Preface: Special issue on Foundations of Coordination Languages and Self-adaptive Systems

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Modern software systems are distributed, concurrent, mobile, and often involve the composition of heterogeneous components and of stand-alone services. Theoretical models, languages and tools for coordinating, composing and adapting services are hence required. They can indeed simplify the development of complex distributed service-based systems, enable functional correctness proofs and improve reusability and maintainability of such systems.

This Special Issue (SI) is dedicated to Foundations of Coordination Languages and Self-adaptive Systems. This SI is a follow-up of the FOCLASA workshop that we organized at the 15th International Conference on Software Engineering and Formal Methods (SEFM 2017), held in Trento, Italy on September 4–8, 2017. The workshop received 16 full paper submissions. After a careful reviewing process, the international Program Committee decided to select seven papers for presentation during the workshop and inclusion in the FOCLASA'17 proceedings. From these papers, the six best papers were selected and invited for an extended version to this special issue. All the submissions went through a rigorous peer review process; four papers were finally accepted and are included in this special issue. These papers provide key insights on different aspects of coordination languages and self-adaptive systems.

The first paper, "*Orchestrating Incomplete TOSCA Applications with Docker*" by A. Brogi et al., presents first a TOSCA (Topology and Orchestration Specification for Cloud Applications) representation for multi-component applications, which can be used to specify the components forming an application, the dependencies occurring among them, and the software support that each component requires to effectively run. Second, the authors present TosKeriser, a tool that automatically completes TOSCA application specifications, by discovering and including Docker-based runtime environments providing the software support needed by the application components. This tool was applied successfully on two concrete case studies.

The second paper, "*Towards Attack-Resistant Aggregate Computing Using Trust Mechanisms*" by Casadei et al., focuses on security aspects in the context of Aggregate Computing. This paper has focused on attacks based on the diffusion of well-formed, factitious messages and the use of trust mechanisms was proposed to make algorithms resistant to them. After the sensitivity analysis of the proposed trust metrics, several experiments have been executed to verify the ability of an extended gradient algorithm adopting trust mechanisms to tolerate attacks issued by one or more fake nodes emitting random values capable of distorting the ideal gradient field. The investigation has also been complemented with an analysis of the effect, in terms of error and convergence, of some key influencing factors and parameters, for both plain trust and trust with recommendations.

The third paper, "*Reasoning about Sensing Uncertainty and its Reduction in Decision-Making for Self-adaptation*" by Cámara et al., describes an analysis technique based on model checking of stochastic multi-player games that enables one to quantify the benefits in adaptation performance of factoring sensing uncertainty explicitly into decision-making. The novelty of this approach resides in the definition of patterns to systematically encode environment sensing uncertainty in adaptation scenarios, and an analysis method to explore the solution space while factoring in such uncertainty. This ability shows potential for using these models in adaptive systems to make good decisions about when to model uncertainty explicitly, and when to take advantage of uncertainty reduction tactics.

The fourth paper, "*Actor-Based Macroscopic Modeling and Simulation for Smart Urban Planning*" by De Berardinis et al., focuses on Tangramob, an agent-based framework for simulating the evolution of urban traffic. The authors designed a simplified model architecture of Tangramob in Timed Rebeca, a timed extension of the actor-based modeling language Rebeca that supports timing features, and developed a tool-chain that generates runnable instances of this model starting from the same input files of Tangramob. Running Timed Rebeca models allows users to get an idea of how the mobility initiatives under study affect the traveling experience of commuters. Once a subset of these initiatives is identified according to user's goals and budget, it is possible to simulate them with Tangramob in order to get more detailed results.

Many people have contributed to the success of this special issue. Besides the authors of the papers, we would like to thank both the members of the Program Committee of the FOCLASA'17 workshop and the additional reviewers who kindly agreed to help us with the reviewing of the papers in this special issue. All carried out an excellent job during this demanding process: Pedro Alvarez, Farhad Arbab, Luis Barbosa, Simon Bliudze, Radu Calinescu, Javier Camara, Flavio De Paoli, Schahram Dustdar, Jean-Marie Jacquet, Sung-Shik Jongmans, Nima Kaviani, Narges Khakpour, Natallia Kokash, Michael Lienhardt, Alberto Lluch Lafuente, Sun Meng, Hernan C. Melgratti, Mohammad Mousavi, Ayoub Nouri, Marc Oriol, Pascal Poizat, Jose Proenca, Michael Sheng, Marjan Sirjani, Jacopo Soldani, Carolyn Talcott, Massimo Tivoli, Giuseppe Vizzari, Lina Ye, Gianluigi Zavattaro.

We hope that these papers will bring the reader novel insights and ideas.

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