

GUEST EDITORIAL
SPECIAL ISSUE ON
“AGENTS AND MULTI-AGENT SYSTEMS:
FROM OBJECTS TO AGENTS”

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Agents and Multi-Agent Systems (MAS) represent a powerful paradigm both for modeling and analyzing natural and artificial systems and for developing software application in terms of autonomous, goal-driven and interacting entities, that can operate in open and heterogeneous environments. In both cases, simulation plays a key role; indeed, when the agent paradigm is exploited for modeling natural and artificial systems (socio-economics systems, crowds, climate systems, etc.) with the aim of studying their properties and analyzing their behaviors, simulation represents the main investigation tool for executing controlled experiments, observing the evolution of the system and gathering data to analyze for improving the understanding of the system and related phenomena of interest. On the other hand, when MAS represent computing systems and/or software applications to be effectively delivered, simulation represents an effective tool to validate and evaluate these systems/applications before their deployment and execution.

In the sketched reference framework, the aim of this special issue is to provide a comprehensive guide on new ideas and results in MAS. It captures the state-of-the-art in such domains in terms of techniques and methodologies for agent-based modeling and simulation of complex systems and simulation-driven development processes for multi-agent systems. It also identifies research directions and technologies that will drive innovation within these fields.

The research efforts which address how Modeling and Simulation techniques and methodologies can provide and receive benefits from the Agent-based paradigm are constantly growing. The field is gaining considerable research interest and is expected to be of increasing interest to commercial developers in a wide range of application domains (e.g. financial, economic, social, logistics, chemical, engineering). Moreover, Agent-based Simulation (ABS) and Agent-oriented Software Engineering (AOSE) are recognized as very interesting emerging paradigms that will have a major impact on the quality of science and society over the next years, their knowledge will help position the researchers and practitioners at the forefront of the field. Therefore, we believe that the methodological and technological trends in the convergence and integration of these areas need to be further explored in order to provide a research roadmap to the ABS and AOSE communities.

This special issue follows the XIII edition of the Workshop “*From Objects to Agents*” (WOA), chaired by the Editors and by Federico Bergenti, that was held in Torino (Italy), co-located with the International Conference of the Italian Association for Artificial Intelligence (AI*IA). WOA is the reference event for the Italian scientific community active in the Agents and Multi-Agent Systems research domain. It was first held in the year 2000 in Parma (Italy). Initially, it was conceived as a meeting occasion for researchers and practitioners from the working group on MAS of AI*IA and from the TABOO association (Advanced Technologies Based on Concepts from Object-Orientation). Since then, it was held in many different Italian locations, from north to south, gaining a conspicuous success (on average 50-60 participants each edition) and succeeding in gathering researchers and practitioners from various research fields, thanks to its format. WOA is a real workshop where presenters and participants exchange opinions and discuss on-going works in a friendly yet rigorous setting. From 2004 WOA includes a free one day school, where experienced scientists and professionals introduce younger researchers as well as Ph.D. and undergraduate students to hot topics in the field with the aim of divulging them and let them have a greater impact on research and on industry.

The present one is the first special issue following one of WOA editions and witnesses the always growing relevance of this event. The issue contains eight papers, each of which is the enhanced and extended version of one of the works presented at WOA 2013, which was further selected for the magazine publication. The resulting contributions deal with a wide range of topics ranging from methodological aspects and development frameworks for Agent-based Modeling and Simulation to interesting case studies and concrete applications of the agent-based mindset in various domains (e.g. disaster management, crowd simulation, negotiation, social networking).

The paper “*Coordination Mechanisms for the Modelling and Simulation of Stochastic Systems: The Case of Uniform Primitives*” (by Stefano Mariani and Andrea Omicini) focusses on stochastic systems, and discusses the role of uniform primitives as the nature-inspired coordination mechanism that could work as the core of a coordination-based complex system simulator.

An interesting approach to Agent-Based Simulation is proposed by Agostino Poggi in the paper “*Replaceable Implementations for Agent-Based Simulation*”. The proposal is based on CoDE (Concurrent Development Environment), a software framework implemented in Java for the development of software applications based on the actor paradigm. The framework allows using different implementations of the components that drive the execution of the actors and delegates the management of the reception of messages to the execution environment. Moreover, the paper shows how the performance of applications can be optimized by choosing the suitable combination among the alternative implementations of the main framework components.

The paper “*Multi-Agent Systems for Social Games with AMUSE*” (by Federico Bergenti, Giovanni Caire, and Danilo Gotta) introduces the multi-agent architecture AMUSE a novel agent platform that supports the development and large-scale deployment of social games. The authors outline the major functionality and the multi-agent architecture of AMUSE, illustrate the current state of the development, and relate it to the list of game design patterns that the platform adopts.

The paper “*Knowledge-Artifact Based Agents in Android: A Case Study*” (by Fabio Sartori, Lorenza Manenti, and Luca Grazioli) presents the application of an innovative framework for programming agents in Android, based on the Knowledge-Artifact notion to develop knowledge-based systems. The two described case studies concern the support of operators tackling critical situations following natural disasters, like disruptive earthquakes.

In “*A Service-based Testbed for Trust Negotiation*” (by Filippo Agazzi and Michele Tomaiuolo), the authors present a service-based test bed for Trust Negotiation. Trust Negotiation allows users to develop trust incrementally, by disclosing credentials step by step, thus allowing services and resources to be shared in an open environment, and access rights can be granted on the basis of peer-to-peer trust relationships.

The paper “*Analyzing Negotiation Trends in a QoS-aware Market of Services*” (by Claudia Di Napoli, Dario Di Nocera, and Silvia Rossi) describes an empirical evaluation of negotiation communication trends, performed when composing services to deliver a QoS-aware Service-Based Application. Advantages and disadvantages of negotiation are estimated in a simulated stochastic market of services, searching for settings in which communication costs are compensated by an increased probability for the negotiation to succeed.

The paper “*Optimizing Social Group Homogeneity in Online Communities*” (by Pasquale De Meo, Emilio Ferrara, Domenico Rosaci, and Giuseppe M. L. Sarnè) introduces a group homogeneity measure based on users’ behavioral information. Such a measure is optimized by a novel algorithm that operates in a fully-distributed multi-agent framework and performs users and groups profiles matching. Such an approach produces clear and significant advantages in groups formation in an online social network context as it is shown by some experimental campaigns performed on simulated social networks.

In “*Pedestrian and Crowd Studies: Towards the Integration of Automated Analysis and Synthesis*” (by Sultan D. Khan, Luca Crociani, and Giuseppe Vizzari), the authors present an agent-based model for the simulation of crowds of pedestrians whose main innovative element is the representation and management of social interaction among the pedestrians based on verbal or non-verbal communication among members of groups; these mechanisms allow the group to preserve cohesion even in particular conditions, such as counter flows, presence of obstacles or narrow passages.

Last but not least, the guest editors would like to thank all the authors, the reviewers, and the editors of *SCS M&S Magazine* whose joint efforts allowed this special issue to become real. We are very proud of it and we consider it an important achievement for the WOA workshop series.

Matteo Baldoni is an Associate Professor of Computer Science at the University of Turin (Italy) since 2006. He received a Ph.D. in Computer Science in 1998 and was a researcher from 1999 through 2006. He has been working for 20 years on multi-agent systems, computational logics, declarative programming languages, knowledge representation and reasoning, interaction protocols. He has also a long-term research experience on Semantic Web and E-learning. Currently, his research interests include foundations of social computing, programming and

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