Theoretical Computer Science 537 (2014) 1–2

Contents lists available at ScienceDirect

Theoretical Computer Science

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Preface

Theoretical Aspects of Computing (ICTAC 2011)

This issue is devoted to extended versions of selected contributions from the tutorials and from the technical sessions of the International Colloquium on Theoretical Aspects of Computing (ICTAC) held from 31 August to 2 September 2011 at Mabalingwe Nature Reserve, in the Waterberg mountains, two hours travel from the centre of Johannesburg, South Africa. It was the eighth of a series of events created by the International Institute for Software Technology of the United Nations University.

The aim of the colloquium is to bring together practitioners and researchers from academia, industry and government to present research results, and exchange experience and ideas. An important aim of the colloquia is to promote cooperation in research and education between participants and their institutions, from developing and industrial countries, in accordance with the mandate of the United Nations University.

Each of the 44 submitted papers was evaluated by at least two Program Committee members. After extensive discussions, the Program Committee decided to accept 14 papers. The proceedings including these papers were published by Springer as volume 6916 of Lecture Notes in Computer in Science in 2011. After the colloquium, we invited the three tutorial presenters to submit papers inspired by their tutorial presentations and the authors of eight papers to submit extended versions of their ICTAC papers. After additional reviewing and further revisions, we were able to accept seven papers for inclusion in this special issue.

TCTL-preserving translations from timed-arc Petri nets to networks of timed automata

Inspired by *Jiří Srba*'s tutorial, *Joakim Byg*, *Morten Jacobsen*, *Lasse Jacobsen*, *Kenneth Yrke Jørgesen*, *Mikael Harkjær Møller* and *Jiří Srba* present a framework for TCTL-preserving translations between time-dependent modelling formalisms. They prove that once the original and the translated system are in one-by-many correspondence relation, TCTL properties of the original system can be transformed too while preserving the verification answers. They also demonstrate the usability of the technique on two reductions from bounded timed-arc Petri nets to networks for timed automata, providing unified proofs of the translations implemented in the verification tool TAPAAL. Finally, they evaluate the efficiency of the approach on a number of experiments.

Topology, monitorable properties and runtime verification

Based on their tutorial presentation, *Volker Diekert* and *Martin Leucker* review concepts like safety, liveness, and monitorability from a rigorous topological viewpoint. They then show that all ω-regular languages which are deterministic and co-deterministic are monitorable, but certain deterministic liveness properties like "infinitely many a's" cannot be written as a countable union of monitorable languages. They conclude their paper with a brief discussion on model checking with LTL, its three-valued variant LTL_3 and monitor constructions based upon LTL_3.

Axiomatizing weak simulation semantics over BCCSP

Luca Aceto, *David de Frutos Escrig*, *Carlos Gregorio-Rodríguez* and *Anna Ingolfsdottir* study the (in)equational theory of the largest (pre)congruences over the language BCCSP induced by variations on the classic simulation preorder and equivalence that abstract from internal steps in process behaviours. In particular, they focus on the (pre)congruences associated with the weak simulation, the weak complete simulation and the weak ready simulation preorders. Finally, they present results on the (non)existence of finite (ground-)complete (in)equational axiomatizations for each of these behavioural semantics and discuss the axiomatization of such semantics using conditional equations.

http://dx.doi.org/10.1016/j.tcs.2014.05.010

Characterization, definability and separation via saturated models

Carlos Areces, *Facundo Carreiro* and *Santiago Figueira* provide general conditions under which Characterization Theorem, Definability Theorem and Separation Theorem for modal logics can be established for a given choice of model class and modal language whose expressivity is below first order logic. The fundamental condition is that the class of ω-saturated models in question has the Hennessy–Milner property with respect to the notion of observational equivalence under consideration.

On some derivation mechanisms and the complexity of their Szilard languages

Liliana Cojocaru and *Erkki Mäkinen* investigate computational resources used by (alternating) Turing machines to accept Szilard languages of Chomsky grammars, regulated grammars and grammar systems. They relate their results to the circuit complexity classes $\mathcal{NC}^1$ and $\mathcal{NC}^2$. They then focus on parallel communicating grammar systems (PCGSs) with context-free components and prove that the class of Szilard languages of centralized (returning or non-returning) PCGSs is included in $\mathcal{NC}^1$.

Ambiguity and structural ambiguity of symmetric difference NFAs

A. Brink van der Merwe, *Lynette van Zijl* and *Jaco Geldenhuys* show that the trade-off in the conversion from nondeterministic unary symmetric difference automata to unambiguous nondeterministic unary automata is linear with constant 1 in the number of states. They also consider the complexity of deciding unambiguity for k-deterministic finite automata and investigate the interplay between ambiguity and structural ambiguity.

Towards a generic view of primality through multiset decompositions of natural numbers

Paul Tarau describes mechanisms to emulate properties of prime numbers through isomorphisms connecting them to computationally simpler representations involving bijections from natural numbers to multisets of natural numbers. Such mechanisms are implemented as Haskell code, which is also available online.

We would like to thank all reviewers of this special issue for their very detailed comments, which enabled the authors to further improve their works in the final revised versions of their papers published in this special issue.

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