
Preface

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Biographical notes: Matteo Baldoni is an Associate Professor at the University of Torino. His research interests include programming and engineering multi-agent systems, socio-technical systems and artificial intelligence. He is in the steering committee of the Italian Association for Artificial Intelligence (AI*IA), of the Engineering Multi-Agent Systems (EMAS) Workshop, Normative Multi-Agent Systems (NorMAS) Workshop, and Principles and Practice of Multi-Agent Systems (PRIMA) Conference. He organised AI*IA 2013, EMAS 2015–2016, NorMAS 2014, DALT 2005–2009, 2012 and EASSS 2009. He was the Program Co-Chair of AI*IA 2013 and PRIMA 2016. He has published more than 130 papers and co-edited more than ten books.

Jörg P. Müller is a Full Professor of Computer Science at the Department of Informatics at the TU Clausthal. He obtained his PhD from the Universität des Saarlandes. Prior to that, he had worked in software technology-related R&D positions at Siemens, John Wiley & Sons, Mitsubishi Electric and DFKI. His current research interests cover the broad area of modelling and simulation of

socio-technical systems, coordination and intelligent systems. He has served on numerous conference committees in the area of intelligent agents and multi-agent systems and co-authored over 200 scientific papers.

Ingrid Nunes is a Professor Adjunto (Senior Lecturer) at the Instituto de Informática, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil. She holds a research productivity (PQ) fellowship level 2 granted by CNPq. She obtained her PhD in Informatics at the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), Brazil. She is the Head of the Prosoft research group, and her main research areas are agent-oriented software engineering and software maintenance and evolution.

Rym Zalila-Wenkstern is an Associate Professor at the University of Texas at Dallas. She obtained her PhD in Computer Science from the University of Ottawa, Canada, and Doctorat de Spécialité in Computer Science from the University of Tunis, Tunisia. She is the Director of the Multi-Agent and Visualization Systems Lab. Her research projects are focused on the application of the agent paradigm for the development of large-scale, real-world adaptive systems. She has served on numerous international conference committees in the fields of software engineering and multi-agent systems. She is the CEO of ZW Corp., a start-up specialising in the development of web-based multi-agent systems.

This special issue of the *International Journal of Agent-Oriented Software Engineering* is guest edited by the organisers of the Fourth International Workshop on Engineering Multi-Agent Systems (EMAS) 2016, which took place as a workshop at AAMAS 2016 in Singapore (<http://www.utdmavs.org/emas2016>).

The EMAS Workshop series (<http://emas.in.tu-clausthal.de>) brings together the communities that are concerned with different aspects of EMAS, allowing for better interchange of ideas between the communities. It was created in 2013 as a merger of three separate workshops (with overlapping communities) that focused on software engineering aspects (AOSE), programming aspects (ProMAS), and the application of declarative techniques to design, programming and verification (DALT).

A multi-agent system is composed of multiple autonomous entities (agents) that collaborate to achieve individual and system goals, which can be possibly conflicting. Agents are typically located in a dynamic distributed environment. As result, there are many challenges associated with the design, implementation and verification of these systems to be addressed. Existing solutions include development methods and techniques to be incorporated to agents, programming languages and platforms, and developed complex and innovative applications from which lessons can be learned.

After the presentation of all accepted papers at EMAS 2016, the authors submitted a revised version that was carefully re-reviewed for inclusion in the post-proceedings (Springer LNAI 10093). All authors were then invited to submit a significantly extended version of their papers for this special issue of *IJAOSE* on EMAS and applications.

Eight papers were submitted and after a careful and extensive double blind reviewing phase, six papers were finally selected for inclusion in this special issue. The first two papers focus on providing solutions to implement and verify agent-based systems; the following three papers provide different forms of infrastructure needed to implement multi-agent systems; while the last paper focuses on the satisfaction non-functional

requirements by agent-oriented approaches by means of a case study. These selected papers are briefly introduced as follows.

- 1 In ‘Augmenting agent computational environments with quantitative reasoning modules and customisable bridge rules’, Costantini and Formisano consider the software engineering problem of how to practically empower agents with the capability of performing budget-constrained reasoning in a uniform and principled way. This reasoning is used to determine one or more courses of agent’s actions, also according to policies/preferences.
- 2 In ‘Automating failure detection in cognitive agent programs’, by Koeman, Hindriks and Jonker address the crucial question of how cognitive agent programs can be automatically, efficiently, and reliably tested. They propose a test language and prove theoretical properties regarding expressiveness. They also provide an implementation for the GOAL BDI language, and evaluate the usefulness of their framework in an empirical study.
- 3 In ‘Protocol and role: abstraction mechanisms in agent oriented programming languages’, by Kristensen presents a language for programming multi-agent systems that is based on the key concepts of role and protocol for capturing the interaction structure of the system itself. The description of the interaction structures between agents becomes understandable and the development process of multi-agent systems becomes efficient and flexible. The language mechanisms are illustrated by means of a supporting application framework.
- 4 In ‘Experimental analysis of the effect of filtering perceptions in BDI agents’, by Stabile, Pantoja and Sichman address the lack of control over the agents’ perceptions in the BDI paradigm. Specifically, irrelevant information overloads agents increasing the processing time. In order to provide greater control on the agents’ perceptions and to reduce their time response, a filtering perception mechanism within the Jason interpreter is proposed. Different filters proposed in the literature were implemented and evaluated.
- 5 In ‘A multi-agent platform for the deployment of ambient systems’, by El Fallah-Seghrouchni, Piette, Caval and Taillibert present a multi-agent platform that allows standard IoT applications to be deployed and executed as integrated, context-aware applications. Various types of agents manage the infrastructure and the deployed application to ensure that the application executes in a context-aware fashion.
- 6 In ‘Improving flexibility and dependability of remote patient monitoring with agent-oriented approaches’, by Ancona, Ferrando and Mascardi, five state-of-the-art agent-oriented approaches are analysed to verify which (if any) can ensure flexibility and dependability in remote patient monitoring (RPM) systems designed and implemented as multi-agent systems.

It is our sincere hope that the readers from academia and industry alike will enjoy reading the set of papers which we have collected for them, and will find them as instructive and inspiring as we do.

We would like to thank all the authors for their contribution to this special issue, and also to the referees for their work in carefully reviewing the articles. Furthermore, we would like to thank the Editor-in-Chief, Professor Michael Winikoff for his invaluable support throughout the special issue production process.