Guest Editorial Preface

Special Issue of Dependability Through Assuredness

Yutaka Matsuno, Nihon University, Tokyo, Japan

Toshinori Takai, Nara Institute of Science and Technology, Ikoma, Japan

Shuichiro Yamamoto, Nagoya University, Nagoya, Japan

Marshall McLuhan pointed that composite roles will appear as the progress of the automation in his book "Understanding Media –The Extensions of Man" (1964). He also predicted that more than 50 years ago, policies were needed to manage structural changes around the world as an organic complex.

Recently, many companies are interested in the digital transformation (DX). The Ministry of Economy, Trade and Industry of Japanese Government defined the Digital Transformation (DX) as follows. Companies shall transform the business itself, organization, process, corporate culture and culture to establish a competitive advantage, respond to drastic changes in the business environment, by utilizing data and digital technology.

DX not only promotes the digitalization of companies but also our Society as a whole. The digital business ecosystem integrates diverse business processes using digital technologies. Autonomous vehicle is also an example of the composite system consists of human driver and automated driving system. There is a forecast that by 2025 we'll see millions of autonomous vehicles on the road. Automated driving cars change the road traffic policy as McLuhan predicted.

The dependable digital business ecosystem needs the assuredness of accountability of safety, security and reliability of actors. The digital business innovation also needs repetitive Hypothesis testing cycle using Proof of Concept trials. Therefore, software development continues to evolve for satisfying changes of customer needs. This shows that digitalization change shall be coexisted with quality assurance.

As noted above, DX needs extreme dependability of software among elements of composite systems. Therefore, this special issue introduces research topics on dependability software engineering towards digitalization.

This special issue of the International Journal of Systems and Software Security and Protection (IJSSP) accepted five papers. The five papers in this special issue cover a range of aspects of dependability through assuredness as follows:

- **CC Case Safety and Security Engineering Methodology:** This paper describes an integration of safety & security analysis that can assure the demands of complex systems, including IoT and AI, using safety and security technologies in an integrated manner. As a central framework of CC-Case, this manuscript shows requirements extraction by STAMP/STPA extension to safety and Security (STAMP S & S) and assurance using GSN divided into a logical model and a concrete model.

- **Six-Assurance Case Patterns by Strengthening/Weakening Argument:** This paper proposes a classification of GSN (Goal Structuring Notation) diagrams. GSN is used to graphically present assurance cases. Based on survey on existing GSN diagrams appeared in assurance cases papers, the paper identifies six assurance cases patterns. The patterns are useful for creating new assurance cases.
- **A Goal-Oriented Approach to Requirements Development and Quantitative Security Assurance:** This paper proposes a semi-automatic, quantitative system security assurance approach for developing security requirement and security assurance cases by extending the traditional GSN (Goal Structuring Notation). Next, two greedy algorithms for quantitative system security assurance are implemented and evaluated. In addition, a case study and an experiment are carried out to verify the effectiveness and efficiency of the proposed approach and the proposed algorithms.
- **Enterprise Architecture-Based Project Assurance Model for the Proof-of-Concept of AI Service Systems:** In this paper, before starting such a PoC project, the authors focus on the project design phase and consider the construction of a model representing PoC projects that develop AI service systems, so that all stakeholders from both the business and IT divisions can understand the project from their respective perspectives. To create such a model in various application domains, the authors propose an enterprise architecture (EA)-based modelling approach. In this approach, the authors introduce business goals to represent how each development process has contributed to the project goals.
- **A Composite Safety Assurance Method for Developing System Architecture Using Model Checking:** This paper proposes an approach, which clearly defines the relationships between safety issues and system elements, and integrates them using ArchiMate. Also, the proposed method apply model checking to system safety assurance, and the checking results are regarded as evidence of assurance cases. This method consists of four steps: interaction visualization, processes model checking, assurance case creation, and composite safety assurance. The significance of this work is that it provides a formalized procedure for safety-critical system assurance, which could increase the confidence in system safety.

Yutaka Matsuno
Toshinori Takai
Shuichiro Yamamoto
Guest Editors
IJSSSP