

Lecture Notes in Computer Science

1276

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Advisory Board: W. Brauer D. Gries J. Stoer

Tao Jiang D.T. Lee (Eds.)

Computing and Combinatorics

Third Annual International Conference
COCOON '97
Shanghai, China, August 20-22, 1997
Proceedings



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany

Juris Hartmanis, Cornell University, NY, USA

Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Tao Jiang

Department of Computer Science, McMaster University

Hamilton, Ontario L8S 4K1, Canada

E-mail: jiang@maccs.mcmaster.ca

D.T. Lee

Department of Electrical and Computer Engineering, Northwestern University

2145 Sheridan Road, Evanston, IL 60208-3118, USA

E-mail: dtlee@dtlee.ece.nwu.edu

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Computing and combinatorics : third annual international conference ; proceedings / COCOON '97, Shanghai, China, August 20 - 22, 1997. Tao Jiang ; D. T. Lee (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Budapest ; Hong Kong ; London ; Milan ; Paris ; Santa Clara ; Singapore ; Tokyo : Springer, 1997
(Lecture notes in computer science ; Vol. 1276)
ISBN 3-540-63357-X

CR Subject Classification (1991): F.2, G.2.1-2, I.3.5, F.4.2, C.2.3-4

ISSN 0302-9743

ISBN 3-540-63357-X 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 1997

Printed in Germany

Typesetting: Camera-ready by author

SPIN 10547842 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Preface

The abstracts and papers in this volume were presented at the Third Annual International Computing and Combinatorics Conference, on August 20-22, 1997, in Shanghai, China. The topics cover most aspects of theoretical computer science and combinatorics pertaining to computing. The conference was held in cooperation with the Chinese Academy of Sciences, Fudan University, China Computer Federation, Shanghai Computer Society, and the Chinese Association of Discrete Mathematics.

The 53 regular papers were selected from 106 submissions by an international program committee consisting of Sanjeev Arora, Paul Beame, Marshall Bern, Siuwing Cheng, Maxime Crochemore, Josep Díaz, Xin He, Wenlian Hsu, Yoshihide Igarashi, Tao Jiang (co-chair), Richard Karp, Sam Kim, Ker-I Ko, Kojiro Kobayashi, D.T. Lee (co-chair), Rajeev Motwani, Ian Munro, Maurice Nivat, Shang-Hua Teng, Les Valiant, Paul Vitányi, Jie Wang, Mihalis Yannakakis, and Hong Zhu.

The authors of these papers come from the following countries and regions: Australia, Canada, China (including Taiwan), France, Germany, Italy, Hong Kong, Japan, Korea, Hungary, Latvia, New Zealand, Singapore, Spain, The Netherlands, UK, and USA. Every submitted paper was reviewed by three program committee members. Many of these papers represent reports of continuing research, and it is expected that most of them will appear in a more polished and complete form in scientific journals. In addition to the regular papers, two program committee members (Paul Vitányi and Shang-Hua Teng) were invited to present plenary lectures on their research programs.

The Hao Wang Award was inaugurated this year to honor the paper(s) judged by the program committee to have the greatest scientific merit. The recipient of the first Hao Wang Award is “Resolution of Hartmanis’ Conjecture for NL-hard Sparse Sets” by Jin-Yi Cai and D. Sivakumar.

We wish to thank all who have made this meeting possible: the authors for submitting papers, the program committee members and referees for their excellent work in reviewing the papers, the sponsors, the local organizers, and Springer for their support and assistance. We are especially grateful to the conference organizing committee members Dingzhu Du, Ming Li, and Hong Zhu for their organizational work, David Karger and Samuel A. Rebelsky for their advice on the ACM SIGACT electronic submissions system, Daniel D. Sleator for his program committee assistance software, and Dan Trottier and Yufang Hua for their technical support.

Program Committee Co-Chairs:

Tao Jiang, McMaster U., Canada

D.T. Lee, Northwestern U., USA

Program Committee Members:

Sanjeev Arora, Princeton, USA

Paul Beame, U. Washington, USA

Marshall Bern, Xerox PARC, USA

Siuwing Cheng, UST, HK

Maxime Crochemore, U. Paris, France

Josep Díaz, UPC, Barcelona, Spain

Xin He, SUNY Buffalo, USA

Wenlian Hsu, Academy of Science, Taiwan

Yoshihide Igarashi, Gunma U., Japan

Richard Karp, U. Washington, USA

Sam Kim, Kyungpook National U., Korea

Ker-I Ko, SUNY Stony Brook, USA

Kojiro Kobayashi, Tokyo Inst. of Tech., Japan

Rajeev Motwani, Stanford, USA

Ian Munro, Waterloo, Canada

Maurice Nivat, U. Paris, France

Shang-Hua Teng, U. of Minnesota, USA

Les Valiant, Harvard, USA

Paul Vitányi, CWI, The Netherlands

Jie Wang, UNC Greensboro, USA

Mihalis Yannakakis, Bell Labs, USA

Hong Zhu, Fudan U., China

Organizing Committee Members:

Ding-Zhu Du, Inst. of Applied Math., Chinese Academy of Sci., China
and University of Minnesota, USA

Ming Li, University of Waterloo, Canada

Hong Zhu, Fudan University, China

Contents

SESSION 1: Parallel and Distributed Computing

Conflict-Free Access to Templates of Trees and Hypercubes in Parallel Memory Systems	1
<i>Sajal K. Das, M. Cristina Pinotti</i>	
Many-to-One Packet Routing via Matchings	11
<i>Danny Krizanc, Louxin Zhang</i>	
A Multi-tree Generating Routing Scheme Using Acyclic Orientations	18
<i>Fred S. Annexstein, Kenneth A. Berman, Ram Swaminathan</i>	

SESSION 2: Computational Geometry

An Algorithm for Heilbronn's Problem	23
<i>Claudia Bertram-Kretzberg, Thomas Hofmeister, Hanno Lefmann</i>	
Optimal Multiresolution Polygonal Approximation	32
<i>K. W. Chan, Francis Y. L. Chin</i>	
Constructing a Strongly Convex Superhull of Points	42
<i>Wei Chen, Xiao Wen Deng, Koichi Wada, Kimio Kawaguchi</i>	
Fast Range Searching with Delaunay Triangulations	52
<i>Binhai Zhu</i>	

SESSION 3: Complexity

Resolution of Hartmanis' Conjecture for NL-hard Sparse Sets	62
<i>Jin-Yi Cai, D. Sivakumar</i>	
Can Large Fanin Circuits Perform Reliable Computations in the Presence of Noise?	72
<i>Rüdiger Reischuk</i>	
On Set Systems with Restricted Intersections Modulo a Composite Number	82
<i>Vince Grolmusz</i>	
Size and Variable Ordering of OBDDs Representing Threshold Functions ..	91
<i>Yasuhiko Takenaga, Mitsushi Nouzoe, Shuzo Yajima</i>	

SESSION 4: Computational Biology I

The Performance of Neighbor-Joining Algorithms of Phylogeny Reconstruction	101
<i>Kevin Atteson</i>	
Inferring Evolutionary Trees with Strong Combinatorial Evidence	111
<i>Vincent Berry, Olivier Gascuel</i>	
Parsimony is Hard to Beat	124
<i>Kenneth Rice, Tandy Warnow</i>	
On the Complexity of Computing Evolutionary Trees	134
<i>Leszek Gąsieniec, Jesper Jansson, Andrzej Lingas, Anna Östlin</i>	

SESSION 5: Computability

Computable Invariance	146
<i>Vasco Brattka</i>	
Subclasses of Computable Real Valued Functions	156
<i>Qing Zhou</i>	
Computability on Continuous, Lower Semi-continuous and Upper Semi-continuous Real Functions	166
<i>Klaus Weihrauch, Xizhong Zheng</i>	

SESSION 6: Cryptography and Computational Finance

Contrast-Optimal k out of n Secret Sharing Schemes in Visual Cryptography	176
<i>Thomas Hofmeister, Matthias Krause, Hans U. Simon</i>	
A Rabin-Type Scheme Based on $y^2 \equiv x^3 + bx^2 \pmod{n}$	186
<i>Seng Kiat Chua, San Ling</i>	
Optimal Bidding Algorithms Against Cheating in Multiple-Object Auctions	192
<i>Ming-Yang Kao, Junfeng Qi, Lei Tan</i>	

SESSION 7: Graph Algorithms

Spring Algorithms and Symmetry	202
<i>Peter Eades, Xuemin Lin</i>	
Generalized Vertex-Rankings of Partial k -trees	212
<i>Md. Abul Kashem, Xiao Zhou, Takao Nishizeki</i>	
A Selected Tour of the Theory of Identification Matrices	222
<i>Lin Chen</i>	
Efficient Domination on Permutation Graphs and Trapezoid Graphs	232
<i>Y. Daniel Liang, Chin Lung Lu, Chuan Yi Tang</i>	

SESSION 8: Computational Biology II

On Physical Mapping Algorithms - An Error-Tolerant Test for the Consecutive Ones Property	242
<i>Wen-Lian Hsu</i>	
The Median Problem for Breakpoints in Comparative Genomics	251
<i>David Sankoff, Mathieu Blanchette</i>	
Fast Algorithms for Aligning Sequences with Restricted Affine Gap Penalties	264
<i>Kun-Mao Chao</i>	
A Matrix Representation of Phylogenetic Trees	274
<i>Sanzheng Qiao, W.S.-Y. Wang</i>	

SESSION 9: Algorithms

Edge and Node Searching Problems on Trees	284
<i>Sheng-Lung Peng, Chin-Wen Ho, Tsan-sheng Hsu, Ming-Tat Ko, Chuan-Yi Tang</i>	
Construction of Nearly Optimal Multiway Trees	294
<i>Peter Becker</i>	
Optimal Algorithms for Circle Partitioning	304
<i>Kuo-Hui Tsai, Da-Wei Wang</i>	
Hexagonal Routing of Multiterminal Nets	311
<i>Xuehou Tan, Xiaoyu Song</i>	

SESSION 10: Rewriting and Logic

Design and Analysis of Parallel Set-Term Unification 321
Seung-Jin Lim, Yiu-Kai Ng

On Modularity of the Completeness in Order-Sorted Term Rewriting
 Systems 331
Yoshinobu Kawabe, Naohiro Ishii

A Three-Valued Quantificational Logic of Context 343
Kaile Su, Decheng Ding, Huowang Chen

SESSION 11: Algorithms and Applications

A Compact Storage Scheme for Fast Wavelet-Based Subregion Retrieval .. 353
A.S. Poulakidas, A. Srinivasan, O. Egecioglu, O. Ibarra, T. Yang

A Declustering Algorithm for Minimizing Spatial Join Cost 363
Yanchun Zhang, Jitian Xiao, Xiaofang Zhou

Fixed Topology Steiner Trees and Spanning Forests with Applications
 in Network Communications 373
Lusheng Wang, Xiaohua Jia

A Branch-and-Bound Algorithm for Computing Node Weighted
 Steiner Minimum Trees 383
Guoliang Xue

SESSION 12: Automata, Languages and Complexity

A Complete Characterization of Repetitive Morphisms over
 the Two-Letter Alphabet 393
Yuji Kobayashi, Friedrich Otto, Patrice Séébold

An Algorithm for Identifying Spliced Languages 403
Sam M. Kim

The Shapes of Trees 412
Ulrich Hertrampf

Tally Languages Accepted by Alternating Multitape Finite Automata 422
*Dainis Geidmanis, Janis Kaņeps, Kalvis Apsītis, Daina Taimiņa,
 Elena Calude*

SESSION 13: Parallel and Distributed Computing II

Independent Spanning Trees of Chordal Rings	431
<i>Yukihiro Iwasaki, Yuka Kajiwarra, Koji Obokata, Yoshihide Igarashi</i>	
Rearrangeable Graphs	441
<i>Qing Hu, Yixin Zhang, Xiaojun Shen</i>	
Projective Torus Networks	451
<i>Ting-Yi Sung, Tung-Yang Ho, Lih-Hoing Hsu</i>	

SESSION 14: Mathematical Programming and Genetic Algorithms

On the 100% Rule of Sensitivity Analysis in Linear Programming	460
<i>Pu Cai, Jin-Yi Cai</i>	
Enumerating Triangulations for Products of Two Simplices and for Arbitrary Configurations of Points	470
<i>Fumihiko Takeuchi, Hiroshi Imai</i>	
Tree Structure Genetic Algorithm with a Nourishment Mechanism	482
<i>Zhangang Han, Ruqian Lu</i>	

SESSION 15: Parallel and Distributed Computing III

An Approach to Scalability of Parallel Matrix Multiplication Algorithms .	492
<i>Xingfu Wu</i>	
Limited Acceleration Mechanism for Cell Loss Free Flow Control in ATM Networks	502
<i>Hong Liu, Enmin Song, Reza Sotudeh</i>	
They Are Just Butterflies	512
<i>Yonghong Chen and Qiao Li</i>	

Invited Lectures:

Mutual Search	514
<i>Paul Vitányi</i>	
Eigenvalues, Eigenvectors, and Graph Partitioning	515
<i>Shang-Hua Teng</i>	

Corrigenda:

Corrigendum: Exact Learning of Subclasses of CDNF Formulas with Membership Queries	516
<i>Carlos Domingo</i>	

Author Index	521
---------------------------	-----