Preface

This volume contains the papers presented at the 5th Workshop on Reachability Problems RP 2011 during September 28–30, 2011 in the Department of Informatics and Computer Science, University of Genoa, Italy. RP 2011 was the fifth in the series of workshops following four successful meetings at 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 Reachability 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 20 presentations of the fifth 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

Vesa Halava and Igor Potapov (Eds.): Proceedings of the Second Workshop on
Reachability Problems in Computational Models (RP 2008). Electronic Notes in

Olivier Bournez and Igor Potapov (Eds.): Reachability Problems, Third Interna-
tional 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, Fourth In-
teernational Workshop, RP 2010, Brno, Czech Republic, August 28–29, 2010,

The four keynote speakers at the 2011 edition of the conference were:

– Krishnendu Chatterjee, IST Austria, “Graph Games with Reachability Ob-
jectives: Mixing Chess, Soccer and Poker”
– Bruno Courcelle, Labri, Université Bordeaux 1, “Automata for Monadic
Second-Order Model-Checking”
– Joost-Pieter Katoen, RWTH Aachen, “Timed Automata as Observers of
Stochastic Processes”
– Jean-Francois Raskin, CFV, Université Libre de Bruxelles, “Reachability
Problems for Hybrid Automata”

There were 24 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 finally to accept 16 papers, in addition to the four
invited talks.

We gratefully acknowledge the financial support from the Games for Design
and Verification initiative of the European Science Foundation that helped us
invite keynote speakers of exceptionally high scientific level to Genoa.

We also gratefully acknowledge the support of the University of Genoa, of
the Department of Informatics and Computer Science, and of the ASAP team
for the help in the organization of the workshop.
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 2011 a success.

September 2011

Giorgio Delzanno
Igor Potapov
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Guan, Nan  Soulé, Romain
Göller, Stefan  Trtik, Marek
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Holik, Lukas
Graph Games with Reachability Objectives (Invited Talk) ...................... 1
  Krishnendu Chatterjee

Observing Continuous-Time MDPs by 1-Clock Timed Automata
(Invited Talk) ........................................................................ 2
  Taolue Chen, Tingting Han, Joost-Pieter Katoen, and
  Alexandru Mereacre

Automata for Monadic Second-Order Model-Checking (Invited Talk) ... 26
  Bruno Courcelle

Reachability Problems for Hybrid Automata (Invited Talk) .............. 28
  Jean-François Raskin

Synthesis of Timing Parameters Satisfying Safety Properties ............ 31
  Étienne André and Romain Soulat

Formal Language Constrained Reachability and Model Checking
Propositional Dynamic Logics ................................................. 45
  Roland Axelsson and Martin Lange

Completeness of the Bounded Satisfiability Problem for Constraint
LTL ...................................................................................... 58
  Marcello M. Bersani, Achille Frigeri, Matteo Rossi, and
  Pierluigi San Pietro

Characterizing Conclusive Approximations by Logical Formulae ...... 72
  Yohan Boichut, Thi-Bich-Hanh Dao, and Valérie Murat

Decidability of LTL for Vector Addition Systems with One Zero-Test ... 85
  Rémi Bonnet

Complexity Analysis of the Backward Coverability Algorithm for
VASS .................................................................................. 96
  Laura Bozzelli and Pierre Ganty

Automated Termination in Model Checking Modulo Theories .......... 110
  Alessandro Carioni, Silvio Ghilardi, and Silvio Ranise

Monotonic Abstraction for Programs with Multiply-Linked
Structures ............................................................................. 125
  Parosh Aziz Abdulla, Jonathan Cederberg, and Tomáš Vojnar
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient Bounded Reachability Computation for Rectangular Automata</td>
<td>139</td>
</tr>
<tr>
<td>Xin Chen, Erika Ábrahám, and Goran Frehse</td>
<td></td>
</tr>
<tr>
<td>Reachability and Deadlocking Problems in Multi-stage Scheduling</td>
<td>153</td>
</tr>
<tr>
<td>Christian E.J. Eggermont and Gerhard J. Woeginger</td>
<td></td>
</tr>
<tr>
<td>Improving Reachability Analysis of Infinite State Systems by</td>
<td>165</td>
</tr>
<tr>
<td>Specialization</td>
<td></td>
</tr>
<tr>
<td>Fabio Fioravanti, Alberto Pettorossi, Maurizio Proietti, and</td>
<td></td>
</tr>
<tr>
<td>Valerio Senni</td>
<td></td>
</tr>
<tr>
<td>Lower Bounds for the Length of Reset Words in Eulerian Automata</td>
<td>180</td>
</tr>
<tr>
<td>Vladimir V. Gusev</td>
<td></td>
</tr>
<tr>
<td>Parametric Verification and Test Coverage for Hybrid Automata Using</td>
<td>191</td>
</tr>
<tr>
<td>the Inverse Method</td>
<td></td>
</tr>
<tr>
<td>Laurent Fribourg and Ulrich Kühne</td>
<td></td>
</tr>
<tr>
<td>A New Weakly Universal Cellular Automaton in the 3D Hyperbolic Space</td>
<td>205</td>
</tr>
<tr>
<td>with Two States</td>
<td></td>
</tr>
<tr>
<td>Maurice Margenstern</td>
<td></td>
</tr>
<tr>
<td>A Fully Symbolic Bisimulation Algorithm</td>
<td>218</td>
</tr>
<tr>
<td>Malcolm Mumme and Gianfranco Ciardo</td>
<td></td>
</tr>
<tr>
<td>Reachability for Finite-State Process Algebras Using Static Analysis</td>
<td>231</td>
</tr>
<tr>
<td>Nataliya Skrypnyuk and Flemming Nielson</td>
<td></td>
</tr>
<tr>
<td>Author Index</td>
<td>245</td>
</tr>
</tbody>
</table>