Preface: Special Issue on Software Verification and Testing (Selected Papers from SAC-SVT'15)

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Software drives today's world. Daily needs like electricity supply, transportation, groceries, are all empowered by software, and not to mention communication and emails. This dependency will only increase, given innovations like the Internet-of-things, 3D printing, self-driving cars and drones. Therefore, software correctness is more important than ever: nobody wants drones to drop on our heads, autonomous cars to crash, or intrudes to enter our house via Internet-of-things devices. Hence, rigorous verification and testing is of paramount importance, as a technique to assess and improve the quality of software systems.

This is exactly the topic of the Software Verification and Testing (SVT) track of the ACM Symposium on Applied Computing. This special issue of the Journal on Science of Computer Programming arose from the SVT track at the 30th ACM Symposium on Applied Computing, held in Salamanca, Spain on April 13-17, 2015. The track received 60 full paper submissions. After a careful reviewing process, the international Program Committee decided to select 14 papers for presentation during the symposium and inclusion in the SAC'15 proceedings. From these 14 papers, the six best papers were selected and invited for an extended version to this special issue. These extended papers went again through a rigorous peer review process; five papers were finally accepted and are included in this special issue. The papers included here provide key insights on different formal verification and testing approaches.

This special issue includes three papers on testing. The paper *Model-Based Testing for Building Reliable Realtime Interactive Music Systems* by Poncelet and Jacquemard concerns an unusual, and innovative case study in model based testing, namely an interactive music system. Such a system allows musical performers and composers to create an interactive piece of music where the system reacts in realtime to audio signals from musicians. The paper describes how such complex realtime behaviour can be tested automatically by using timed automata and the testing tool UPPAAL TRON.

The paper *CenUMS – Concurrency Enhanced Usage Models for Statistical Testing of Complex Systems with Concurrent Streams of Use* by Homm, Eckert, and German represents a natural extension of Markov Chain Usage Models by composite states with regions, which are used to formalize concurrent streams of use. This allows a simplified and reasonable specification as it hides the state space explosion. This paper provides configurable algorithms for test case generation that take composite states into account. A new analysis method also leads to a significant improvement of the calculation time for parameters.

The last paper on testing is *Tri-Modal Under-Approximation for Test Generation* by Bride, Julliand, and Masson. This paper presents a method for under-approximating behavioural models with the guarantee that the abstract paths can be instantiated as executions of models. This allows a model-based testing approach to operate on an abstraction of infinite or very large behavioural model, by characterizing the abstract transitions as either may, must+ or must-.

Initial experimental results show that, despite the complexity of symbolic exploration, the method is able to reach significant configurations within a small number of exploration steps.

Two papers in the area of verification were accepted. The paper *Symmetry Reduction for Time Petri Net State Classes* by Bourdil, Berthomieu, Dal Zilio, and Vernadat proposes a method to exploit the symmetries of a realtime system represented by Time Petri nets. The method handles both markings and timing constraints and it can be used in conjunction with the widely used state classes abstraction, with initial experiments showing its effectiveness.

The other paper is *Fast as a Shadow, Expressive as a Tree: Optimized Memory Monitoring for C* by Jakobsson, Kosmatov, and Signoles. This paper addresses memory monitoring in the context of runtime assertion checking of C programs, annotated in E-ACSL, an expressive specification language offered by the FRAMA-C framework for analysis of C code. The paper proposes an effective combination of tree-based and shadow-memory-based techniques that reconciles the efficiency of shadow memory with the high expressiveness of runtime annotations. Experiments confirm that this hybrid approach leads to a significant speedup.

Many people have contributed to this special issue. Besides the authors of the papers, we would like to thank both the members of the Program Committee of the symposium and the additional reviewers who kindly agreed to help us with the reviewing of the papers in this special issue. All carried out an excellent job during this demanding process: Stefan Blom (University of Twente, The Netherlands), Laura Brandán Briones (National University of Cordoba, Argentina), Maximiliano Cristiá (Universidad Nacional de Rosario, Argentina), Marco Faella (University of Naples, Italy), Ylies Falcone (University of Grenoble Alpes, France), Tingting Han (University of London, UK), Fabrice Kordon (University Pierre et Marie Curie, France), Stefan Leue (University of Konstanz, Germany), Malte Lochau (Darmstadt University, Germany), Annabelle McIver (Macquarie University, Australia), Stephan Mennicke (TU Braunschweig, Germany), Mercedes Merayo (Universidad Complutense de Madrid, Spain), Dominique Mery (University of Lorraine, France), Mohammad Mousavi (Halmstad University, Sweden), Brian Nielsen (Aalborg University, Denmark), Jun Pang (University of Luxembourg, Luxembourg), Corina Pasareanu (NASA Ames, USA), Wishnu Prasetya (Utrecht University, The Netherlands), Marjan Sirjani (Reykjavik University, Iceland), Hasan Sözer (Özyegin University, Turkey), Tanja Vos (Valencia University, Spain), Anton Wijs (Eindhoven University of Technology, The Netherlands), Karsten Wolf (Universität Rostock, Germany), Liu Yang (Nanyang Technological University, Singapore), Gianluigi Zavattaro (University of Bologna, Italy), Lijun Zhang (Chinese Academy of Sciences, China).

We hope that these articles will bring the reader novel insights and ideas.

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