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Mario Paolucci · Jaime Simão Sichman ·
Harko Verhagen (Eds.)

Multi-Agent-Based Simulation XX

20th International Workshop, MABS 2019 Montreal, QC, Canada, May 13, 2019 Revised Selected Papers

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Editors
Mario Paolucci
ISTC/CNR
Rome, Italy

Jaime Simão Sichman
Laboratório de Técnicas Inteligentes
Universidade de São Paulo
São Paulo, Brazil

Harko Verhagen
Institutionen för data- och systemvetenskap
Stockholm University
Kista, Sweden

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Preface

This volume presents selected papers from the 20th International Workshop on Multi-Agent-Based Simulation (MABS 2019), a workshop hosted by the 18th International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2019), which took place in Montreal, Canada, during May 13–17, 2019. The main scientific focus of MABS 2019, and of the present volume, lies in the confluence of social sciences and multi-agent systems, with a strong application/empirical vein. The workshop is concerned with (i) exploratory agent-based simulation as a principled way of undertaking scientific research in the social sciences and (ii) using social theories as an inspiration for new frameworks and developments in multi-agent systems.

The meeting of researchers from multi-agent systems (MAS) engineering and the social/economic/organizational sciences is recognized as a source of cross-fertilization, and it has undoubtedly contributed to the body of knowledge produced in the MAS area. The excellent quality level of this workshop has been recognized since its inception and its proceedings have been regularly published in Springer's *Lecture Notes in Artificial Intelligence* series. More information about the MABS workshop series may be found at https://www.pcs.usp.br/∼mabs/.

The goal of the workshop is to bring together researchers interested in MAS engineering with researchers aiming to find efficient solutions to model complex social systems from areas such as economics, management, organization science, and social sciences in general. In all these areas, agent theories, metaphors, models, analyses, experimental designs, empirical studies, and methodological principles all converge into simulation as a way of achieving explanations and predictions, exploration and testing of hypotheses, and better designs and systems.

We are very grateful to Jean-Daniel Kant, who gave a very inspiring invited talk on evaluation and design of policies, and to the participants who provided a lively atmosphere of debate during the presentation of the papers and during the general discussion about the challenges that the MABS field faces. We are also very grateful to all the members of the Program Committee and to external reviewers for their hard work.

In this edition, 15 submissions were received from which we selected 10 for presentation (near 66% acceptance) and 9 for the post-proceedings. The papers presented in the workshop have been revised and reviewed again in order to become part of this post-proceedings volume. The content of this volume can be divided in two main sections, the first containing policy-oriented models, and the second oriented to foundational models and models based on artefacts.

In the MABS and policy section, models are used to inform, plan, and support policy interventions. We have five papers in this section.

In "Modelling policy shift advocacy," Antoni Perello-Moragues, Pablo Noriega, Lucia Alexandra Popartan, and Manel Poch show how to create and study value-driven policy-making systems in the context of urban water management. The agents in the

simulation can detect emergent phenomena and respond to them. This allows modeling of agents that are irrational, when goal satisfaction is unfeasible, misaligned between local and global policy spheres, and under the effect of policy-makers with limited competence.

Letícia da Silva Rodrigues, Sóstenes Gutembergue Mamedio Oliveira, Luiz Fernandez Lopez, and Jaime Simão Sichman present a simulation of the propagation of the Dengue virus in the second paper of this section, entilted "Agent based simulation of the Dengue virus propagation." The goal of the work was to compare its results with those that come from some traditional deterministic epidemiological models. Their simulation obtained the same macro behavior of the classical models, thus indicating that multi-agent models can represent reality at least as well as the classical models.

The third and fourth papers add to a fecund line of ABM research, the modeling of mobility, with both papers adding elements based on social and psychological aspects. In their paper, "On developing a more comprehensive decision-making architecture for empirical social research: agent-based simulation of mobility demands in Switzerland," Khoa Nguyen and René Schumann use a social psychology theory to frame modeling in an architecture aimed to improve communication between stakeholder and modelers. They apply a tree-like layered model for the generation of intentions and actions. Using this frame, they calibrate their model by matching answers from survey data to numeric simulation parameters. Juhi Singh, Atharva Deshpande, and Shrisha Rao use the boids model for motion, together with their own model of physical discomfort in "Modeling Pedestrian Behaviour Under Panic During a Fire Emergency." One of the potentially useful results of their approach is how clustering can slow down the evacuation process.

The fifth and last paper in this section, entitled "Reinforcement Learning of Supply Chain Control Policy using Closed Loop Multi Agent Simulation," models a supply chain including product unavailability, emptiness of shelves, product wastage, and over-supply. Souvik Barat, Harshad Khadilkar, Vinay Kulkarni, Vinita Baniwal, Hardik Meisheri, Monika Gajrani, and Prashant Kumar show how the reward function in a reinforcement learning model can be substituted with an agent-based simulation, adding elements such as uncertainty, adaptability, and emergent behavior, thus increasing the realism of the objective. This paper concludes the MABS and policy section.

The second section in the volume is related to MABS Foundations and Social Artifacts and includes four papers. In the first one, called "An Opinion Diffusion Model with Vigilant Agents and Deliberation," George Butler, Gabriella Pigozzi, and Juliette Rouchier extend the classic opinion dynamics model to include group-level deliberative discussions. The simulation results reveal that asking for more deliberation and including a larger percentage of agents in the deliberative instances (up to 25%, then the effect tapers off) guarantees better deliberated outcomes.

In the second paper, Samaneh Heidari, Nanda Wijermans, and Frank Dignum contribute to the debate on norms, reconnecting to the tradition that sees them as the embodiment of values. In "Agents with Dynamic Social Norms," the authors apply a value-driven norm specification that allows for explaining norm change in situations where agents can move between social groups.

The third paper, entitled "A collective action simulation platform" by Stephen Cranefield, Hannah Clark-Younger, and Geoff Hay, breaks the cage of simple game theory with agents that create explicit references to social expectations and manipulate them via a PROLOG-based module for event calculus. This is applied to a classic social dilemma, where it achieves social coordination instead of defection.

The last paper, whose authors are Samarth Swarup and Reza Rezazadegan, takes agents heterogeneity seriously, discussing it also as a simulation result and not only as simulation input. In fact, how good would it be to have heterogenous agents that all behave the same? In "Constructing an Agent Taxonomy from a Simulation through Topological Data Analysis," the authors take as an example evacuation simulation and show how their approach better detects group behavior, when compared with simple clustering. Moving to a more complex simulation of a disaster, they show how the topological approach allows extracting non-obvious taxa from the simulated behavior.

In order to conclude this brief review, and before leaving the reader with the content of the volume that we have roughly sketched in this introduction, we remark on the adoption of platforms and presentation standards in this year's papers. Of the nine papers, three of them did not name an agent software platform. Two of them used Repast, and one each used Netlogo, MASON, and the more recent, GAMA, respectively. The last paper used an actor-based platform named ESL. None of the papers mentioned the ODD standard in any of its implementations: for good or for bad, we are still in a multi-agent simulation babel tower.

April 2020

Mario Paolucci
Jaime Simão Sichman
Harko Verhagen

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