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Engineering Multi-Agent Systems

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Revised Selected Papers

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Preface

The International Workshop on Engineering Multi-Agent Systems (EMAS) was formed in 2013 as a merger of three long-running workshops: Agent-Oriented Software Engineering (AOSE), Programming Multi-Agent Systems (ProMAS), and Declarative Agent Languages and Technologies (DALT). This merger established EMAS as a reference venue for work concerned broadly with the engineering of agents and multi-agent systems.

The three parent events have a long history of association with the International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS), and since its inception EMAS has been co-located at AAMAS: EMAS 2013 in St. Paul (with post-proceedings published as Springer LNCS/LNAI volume 8245), EMAS 2014 in Paris (LNCS/LNAI 8758, and a special issue in the International Journal of Agent-Oriented Software Engineering, IJAOSE Vol. 5 No. 2/3, 2016), EMAS 2015 in Istanbul (LNCS/LNAI 9318, and a special issue in IJAOSE Vol. 6 No. 2, 2018), EMAS 2016 in Singapore (LNCS/LNAI 10093, and a special issue in the IJAOSE Vol. 6 No. 3/4, 2018), EMAS 2017 in São Paulo (LNCS/LNAI 10738), EMAS 2018 in Stockholm (LNAI 11375, and a report in Software Engineering Notes), EMAS 2019 in Montreal (LNAI 12058), and EMAS 2020 in Auckland (LNAI 12589).

EMAS 2021 aimed to build on this history by gathering researchers and practitioners in the domains of agent-oriented software engineering, programming multi-agent systems, declarative agent languages and technologies, artificial intelligence, and machine learning to present and discuss their research and emerging results in MAS engineering. The overall purpose of the workshop was to facilitate the cross-fertilization of ideas and experiences in the various fields to

- enhance our knowledge of the theory and practice of engineering intelligent agents and multi-agent systems, and advance the state of the art;
- demonstrate how MAS methodologies, architectures, languages and tools can be used in the engineering of deployed large-scale and open MAS;
- define new directions for engineering MAS by drawing on results and recommendations from related research areas; and
- encourage PhD and Masters students to become involved in and contribute to the area.

As with previous editions, this edition of the EMAS workshop was intended to be co-located with AAMAS, which was planned to be held in London, UK, in May 2021. As AAMAS 2021 was a virtual event, EMAS 2021 was held as a virtual (online) event, spanning two days. EMAS 2021 received 27 submissions, each of which was reviewed (single blind) by three reviewers. In total, 25 papers were accepted (21 full papers and four doctoral and demonstration papers). In addition to these 25 papers, EMAS 2021 also had two invited talks, “Agent Programming in the Cognitive Era: A New Era for Agent Programming?” by Alessandro Ricci and “Explicitly Ethical Agent Reasoning”

by Louise Dennis. The keynotes were delivered synchronously over Zoom. Talks were pre-recorded and available from the EMAS 2021 website, together with the slides and the final workshop presentation version of the papers. Each talk also had a live Q&A session on Zoom. The Q&A sessions were intended to allow interaction between authors and participants. After a second review process, 21 papers were selected for inclusion in this volume.

We would like to thank all individuals, institutions, and sponsors that supported EMAS 2021, in particular TU Clausthal for hosting the website. We thank the authors for submitting high-quality research papers. We are indebted to our Program Committee members and additional reviewers for spending their valuable time by providing careful reviews and recommendations on the submissions, the members of the EMAS Steering Committee for their valuable suggestions and support, Alessandro Ricci and Louise Dennis for their inspiring keynotes, and finally the AAMAS workshop chairs, Francesco Belardinelli and Matthijs Spaan, for all their work and support.

January 2022

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