

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

University of California, Los Angeles, CA, 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

Oscar H. Ibarra Hsu-Chun Yen (Eds.)

Implementation and Application of Automata

11th International Conference, CIAA 2006
Taipei, Taiwan, August 21-23, 2006
Proceedings

Volume Editors

Oscar H. Ibarra
University of California
Department of Computer Science
Santa Barbara, CA 93106, USA
E-mail: ibarra@cs.ucsb.edu

Hsu-Chun Yen
National Taiwan University
Department of Electrical Engineering
Taipei, Taiwan 106, ROC
E-mail: yen@cc.ee.ntu.edu.tw

Library of Congress Control Number: 2006930260

CR Subject Classification (1998): F.1.1-2, F.4.2-3, F.2

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

ISSN	0302-9743
ISBN-10	3-540-37213-X Springer Berlin Heidelberg New York
ISBN-13	978-3-540-37213-4 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
springer.com

© Springer-Verlag Berlin Heidelberg 2006
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11812128 06/3142 5 4 3 2 1 0

Preface

The 11th International Conference on Implementation and Application of Automata (CIAA 2006) was held at the National Taiwan University, Taiwan, August 21–23, 2006.

This volume of *Lecture Notes in Computer Science* contains the papers that were presented at CIAA 2006, as well as the abstracts of the poster papers that were displayed during the conference. The volume also includes the abstracts and extended abstracts of three invited lectures presented by Ming Li, Grzegorz Rozenberg, and Sheng Yu.

The 22 regular papers were selected from 76 submissions covering various topics in the theory, implementation, and applications of automata and related structures. Each submitted paper was reviewed by at least three Program Committee members, with the assistance of referees. The authors of the papers presented here come from the following countries: Austria, Canada, China, Cyprus, Czech Republic, Finland, France, Germany, Hungary, India, Ireland, Italy, The Netherlands, Poland, Spain, Sweden, Taiwan, UK, and USA.

We wish to thank all who have made this meeting possible: the authors for submitting papers, the Program Committee members and external referees (listed in the proceedings) for their excellent work, and our three invited speakers. Finally, we wish to express our sincere appreciation to the sponsors, local organizers, proceedings Chair, the editors of the *Lecture Notes in Computer Science* series and Springer, in particular Alfred Hofmann, for their help in publishing this volume.

August 2006

Oscar H. Ibarra
Hsu-Chun Yen

Organization

Program Committee

Marie-Pierre Béal	University of Marne-la-Vallee, France
Cristian Calude	University of Auckland, New Zealand
Jean-Marc Champarnaud	Université de Rouen, France
Erzsébet Csuhaj-Varjú	Hungarian Academy of Sciences, Hungary
Jürgen Dassow	University of Magdeburg, Germany
Jacques Farré	Université de Nice - Sophia Antipolis, France
Rudolf Freund	Vienna University of Technology, Austria
Jozef Gruska	Masaryk University, Czech Republic
Tero Harju	University of Turku, Finland
Jan Holub	Czech Technical University, Czech Republic
Markus Holzer	Technische Universität München, Germany
Oscar H. Ibarra (Co-chair)	University of California, Santa Barbara, USA
Masami Ito	Kyoto Sangyo University, Japan
Kazuo Iwama	Kyoto University, Japan
Juhani Karhumäki	University of Turku, Finland
Hsueh-I Lu	National Taiwan University, Taiwan, ROC
Denis Maurel	Université de Tours, France
Mehryar Mohri	New York University, USA
Andrei Paun	Louisiana Tech, USA
Bala Ravikumar	Sonoma State University, USA
Wojciech Rytter	Warsaw University, Poland, and NJIT, USA
Jacques Sakarovitch	CNRS/ENST, Paris, France
Kai Salomaa	Queen's University, Canada
Pierluigi San Pietro	Politecnico di Milano, Italy
Giora Slutzki	Iowa State University, USA
Bow-Yaw Wang	Academia Sinica, Taiwan, ROC
Farn Wang	National Taiwan University, Taiwan, ROC
Bruce W. Watson	University of Pretoria, South Africa
Hsu-Chun Yen (Co-chair)	National Taiwan University, Taiwan, ROC
Sheng Yu	University of Western Ontario, Canada

Additional Reviewers

Cyril Allauzen	Ming-Chang Dong	Harumichi Nishimura
Manuel Baclet	Rémi Forax	Alexander Okhotin
Miroslav Balík	Nathalie Friburger	Maciej Pilichowski
Kamel Barkaoui	Hermann Gruber	Libor Polak
Samik Basu	Vesa Halava	Gheorge Rahonis
Nicolas Bedon	Geza Horvath	Ashish Rastogi
Jean Berstel	Geng-Dian Huang	Chantal Reynaud
Franziska Biegler	Jarkko Kari	Matteo Rossi
Renaud Blanch	Tomi Kärki	Nicolae Santean
Henning Bordihn	Martin Kutrib	Sylvain Schmitz
Ján Bouda	Eric Laporte	Luc Segoufin
Bohuš Brim	Martin Leucker	Jason R. Smith
Luboš Brim	Chih-Wei Lin	Paola Spoletini
Lin-Zan Cai	Li-Ping Lin	Alain Terlutte
Cezar Campeanu	Sylvain Lombardy	Ming-Hsien Tsai
Chih-Hong Cheng	Ian McQuillan	Ladislav Vagner
Loek Cleophas	Alexander Meduna	Thomas Worsch
Mark Daley	Angelo Morzenti	Shigeru Yamashita
Akim Demaille	Gonzalo Navarro	Artur Zaroda
Michael Domaratzki	Ernest Ketcha Ngassam	

Organizing Committee

Tsan-Sheng Hsu (Co-chair)	Academia Sinica, Taiwan, ROC
Oscar H. Ibarra	University of California, Santa Barbara, USA
Hsueh-I Lu	National Taiwan University, Taiwan, ROC
Bow-Yaw Wang	Academia Sinica, Taiwan, ROC
Farn Wang	National Taiwan University, Taiwan, ROC
Hsu-Chun Yen (Co-chair)	National Taiwan University, Taiwan, ROC

Proceedings Committee

Oscar H. Ibarra	University of California, Santa Barbara, USA
Hsu-Chun Yen	National Taiwan University, Taiwan, ROC

Publicity Committee

Hsueh-I Lu	National Taiwan University, Taiwan, ROC
Farn Wang	National Taiwan University, Taiwan, ROC

Steering Committee

Jean-Marc Champarnaud	Université de Rouen, France
Oscar H. Ibarra	University of California, Santa Barbara, USA
Denis Maurel	Université de Tours, France
Derick Wood	Hong Kong Univ. of Science and Technology, Hong Kong, China
Sheng Yu (Chair)	University of Western Ontario, Canada

Sponsoring Institutions

National Taiwan University, Taiwan, ROC
 Center for Information and Electronic Technologies, NTU, Taiwan, ROC
 National Science Council, Taiwan, ROC
 Ministry of Education, Taiwan, ROC
 Academia Sinica, Taiwan, ROC
 University of California, Santa Barbara, USA

Table of Contents

Invited Lectures

Information Distance and Its Applications <i>Ming Li</i>	1
Theory Inspired by Gene Assembly in Ciliates <i>Grzegorz Rozenberg</i>	10
On the State Complexity of Combined Operations <i>Sheng Yu</i>	11

Technical Contributions

Path-Equivalent Removals of ε -transitions in a Genomic Weighted Finite Automaton <i>Mathieu Giraud, Philippe Veber, Dominique Lavenier</i>	23
Hybrid Extended Finite Automata <i>Henning Bordihn, Markus Holzer, Martin Kutrib</i>	34
Refinement of Near Random Access Video Coding with Weighted Finite Automata <i>German Tischler</i>	46
Borders and Finite Automata <i>Martin Šimůnek, Bořivoj Melichar</i>	58
Finding Common Motifs with Gaps Using Finite Automata <i>Pavlos Antoniou, Jan Holub, Costas S. Iliopoulos, Bořivoj Melichar, Pierre Peterlongo</i>	69
Factor Oracles <i>Maxime Crochemore, Lucian Ilie, Emine Seid-Hilmi</i>	78
Reducing Simple Grammars: Exponential Against Highly-Polynomial Time in Practice <i>Cédric Bastien, Jurek Czyzowicz, Wojciech Fraczak, Wojciech Rytter</i>	90
Tiburon: A Weighted Tree Automata Toolkit <i>Jonathan May, Kevin Knight</i>	102

Around Hopcroft's Algorithm <i>Manuel Baclet, Claire Pagetti</i>	114
Multi-tape Automata with Symbol Classes <i>Florent Nicart, Jean-Marc Champarnaud, Tibor Csáki, Tamas Gaál, Andre Kempe</i>	126
On the Computation of Some Standard Distances Between Probabilistic Automata <i>Corinna Cortes, Mehryar Mohri, Ashish Rastogi</i>	137
Does o-Substitution Preserve Recognizability? <i>Andreas Maletti</i>	150
Correctness Preservation and Complexity of Simple RL -Automata <i>Hartmut Messerschmidt, Frantisek Mráz, Friedrich Otto, Martin Plátek</i>	162
Bisimulation Minimization of Tree Automata <i>Parosh Aziz Abdulla, Lisa Kaati, Johanna Högberg</i>	173
Forgetting Automata and Unary Languages <i>Jens Glöckler</i>	186
Structurally Unambiguous Finite Automata <i>Hing Leung</i>	198
Symbolic Implementation of Alternating Automata <i>Roderick Bloem, Alessandro Cimatti, Ingo Pill, Marco Roveri, Simone Semprini</i>	208
On-the-Fly Branching Bisimulation Minimization for Compositional Analysis <i>Yung-Pin Cheng, Hong-Yi Wang, Yu-Ru Cheng</i>	219
Finite-State Temporal Projection <i>Tim Fernando</i>	230
Compiling Linguistic Constraints into Finite State Automata <i>Matthieu Constant, Denis Maurel</i>	242
Shift-Resolve Parsing: Simple, Unbounded Lookahead, Linear Time <i>José Fortes Gálvez, Sylvain Schmitz, Jacques Farré</i>	253

A Family of Algorithms for Non Deterministic Regular Languages
Inference

Manuel Vázquez de Parga, Pedro García, José Ruiz 265

Poster Abstracts

XSLT Version 2.0 Is Turing-Complete: A Purely Transformation Based
Proof

Ruhsan Onder, Zeki Bayram 275

A Finite Union of DFAs in Symbolic Model Checking of Infinite Systems

Suman Roy, Bhaskar Chakraborty 277

Universality of Hybrid Quantum Gates and Synthesis Without Ancilla
Qudits

Guowu Yang, Fei Xie, Xiaoyu Song, Marek Perkowski 279

Reachability Analysis of Procedural Programs with Affine Integer
Arithmetic

Michael Luttenberger 281

Lexical Disambiguation with Polarities and Automata

Guillaume Bonfante, Joseph Le Roux, Guy Perrier 283

Parsing Computer Languages with an Automaton Compiled from
a Single Regular Expression

Adrian D. Thurston 285

Tighter Packed Bit-Parallel NFA for Approximate String Matching

Heikki Hyyrö 287

Author Index 291