Application and Theory of Petri Nets and Concurrency 2023: Special Issue of Selected Papers

Preface

This special issue presents selected papers from the 44th International Conference on Application and Theory of Petri Nets and Concurrency (Petri Nets 2023), which was organised by the R&D Group on Reconfigurable and Embedded Systems at NOVA School of Science and Technology, NOVA University Lisbon, in June 2023. The Program Committee selected 17 regular papers and 4 tool papers out of 47 papers submitted to Petri Nets 2023. Each paper was single-blind reviewed by at least four reviewers. After the conference, four papers were distinguished by the Program Committee members, whose authors were invited to revise and substantially enhance their conference papers for this special issue. The extended submissions have been reviewed in a separate reviewing process to meet the standards of Fundamenta Informaticae. The four selected papers in this special issue cover a variety of new results in theory as well as in applications.

The paper *Myhill-Nerode Theorem for Higher-Dimensional Automata* by Uli Fahrenberg and Krzysztof Ziemiański, contributes to the study of HDA (Higher-Dimensional Automata), which are concurrency models with non-interleaving semantics and are one of very few system models that can adequately represent concurrent computations given by interval orders. The paper presents a Myhill-Nerode type theorem, characterizing regular languages for HDAs, and gives the construction of an HDA for a given regular HDA language. It is shown that that there are regular languages which are not recognizable by deterministic HDAs.

In the paper *A rewriting-logic-with-SMT-based formal analysis and parameter synthesis framework for parametric time Petri nets*, Jaime Arias, Kyungmin Bae, Carlos Olarte, Peter Csaba Ölveczky and Laure Petrucci introduce a symbolic rewriting-logic semantics for parametric time Petri nets with inhibitor arcs (PITPNs) and prove that it is bisimilar to the standard semantics of PITPNs. This allows the use of the rewriting logic tool Maude, combined with SMT solving, for formal analyses of PITPNs including full LTL model checking and analysis with user-defined execution strategies.

In their paper *Taking Complete Finite Prefixes To High Level, Symbolically*, Nick Würdemann, Thomas Chatain, Stefan Haar and Lukas Panneke define complete finite prefixes of the symbolic

unfolding of high-level Petri nets. For a class of safe high-level Petri nets, they provide and evaluate an algorithm for constructing small such prefixes. Moreover, the authors identify a class of unbounded high-level Petri nets, for which the presented approach can be adapted.

The paper *On the Complexity of Proving Polyhedral Reductions* by Nicolas Amat, Silvano Dal Zilio and Didier Le Botlan extends and deepens existing research on polyhedral abstractions for parametrized Petri nets with linear constraints between the markings of places. The authors present an automatic technique to prove such abstractions using SMT solvers and give an overview of their application to speed up the analysis of reachability problems.

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