

Preface

## Fundamentals of Software Engineering (extended versions of selected papers of FSEN 2021)

Within the past few decades, computer systems have revolutionised the world. Software and hardware systems have become integrated into nearly every aspect of everyday life. The ever more central role of computers in society poses many challenges concerning their reliability, safety, correctness and robustness. Based on various fundamental concepts from theoretical computer science, formal methods and related techniques aim at making a significant contribution to better quality systems. The progress and development of formal methods in academia and industry has led to mathematically sound methods and tools for system analysis and verification.

This special issue is dedicated to selected papers from the ninth IPM International Conference on Fundamentals of Software Engineering (FSEN), which was held virtually (due to the Covid-19 Pandemic) on May 19-21, 2021. This biennial event is organised by the School of Computer Science at the Institute for Research in Fundamental Sciences (IPM) in Iran, in cooperation with ACM SIGSOFT and IFIP Working Group 2.2. The topics of interest in FSEN span over all aspects of formal methods, especially those related to advancing the application of formal methods in the software industry and promoting their integration with practical engineering techniques. The Program Committee of FSEN 2021 consists of 42 top researchers from 16 countries. FSEN 2021 received 38 submissions from 18 countries out of which 12 regular papers and 4 short papers have been accepted for publication in the conference post-proceedings. This special issue contains extended, revised versions of the best papers which have undergone additional rounds of detailed anonymous peer review. Four papers have been selected as result of this process:

*Automated Replication of Tuple Spaces via Static Analysis* by Rocco De Nicola, Luca Di Stefano, Omar Inverso, Aline Uwimbabazi is about designing replication policies in distributed systems that use tuple spaces for process coordination and data storage. The authors propose an automated technique to transform the specifications of a system into an equivalent version where tuples are replicated.

*A Program Logic for Fresh Name Generation* by Harold Pancho Elliott and Martin Berger presents a Hoare-style program logic for Pitts and Stark's  $\nu$ -calculus, an extension of the call-by-value simply-typed  $\lambda$ -calculus with a mechanism for the generation of fresh names. It also illustrates the usage of this logic through reasoning about well-known difficult cases from the literature.

*Innermost Term Rewriting on GPUs* by Johri van Eerd, Jan Friso Groote, Pieter Hijma, Jan Martens, Muhammad Osama and Anton Wijs addresses the problem of implementing term rewriting on a GPU. The approach is based on repeatedly performing a massively parallel evaluation of all subterms.

*Automated Testing of an Industrial Stock Market Trading Platform Based on Functional Specification* by Arvin Zakeriyan, Ramtin Khosravi, Hadi Safaria, Ehsan Khamespanah and Seyedeh Mehrnaz Shamsabadi addresses the problem of developing tests for industrial software systems, with a case study in stock market matching engine. The authors specify the domain logic of the system in Gallina and generate test cases using a search-based approach.

The Guest Editors wish to thank all authors that contributed to this special issue for their submissions and careful revisions of their articles, and all reviewers for their detailed and construc-

tive feedback suggesting valuable improvements. We are also grateful to the Editors-in-Chief Mohammadreza Mousavi and Andrea De Lucia, and the members of the Editorial Board for giving us the opportunity to publish this special issue and for their precious help in these complicated times. Special thanks also go to the General Chairs Farhad Arbab and Pejman Lotfi-Kamran and the Steering Committee, in particular the Steering Committee Chair Marjan Sirjani, for their valuable support during all phases of the organisation of the conference and the special issue. We also thank IFIP, the IFIP Working Group 2.2 and ACM for their continuing support of the FSEN conference series in these uncertain times. We hope you will enjoy this selection of research articles and are looking forward to future collaboration.

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