

Afonso Ferreira Horst Reichel (Eds.)

STACS 2001

18th Annual Symposium
on Theoretical Aspects of Computer Science
Dresden, Germany, February 15-17, 2001
Proceedings



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Afonso Ferreira
CNRS, I3S & INRIA Sophia Antipolis
INRIA, 2004 Route des Lucioles, 06902 Sophia-Antipolis, France
E-mail: ferreira@sophia.inria.fr

Horst Reichel
TU Dresden
Institut für Theoretische Informatik, Fakultät Informatik
01062 Dresden, Germany
E-mail: reichel@tcs.inf.tu-dresden.de

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

STACS <18, 2001, Dresden>:
Proceedings / STACS 2001 / 18th Annual Symposium on Theoretical
Aspects of Computer Science, Dresden, Germany, February 15 - 17, 2001.
Afonso Ferreira ; Horst Reichel (ed.). - Berlin ; Heidelberg ; New
York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ;
Tokyo : Springer, 2001
(Lecture notes in computer science ; Vol. 2010)
ISBN 3-540-41695-1

CR Subject Classification (1998): F, E.1, I.3.5, G.2

ISSN 0302-9743

ISBN 3-540-41695-1 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH
© Springer-Verlag Berlin Heidelberg 2001
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Christian Grosche
Printed on acid-free paper SPIN 10782078 06/3142 5 4 3 2 1 0

Table of Contents

Invited Presentations

- Recurrence in Infinite Words (Extended Abstract) 1
Julien Cassaigne (Institut de Mathématiques de Luminy)

- Generalized Model-Checking Problems for First-Order Logic 12
Martin Grohe (University of Illinois at Chicago)

- Myhill–Nerode Relations on Automatic Systems and the Completeness of Kleene Algebra 27
Dexter Kozen (Cornell University)

Contributions

- 2-Nested Simulation Is Not Finitely Equationally Axiomatizable 39
Luca Aceto (BRICS), Wan Fokkink (CWI), Anna Ingólfssdóttir (BRICS)

- On the Difference between Polynomial-Time Many-One and Truth-Table Reducibilities on Distributional Problems 51
Shin Aida (Nagoya University), Rainer Schuler (Tokyo Institute of Technology), Tatsuie Tsukiji (Nagoya University), Osamu Watanabe (Tokyo Institute of Technology)

- Matching Polygonal Curves with Respect to the Fréchet Distance 63
Helmut Alt (Freie Universität Berlin), Christian Knauer (Freie Universität Berlin), Carola Wenk (Freie Universität Berlin)

- On the Class of Languages Recognizable by 1-Way Quantum Finite Automata 75
Andris Ambainis (University of California, Berkeley), Arnolds Kikusts (University of Latvia, Rīga), Māris Valdats (University of Latvia, Rīga)

- Star-Free Open Languages and Aperiodic Loops 87
Martin Beaudry (Université de Sherbrooke), François Lemieux (Université du Québec), Denis Thérien (McGill University, Montréal)

- A $\frac{5}{2}n^2$ -Lower Bound for the Multiplicative Complexity of $n \times n$ -Matrix Multiplication 99
Markus Bläser (Med. Universität zu Lübeck)

- Evasiveness of Subgraph Containment and Related Properties 110
Amit Chakrabarti (Princeton University), Subhash Khot (Princeton University), Yaoyun Shi (Princeton University)

XII Table of Contents

On the Complexity of Computing Minimum Energy Consumption Broadcast Subgraphs	121
Andrea E.F. Clementi (<i>Università di Roma</i>), Pilu Crescenzi (<i>Università di Firenze</i>), Paolo Penna (<i>Università di Roma</i>), Gianluca Rossi (<i>Università di Firenze</i>), Paola Vocca (<i>Università di Roma</i>)	
On Presburger Liveness of Discrete Timed Automata	132
Zhe Dang (<i>Washington State University</i>), Pierluigi San Pietro (<i>Politecnico di Milano</i>), Richard A. Kemmerer (<i>University of California at Santa Barbara</i>)	
Residual Finite State Automata	144
François Denis (<i>Université de Lille I</i>), Aurélien Lemay (<i>Université de Lille I</i>), Alain Terlutte (<i>Université de Lille I</i>)	
Deterministic Radio Broadcasting at Low Cost	158
Anders Dessimann (<i>Lund Institute of Technology</i>), Andrzej Pelc (<i>Université du Québec</i>)	
The Existential Theory of Equations with Rational Constraints in Free Groups is PSPACE-Complete	170
Volker Diekert (<i>Universität Stuttgart</i>), Claudio Gutiérrez (<i>Universidad de Chile</i>), Christian Hagenah (<i>Universität Stuttgart</i>)	
Recursive Randomized Coloring Beats Fair Dice Random Colorings	183
Benjamin Doerr (<i>Christian-Albrechts-Universität zu Kiel</i>), Anand Srivastav (<i>Christian-Albrechts-Universität zu Kiel</i>)	
Randomness, Computability, and Density	195
Rod G. Downey (<i>Victoria University of Wellington</i>), Denis R. Hirschfeldt (<i>Victoria University of Wellington</i>), André Nies (<i>University of Chicago</i>)	
On Multipartition Communication Complexity (Extended Abstract)	206
Pavol Ďuriš (<i>RWTH Aachen</i>), Juraj Hromkovič (<i>RWTH Aachen</i>), Stasys Jukna (<i>Johann Wolfgang Goethe-Universität Frankfurt</i>), Martin Sauerhoff (<i>Universität Dortmund</i>), Georg Schnitger (<i>Johann Wolfgang Goethe-Universität Frankfurt</i>)	
Scalable Sparse Topologies with Small Spectrum	218
Robert Elsässer (<i>University of Paderborn</i>), Rastislav Královič (<i>Comenius University, Bratislava</i>), Burkhard Monien (<i>University of Paderborn</i>)	
Optimal Preemptive Scheduling on Uniform Processors with Non-decreasing Speed Ratios	230
Leah Epstein (<i>The Interdisciplinary Center, Herzliya</i>)	

The UPS Problem	238
<i>Cristina G. Fernandes (Universidade de São Paulo), Till Nierhoff (Humboldt-Universität, Berlin)</i>	
Gathering of Asynchronous Oblivious Robots with Limited Visibility	247
<i>Paola Flocchini (University of Ottawa), Giuseppe Prencipe (Università di Pisa), Nicola Santoro (Carleton University), Peter Widmayer (ETH Zürich)</i>	
Generalized Langton's Ant: Dynamical Behavior and Complexity	259
<i>Anahí Gajardo (Universidad de Chile), Eric Goles (Universidad de Chile), Andrés Moreira (Universidad de Chile)</i>	
Optimal and Approximate Station Placement in Networks (With Applications to Multicasting and Space Efficient Traversals)	271
<i>Clemente Galdi (Università di Salerno), Christos Kaklamanis (University of Patras), Manuela Montangero (Università di Salerno), Pino Persiano (Università di Salerno)</i>	
Learning Expressions over Monoids (Extended Abstract)	283
<i>Ricard Gavaldà (Universitat Politècnica de Catalunya), Denis Thérien (McGill University)</i>	
Efficient Recognition of Random Unsatisfiable k -SAT Instances by Spectral Methods	294
<i>Andreas Goerdt (TU Chemnitz), Michael Krivelevich (Tel Aviv University)</i>	
On the Circuit Complexity of Random Generation Problems for Regular and Context-Free Languages	305
<i>Massimiliano Goldwurm (Università degli Studi di Milano), Beatrice Palano (Università degli Studi di Torino), Massimo Santini (Università degli Studi di Milano)</i>	
Efficient Minimal Perfect Hashing in Nearly Minimal Space	317
<i>Torben Hagerup (Johann Wolfgang Goethe-Universität Frankfurt), Torsten Tholey (Johann Wolfgang Goethe-Universität Frankfurt)</i>	
Small PCPs with Low Query Complexity	327
<i>Prahлад Harsha (Massachusetts Institute of Technology), Madhu Sudan (Massachusetts Institute of Technology)</i>	
Space Efficient Algorithms for Series-Parallel Graphs	339
<i>Andreas Jakoby (Universität Lübeck), Maciej Liśkiewicz (Universität Lübeck), Rüdiger Reischuk (Universität Lübeck)</i>	
A Toolkit for First Order Extensions of Monadic Games	353
<i>David Janin (Université de Bordeaux), Jerzy Marcinkowski (University of Wrocław)</i>	

XIV Table of Contents

Polynomial Time Approximation Schemes for MAX-BISECTION on Planar and Geometric Graphs	365
<i>Klaus Jansen (Christian-Albrechts-University of Kiel), Marek Karpinski (University of Bonn), Andrzej Lingas (Lund University), Eike Seidel (Christian-Albrechts-University of Kiel)</i>	
Refining the Hierarchy of Blind Multicounter Languages	376
<i>Matthias Jantzen (Universität Hamburg), Alexy Kurganskyy (Universität Hamburg)</i>	
A Simple Undecidable Problem: The Inclusion Problem for Finite Substitutions on ab^*c	388
<i>Juhani Karhumäki (University of Turku), Leonid P. Lisovik (Kiev National University)</i>	
New Results on Alternating and Non-deterministic Two-Dimensional Finite-State Automata.....	396
<i>Jarkko Kari (University of Iowa), Cristopher Moore (University of New Mexico)</i>	
The Complexity of Minimal Satisfiability Problems	407
<i>Lefteris M. Kirousis (University of Patras), Phokion G. Kolaitis (University of California, Santa Cruz)</i>	
On the Minimal Hardware Complexity of Pseudorandom Function Generators (Extended Abstract)	419
<i>Matthias Krause (Univ. Mannheim), Stefan Lucks (Univ. Mannheim)</i>	
Approximation Algorithms for Minimum Size 2-Connectivity Problems ...	431
<i>Piotr Krysta (Max-Planck-Institut, Saarbrücken), V.S. Anil Kumar (Max-Planck-Institut, Saarbrücken)</i>	
A Model Theoretic Proof of Büchi-Type Theorems and First-Order Logic for N-Free Pomsets	443
<i>Dietrich Kuske (Technische Universität Dresden)</i>	
An Ehrenfeucht-Fraïssé Approach to Collapse Results for First-Order Queries over Embedded Databases	455
<i>Clemens Lautemann (Johannes Gutenberg-Universität, Mainz), Nicole Schweikardt (Johannes Gutenberg-Universität, Mainz)</i>	
A New Logical Characterization of Büchi Automata	467
<i>Giacomo Lenzi (Université Bordeaux)</i>	
A Primal-Dual Approximation Algorithm for the Survivable Network Design Problem in Hypergraph	478
<i>Liang Zhao (Kyoto University), Hiroshi Nagamochi (Tohoku University of Technology), Toshihide Ibaraki (Kyoto University)</i>	

The Complexity of Copy Constant Detection in Parallel Programs	490
<i>Markus Müller-Olm (Universität Dortmund)</i>	
Approximation Algorithms for the Bottleneck Stretch Factor Problem	502
<i>Giri Narasimhan (University of Memphis), Michiel Smid (University of Magdeburg)</i>	
Semantical Principles in the Modal Logic of Coalgebras	514
<i>Dirk Pattinson (Ludwig-Maximilians-Universität München)</i>	
The $\#a = \#b$ Pictures Are Recognizable	527
<i>Klaus Reinhardt (Universität Tübingen)</i>	
A Logical Approach to Decidability of Hierarchies of Regular Star-Free Languages	539
<i>Victor L. Selivanov (Ershov Institute of Informatics Systems, Novosibirsk)</i>	
Regular Languages Defined by Generalized First-Order Formulas with a Bounded Number of Bound Variables	551
<i>Howard Straubing (Boston College, Chestnut Hill), Denis Thérien (McGill University, Montréal)</i>	
New Bounds on the OBDD-Size of Integer Multiplication via Universal Hashing	563
<i>Philipp Woelfel (Univ. Dortmund)</i>	
Author Index	575