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Preface for the special issue "FM15"

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This special issue of the Acta Informatica is dedicated to the 20th anniversary edition of the International Symposium on Formal Methods, FM 2015, held in Oslo, June 21–25.

FM 2015 attracted 124 submissions to the main track out of which 32 papers were accepted by the Program Committee, resulting in an acceptance rate of 0.26. The Lecture Notes in Computer Science conference proceedings further contains nine papers selected by the Program Committee of the Industry Track, which was chaired by Ralf Huuck (NICTA, Australia), Peter Gorm Larsen (Aarhus University, Denmark), and Andreas Roth (SAP, Germany).

The program covered a wide spectrum of all the different aspects of the use of, and research on, formal methods for software development.

It included 4 invited talks by Elvira Albert (Complutense University of Madrid, Spain), Werner Damm (Carl von Ossietzky Universität Oldenburg, DE), Valérie Issarny (INRIA, France), and Leslie Lamport (Microsoft Research, US), 11 workshops, 4 tutorials, a doctoral symposium, and a tool exhibition.

We decided to devote special issues of both Formal Aspects of Computing and Acta Informatica to FM 2015 in order to provide a focussed and coherent view on the wide range of topics.

Together the special issues comprise the most well received research papers covering a spectrum of advances in formal methods.

The papers selected for publication in the companion special issue of Formal Aspects of Computing address the tool-supported application of formal methods in practice.

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This special issue focusses on theoretical foundations: all aspects of theory related to specification, verification, refinement, and static and dynamic analysis.

It contains three extended versions of papers that have been presented at the conference: Probabilistic Bisimulation for Realistic Schedulers.

Authors: Lijun Zhang, Pengfei Yang, Lei Song, Holger Hermanns, Christian Eisentraut, David N. Jansen, Jens Chr. Godskesen.

This paper studies an equivalence notion for probabilistic automata which is strictly coarser than the popular weak distribution bisimilarity. Instead of considering arbitrary schedulers this new coarser notion of bisimilarity allows a validation in the context of realistic subclasses of schedulers. In particular, trace distribution equivalence is implied for partial information schedulers, and compositionality is preserved by distributed schedulers.

The intersection of the two scheduler classes spans a coarser and still reasonable compositional theory of behavioral semantics.

Replication, Refinement and Reachability: Complexity in Dynamic Condition-Response Graphs.

Authors: Søren Debois, Thomas Hildebrandt, Tijs Slaats.

The main contribution of this paper is an analysis of the complexity of reachability and run-time refinement under safety and liveness constraints in event-based process models specified by an extension of Dynamic Condition Response (DCR) graphs with replication of sub-processes. It is proven that event-reachability and refinement are NP-hard for processes without replication, and that these finite state processes recognise exactly the languages that are the union of a regular and an ω-regular language. It is further proven that replication gives rise to undecidability of event-reachability and refinement. However it is shown that refinement allows a tractable approximation.

Descending chains and narrowing on template abstract domains.

Authors: Gianluca Amato, Simone Di Nardo Di Maio, Maria Chiara Meo, Francesca Scozzari.

In this paper the authors show that for a large class of numerical abstract domains over integer variables (such as intervals, octagons, template parallelotopes and template polyhedra) a static analysis by abstract interpretation does not give rise to infinite descending chains. Consequently there is no need for proving termination of the analysis by using narrowing operators.

The paper further investigates new techniques for ensuring in general termination and improving the precision of the static analysis of such domains.