Introduction to the Minitrack on Self-Adaptive Systems and Applications

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1. Introduction

This is the first edition of the minitrack *Self-Adaptive Systems and Applications*, which is part of the *Software Technology* track. The minitrack provides a venue for papers on self-adaptive systems and applications.

Self-adaptation is often seen as an emergent property in self-organizing systems, where adaptation mechanisms are not explicitly defined. Adaptivity is the capacity to learn and adapt to its environments, especially considering various uncertainties. A special emphasis of this minitrack is the inclusion of self-adaptive systems and applications in constantly changing environments to facilitate reducing (re-)configuration, troubleshooting, or maintenance during the operating phase. Among others, challenges of self-adaptive systems include dealing with uncertainties, communication overhead, adaptation decision criteria, a degree of decentralization, or model drift.

In general, the intended scope of the minitrack includes, but is not limited to, the following topics:

- Machine Learning for Self-Adaptive Systems and Applications
- Self-Aware and Context-Aware Applications
- Self-Configuring, -Healing, -Protecting and -Optimizing Systems
- Self-Organizing Applications
- Self-Adaptive Systems and Applications
- Decentralization and Emergent Applications
- Automation and Autonomization in (Intra-)Logistics
- Robotics and Automation
- Coordination and collaboration of autonomous agents
- Smart data models (harmonization of data for portability for different applications)

2. Contributions

The minitrack received five submissions, of which three have been accepted and two were rejected.

The first paper by Chahal et al. discusses a multi-agent patrolling problem. The multi-agent patrolling problem consists of positioning agents to minimize their idleness. Chahal et al. present an approach based on the discretization of a continuous environment to generate dynamic waypoints, the so-called interest points (IP). With this approach, the agents can cover the whole environment while dealing with its topography and their own observation range. A proof is given that the agents and their observation range cover the whole environment. The illustrative experiments show that such dynamic IP locations are adaptive and more efficient in locating high-idleness areas than the static IP approach.

In the second paper, Ghumrawi et al. address the acceleration of agent-based models (ABM) and fuzzy cognitive maps (FCM) to study emergent phenomena in large-scale self-adaptive systems. The authors developed an open-source library that automatically accelerates ABM/FCM models by leveraging the available cores of a graphical processing unit. The

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library's feasibility, correctness, and scalability are analyzed based on a case study and across different networks representing agent interactions.

This minitrack concludes with a paper by Riley et al. that presents the architectural design of an adaptive layer for intrusion detection systems (IDS). They ask what to do if the analysis technologies must be adapted. In the paper, Riley et al. consider an IDS that is assisted by two components: A neural network that finds security anomalies and an attack graph that informs the IDS about system states of interest. The authors present two use cases to demonstrate different mitigation strategies and their impact on the IDS's supporting components.

3. Conclusion

The papers selected for the minitrack cover a wide range of different aspects in self-adaptive systems and applications. This demonstrates the importance of self-adaption and shows that the interest in self-adaptation is not limited to particular systems and applications. As a conclusion, we aim to develop further, establish, and present future editions of the minitrack on self-adaptive systems and applications. We are convinced that these will be of high interest for a broad community in academia and industry.