécnica de Valencia, Spain  
E-mail: jsuch@dsic.upv.es

Danny Weyns  
Linnaeus University, Växjö, Sweden  
E-mail: danny.weyns@lnu.se

Frank Dignum  
Utrecht University, The Netherlands  
E-mail: f.p.m.dignum@uu.nl

ISSN 0302-9743 e-ISSN 1611-3349  
ISBN 978-3-642-27215-8 e-ISBN 978-3-642-27216-5  
DOI 10.1007/978-3-642-27216-5  
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011943106

CR Subject Classification (1998): I.2.11, I.2, C.2, H.3.4-5, H.5.3, I.6, J.1

LNCS Sublibrary: SL 7 – Artificial Intelligence

© Springer-Verlag Berlin Heidelberg 2012

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. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

*Typesetting:* Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

# Preface

The International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS) is without a doubt the most important conference in the area of agent research. Each year a number of workshops are organized in cooperation with AAMAS to discuss and present the latest results in more specialized areas. Some of these areas are big enough to warrant separate proceedings. However, certain workshops deal with very new or advanced topics and although they might be very successful they do not attract enough submissions to warrant separate proceedings. In this volume we bundle the papers from a number of these workshops.

I think we can rightfully state that the papers are of high quality and treat some of the new and advanced areas of research in agents. The workshops included are: Agent-based Modeling for PoLicy Engineering (AMPLE), Agent-Oriented Software Engineering (AOSE), Autonomous Robots and Multirobot Systems (ARMS), Data-Oriented Constructive Mining and Multi-Agent Simulation, Massively Multi-Agent Systems: Models, Methods and Tools (DOCM<sup>3</sup>AS) and Infrastructures and Tools for Multiagent Systems (ITMAS). Revised versions of the papers are included for each of the workshops. Some papers that were presented at the workshops were consequently submitted (and accepted) at other conferences. From these papers a two-page abstract is included such that a complete overview of all workshops can be maintained. In subsequent sections each workshop will be briefly introduced and an introduction to the papers of the workshop will be given.

## **AMPLE**

AMPLE was conceived as a workshop with particular focus on policy engineering as an application area for agent-based modeling. The goal of AMPLE is to connect agent and artificial society research on the one hand, with policy making, institutional analysis and tools like system dynamics and gaming on the other. We explore the benefits the combination could have for decision support in policy development, and for the further enrichment of agent-based modeling and simulation.

For the first AMPLE workshop at AAMAS 2011, we selected nine contributed papers, and invited Catholijn Jonker to give a talk at the start of the workshop. This talk very adequately set the stage for the rest of the day. It provided a number of central questions and a few statements on the main promises and challenges for agent-based modeling for policy engineering, which were illustrated with recent research experiences. These questions and statements served as threads throughout the workshop, to which everybody was able to connect their contribution.

We clustered the nine contributed papers around three themes: Methods, Culture and Policy Formulation. In the session on Methods, we collected the work on

influence mechanisms for information propagation presented by Andrew Wicker, a maritime customs simulation presented by Neil Yorke-Smith, and MAS as a decision support tool in the water rights market, presented by Pablo Noriega. The Culture session combined the contributions on distinguishing norm types in order to simulate compliance differences over different groups, presented by Francien Dechesne, on modeling culture in multi-agent organizations, presented by Alexis Morris, and on substantiating agent-based quality goals, presented by Sonja Pedell. The final session on Policy Formulation contained the work presented by Amineh Ghorbani on a framework for agent-based social simulation, and the work on agent-based motivation models, presented again by Sonja Pedell. An important and fruitful part of the workshop was an extended discussion session, for which we asked all speakers to prepare a statement on the main future perspectives and challenges for agent-based modeling for policy engineering. All in all, the participants agreed upon the joint conclusion that there are questions in policy making that require the fine granularity of agent-based modeling, but there is an important (and interesting!) challenge in developing evaluation methodologies. This has already proved to be material for new collaborations.

## **AOSE**

Since the early 1990s, multi-agent system researchers have developed a large body of knowledge on the foundations and engineering principles for designing and developing agent-based systems. The 11 past editions of the Agent-Oriented Software Engineering Workshop (AOSE) had a key role in this endeavor. For 2011, the workshop organizers and the Steering Committee decided to organize a special edition of AOSE. In particular, the objective was to wrap up the previous editions of the workshop with a discussion of the state of the art in the key areas of AOSE, and based on that outline the future of the field. The aim was to find a way out of the increasing fragmentation and fuzziness on software engineering in AOSE.

The workshop program included invited papers complemented by accepted papers from the call for papers. Invited papers were presented by renowned researchers and engineers in different areas of the field, including agent-oriented methodologies, coordination infrastructures for multi-agent systems, programming agents and multi-agent systems, engineering multi-agent organizations, engineering self-organizing systems, and agents and services. In addition to the invited papers, the workshop received nine regular papers. In this volume, a selection of four revised papers is included. The papers cover various topics in the field, including agent architectures, inter-agent coordination, and work that focuses on reuse. The authors pay particular attention to challenges for future research and the position of their work in the broader field of agent-oriented software engineering and software engineering in general.

The organizers are sincerely grateful to Jorge J. Gómez Sanz and Ingrid Nunes for the support with organizing the workshop.

## ARMS

Robots are agents, too. Indeed, agent researchers are sometimes inspired by robots, sometimes use robots in motivating examples, and sometimes make contributions to robotics. Both practical and analytical techniques in agent research influence, and are being influenced by, research into autonomous robots and multi-robot systems.

Despite the significant overlap between the multi-agent and robotics research areas, roboticists and agents researchers have only a few opportunities to meet and interact. The recently established robotics track at AAMAS is one such opportunity. The goal of the ARMS workshop is to extend and widen this opportunity, by offering a forum where researchers in this area of research can interact and present promising innovative research directions and new results. The workshop was coordinated and associated with the AAMAS robotics track.

For this year's call, special consideration was given to the coordination of autonomous mobile robots. Existing approaches such as motion planning (constructing conflict-free trajectories in space and time), route planning (e.g., based on reserving exclusive time slots), and designing traffic systems often originate from different fields of research; we believe all of these approaches can benefit from the cross-fertilization a workshop such as ARMS aims to achieve.

We received 14 submissions to the ARMS workshop, 12 of which were accepted; the authors of 11 submission decided to publish their papers in these joint proceedings. The wide range of topics covered by these contributions were treated in five sessions at the workshop. In the Human–Robot Interaction session, a paper by Hindriks et al. studied a robot with socio-cognitive interaction abilities in an interaction setting, while Sklar et al. considered how a team of robots, each with limited mobility and sensing capabilities, can work with a human operator in a dynamic environment. Finally, the paper by Scerri posed a challenge problem on flood disaster mitigation using multiple, unmanned surface vehicles (boats); if you join in the research, they may even send you a boat!

The Robot Perception session consisted of two contributions. Sadeh-Or and Kaminka presented an anytime version of the feature-matching algorithm SURF that aims to reduce the computation time for real-time vision-based tasks. In the paper by Agmon and Elmaliah, a robot tries to navigate an environment when it is unable to accurately determine its location, for instance, due to low-quality sensors. In the related session on Robot Exploration, Mesbah and Doshi considered the situation where not only a robot's own location is uncertain, but also the location of other, possibly non-cooperative robots. The authors generalize particle filtering, and employ behavioral models of other robots, to tackle the localization tasks. Finally, Keidar et al. developed frontier exploration methods that save computation time by processing only new readings, rather than the entire map, as is common in frontier-detection algorithms.

The session on Robots in Motion contained two papers on route planning through the use of reservations: robots reserve locations in space and time to avoid collisions, and to be able to find route plans that are optimal with regard to a set of existing reservations. Wang and Goh showed how their algorithm can

be applied in an interactive educational system in which cube-like mobile robots arrange themselves on a mat to assist children in spelling exercises. Callies et al. developed an approach in which agents negotiate over potential conflicts as late as possible, because future conflicts may be resolved as a by-product of earlier negotiation outcomes.

The final session of the workshop was on Multi-Robot Teamwork. In the paper by Cheng et al., robots employ Q-learning to learn both the formation and the size of a coalition in area coverage problems. Korsah et al. studied the problem of optimal assignment of spatially distributed tasks to multiple cooperative robots. An envisioned application domain is emergency response, in which patients need to be brought to a safe location, and medical personnel needs to be present to assist in the extraction and transportation.

### **DOCM<sup>3</sup>AS**

The primary aim of the DOCM<sup>3</sup>AS workshop is to facilitate the collaboration among researchers on multi-agent simulation (MASim), data mining (DM), and massively multi-agent systems (MMAS). While MASim researchers have simulation and modeling technologies, DM researchers have analytical and knowledge-retrieval techniques. There is thus a complementary relationship between MASim and DM researches. Furthermore, MMAS technologies are fundamental for reproducing and generating mega-scale complex systems, such as human society, social systems, the Internet, and the WWW. Therefore, the ultimate goal of this workshop is to create a new multi-agent research area by synthesizing these different areas.

In fact, to understand mega-scale complex phenomena, technologies and methodologies for simulation, knowledge discovery, and computational modeling are required. Although MASim and MMAS researchers are good at working on the implementation of tools for multi-agent simulations and the design of computational models, they are not necessarily experts of knowledge discovery who can extract essentials of complex systems. On the other hand, DM researchers are technicians for knowledge discovery although, it is usually hard for them to actively analyze obtained knowledge through simulations. The challenge of DOCM<sup>3</sup>AS is to create a bridge between multi-agent simulation and DM technologies, and subsequently find the best mix of MASim and DM technologies.

For the first workshop, we got seven submissions and selected five papers from these. Even in five papers, we could secure diversities of research topics, such as human behavior modeling, analysis of emergent organizational phenomena, and massive multi-agent simulations for practical issues. However, this is still not enough to develop a good combination among MAS and DM researches. We will continue to make an effort at accelerating new research activities.

### **ITMAS**

ITMAS 2011 followed the success of its predecessor ITMAS 2010, which was the very first edition of ITMAS. ITMAS 2010 was held in conjunction with AAMAS 2010 in Toronto (Canada). ITMAS 2011 was again held in conjunction with AAMAS 2011, this time in Taipei (Taiwan).

ITMAS aims at bringing together leading researchers from both academia and industry to discuss issues on the design and implementation of infrastructures and tools for multi-agent systems. When developing applications based on multi-agent systems, developers and users demand infrastructures and tools which support essential features in multi-agent systems (such as agent organizations, mobility, etc.) and facilitate the system design, management, execution and evaluation. Agent infrastructures are usually built using other technologies such as grid systems, service-oriented architectures, P2P networks, etc. In this sense, the integration and inter-operability of such technologies in multi-agent systems is also a challenging issue in the area of both tools and infrastructures for multi-agent systems. A long-term goal is the industrial development of infrastructures for building highly scalable applications comprising pre-existing agents that must be organized or orchestrated.

In order for multi-agent systems to be included in real domains such as media and Internet, logistics, e-commerce and health care, infrastructures and tools for multi-agent systems should provide efficiency, scalability, security, management, monitoring and other features related to building real applications.

This year we had 17 submissions from which 9 were finally accepted. This confirms both the relevance and interest of the workshop. Moreover, all of the submissions received were of high quality. We had three papers describing works that integrate different existing technologies to support MAS (Frantz et al., Sensoy et al., and Such et al.); two papers describing infrastructures and tools that support normative MAS (Criado et al., and Oh et al.); two papers describing infrastructures and tools for MAS with adaptive capabilities (Alberola et al., and Centeno et al.); Laclavik et al. presented an evaluation of agent platforms for the simulation of human behavior modeling; and finally, Sensoy presented an architecture based on evolving semantics for agent-based collaborative search.

October 2011

Frank Dignum  
 Francien Dechesne  
 Hiromitsu Hattori  
 Adriaan ter Mors  
 Jose Miguel Such  
 Danny Weyns



# Organization

## Editors

Francien Dechesne	Delft University of Technology, The Netherlands
Hiromitsu Hattori	Kyoto University, Japan
Adriaan ter Mors	Delft University of Technology, The Netherlands
Jose Miguel Such	Universitat Politècnica de València, Spain
Danny Weyns	Linnaeus University, Sweden
Frank Dignum	Utrecht University, The Netherlands

## Workshop Organizers AMPLE

Francien Dechesne	Delft University of Technology, The Netherlands
Virginia Dignum	Delft University of Technology, The Netherlands
Amineh Ghorbani	Delft University of Technology, The Netherlands
Julian Padget	University of Bath, UK

## Program Committee AMPLE

Frances Brazier	Delft University of Technology, The Netherlands
Rosaria Conte	IRC, Italy
Nuno David	University of Lisbon, Portugal
Frank Dignum	Utrecht University, The Netherlands)
Bruce Edmonds	Center for Policy Modeling, Manchester, UK
Andreas Ernst	University of Kassel, Germany
Armando Geller	George Mason University, USA
Nigel Gilbert	University of Surrey, UK
Maria Gini	University of Minnesota, USA
Gertjan Hofstede	University of Wageningen, The Netherlands
Jeroen van den Hoven	Delft University of Technology, The Netherlands
Catholijn Jonker	Delft University of Technology, The Netherlands

Jens Pfau	University of Melbourne, Australia
Nicole Ronald	Technical University of Eindhoven, The Netherlands
Jaime Sichman	Polytechnal University of Sao Paulo, Brazil
Barry Silverman	University of Pennsylvania, USA
Liz Sonenberg	University of Melbourne, Australia
Yao-Hua Tan	Delft University of Technology, The Netherlands

## **External Reviewers AMPLE**

Sara Casare	University of São Paulo, Brazil
-------------	---------------------------------

## **Workshop Organizers AOSE**

Danny Weyns	Linnaeus University, Sweden
Jörg Müller	Technische Universität Clausthal, Germany

## **Program Committee AOSE**

Brian Henderson-Sellers	University of Technology, Sydney, Australia
Marie-Pierre Gleizes	IRIT, Université Paul Sabatier, France
Haralambos Mouratidis	University of East London, UK
Philippe Mathieu	University of Lille, France
Scott Deloach	Kansas State University, USA
Michael Winikoff	University of Otago, New Zealand
Ruben Fuentes	Universidad Complutense de Madrid, Spain
Paolo Giorgini	University of Trento, Italy
Aditya Ghose	University of Wollongong, Australia
Jeffrey Kephart	IBM T.J. Watson Research Center, USA
João Leite	Universidade Nova de Lisboa, Portugal
Flavio Oquendo	European University of Brittany - UBS/VALORIA, France
Michal Pechoucek	Czech Technical University Prague, Czech Republic
Frédéric Migeon	IRIT, Université Paul Sabatier, France
Juan Antonio Botia Blaya	Universidad de Murcia, Spain
Adriana Giret	Technical University of Valencia, Spain
Jorge J. Gómez Sanz	Universidad Complutense de Madrid, Spain
Juergen Lind	Iteratec GmbH, Germany
Anna Perini	Fondazione Bruno Kessler, IRST, Italy
Fariba Sadri	Imperial College London, UK
Alessandro Garcia	PUC-Rio, Brazil

Onn Shehory	IBM Haifa Research Lab, Israel
Eric Yu	University of Toronto, Canada
Laszlo Gulyas	Aitia International, Inc., Hungary
Alessandro Ricci	University of Bologna, Italy
Holger Giese	University of Postdam, Germany
Massimo Cossentino	Italian National Research Council, Italy
Van Parunak	Jacobs Technology, Jacobs Engineering, Ann Arbor, USA
Simon Miles	King's College London, UK
Gauthier Picard	SMA/G2I - Ecole des Mines de Saint-Etienne, France
Carole Bernon	IRIT, Université Paul Sabatier, France
Mark Klein	Software Engineering Institute, Carnegie Mellon, USA

## Workshop Organizers ARMS

Adriaan ter Mors	Delft University of Technology, The Netherlands
Gal Kaminka	Bar Ilan University, Israel
Simon Parsons	Brooklyn College, USA
Ayanna Howard	Georgia Tech, USA
Emanuele Menegatti	Università degli Studi di Padova, Italy
Pedro Lima	Instituto Superior Técnico, Portugal
Sonia Chernova	Worcester Polytechnic Institute, USA
Daniele Nardi	Sapienza Università di Roma, Italy
Erol Sahin	Middle East Technical University, Turkey
Elisabeth Sklar	Brooklyn College, USA
Paul Scerri	Carnegie Mellon, USA
Alfons Salden	Almende BV, The Netherlands
Petr Skobelev	Smart Solutions Ltd., Russia
Pierre Castagna	Université de Nantes, France

## Program Committee ARMS

Lynne E. Parker	The University of Tennessee, USA
Naomi E. Leonard	Princeton University, USA
Laura Barbulescu	Carnegie Mellon University, USA
Lucia Pallottino	University of Pisa, Italy
Tatsushi Nishi	Osaka University, Japan
Rongxin Cui	National University of Singapore, Singapore
Koen Hindriks	Delft University of Technology, The Netherlands

## Workshop Organizers DOCM<sup>3</sup>AS

Hiromitsu Hattori	Kyoto University, Japan
Satoshi Kurihara	Osaka University, Japan
Nadeem Jamali	University of Saskatchewan, Canada
Kiyoshi Izumi	University of Tokyo, Japan
Hidenori Kawamura	Hokkaido University, Japan
Fujio Toriumi	Nagoya University, Japan
Zahia Guessoum	University of Paris 6, France

## Program Committee DOCM<sup>3</sup>AS

Myriam Abramson	Naval Research Laboratory, USA
Gul Agha	University of Illinois, USA
K. Suzanne Barber	University of Texas at Austin, USA
Tibor Bosse	Vrije Universiteit, The Netherlands
Dan Corkill	University of Massachusetts, USA
Raj Dasgupta	University of Nebraska, USA
Keith Decker	University of Delaware, USA
Alexis Drogoul	Institut de Recherche pour le Développement, France
Satoru Fujita	Hosei University, Japan
Tomoyuki Higuchi	The Institute of Statistical Mathematics, Japan
Akihiro Inokuchi	Osaka University, Japan
Toru Ishida	Kyoto University, Japan
Nadia Kabachi	University of Lyon, France
Toshihiro Kamishima	AIST, Japan
Woo-Young Kim	Intel Inc., USA
Yasuhiko Kitamura	Kwansei Gakuin University, Japan
Franziska Kluegl	University of Wurzburg, Germany
Victor R. Lesser	University of Massachusetts, USA
Jiming Liu	Hong Kong Baptist University, Hong Kong
Roger Mailler	University of Tulsa, USA
René Mandiau	Université de Valenciennes et du Hainaut Cambresis, France
Ryusuke Masuoka	Fujitsu Laboratories of America Inc., USA
Hideyuki Nakashima	Future University Hakodate, Japan
Nariaki Nishino	University of Tokyo, Japan
Itsuki Noda	AIST, Japan
Michael J. North	Argonne National Laboratory, USA
Akihiko Ohsuga	University of Electro-Communications, Japan
Charlie Ortiz	Artificial Intelligence Center, USA
Ei-ichi Osawa	Future University Hakodate, Japan

Mario Paolucci	Institute for Cognitive Science and Technology, Italy
Paul Scerri	Carnegie Mellon University, USA
Kosuke Shinoda	AIST, Japan
Olivier Simonin	Université Henri Poincaré, France
Shunsuke Soeda	AIST, Japan
Toshiharu Sugawara	Waseda University, Japan
Pang-Ning Tan	Michigan State University, USA
Walt Truszkowski	NASA Goddard Space Flight Center, USA
Carlos Varela	Rensselaer Polytechnic Institute, USA
Hui Xiong	Rutgers, USA
Gaku Yamamoto	IBM Software Group, Japan
Hitoshi Yamamoto	Rissho University, Japan
Jung-Jin Yang	The Catholic University of Korea, Korea
Philip S. Yu	University of Illinois, USA
Franco Zambonelli	Università di Modena e Reggio Emilia, Italy

## Workshop Organizers ITMAS

Vicent Botti	Universitat Politècnica de València, Spain
Ana Garcia-Fornes	Universitat Politècnica de València, Spain
Michal Pechoucek	Czech Technical University in Prague, Czech Republic
Alessandro Ricci	Alma Mater Studiorum-Università di Bologna, Italy
Jose M. Such	Universitat Politècnica de València, Spain
Danny Weyns	Katholieke Universiteit Leuven, Belgium

## Program Committee ITMAS

Juan M. Alberola	Universitat Politècnica de València, Spain
Matteo Baldoni	Università degli Studi di Torino, Italy
Fabio Belfemine	Telecom Italia, Italy
Juan A. Botía	University of Murcia, Spain
Vicent Botti	Universitat Politècnica de València, Spain
Juan M. Corchado	University of Salamanca, Spain
Yves Demazeau	Laboratoire de Informatique de Grenoble, France
Nadia Erdogan	Istanbul Teknik Universitesi, Turkey
Agustin Espinosa	Universitat Politècnica de València, Spain
Marc Esteve	IIIA-CSIC, Spain
Ana Garcia-Fornes	Universitat Politècnica de València, Spain
Dominic Greenwood	Whitestein Technologies, Switzerland
Jomi F. Hubner	Federal University of Santa Catarina, Brazil

Kamalakar Karlapalem  
Yasuhiko Kitamura  
Abder Koukam  
Michal Laclavik  
Tim Miller  
Pavlos Moraitis  
Andrea Omicini

Sascha Ossowski  
Julian Padget  
Michal Pechoucek  
Alessandro Ricci

Juan A. Rodriguez-Aguilar  
Murat Sensoy  
Carles Sierra  
Michael Shumacher

Jose M. Such  
Pavel Vrba

Danny Weyns

Int. Institute of Information Technology, India  
Kwansei Gakuin University, Japan  
University of Technology UTBM, France  
Slovak Academy of Sciences, Slovak Republic  
University of Melbourne, Australia  
Paris Descartes University, France  
Alma Mater Studiorum-Università di Bologna,  
Italy

University Rey Juan Carlos, Spain  
University of Bath, UK  
Agent Technology Center, Czech Republic  
Alma Mater Studiorum-Università di Bologna,  
Italy

IIIA-CSIC, Spain  
University of Aberdeen, UK  
IIIA-CSIC, Spain  
University of Applied Sciences Western,  
Switzerland

Universitat Politècnica de València, Spain  
Rockwell Automation Research Center,  
Czech Republic

Katholieke Universiteit Leuven, Belgium

## External Reviewers ITMAS

Maria Del Carmen Delgado  
Stephane Galland  
Moser Silva Fagundes  
Nikolaos Spanoudakis

IIIA-CSIC, Spain  
University of Technology UTBM, France  
University Rey Juan Carlos, Spain  
Technical University of Crete, Greece

# Table of Contents

## AMPLE Workshop

### Methods

Leveraging Multiple Mechanisms for Information Propagation (Extended Abstract) .....	1
<i>Andrew W. Wicker and Jon Doyle</i>	
A Case Study in Model Selection for Policy Engineering: Simulating Maritime Customs .....	3
<i>Hassan Harb, F. Jordan Srou, and Neil Yorke-Smith</i>	
Towards Qualitative Reasoning for Policy Decision Support in Demonstrations .....	19
<i>Natalie Fridman, Gal A. Kaminka, and Avishay Zilka</i>	
The Role of MAS as a Decision Support Tool in a Water-Rights Market .....	35
<i>Vicente Botti, Antonio Garrido, Adriana Giret, and Pablo Noriega</i>	

### Culture

Understanding Compliance Differences between Legal and Social Norms: The Case of Smoking Ban .....	50
<i>Francien Dechesne, Virginia Dignum, and Yao-Hua Tan</i>	
Modelling Culture in Multi-agent Organizations .....	65
<i>Alexis Morris, William Ross, and Mihaela Ulieru</i>	
Substantiating Agent-Based Quality Goals for Understanding Socio-Technical Systems .....	80
<i>Sonja Pedell, Tim Miller, Leon Sterling, Frank Vetere, and Steve Howard</i>	

### Policy Formulation

An Analysis and Design Framework for Agent-Based Social Simulation .....	96
<i>Amineh Ghorbani, Virginia Dignum, and Gerard Dijkema</i>	
The Benefits of Agent-Based Motivation Models in Policy Formulation and Implementation .....	113
<i>Sonja Pedell and Leon Sterling</i>	

## AOSE Workshop

AgentStore — A Pragmatic Approach to Agent Reuse . . . . .	128
<i>Axel Hessler, Benjamin Hirsch, Tobias Küster, and Sahin Albayrak</i>	
Dynamically Adapting BDI Agents Based on High-Level User Specifications . . . . .	139
<i>Ingrid Nunes, Michael Luck, Simone Diniz Junqueira Barbosa, Simon Miles, and Carlos J.P. de Lucena</i>	
Engineering Coordination: Selection of Coordination Mechanisms . . . . .	164
<i>René Schumann</i>	
Augmenting Android with AOSE Principles for Enhanced Functionality Reuse in Mobile Applications . . . . .	187
<i>Christopher Frantz, Mariusz Nowostawski, and Martin K. Purvis</i>	

## ARMS Workshop

### Human-Robot Interaction

The iCat as a Natural Interaction Partner: Playing Go Fish with a Robot . . . . .	212
<i>Koen Hindriks, Mark A. Neerincx, and Mirek Vink</i>	
Designing the HRTeam Framework: Lessons Learned from a Rough-and-Ready Human/Multi-Robot Team . . . . .	232
<i>Elizabeth Sklar, A. Tuna Ozgelen, J. Pablo Munoz, Joel Gonzalez, Mark Manashirov, Susan L. Epstein, and Simon Parsons</i>	
Flood Disaster Mitigation: A Real-World Challenge Problem for Multi-agent Unmanned Surface Vehicles . . . . .	252
<i>Paul Scerri, Balajee Kannan, Pras Velagapudi, Kate Macarthur, Peter Stone, Matt Taylor, John Dolan, Alessandro Farinelli, Archie Chapman, Bernadine Dias, and George Kantor</i>	

### Robot Perception

AnySURF: Flexible Local Features Computation . . . . .	270
<i>Eran Sadeh-Or and Gal A. Kaminka</i>	
Robot Navigation with Weak Sensors . . . . .	272
<i>Noa Agmon, Yehuda Elmaliah, Yaron Mor, and Oren Slor</i>	



## Robot Exploration

Individual Localization and Tracking in Multi-robot Settings with Dynamic Landmarks (Extended Abstract) .....	277
<i>Anousha Mesbah and Prashant Doshi</i>	
Fast Frontier Detection for Robot Exploration .....	281
<i>Matan Keidar, Eran Sadeh-Or, and Gal A. Kaminka</i>	

## Robots in Motion

Lazy Auctions for Multi-robot Collision Avoidance and Motion Control under Uncertainty .....	295
<i>Jan-P. Calliess, Daniel Lyons, and Uwe D. Hanebeck</i>	
Multi-robot Path Planning with the Spatio-Temporal A* Algorithm and Its Variants .....	313
<i>Wenjie Wang and Wooi-Boon Goh</i>	

## Multi-robot Teamwork

Adaptive Multi-robot Team Reconfiguration Using a Policy-Reuse Reinforcement Learning Approach .....	330
<i>Prithviraj Dasgupta, Ke Cheng, and Bikramjit Banerjee</i>	
Bounded Optimal Constrained Coordination with Delay Penalties and Location Choice (Extended Abstract) .....	346
<i>G. Ayorkor Korsah, Anthony Stentz, and M. Bernardine Dias</i>	

## DOCM<sup>3</sup>AS Workshop

Modeling Human Behavior Selection under Environmental Subsidy Policy by Multi-agent Simulation .....	350
<i>Tomoko Imoto, Shin'ya Nakano, and Tomoyuki Higuchi</i>	
TaxiSim: A Multiagent Simulation Platform for Evaluating Taxi Fleet Operations .....	359
<i>Shih-Fen Cheng and Thi Duong Nguyen</i>	
Parallel Agent-Based Simulator for Influenza Pandemic .....	361
<i>Masaya M. Saito, Seiya Imoto, Rui Yamaguchi, Satoru Miyano, and Tomoyuki Higuchi</i>	
A Hybrid Macro-Micro Pedestrians Evacuation Model to Speed Up Simulation in Road Networks .....	371
<i>Nguyen Thi Ngoc Anh, Zucker Jean Daniel, Nguyen Huu Du, Alexis Drogoul, and Vo Duc An</i>	

A Unified Agent-Based Model to Analyze Organizational Deviation and Kaizen Activities . . . . .	384
<i>Tomomi Kobayashi, Satoshi Takahashi, Masaaki Kunigami, Atsushi Yoshikawa, and Takao Terano</i>	

## ITMAS Workshop

Agent-Based Simulation Platform Evaluation in the Context of Human Behavior Modeling . . . . .	396
<i>Michal Laclavík, Štefan Dlugolinský, Martin Šeleng, Marcel Kvassay, Bernhard Schneider, Holger Bracker, Michał Wrzeszcz, Jacek Kitowski, and Ladislav Hluchý</i>	
An Agent Infrastructure for Privacy-Enhancing Agent-Based E-commerce Applications . . . . .	411
<i>Jose M. Such, Agustín Espinosa, and Ana Garcia-Fornes</i>	
Auto-Adaptation of Open MAS through On-Line Modifications of the Environment . . . . .	426
<i>Roberto Centeno and Holger Billhardt</i>	
Combining Semantic Web and Logic Programming for Agent Reasoning . . . . .	428
<i>Murat Şensoy, Wamberto W. Vasconcelos, and Timothy J. Norman</i>	
Cost-Aware Reorganization Service for Multiagent Systems . . . . .	442
<i>Juan M. Alberola, Vicente Julian, and Ana Garcia-Fornes</i>	
A Distributed Architecture for Enforcing Norms in Open MAS . . . . .	457
<i>Natalia Criado, Estefania Argente, Pablo Noriega, and Vicent Botti</i>	
Evolving Semantics for Agent-Based Collaborative Search . . . . .	472
<i>Murat Şensoy</i>	
Micro-agents on Android: Interfacing Agents with Mobile Applications . . . . .	488
<i>Christopher Frantz, Mariusz Nowostawski, and Martin K. Purvis</i>	
Introduction to Prognostic Normative Reasoning . . . . .	503
<i>Jean Oh, Felipe Meneguzzi, Katia Sycara, and Timothy J. Norman</i>	
<b>Author Index . . . . .</b>	<b>505</b>