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Editorial

Introduction to the Special Issue on Software-Intensive Autonomous Systems: Methods and applications

1. Introduction

The focal concerns are Software-Intensive Autonomous Systems (SIAS). A SIAS is, by definition, any system where software influences, to a large extent, the design, construction, deployment, and evolution of the system as a whole. Some examples include computer-based systems ranging from individual software applications, information systems, embedded systems for automotive applications, telecommunications, wireless ad hoc systems, business applications with an emphasis on web services, software product lines and product families, cyberphysical systems, and systems-of-systems.

The emerging software-intensive systems become more and more considered as autonomy enabling solutions in different ICT-related domains. However, their increasing complexity makes them difficult to design, develop and maintain, and rises many challenges for researchers, architects, and developers. On the one hand, they must meet very stringent guarantees of adaptiveness, flexibility, performance and reliability, both for business as well as for safety reasons. On the other hand, their development requires interaction between engineers from control system and software domains, whose differing backgrounds are often a source of confusion and misunderstanding.

To master complex aspects of software-intensive systems, it is important to combine efforts from foundational research and recent engineering techniques that are based on mathematically well founded theories and approaches. The new methods should support the system life cycle including requirements, design, implementation, maintenance, reconfiguration and adaptation. This ensures the required levels of quality and trust, putting change and adaptation at all levels of system development.

2. Overview of the special issue

The theme of this special issue is "Software-Intensive Autonomous Systems". We solicited the submission of high-quality papers describing original and significant work in the SIAS domain as well as submissions of extended papers from the workshop of Adaptive and Reconfigurable Systems and Architectures (AROSA 2020). The call for papers attracted 10 submissions covering diverse relevant topics. Each submitted article was carefully evaluated by at least two experts in the field. After a rigorous peer review process, two high-quality research papers have been selected for the issue.

Paper 1 titled "Model-Based Safety Engineering for Autonomous Train Map" by Nadia Chouchani focuses on a model-based approach to match between safety concepts expressed as an ontology, a derived safety model and a safety-extended railway infrastructure map model for autonomous trains. The proposed approach is validated by railway safety case studies for autonomous train map. The integration of this model-based safety solution from the early stages of the map system design improves the safety decisions management process.

Paper 2 titled "Practical Hybrid Confidentiality-based Analytics Framework with Intel SGX" by Abdulatif Alabdulatif focuses on the development of a privacy-preserving data analytics framework for the adaption of confidentiality-based data analysis in various domains in the realm of IoT. The developed framework aims to build a hybrid privacy-preservation solution that combines both software- and hardwarebased techniques to maintain data confidentiality in volatile and untrusted cloud environments. The framework comprises techniques, including advanced encryption standard (AES) and Intel as software guard extensions (SGX). The proposed framework can be beneficial for end-to-end confidentiality-based data computations across IoT domains, such as health care and smart-grid applications.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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