1st International Workshop on Requirements Engineering for Self-Adaptive and Cyber-Physical Systems

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1 Introduction

Over the last ten years, self-adaptive systems (SAS) and cyber-physical systems (CPS) have attracted the attention of the research community. Self-adaptivity and cyber-physicality are increasingly important properties of software-intensive systems, which give rise to new challenges for system development. Their highly connected and context-aware nature leads to changes in their runtime behavior, stressing the need for runtime adaptation and reorganization. These challenges must be addressed by engineering these systems to be self-adaptive and cyber physical at the earliest possible stages during development: during requirements engineering. In the spirit of RESACS's mother conference, REFSQ, this workshop aimed to provide a platform to exchange ideas about new approaches to requirements engineering for SAS and CPS.

2 Workshop Summary

The workshop program was at the same time diverse and fascinating. One of the core topics discussed was trustworthiness. Goldsteen et al. [1] present a tool support to monitor the satisfaction of trustworthiness requirements during runtime. A fundamental prerequisite to be able to monitor trustworthiness at runtime, however, is that during requirements engineering detrimental factors which impair trustworthiness are considered. For this purpose, Bandyszak et al. [2] provide a process model, according to which the requirements engineering process for cyber physical systems can be structured to account for trustworthiness and enable CPS trustworthiness monitoring at runtime through tools. Similarly, Kneer and Kamsties [3] present an approach to generate a model-based requirements monitor, which enables users to survey requirements satisfaction during runtime adaptation in self-adaptive systems. Runtime adaptation gives rise to a significant degree of uncertainty about the system behavior and context configuration at runtime. Brings et al. [4] present an investigation into the state of the art on dealing with this type of uncertainty and point out that one commonality between SAS and CPS is hence the need to monitor requirements satisfaction, be it functional or quality requirements (e.g., trustworthiness), at runtime. A prerequisite to do so is, however, that the requirements to be monitored are known to the system itself. Tenoyo et al. [5] propose a model-based approach to aid artifact development in reengineering projects, which could be used to introduce development-time requirements into the runtime knowledge base of a system. However, for SAS and CPS, adaptation must not only be accounted for during runtime, but also during development time. In this sense, Battram et al. [6] present an approach to verify CPS component organizations by making use of multi-aspect contracts, which enables developers to reuse CPS components. Albers and Dörfel [7] apply real-time analysis on CPS to simulate their timing behavior in adaptive settings.

3 Workshop Technicalities

Each paper has received three reviews from program committee members and organizers. The reviews aimed at improving the soundness of the presented ideas and giving new impulses for future research. Based on the reviews, seven papers were accepted for presentation at the workshop. In total, 25% of the submitted manuscripts were accepted as full papers, 37.5% as short papers, and 25% for poster presentation.

We, the organizers, are indebted to the program committee members:

- Raian Ali – *Bournemouth University, UK*
- Ottmar Bender – *Airbus Defence and Space, Germany*
- Fabiano Dalpiaz – *Utrecht University, Netherlands*
- Peter Heidl – *Robert Bosch GmbH, Germany*
- Zhi Jin – *Beijing University, China*
- Anna Perini – *Fondazione Bruno Kessler, Italy*
- Carme Quer – *Universitat Politècnica de Catalunya, Spain*
- Marco Roveri – *Fondazione Bruno Kessler, Italy*
- Vítor E. Silva Souza – *Federal University of Espírito Santo, Brazil*

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3. Kneer, F., Kamsties, E.: Model-based Generation of a Requirements Monitor.
4. Brings, J., Salmon, A., Saritas, S.: Context Uncertainty in Requirements Engineering: Definition of a Search Strategy for a Systematic Review and Preliminary Results.
5. Tenoyo, B., Mursanto, P., Azurat, A., Manurung, H.M.: Developing Artifact with Concept Relationship Oriented Methodology, a Progress Report.
6. Battram, P., Kaiser, B., Weber, R.: A Modular Safety Assurance Method considering Multi-Aspect Contracts during Cyber Physical System Design.
7. Albers, K., Dörfel, M.: Using Timing paths to validate end-to-end requirements with methods of schedulability simulation and analysis.