

24th International Conference on Rewriting Techniques and Applications

RTA'13, June 24–26, 2013, Eindhoven, The Netherlands

Edited by

Femke van Raamsdonk



Editor

Femke van Raamsdonk
Department of Computer Science
VU University
Amsterdam, The Netherlands
f.van.raamsdonk@vu.nl

ACM Classification 1998

D.1 Programming Techniques, D.2 Software Engineering, D.3 Programming Languages, F.1 Computation by Abstract Devices, F.2 Analysis of Algorithms and Problem Complexity, F.3 Logics and Meanings of Programs, F.4 Mathematical Logic and Formal Languages, I.1 Symbolic and Algebraic Manipulation, I.2 Artificial Intelligence

ISBN 978-3-939897-53-8

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at <http://www.dagstuhl.de/dagpub/978-3-939897-53-8>.

Publication date

June, 2013

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

License

This work is licensed under a Creative Commons Attribution 3.0 Unported license (CC-BY 3.0):

<http://creativecommons.org/licenses/by/3.0/legalcode>.



In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work under the following conditions, without impairing or restricting the authors' moral rights:

■ Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/LIPIcs.RTA.2013.i

ISBN 978-3-939897-53-8

ISSN 1868-8969

<http://www.dagstuhl.de/lipics>

LIPICS – Leibniz International Proceedings in Informatics

LIPICS is a series of high-quality conference proceedings across all fields in informatics. LIPICS volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Susanne Albers (Humboldt University Berlin)
- Chris Hankin (Imperial College London)
- Deepak Kapur (University of New Mexico)
- Michael Mitzenmacher (Harvard University)
- Madhavan Mukund (Chennai Mathematical Institute)
- Catuscia Palamidessi (INRIA)
- Wolfgang Thomas (RWTH Aachen)
- Pascal Weil (*Chair*, University Bordeaux)
- Reinhard Wilhelm (Saarland University, Schloss Dagstuhl)

ISSN 1868-8969

www.dagstuhl.de/lipics

Contents

Preface	vii
Conference Organization	ix
External Reviewers	xi
Author Index	xiii

Invited Talks

Pattern Generation by Cellular Automata (Invited Talk) <i>Jarkko Kari</i>	1
Husserl and Hilbert on Completeness and Husserl's Term Rewrite-based Theory of Multiplicity (Invited Talk) <i>Mitsuhiro Okada</i>	4
Evidence Normalization in System FC (Invited Talk) <i>Dimitrios Vytiniotis and Simon Peyton Jones</i>	20

Regular Papers

Linear Logic and Strong Normalization <i>Beniamino Accattoli</i>	39
A Combination Framework for Complexity <i>Martin Avanzini and Georg Moser</i>	55
Tyrolean Complexity Tool: Features and Usage <i>Martin Avanzini and Georg Moser</i>	71
Abstract Logical Model Checking of Infinite-State Systems Using Narrowing <i>Kyungmin Bae, Santiago Escobar, and José Meseguer</i>	81
Compression of Rewriting Systems for Termination Analysis <i>Alexander Bau, Markus Lohrey, Eric Nöth, and Johannes Waldmann</i>	97
A Variant of Higher-Order Anti-Unification <i>Alexander Baumgartner, Temur Kutsia, Jordi Levy, and Mateu Villaret</i>	113
Over-approximating Descendants by Synchronized Tree Languages <i>Yohan Boichut, Jacques Chabin, and Pierre Réty</i>	128
Unifying Nominal Unification <i>Christophe Calvès</i>	143
Rewriting with Linear Inferences in Propositional Logic <i>Anupam Das</i>	158
Proof Orders for Decreasing Diagrams <i>Bertram Felgenhauer and Vincent van Oostrom</i>	174

24th International Conference on Rewriting Techniques and Applications (RTA'13).
Editor: Femke van Raamsdonk



Leibniz International Proceedings in Informatics

Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany



Decidable structures between Church-style and Curry-style <i>Ken-etsu Fujita and Aleksy Schubert</i>	190
Expressibility in the Lambda Calculus with μ <i>Clemens Grabmayer and Jan Rochel</i>	206
A Homotopical Completion Procedure with Applications to Coherence of Monoids <i>Yves Guiraud, Philippe Malbos, and Samuel Mimram</i>	223
Extending Abramsky's Lazy Lambda Calculus: (Non)-Conservativity of Embeddings <i>Manfred Schmidt-Schaufß, Elena Machkasova, and David Sabel</i>	239
Algorithms for Extended Alpha-Equivalence and Complexity <i>Manfred Schmidt-Schaufß, Conrad Rau, and David Sabel</i>	255
Unification Modulo Nonnested Recursion Schemes via Anchored Semi-Unification <i>Gert Smolka and Tobias Tebbi</i>	271
Formalizing Knuth-Bendix Orders and Knuth-Bendix Completion <i>Christian Sternagel and René Thiemann</i>	287
Automatic Decidability: A Schematic Calculus for Theories with Counting Operators <i>Elena Tushkanova, Christophe Ringeissen, Alain Giorgetti, and Olga Kouchnarenko</i>	303
Normalized Completion Revisited <i>Sarah Winkler and Aart Middeldorp</i>	319
Beyond Peano Arithmetic – Automatically Proving Termination of the Goodstein Sequence <i>Sarah Winkler, Harald Zankl, and Aart Middeldorp</i>	335
Confluence by Decreasing Diagrams – Formalized <i>Harald Zankl</i>	352

Preface

This volume contains the proceedings of the 24rd International Conference on Rewriting Techniques and Applications (RTA 2013), which was held June 24–26 2013, in Eindhoven, the Netherlands. RTA is the major forum for the presentation of research on all aspects of rewriting. Previous RTA conferences were held in Dijon (1985), Bordeaux (1987), Chapel Hill (1989), Como (1991), Montreal (1993), Kaiserslautern (1995), New Brunswick (1996), Sitges (1997), Tsukuba (1998), Trento (1999), Norwich (2000), Utrecht (2001), Copenhagen (2002), Valencia (2003), Aachen (2004), Nara (2005), Seattle (2006), Paris (2007), Hagenberg/Linz (2008), Brasilia (2009), Edinburgh (2010), Novi Sad (2011), and Nagoya (2012).

RTA 2013 received 50 submissions from 16 countries. The programme committee selected 20 regular papers and 1 system description for presentation at the conference. The selection process greatly benefitted from the conscientious and excellent work of in total 71 external reviewers, some of whom reviewed more than one paper.

The programme committee selected the contributions *Linear Logic and Strong Normalization* by Beniamino Accattoli and *A Homotopical Completion Procedure with Applications to Coherence of Monoids* by Yves Guiraud, Philippe Malbos, and Samuel Mimram together for the best paper award.

Jarkko Kari, Mitsuhiro Okada, and Simon Peyton Jones presented invited talks at RTA 2013. The talk by Simon Peyton Jones was joint with TLCA 2013. It is a great pleasure to thank the invited speakers for enriching the conference with their talks and their participation, and for their contributions to the present proceedings.

We used the EasyChair system for many aspects of the reviewing process. We wish to thank Andrei Voronkov and all others of the EasyChair team for this invaluable tool.

The proceedings of RTA 2013 are published as a volume in the LIPIcs series. I wish to thank the editorial board of LIPIcs for agreeing to publish these proceedings, and the team of the LIPIcs editorial office for their help in the preparation of these proceedings. I thank in particular Marc Herbstritt for always promptly and accurately helping out when needed.

RTA 2013 was organized as part of the International Conference on Rewriting, Deduction, and Programming (RDP 2013). I would like to thank Hans Zantema, the conference chair of RTA 2013, and the other members of the organizing committee of RDP 2013 for their indispensable contribution to the success of RDP 2013. RDP 2013 accommodated also the 11th International Conference on Typed Lambda Calculi and Applications (TLCA 2013). It was a pleasure to work together with Masahito Hasegawa, the programme chair of TLCA 2013. Further, several workshops were organized, including the Annual Meeting of the IFIP Working Group 1.6 on Term Rewriting, the Workshop on Haskell and Rewriting Techniques (HART 2013), the 27th International Workshop on Unification (UNIF 2013), the 2nd International Workshop on Confluence (IWC 2013), and the Workshop on Infinitary Rewriting (WIR 2013). I thank the organizers of all workshops for making the programme of RDP 2013 more diverse and attractive.

I am very grateful to all members of the RTA 2013 programme committee for their reviews, their constructive comments, and the pleasant collaboration. A special word of thanks to Aart Middeldorp and Vincent van Oostrom for their asked and unasked advice.

RTA 2013 gratefully acknowledges the financial support of NWO (the Netherlands Organisation for Scientific Research) and the support of Eindhoven University of Technology.

June 2013

Femke van Raamsdonk



■ Conference Organization

Programme Chair

Femke van Raamsdonk VU University Amsterdam

Conference Chair

Hans Zantema Eindhoven University of Technology

Programme Committee

Eduardo Bonelli	National University of Quilmes
Byron Cook	Microsoft Research Cambridge
Stephanie Delaune	ENS Cachan
Gilles Dowek	Inria Paris–Rocquencourt
Maribel Fernández	King’s College London
Nao Hirokawa	JAIST Ishikawa
Delia Kesner	University Paris-Diderot
Hélène Kirchner	Inria Paris–Rocquencourt
Barbara König	University Duisburg Essen
Temur Kutsia	Johannes Kepler University Linz
Aart Middeldorp	University of Innsbruck
Vincent van Oostrom	Utrecht University
Femke van Raamsdonk	VU University Amsterdam
Kristoffer Rose	IBM Research New York
Manfred Schmidt-Schauß	Goethe University Frankfurt
Peter Selinger	Dalhousie University
Paula Severi	University of Leicester
Aaron Stump	The University of Iowa
Tarmo Uustalu	Institute of Cybernetics Tallinn
Roel de Vrijer	VU University Amsterdam
Johannes Waldmann	HTWK Leipzig
Hans Zantema	Eindhoven University of Technology

Steering Committee

Mauricio Ayala-Rincón	Brasilia University
Frédéric Blanqui	INRIA Tsinghua University Beijing
Salvador Lucas	Technical University of Valencia
Georg Moser (chair)	University of Innsbruck
Masahiko Sakai	Nagoya University
Sophie Tison	University of Lille

RTA Web Page

<http://rewriting.loria.fr/rta/>



■ External Reviewers

Accattoli, Beniamino
Albert, Elvira
Andrei, Oana
Aoto, Takahito
Ayala-Rincón, Mauricio
Baelde, David
Balabonski, Thibaut
Bau, Alexander
Blom, Stefan
Brockschmidt, Marc
Bruggink, H.J. Sander
Bucciarelli, Antonio
Chevalier, Yannick
Cirstea, Horatiu
Conchon, Sylvain
Courtieu, Pierre
Eades, Harley
Echahed, Rachid
Eker, Steven
Falke, Stephan
Felgenhauer, Bertram
Fouquere, Christophe
Fu, Peng
Fuhs, Carsten
Gascón, Adrià
Genet, Thomas
Gimenez, Stéphane
Grabmayer, Clemens
Graham-Lengrand, Stéphane
Gust, Helmar
Habermehl, Peter
Heckel, Reiko
Hirschkoff, Daniel
Hofbauer, Dieter
Jeltsch, Wolfgang
Kapur, Deepak
Ketema, Jeroen
Klop, Jan Willem
Kop, Cynthia
Levy, Jordi
Licata, Daniel R.
Lushman, Brad
Madet, Antoine
Marin, Mircea
Matsuda, Kazutaka
Mazza, Damiano
Minas, Mark
Nakata, Keiko
Nakazawa, Koji
Otto, Carsten
Padovani, Vincent
Payet, Etienne
Petrişan, Daniela
Plump, Detlef
Rau, Conrad
Rémy, Didier
Rochel, Jan
Rose, Eva
Sabel, David
Schaper, Michael
Schneider-Kamp, Peter
Sternagel, Christian
Straßburger, Lutz
Stückrath, Jan
Thiemann, René
Toyama, Yoshihito
Urban, Christian
Vries, Fer-Jan de
Wiedijk, Freek
Winkler, Sarah
Zankl, Harald



■ Author Index

- Accattoli, Beniamino, 39
Avanzini, Martin, 55, 71
- Bae, Kyungmin, 81
Bau, Alexander, 97
Baumgartner, Alexander, 113
Boichut, Yohan, 128
- Calvès, Christophe, 143
Chabin, Jacques, 128
- Das, Anupam, 158
- Escobar, Santiago, 81
- Felgenhauer, Bertram, 174
Fujita, Ken-etsu, 190
- Giorgetti, Alain, 303
Grabmayer, Clemens, 206
Guiraud, Yves, 223
- Kari, Jarkko, 1
Kouchnarenko, Olga, 303
Kutsia, Temur, 113
- Levy, Jordi, 113
Lohrey, Markus, 97
- Machkasova, Elena, 239
Malbos, Philippe, 223
Meseguer, Jóse, 81
Middeldorp, Aart, 319, 335
Mimram, Samuel, 223
Moser, Georg, 55, 71
- Nöth, Eric, 97
- Okada, Mitsuhiro, 4
Ostrom, Vincent van, 174
- Peyton Jones, Simon, 20
- Rau, Conrad, 255
Réty, Pierre, 128
Ringeissen, Christophe, 303
Rochel, Jan, 206

