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# Reachability Problems

6th International Workshop, RP 2012  
Bordeaux, France, September 17-19, 2012  
Proceedings



Springer

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# Preface

This volume contains the papers presented at the 6th International Workshop on Reachability Problems (RP 2012) held during September 17–19, 2012, in the Laboratoire Bordelais de Recherche en Informatique (LaBRI), University of Bordeaux, France. RP 2012 was the sixth in the series of workshops following five successful meetings at the University of Genoa, Italy, in 2011, Masaryk University of Brno, Czech Republic, in 2010, Ecole Polytechnique, France, in 2009, at the University of Liverpool, UK, in 2008, and at Turku University, Finland, in 2007.

The workshop is specifically aimed at gathering together scholars from diverse disciplines and backgrounds interested in reachability problems that appear in algebraic structures, computational models, hybrid systems, logic, and verification.

Reachability is a fundamental problem that appears in several different contexts: finite- and infinite-state concurrent systems, computational models like cellular automata and Petri nets, decision procedures for classical, modal, and temporal logic, program analysis, discrete and continuous systems, time critical systems, hybrid systems, rewriting systems, probabilistic and parametric systems, and open systems modelled as games.

Typically, for a fixed system description given in some form (reduction rules, systems of equations, logical formulas, etc.) a reachability problem consists in checking whether a given set of target states can be reached starting from a fixed set of initial states. The set of target states can be represented explicitly or via some implicit representation (e.g., a system of equations, a set of minimal elements with respect to some ordering on the states). Sophisticated quantitative and qualitative properties can often be reduced to basic reachability questions. Decidability and complexity boundaries, algorithmic solutions, and efficient heuristics are all important aspects to be considered in this context. Algorithmic solutions are often based on different combinations of exploration strategies, symbolic manipulations of sets of states, decomposition properties, reduction to linear programming problems, and they often benefit from approximations, abstractions, accelerations, and extrapolation heuristics. Ad hoc solutions as well as solutions based on general-purpose constraint solvers and deduction engines are often combined in order to balance efficiency and flexibility.

The purpose of the conference is to promote exploration of new approaches for the predictability of computational processes by merging mathematical, algorithmic, and computational techniques. Topics of interest include (but are not limited to): reachability for infinite state systems, rewriting systems; reachability analysis in counter/timed/cellular/communicating automata; Petri-nets; computational aspects of semigroups, groups and rings; reachability in dynamical and hybrid systems; frontiers between decidable and undecidable reachability

problems; complexity and decidability aspects; predictability in iterative maps and new computational paradigms.

All these aspects were discussed in the presentations of the sixth edition of the RP workshop. The proceedings of the previous editions of the workshop appeared in the following volumes:

Mika Hirvensalo, Vesa Halava, Igor Potapov, Jarkko Kari (Eds.): *Proceedings of the Satellite Workshops of DLT 2007*. TUCS General Publication No 45, June 2007. ISBN: 978-952-12-1921-4.

Vesa Halava and Igor Potapov (Eds.): *Proceedings of the Second Workshop on Reachability Problems in Computational Models (RP 2008)*. *Electronic Notes in Theoretical Computer Science*. Volume 223, Pages 1-264 (26 December 2008).

Olivier Bournez and Igor Potapov (Eds.): *Reachability Problems, Third International Workshop, RP 2009*, Palaiseau, France, September 23–25, 2009, *Lecture Notes in Computer Science*, 5797, Springer 2009.

Antonin Kucera and Igor Potapov (Eds.): *Reachability Problems, 4th International Workshop, RP 2010*, Brno, Czech Republic, August 28–29, 2010, *Lecture Notes in Computer Science*, 6227, Springer 2010.

Giorgio Delzanno, Igor Potapov (Eds.): *Reachability Problems, 5th International Workshop, RP 2011*, Genoa, Italy, September 28–30, 2011, *Lecture Notes in Computer Science*, 6945, Springer 2011.

The four keynote speakers at the 2012 edition of the conference were:

- Mikołaj Bojańczyk, University of Warsaw, “Fraenkel-Mostowski Sets with Non-Homogeneous Atoms”
- Antonín Kučera, Masaryk University, “Playing Games with Counter Automata”
- Joël Ouaknine, Oxford University, “Decision Problems for Linear Recurrence Sequences”
- Igor Walukiewicz, University of Bordeaux, “Recursive Schemes, Krivine Machines, and Collapsible Pushdown Automata”

There were 15 submissions. Each submission was reviewed by at least three Program Committee members. The full list of the members of the Program Committee and the list of external reviewers can be found on the next two pages. The Program Committee is grateful for the highly appreciated and high-quality work produced by these external reviewers. Based on these reviews, the Program Committee decided to accept eight papers, in addition to the four invited talks. The workshop also provided the opportunity to researchers to give informal presentations that are prepared very shortly before the event and inform the participants about current research and work in progress.

We gratefully acknowledge the financial support from the Region Aquitaine, the Reachard project founded by the Agence Nationale pour la Recherche (ANR), the Institut Polytechnique de Bordeaux (IPB), The Groupement de Recherche

Génie de la Programmation et du Logiciel (GDR GPL), and the Centre de Recherche INRIA Bordeaux Sud-Ouest.

We also gratefully acknowledge the support of the Laboratoire Bordelais de Recherche en Informatique (LaBRI) and the Centre National de la Recherche Scientifique (CNRS), and of the organization team for their help.

It is also a great pleasure to acknowledge the team of the EasyChair system, and the fine cooperation with the *Lecture Notes in Computer Science* team of Springer, which made possible the production of this volume in time for the conference. Finally, we thank all the authors for their high-quality contributions, and the participants for making this edition of RP 2012 a success.

September 2012

Alain Finkel  
Jerome Leroux  
Igor Potapov

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# Table of Contents

Fraenkel-Mostowski Sets with Non-homogeneous Atoms . . . . .	1
<i>Mikołaj Bojańczyk and Sławomir Lasota</i>	
Recursive Schemes, Krivine Machines, and Collapsible Pushdown Automata . . . . .	6
<i>Sylvain Salvati and Igor Walukiewicz</i>	
Decision Problems for Linear Recurrence Sequences . . . . .	21
<i>Joël Ouaknine and James Worrell</i>	
Playing Games with Counter Automata . . . . .	29
<i>Antonín Kučera</i>	
LTL-Model-Checking via Model Composition . . . . .	42
<i>Ingo Felscher</i>	
On the Relationship between Reachability Problems in Timed and Counter Automata . . . . .	54
<i>Christoph Haase, Joël Ouaknine, and James Worrell</i>	
Smooth Sand Piles . . . . .	66
<i>Stefano Brocchi and Paolo Massazza</i>	
Ariadne: Dominance Checking of Nonlinear Hybrid Automata Using Reachability Analysis . . . . .	79
<i>Luca Benvenuti, Davide Bresolin, Pieter Collins, Alberto Ferrari, Luca Geretti, and Tiziano Villa</i>	
Robustness of Time Petri Nets under Guard Enlargement . . . . .	92
<i>S. Akshay, Loïc Hélouët, Claude Jard, and Pierre-Alain Reynier</i>	
Efficient Probabilistic Model Checking of Systems with Ranged Probabilities . . . . .	107
<i>Khalil Ghorbal, Parasara Sridhar Duggirala, Vineet Kahlon, Franjo Ivančić, and Aarti Gupta</i>	



On the Length of Knot Transformations via Reidemeister Moves  
I and II ..... 121  
    *Rafiq Saleh*

Invariants for LTI Systems with Uncertain Input ..... 137  
    *Paul Hänsch and Stefan Kowalewski*

**Author Index** ..... 149