

Volker Diekert
Bruno Durand (Eds.)

LNCS 3404

STACS 2005

22nd Annual Symposium
on Theoretical Aspects of Computer Science
Stuttgart, Germany, February 2005, Proceedings



Springer

TP 301-53

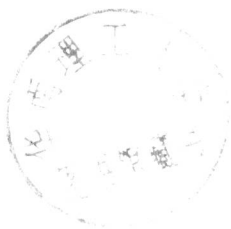
T 396.2

2005

Volker Diekert Bruno Durand (Eds.)

STACS 2005

22nd Annual Symposium
on Theoretical Aspects of Computer Science
Stuttgart, Germany, February 24-26, 2005
Proceedings



E200500911



Springer

Volume Editors

Volker Diekert
Universität Stuttgart, FMI
Universitätsstr. 38, 70569 Stuttgart, Germany
E-mail: diekert@informatik.uni-stuttgart.de

Bruno Durand
LIF - CMI
39, rue Joliot Curie, 13453 Marseille Cedex 13, France
E-mail: bruno.durand@lif.univ-mrs.fr

Library of Congress Control Number: 2005920531

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

ISSN 0302-9743

ISBN 3-540-24998-2 Springer 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. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springeronline.com

© Springer-Verlag Berlin Heidelberg 2005

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11394556 06/3142 5 4 3 2 1 0

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

New York University, NY, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

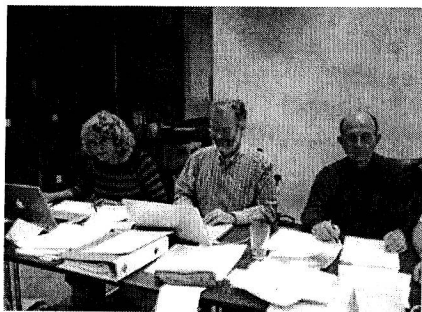
Rice University, Houston, TX, USA

Gerhard Weikum

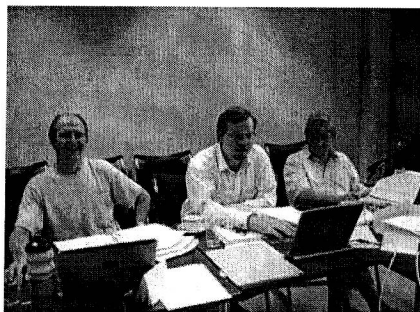
Max-Planck Institute of Computer Science, Saarbruecken, Germany

The Program Committee at Work

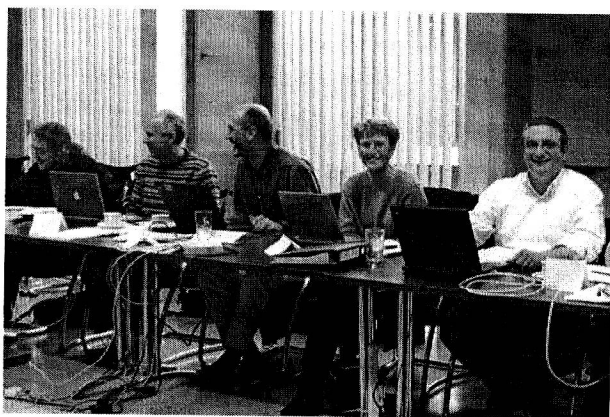
(October 29/30, 2004)



Brigitte Vallée Rolf Klein
Claude Kirchner



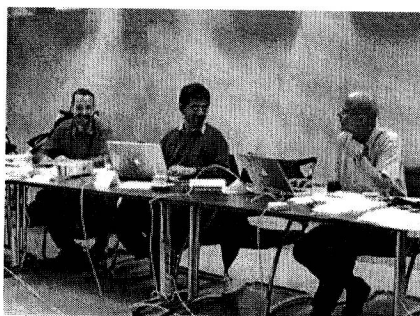
Jop Sibeyn Matthew Hennessy
Friedhelm Meyer auf der Heide



Gilles Schaeffer Dietrich Kuske Giuseppe Persiano
Pascal Weil Monika Henzinger



Gerhard Woeginger Eric Allender
Hendrik Jan Hoogeboom



Peter Høyer Volker Diekert
Bruno Durand

Preface

The Symposium on Theoretical Aspects of Computer Science (STACS) is alternately held in France and in Germany. The conference of February 24–26, 2005 in Stuttgart was the twenty-second in this series. Previous meetings took place in Paris (1984), Saarbrücken (1985), Orsay (1986), Passau (1987), Bordeaux (1988), Paderborn (1989), Rouen (1990), Hamburg (1991), Cachan (1992), Würzburg (1993), Caen (1994), München (1995), Grenoble (1996), Lübeck (1997), Paris (1998), Trier (1999), Lille (2000), Dresden (2001), Antibes (2002), Berlin (2003), and Montpellier (2004).

The interest in STACS has been increasing continuously during recent years and has turned it into a leading conference in theoretical computer science. The call for papers for STACS 2005 led to 217 submissions from all over the world.

The 17 members of the Program Committee met in Stuttgart for two days at the end of October 2004 to select the contributions to be presented at the conference. Thanks are due to the committee as well as to all the external referees for their valuable work put into the reviewing process. Just 54 papers (i.e., 25% of the submissions) could be accepted, thus guaranteeing the very high scientific quality of the conference. Moreover, this strict selection enabled us to keep the conference in its standard format with only two parallel sessions.

We would like to thank the three invited speakers Manindra Agrawal (Singapore), Mireille Bousquet-Mélou (Bordeaux), and Uwe Schöning (Ulm) for presenting lectures and for their contributions to the proceedings.

Finally we thank the local organizing committee and all members of the Institute of Formal Methods in Computer Science for their help. In particular we thank Holger Austinat, Heike Photien, and Horst Prote for their great efforts. Special thanks are due to Andrei Voronkov for his PC-expert software *EasyChair* and for continuously supporting us.

Financial support for the conference was provided by the German research foundation DFG and by the University of Stuttgart. The Informatik Forum Stuttgart (infos e.V.) helped in the management of the conference.

February 2005

Volker Diekert
Bruno Durand

Organization

STACS 2005 was organized by the Institute of Formal Methods in Computer Science at the University of Stuttgart and by infos e.V. under the auspices of the Special Interest Group for Theoretical Computer Science of the Gesellschaft für Informatik (GI).

Program Committee

Eric Allender (Rutgers State University, New Brunswick)
Volker Diekert (Universität Stuttgart), Co-chair
Bruno Durand (Université de Provence, Marseille), Co-chair
Matthew Hennessy (University of Sussex)
Monika Henzinger (École Polytechnique, Lausanne)
Hendrik Jan Hoogeboom (Universiteit Leiden)
Peter Høyer (University of Calgary)
Claude Kirchner (LORIA, Nancy)
Rolf Klein (Universität Bonn)
Dietrich Kuske (Universität Dresden)
Friedhelm Meyer auf der Heide (Universität Paderborn)
Giuseppe Persiano (Università di Salerno)
Gilles Schaeffer (École Polytechnique, Palaiseau)
Jop Sibeyn (Universität Halle)
Brigitte Vallée (Université de Caen)
Pascal Weil (Université Bordeaux 1)
Gerhard Woeginger (Universiteit Eindhoven)

Organizing Committee

Volker Claus	Javier Esparza	Michael Matthiesen
Volker Diekert	Ulrich Hertrampf	Holger Petersen

Software for the Program Committee Work

EasyChair by Andrei Voronkov (University of Manchester)
<http://www.easychair.org>

Referees

Rudolf Ahlswede	Adrianna Alexander	Andris Ambainis
Ali Akhavi	Noga Alon	Klaus Ambos-Spies

Pasquale Ambrosio	Julien Cassaigne	David Eppstein
Matthew Andrews	Julien Cervelle	Leah Epstein
Elliot Anshelevich	Rohit Chada	Thomas Erlebach
Aaron Archer	Krishna Chatterjee	Zoltán Ésik
Carlos Areces	Jingchao Chen	Rolf Fagerberg
André Arnold	Victor Chepoi	Hongbing Fan
Eugène Asarin	Yannick Chevalier	Lene Monrad Favrholdt
Vincenzo Auletta	Andrew Childs	Henning Fernau
Nikhil Bansal	Janka Chlebikova	Alessandro Ferrante
Patrick Bas	Bogdan Chlebus	Michael J. Fischer
Ulrike Baumann	Christian Choffrut	Melvin Fitting
Marie-Pierre Béal	Ferdinando Cicalese	Philippe Flajolet
Danièle Beauquier	Julien Clément	Michele Flammini
Luca Becchetti	Loek Cleophas	Rudolf Fleischer
Emmanuel Beffara	Johanne Cohen	Fedor Fomin
Rene Beier	Loïc Colson	Enrico Formenti
Andras A. Benczur	Robert Cori	Lance Fortnow
Michael Ben-Or	Fabien Coulon	Dimitris Fotakis
Anne Bergeron	Jean-Michel Couvreur	Gereon Frahling
Jean Berstel	Claude Crépeau	Pierluigi Frisco
Marcin Bienkowski	Artur Czumaj	David Gamarnik
Jean-Camille Birget	Paolo D'Arco	Leszek A. Gasieniec
Bruno Blanchet	Guillaume Dabosville	Paul Gastin
Norbert Blum	Elias Dahlhaus	Cyril Gavoille
Achim Blumensath	Benoit Daireaux	Sukumar Ghosh
Carlo Blundo	Valentina Damerow	Dora Giammarresi
Luc Boasson	Philippe Darondeau	Raffaele Giancarlo
Hans L. Bodlaender	Jürgen Dassow	Christian Glaßer
Mikołaj Bojańczyk	Anuj Dawar	Emmanuel Godard
Paola Bonizzoni	Frank Dehne	Ashish Goel
Olaf Bonorden	Marianne Delorme	Joel Goossens
Henning Bordihn	François Denis	Aline Gouget
Alan Borodin	Roberto De Prisco	Erich Grädel
Alin Bostan	Ronald de Wolf	Vladimir Grebinski
Jérémie Bourdon	Walter Didimo	Frederic Green
Olivier Bournez	Martin Dietzfelbinger	Martin Grohe
Patricia Bouyer	Clare Dixon	Clemens Gröpl
Julian Bradfield	Gilles Dowek	Roberto Grossi
Robert Brijder	Rod Downey	Jozef Gruska
Hervé Brönnimann	Jean-Christophe Dubacq	Jens Gustedt
Anne Brüggemann-Klein	Devdatt Dubhashi	Torben Hagerup
Véronique Bruyère	Guillaume Dufay	Nir Halman
Harry Buhrman	Arnaud Durand	Horst W. Hamacher
Andrei Bulatov	Jérôme Durand-Lose	Tero Harju
Peter Bürgisser	Thomas Eiter	Prahladh Harsha
	Joost Engelfriet	

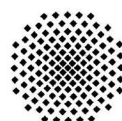
Pinar Heggernes	Walter A. Kosters	Catherine McCartin
Tom Henzinger	Daniel Král'	Ross McConnell
Miki Hermann	Dieter Kratsch	Pierre McKenzie
Ulrich Hertrampf	Danny Krizanc	Kurt Mehlhorn
Andreas Herzig	Andrei Krokhin	Stephan Merz
William Hesse	Piotr Krysta	Yves Métivier
Lisa Higham	Gregory Kucherov	Ulrich Meyer
Denis Hirshfeldt	Manfred Kufleitner	Filippo Mignosi
John Hitchcock	Michal Kunc	Peter Bro Miltersen
Thomas Hofmeister	Martin Kutrib	Manuela Montangero
Markus Holzer	Gregory Lafitte	Cris Moore
Juraj Hromkovič	Martin Lange	François Morain
Falk Hüffner	Elmar Langetepe	Malika More
Cor Hurkens	Sophie Laplante	Mohamed Mosbah
Samuel Hym	François Laroussinie	Anca Muscholl
David Ilcinkas	Salvatore La Torre	Muthu Muthukrishnan
Lucian Ilie	Michel Latteux	N.S. Narayanaswamy
Neil Immerman	Reinhard Laue	Ashwin Nayak
Sandy Irani	Jean-Marie Le Bars	Ilan Newman
Yuval Ishai	Grégoire Lecerf	Pierre Nicodème
Gabor Ivanyos	Martin Leucker	David Nicol
Bill Jackson	Christos Levcopoulos	Rolf Niedermeier
Riko Jacob	Asaf Levin	Noam Nisan
David Pokrass Jacobs	Loick Lhote	Ryan O'Donnell
David Janin	Christian Liebchen	Nicolas Ollinger
Klaus Jansen	Yuri Lifshits	Harold Ollivier
Emmanuel Jeandel	Luigi Liquori	Ayoub Otmani
Emmanuel Jeannot	Martin Löhnertz	Martin Otto
Mark Jerrum	Sylvain Lombardy	Rasmus Pagh
Mohamed Kaaniche	Alexandro López-Ortiz	Christophe Papazian
Frank Kammer	Tamas Lukovszki	Domenico Parente
Juhani Karhumäki	Olivier Ly	Mimmo Parente
Jarkko Kari	Frederic Magniez	Gennaro Parlato
Marek Karpinski	Meena Mahajan	Tomi A. Pasanen
Jonathan Katz	Anirban Mahanti	Hélène Paugam-Moisy
Jordan Kerenidis	Jean Mairesse	Andrzej Pelc
Lutz Kettner	Oded Maler	David Peleg
Bakhadyr Khoussainov	Sebastian Maneth	Rudi Pendavingh
Samir Khuller	Yannis Mannooussakis	Paolo Penna
Andreas Klappenecker	Stuart Margolis	Holger Petersen
Jetty Kleijn	Jean-Yves Marion	Jordi Petit
Bettina Klinz	Charles Martel	Ion Petre
Adam Klivans	Conrado Martínez	Jean-Eric Pin
Daniel Kobler	Barbara Masucci	Dennis Pixton
Roman Kolpakov	Jacques Mazoyer	Andrei Popescu

Natacha Portier	Detlef Seese	Andrea Torsello
Dominique Poulalhon	Raimund Seidel	Luca Trevisan
Guido Proietti	Victor Selivanov	Philippas Tsigas
Mathieu Raffinot	Pranab Sen	Vinodchandran Variyam
Silvio Ranise	Géraud Sénizergues	Yann Vaxès
Julian Rathke	Maria Serna	Vlatko Vedral
Oded Regev	Paul Sernine	Ivan Vegner
Mireille Régnier	Wendelin Serwe	Carmine Ventre
Horst Reichel	Jiří Sgall	Nikolai Vereshchagin
Wolfgang Reisig	Alexander Shen	Ivan Visconti
Bernhard Reus	Amir Shpilka	Paul Vitányi
Yossi Richter	Sandeep K. Shukla	Berthold Vöcking
Michel Rigo	Riccardo Silvestri	Heribert Vollmer
John Michael Robson	Martin Skutella	Sergei Vorobyov
Manuel Rode	Christian Sohler	Timothy Walsh
Andrei Romashchenko	Greg Sorkin	Igor Walukiewicz
Adi Rosen	Robert Spalek	Rolf Wanka
Andrei Rumyantsev	Jeremy Sproston	Ingo Wegener
Michael Rusinowitch	Ludwig Staiger	Matthias Westermann
Jörg R. Sack	Frank Stephan	Tom Wexler
Jacques Sakarovitch	Howard Straubing	Avi Wigderson
Kai Salomaa	Martin Strauss	Thomas Wilke
Miklos Santha	Madhu Sudan	Erik Winfree
Luigi Santocanale	Hung-Min Sun	Guohua Wu
Martin Sauerhoff	Firas Swidan	Hiroaki Yamamoto
Carla D. Savage	Mario Szegedy	Ching-Nung Yang
Christian Scheideler	Alain Tapp	Shaofa Yang
Christian Schindelhauer	Jan Arne Telle	Nobuko Yoshida
Werner Schindler	Véronique Terrier	Mariette Yvinec
Karl Schlechta	Guillaume Theyssier	Martin Zachariasen
Markus Schmidt	P.S. Thiagarajan	Norbert Zeh
Henning Schnoor	Robin Thomas	Marc Zeitoun
Uwe Schöning	Siegbert Tiga	Xizhong Zheng
Eric Schost	Jean-Pierre Tillich	Martin Ziegler
Lutz Schröder	Cesare Tinelli	Alexandre Zvonkine
Stefan Schwoon	Hans Raj Tiwary	

Sponsoring Institutions

Deutsche
Forschungsgemeinschaft

DFG



**Universität
Stuttgart**

Lecture Notes in Computer Science

For information about Vols. 1–3295

please contact your bookseller or Springer

Vol. 3418: U. Brandes, T. Erlebach (Eds.), *Network Analysis*. XII, 471 pages. 2005.

Vol. 3412: X. Franch, D. Port (Eds.), *COTS-Based Software Systems*. XVI, 312 pages. 2005.

Vol. 3406: A. Gelbukh (Ed.), *Computational Linguistics and Intelligent Text Processing*. XVII, 829 pages. 2005.

Vol. 3404: V. Diekert, B. Durand (Eds.), *STACS 2005*. XVI, 706 pages. 2005.

Vol. 3403: B. Ganter, R. Godin (Eds.), *Formal Concept Analysis*. XI, 419 pages. 2005. (Subseries LNAI).

Vol. 3398: D.-K. Baik (Ed.), *Systems Modeling and Simulation: Theory and Applications*. XIV, 733 pages. 2005. (Subseries LNAI).

Vol. 3397: T.G. Kim (Ed.), *Artificial Intelligence and Simulation*. XV, 711 pages. 2005. (Subseries LNAI).

Vol. 3393: H.-J. Kreowski, U. Montanari, F. Orejas, G. Rozenberg, G. Taentzer (Eds.), *Formal Methods in Software and Systems Modeling*. XXVII, 413 pages. 2005.

Vol. 3391: C. Kim (Ed.), *Information Networking*. XVII, 936 pages. 2005.

Vol. 3388: J. Lagergren (Ed.), *Comparative Genomics*. VIII, 133 pages. 2005. (Subseries LNBI).

Vol. 3387: R. Cardoso, A. Sheth (Eds.), *Semantic Web Services and Web Process Composition*. VIII, 147 pages. 2005.

Vol. 3386: S. Vaudenay (Ed.), *Public Key Cryptography - PKC 2005*. IX, 436 pages. 2005.

Vol. 3385: R. Cousot (Ed.), *Verification, Model Checking, and Abstract Interpretation*. XII, 483 pages. 2005.

Vol. 3382: J. Odell, P. Giorgini, J.P. Müller (Eds.), *Agent-Oriented Software Engineering V*. X, 239 pages. 2005.

Vol. 3381: P. Vojtáš, M. Bieleková, B. Charron-Bost, O. Sýkora (Eds.), *SOFSEM 2005: Theory and Practice of Computer Science*. XV, 448 pages. 2005.

Vol. 3379: M. Hemmje, C. Niederee, T. Risse (Eds.), *From Integrated Publication and Information Systems to Information and Knowledge Environments*. XXIV, 321 pages. 2005.

Vol. 3378: J. Kilian (Ed.), *Theory of Cryptography*. XII, 621 pages. 2005.

Vol. 3376: A. Menezes (Ed.), *Topics in Cryptology - CT-RSA 2005*. X, 385 pages. 2004.

Vol. 3375: M.A. Marsan, G. Bianchi, M. Listanti, M. Meo (Eds.), *Quality of Service in Multiservice IP Networks*. XIII, 656 pages. 2005.

Vol. 3374: D. Weyns, H.V.D. Parunak, F. Michel (Eds.), *Environments for Multi-Agent Systems*. X, 279 pages. 2005. (Subseries LNAI).

Vol. 3368: L. Paletta, J.K. Tsotsos, E. Rome, G.W. Humphreys (Eds.), *Attention and Performance in Computational Vision*. VIII, 231 pages. 2005.

Vol. 3366: I. Rahwan, P. Moraitis, C. Reed (Eds.), *Argumentation in Multi-Agent Systems*. XII, 263 pages. 2005. (Subseries LNAI).

Vol. 3363: T. Eiter, L. Libkin (Eds.), *Database Theory - ICDT 2005*. XI, 413 pages. 2004.

Vol. 3362: G. Barthe, L. Burdy, M. Huisman, J.-L. Lanet, T. Muntean (Eds.), *Construction and Analysis of Safe, Secure, and Interoperable Smart Devices*. IX, 257 pages. 2005.

Vol. 3361: S. Bengio, H. Bourlard (Eds.), *Machine Learning for Multimodal Interaction*. XII, 362 pages. 2005.

Vol. 3360: S. Spaccapietra, E. Bertino, S. Jajodia, R. King, D. McLeod, M.E. Orłowska, L. Strous (Eds.), *Journal on Data Semantics II*. XI, 223 pages. 2004.

Vol. 3359: G. Grieser, Y. Tanaka (Eds.), *Intuitive Human Interfaces for Organizing and Accessing Intellectual Assets*. XIV, 257 pages. 2005. (Subseries LNAI).

Vol. 3358: J. Cao, L.T. Yang, M. Guo, F. Lau (Eds.), *Parallel and Distributed Processing and Applications*. XXIV, 1058 pages. 2004.

Vol. 3357: H. Handschuh, M.A. Hasan (Eds.), *Selected Areas in Cryptography*. XI, 354 pages. 2004.

Vol. 3356: G. Das, V.P. Gulati (Eds.), *Intelligent Information Technology*. XII, 428 pages. 2004.

Vol. 3355: R. Murray-Smith, R. Shorten (Eds.), *Switching and Learning in Feedback Systems*. X, 343 pages. 2005.

Vol. 3353: J. Hromkovič, M. Nagl, B. Westfechtel (Eds.), *Graph-Theoretic Concepts in Computer Science*. XI, 404 pages. 2004.

Vol. 3352: C. Blundo, S. Cimato (Eds.), *Security in Communication Networks*. XI, 381 pages. 2005.

Vol. 3350: M. Hermenegildo, D. Cabeza (Eds.), *Practical Aspects of Declarative Languages*. VIII, 269 pages. 2005.

Vol. 3349: B.M. Chapman (Ed.), *Shared Memory Parallel Programming with Open MP*. X, 149 pages. 2005.

Vol. 3348: A. Canteaut, K. Viswanathan (Eds.), *Progress in Cryptology - INDOCRYPT 2004*. XIV, 431 pages. 2004.

Vol. 3347: R.K. Ghosh, H. Mohanty (Eds.), *Distributed Computing and Internet Technology*. XX, 472 pages. 2004.

Vol. 3346: R.H. Bordini, M. Dastani, J. Dix, A.E.F. Seghrouchni (Eds.), *Programming Multi-Agent Systems*. XIV, 249 pages. 2005. (Subseries LNAI).

Vol. 3345: Y. Cai (Ed.), *Ambient Intelligence for Scientific Discovery*. XII, 311 pages. 2005. (Subseries LNAI).

- Vol. 3344: J. Malenfant, B.M. Østvold (Eds.), Object-Oriented Technology. ECOOP 2004 Workshop Reader. VIII, 215 pages. 2005.
- Vol. 3342: E. Şahin, W.M. Spears (Eds.), Swarm Robotics. IX, 175 pages. 2005.
- Vol. 3341: R. Fleischer, G. Trippen (Eds.), Algorithms and Computation. XVII, 935 pages. 2004.
- Vol. 3340: C.S. Calude, E. Calude, M.J. Dinneen (Eds.), Developments in Language Theory. XI, 431 pages. 2004.
- Vol. 3339: G.I. Webb, X. Yu (Eds.), AI 2004: Advances in Artificial Intelligence. XXII, 1272 pages. 2004. (Subseries LNAI).
- Vol. 3338: S.Z. Li, J. Lai, T. Tan, G. Feng, Y. Wang (Eds.), Advances in Biometric Person Authentication. XVIII, 699 pages. 2004.
- Vol. 3337: J.M. Barreiro, F. Martin-Sanchez, V. Maojo, F. Sanz (Eds.), Biological and Medical Data Analysis. XI, 508 pages. 2004.
- Vol. 3336: D. Karagiannis, U. Reimer (Eds.), Practical Aspects of Knowledge Management. X, 523 pages. 2004. (Subseries LNAI).
- Vol. 3335: M. Malek, M. Reitenspieß, J. Kaiser (Eds.), Service Availability. X, 213 pages. 2005.
- Vol. 3334: Z. Chen, H. Chen, Q. Miao, Y. Fu, E. Fox, E.-p. Lim (Eds.), Digital Libraries: International Collaboration and Cross-Fertilization. XX, 690 pages. 2004.
- Vol. 3333: K. Aizawa, Y. Nakamura, S. Satoh (Eds.), Advances in Multimedia Information Processing - PCM 2004, Part III. XXXV, 785 pages. 2004.
- Vol. 3332: K. Aizawa, Y. Nakamura, S. Satoh (Eds.), Advances in Multimedia Information Processing - PCM 2004, Part II. XXXVI, 1051 pages. 2004.
- Vol. 3331: K. Aizawa, Y. Nakamura, S. Satoh (Eds.), Advances in Multimedia Information Processing - PCM 2004, Part I. XXXVI, 667 pages. 2004.
- Vol. 3330: J. Akiyama, E.T. Baskoro, M. Kano (Eds.), Combinatorial Geometry and Graph Theory. VIII, 227 pages. 2005.
- Vol. 3329: P.J. Lee (Ed.), Advances in Cryptology - ASIACRYPT 2004. XVI, 546 pages. 2004.
- Vol. 3328: K. Lodaya, M. Mahajan (Eds.), FSTTCS 2004: Foundations of Software Technology and Theoretical Computer Science. XVI, 532 pages. 2004.
- Vol. 3327: Y. Shi, W. Xu, Z. Chen (Eds.), Data Mining and Knowledge Management. XIII, 263 pages. 2005. (Subseries LNAI).
- Vol. 3326: A. Sen, N. Das, S.K. Das, B.P. Sinha (Eds.), Distributed Computing - IWDC 2004. XIX, 546 pages. 2004.
- Vol. 3325: C.H. Lim, M. Yung (Eds.), Information Security Applications. XI, 472 pages. 2005.
- Vol. 3323: G. Antoniou, H. Boley (Eds.), Rules and Rule Markup Languages for the Semantic Web. X, 215 pages. 2004.
- Vol. 3322: R. Klette, J. Žunić (Eds.), Combinatorial Image Analysis. XII, 760 pages. 2004.
- Vol. 3321: M.J. Maher (Ed.), Advances in Computer Science - ASTAN 2004. XII, 510 pages. 2004.
- Vol. 3320: K.-M. Liew, H. Shen, S. See, W. Cai (Eds.), Parallel and Distributed Computing: Applications and Technologies. XXIV, 891 pages. 2004.
- Vol. 3319: D. Amyot, A.W. Williams (Eds.), Telecommunications and beyond: Modeling and Analysis of Reactive, Distributed, and Real-Time Systems. XII, 301 pages. 2005.
- Vol. 3318: E. Eskin, C. Workman (Eds.), Regulatory Genomics. VIII, 115 pages. 2005. (Subseries LNBI).
- Vol. 3317: M. Domaratzki, A. Okhotin, K. Salomaa, S. Yu (Eds.), Implementation and Application of Automata. XII, 336 pages. 2005.
- Vol. 3316: N.R. Pal, N.K. Kasabov, R.K. Mudi, S. Pal, S.K. Parui (Eds.), Neural Information Processing. XXX, 1368 pages. 2004.
- Vol. 3315: C. Lemaître, C.A. Reyes, J.A. González (Eds.), Advances in Artificial Intelligence - IBERAMIA 2004. XX, 987 pages. 2004. (Subseries LNAI).
- Vol. 3314: J. Zhang, J.-H. He, Y. Fu (Eds.), Computational and Information Science. XXIV, 1259 pages. 2004.
- Vol. 3313: C. Castelluccia, H. Hartenstein, C. Paar, D. Westhoff (Eds.), Security in Ad-hoc and Sensor Networks. VIII, 231 pages. 2005.
- Vol. 3312: A.J. Hu, A.K. Martin (Eds.), Formal Methods in Computer-Aided Design. XI, 445 pages. 2004.
- Vol. 3311: V. Roca, F. Rousseau (Eds.), Interactive Multimedia and Next Generation Networks. XIII, 287 pages. 2004.
- Vol. 3310: U.K. Wiil (Ed.), Computer Music Modeling and Retrieval. XI, 371 pages. 2005.
- Vol. 3309: C.-H. Chi, K.-Y. Lam (Eds.), Content Computing. XII, 510 pages. 2004.
- Vol. 3308: J. Davies, W. Schulte, M. Barnett (Eds.), Formal Methods and Software Engineering. XIII, 500 pages. 2004.
- Vol. 3307: C. Bussler, S.-k. Hong, W. Jun, R. Kaschek, D. Kinsbuk, S. Krishnaswamy, S.W. Loke, D. Oberle, D. Richards, A. Sharma, Y. Sure, B. Thalheim (Eds.), Web Information Systems - WISE 2004 Workshops. XV, 277 pages. 2004.
- Vol. 3306: X. Zhou, S. Su, M.P. Papazoglou, M.E. Orlowska, K.G. Jeffery (Eds.), Web Information Systems - WISE 2004. XVII, 745 pages. 2004.
- Vol. 3305: P.M.A. Sloot, B. Chopard, A.G. Hoekstra (Eds.), Cellular Automata. XV, 883 pages. 2004.
- Vol. 3303: J.A. López, E. Benfenati, W. Dubitzky (Eds.), Knowledge Exploration in Life Science Informatics. X, 249 pages. 2004. (Subseries LNAI).
- Vol. 3302: W.-N. Chin (Ed.), Programming Languages and Systems. XIII, 453 pages. 2004.
- Vol. 3300: L. Bertossi, A. Hunter, T. Schaub (Eds.), Inconsistency Tolerance. VII, 295 pages. 2005.
- Vol. 3299: F. Wang (Ed.), Automated Technology for Verification and Analysis. XII, 506 pages. 2004.
- Vol. 3298: S.A. McIlraith, D. Plexousakis, F. van Harmelen (Eds.), The Semantic Web - ISWC 2004. XXI, 841 pages. 2004.
- Vol. 3296: L. Bougé, V.K. Prasanna (Eds.), High Performance Computing - HiPC 2004. XXV, 530 pages. 2004.

Table of Contents

Invited Talks

Automorphisms of Finite Rings and Applications to Complexity of Problems <i>Manindra Agrawal, Nitin Saxena</i>	1
Algebraic Generating Functions in Enumerative Combinatorics and Context-Free Languages <i>Mireille Bousquet-Mélou</i>	18
Algorithmics in Exponential Time <i>Uwe Schöning</i>	36

Session 1A

Worst-Case and Average-Case Approximations by Simple Randomized Search Heuristics <i>Carsten Witt</i>	44
Sampling Sub-problems of Heterogeneous Max-cut Problems and Approximation Algorithms <i>Petros Drineas, Ravi Kannan, Michael W. Mahoney</i>	57
Truthful Approximation Mechanisms for Scheduling Selfish Related Machines <i>Nir Andelman, Yossi Azar, Motti Sorani</i>	69

Session 1B

Counting in the Two Variable Guarded Logic with Transitivity <i>Lidia Tendera</i>	83
The Variable Hierarchy of the μ -Calculus Is Strict <i>Dietmar Berwanger, Giacomo Lenzi</i>	97
The Core of a Countably Categorical Structure <i>Manuel Bodirsky</i>	110

Session 2A

How Common Can Be Universality for Cellular Automata? <i>Guillaume Theyssier</i>	121
---	-----

Cellular Automata: Real-Time Equivalence Between One-Dimensional Neighborhoods <i>Victor Poupet</i>	133
---	-----

Session 2B

On the Decidability of Temporal Properties of Probabilistic Pushdown Automata <i>Tomáš Brázdil, Antonín Kučera, Oldřich Stražovský</i>	145
--	-----

Deciding Properties of Contract-Signing Protocols <i>Detlef Kähler, Ralf Küsters, Thomas Wilke</i>	158
---	-----

Session 3A

Polylog-Time Reductions Decrease Dot-Depth <i>Christian Glaßer</i>	170
---	-----

On the Computational Complexity of the Forcing Chromatic Number <i>Frank Harary, Wolfgang Slany, Oleg Verbitsky</i>	182
--	-----

More Efficient Queries in PCPs for NP and Improved Approximation Hardness of Maximum CSP <i>Lars Engebretsen, Jonas Holmerin</i>	194
--	-----

Session 3B

Three Optimal Algorithms for Balls of Three Colors <i>Zdeněk Dvořák, Vít Jelínek, Daniel Král', Jan Kynčl, Michael Saks</i> ..	206
---	-----

Cost Sharing and Strategyproof Mechanisms for Set Cover Games <i>Xiang-Yang Li, Zheng Sun, Weizhao Wang</i>	218
--	-----

On Weighted Balls-into-Bins Games <i>Petra Berenbrink, Tom Friedetzky, Zengjian Hu, Russell Martin</i>	231
---	-----

Session 4A

Computing Minimal Multi-homogeneous Bézout Numbers Is Hard <i>Gregorio Malajovich, Klaus Meer</i>	244
--	-----

Dynamic Complexity Theory Revisited <i>Volker Weber, Thomas Schwentick</i>	256
---	-----

Parametric Duality and Kernelization: Lower Bounds and Upper Bounds on Kernel Size <i>Jianer Chen, Henning Fernau, Iyad A. Kanj, Ge Xia</i>	269
---	-----

Session 4B

Shortest Monotone Descent Path Problem in Polyhedral Terrain <i>Sasanka Roy, Sandip Das, Subhas C. Nandy</i>	281
---	-----

Packet Buffering: Randomization Beats Deterministic Algorithms <i>Markus Schmidt</i>	293
---	-----

Solving Medium-Density Subset Sum Problems in Expected Polynomial Time <i>Abraham D. Flaxman, Bartosz Przydatek</i>	305
---	-----

Session 5A

Quantified Constraint Satisfaction, Maximal Constraint Languages, and Symmetric Polymorphisms <i>Hubie Chen</i>	315
---	-----

Regular Tree Languages Definable in FO <i>Michael Benedikt, Luc Segoufin</i>	327
---	-----

Recursive Markov Chains, Stochastic Grammars, and Monotone Systems of Nonlinear Equations <i>Kousha Etessami, Mihalis Yannakakis</i>	340
--	-----

Session 5B

Connectivity for Wireless Agents Moving on a Cycle or Grid <i>Josep Díaz, Xavier Pérez, Maria J. Serna, Nicholas C. Wormald</i>	353
---	-----

Improved Algorithms for Dynamic Page Migration <i>Marcin Bienkowski, Mirosław Dynia, Mirosław Korzeniowski</i>	365
---	-----

Approximate Range Mode and Range Median Queries <i>Prosenjit Bose, Evangelos Kranakis, Pat Morin, Yihui Tang</i>	377
---	-----

Session 6A

Topological Automata <i>Emmanuel Jeandel</i>	389
---	-----

Minimizing NFA's and Regular Expressions <i>Gregor Gramlich, Georg Schnitger</i>	399
---	-----

Session 6B

Increasing Kolmogorov Complexity <i>Harry Buhrman, Lance Fortnow, Ilan Newman, Nikolai Vereshchagin</i>	412
--	-----

Kolmogorov-Loveland Randomness and Stochasticity <i>Wolfgang Merkle, Joseph Miller, André Nies, Jan Reimann, Frank Stephan</i>	422
---	-----

Session 7A

Information Theory in Property Testing and Monotonicity Testing in Higher Dimension <i>Nir Ailon, Bernard Chazelle</i>	434
--	-----

On Nash Equilibria in Non-cooperative All-Optical Networks <i>Vittorio Bilò, Michele Flammini, Luca Moscardelli</i>	448
--	-----

Speed Scaling to Manage Temperature <i>Nikhil Bansal, Kirk Pruhs</i>	460
---	-----

Session 7B

The Complexity of Solving Linear Equations over a Finite Ring <i>V. Arvind, T.C. Vijayaraghavan</i>	472
--	-----

A Lower Bound on the Complexity of Polynomial Multiplication over Finite Fields <i>Michael Kaminski</i>	485
---	-----

Characterizing TC^0 in Terms of Infinite Groups <i>Andreas Krebs, Klaus-Jörn Lange, Stephanie Reifferscheid</i>	496
--	-----

Session 8A

Fast Pruning of Geometric Spanners <i>Joachim Gudmundsson, Giri Narasimhan, Michiel Smid</i>	508
The PIGs Full Monty – A Floor Show of Minimal Separators <i>Gerard Jennhwa Chang, Antonius J.J. Kloks, Jiping Liu, Sheng-Lung Peng</i>	521
Centrality Measures Based on Current Flow <i>Ulrik Brandes, Daniel Fleischer</i>	533

Session 8B

Varieties of Codes and Kraft Inequality <i>Fabio Burderi, Antonio Restivo</i>	545
Improving the Alphabet-Size in High Noise, Almost Optimal Rate List Decodable Codes <i>Eran Rom, Amnon Ta-Shma</i>	557
The Power of Commuting with Finite Sets of Words <i>Michal Kunc</i>	569

Session 9A

Exact Quantum Algorithms for the Leader Election Problem <i>Seiichiro Tani, Hirotada Kobayashi, Keiji Matsumoto</i>	581
Robust Polynomials and Quantum Algorithms <i>Harry Buhrman, Ilan Newman, Hein Röhrig, Ronald de Wolf</i>	593
Quantum Interactive Proofs with Competing Provers <i>Gus Gutoski, John Watrous</i>	605

Session 9B

Roundings Respecting Hard Constraints <i>Benjamin Doerr</i>	617
Sorting Stably, In-Place, with $O(n \log n)$ Comparisons and $O(n)$ Moves <i>Gianni Franceschini</i>	629