Bin Fu Ding-Zhu Du (Eds.)

Computing and Combinatorics

17th Annual International Conference, COCOON 2011 Dallas, TX, USA, August 2011 Proceedings



Lecture Notes in Computer Science

6842

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

Alfred Kobsa

University of California, Irvine, CA, 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

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbruecken, Germany

Bin Fu Ding-Zhu Du (Eds.)

Computing and Combinatorics

17th Annual International Conference, COCOON 2011 Dallas, TX, USA, August 14-16, 2011 Proceedings



Volume Editors

Bin Fu University of Texas-Pan American Department of Computer Science Edinburg, TX 78539, USA E-mail: binfu@cs.panam.edu

Ding-Zhu Du University of Texas at Dallas Department of Computer Science Richardson, TX 75080, USA E-mail: dzdu@utdallas.edu

ISSN 0302-9743 e-ISSN 1611-3349 ISBN 978-3-642-22684-7 e-ISBN 978-3-642-22685-4 DOI 10.1007/978-3-642-22685-4 Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011932219

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

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

© Springer-Verlag Berlin Heidelberg 2011

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.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

The Annual International Computing and Combinatorics Conference is a forum for researchers working in the areas of algorithms, theory of computation, computational complexity, and combinatorics related to computing. The papers in this volume were presented at the 17th Annual International Computing and Combinatorics Conference (COCOON 2011), held in the city of Dallas, Texas, USA, during August 14-16, 2011. Previous meetings of this conference were held in Singapore (2002), Big Sky (2003), Jeju Island (2004), Kunming (2005), Taipei (2006), Alberta (2007), Dalian (2008), New York (2009), and NhaTrang (2010).

A total of 136 papers were submitted, of which 54 were accepted for presentation at the conference. We received papers from Austrialia, Brazil, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Iran, Israel, Italy, Japan, Korea, Mexico, Norway, Poland, Singapore, Spain, Taiwan, UK, and USA. The papers were evaluated by an international Program Committee consisting of Hee-Kap Ahn, Tatsuya Akutsu, Eric Allender, Zhixiang Chen, Zhi-zhong Chen, Qi Cheng, Ding-Zhu Du, Bin Fu, Xiaofeng Gao, Wen-Lian Hsu, Kazuo Iwama, Iyad Kanj, Neeraj Kayal, Ming-Yang Kao, Donghyun Kim, D. T. Lee, Angsheng Li, Pinyan Lu, Jack Lutz, Mitsunori Ogihara, Hi-rotaka Ono, Desh Ranjan, David Sankoff, Kavitha Telikepalli, Carola Wenk, Boting Yang, Louxin Zhang, and Shengyu Zhang. Each paper was evaluated by at least three Program Committee members, assisted in some cases by external referees. The selection was based on the papers' originality, quality, and relevance to topics of the COCOON 2011. It is expected that most of the accepted papers will appear in a more polished form in scientific journals. In addition to the selected papers, the conference also included one invited presentation by Ryan Williams. The Program Committee selected "Unions of Disjoint NP-complete Sets" by Christian Glaßer, John Hitchcocky, A. Pavan, and Stephen Travers for the Best Paper Award.

We thank all the people who made this meeting possible: the authors for submitting papers, the Program Committee members and external referees for their excellent work, and the invited speaker. Finally, we thank the colleagues at the University of Texas at Dallas for their local arrangements and assistance.

August 2011 Bin Fu Ding-Zhu Du

Organization

Executive Committee

Conference TPC Chairs Bin Fu

(University of Texas - Pan American, USA)

Ding-Zhu Du

(University of Texas at Dallas, USA)

Local Arrangements Chair Weili Wu

(University of Texas at Dallas, USA)

Program Committee

Hee-Kap Ahn Pohang University of Science and Technology, Korea

Tatsuya Akutsu Kyoto University, Japan Eric Allender Rugters University, USA

Zhixiang Chen University of Texas-Pan American, USA

Zhi-zhong Chen Tokyo Denki University, Japan Qi Cheng University of Oklahoma, USA

Ding-zhu Du University of Texas at Dallas, USA, Co-chair Bin Fu University of Texas-Pan American, USA, Co-chair

Xiaofeng Gao Georgia Gwinnett College, USA

Wen-Lian Hsu Academia Sinica, Taiwan Kazuo Iwama Kyoto University, Japan Iyad Kanj DePaul University, USA

Neeraj Kayal Microsoft, USA

Ming-Yang Kao Northwestern University, USA

Donghyun Kim North Carolina Central University, USA

D.T. Lee Academia Sinica, Taiwan

Angsheng Li Chinese Academia of Science, China

Pinyan Lu

Jack Lutz

Mitsunori Ogihara

Hirotaka Ono

Desh Ranjan

David Sankoff

Beijing Microsoft Lab, China
Iowa State University, USA

University of Miami, USA

Kyushu University, Japan

Old Dominion University, USA

University of Ottawa, Canada

Kavitha Telikepalli Tata Institute of Fundamental Research, India Carola Wenk Univeristy of Texas at San Antonio, USA

Boting Yang University of Regina, Canada Louxin Zhang University of Singapore, Singapore

Shengyu Zhang Chinese University of Hong Kong, Hong Kong

VIII Organization

Referees

Ferdinando Cicalese Zaixin Lu Salvatore La Torre

Paolo D'Arco Gaolin Milledge Lidong Wu Yuan-Shin Lee Seth Pettie Jiaofei Zhong

Invited Speaker

Ryan Williams IBM T.J. Walson Research Center, USA

Table of Contents

Derandomizing HSSW Algorithm for 3-SAT	1
Dominating Set Counting in Graph Classes	13
The Density Maximization Problem in Graphs	25
FlipCut Supertrees: Towards Matrix Representation Accuracy in Polynomial Time	37
Tight Bounds on Local Search to Approximate the Maximum Satisfiability Problems	49
Parameterized Complexity in Multiple-Interval Graphs: Partition, Separation, Irredundancy	62
Exact Parameterized Multilinear Monomial Counting via k-Layer Subset Convolution and k-Disjoint Sum	74
On the Rainbow Connectivity of Graphs: Complexity and FPT Algorithms	86
On Parameterized Independent Feedback Vertex Set	98
Cograph Editing: Complexity and Parameterized Algorithms	110
Approximation Complexity of Complex-Weighted Degree-Two Counting Constraint Satisfaction Problems (Extended Abstract)	122

Strong I/O Lower Bounds for Binomial and FFT Computation Graphs	134
Desh Ranjan, John Savage, and Mohammad Zubair	
Spin Systems on Graphs with Complex Edge Functions and Specified Degree Regularities	146
Quantum Algorithm for the Boolean Hidden Shift Problem	158
A Kolmogorov Complexity Proof of the Lovász Local Lemma for Satisfiability	168
Proper n -Cell Polycubes in $n-3$ Dimensions	180
Largest Area Convex Hull of Axis-Aligned Squares Based on Imprecise Data	192
Improved Algorithms for the Point-Set Embeddability Problem for Plane 3-Trees	204
Optimal Strategies for the One-Round Discrete Voronoi Game on a Line	213
Computing the Girth of a Planar Graph in Linear Time	225
Diagonalization Strikes Back: Some Recent Lower Bounds in Complexity Theory	237
Unions of Disjoint NP-Complete Sets	240
ReachFewL = ReachUL Brady Garvin, Derrick Stolee, Raghunath Tewari, and N.V. Vinodchandran	252
$(1+\varepsilon)$ -Competitive Algorithm for Online OVSF Code Assignment with Resource Augmentation	259
Scheduling Jobs on Heterogeneous Platforms	271

Self-assembling Rulers for Approximating Generalized Sierpinski	
Carpets	284
Approximately Uniform Online Checkpointing	297
Bandwidth of Convex Bipartite Graphs and Related Graphs Anish Man Singh Shrestha, Satoshi Tayu, and Shuichi Ueno	307
Algorithms for Partition of Some Class of Graphs under Compaction $Narayan\ Vikas$	319
A Generic Approach to Decomposition Algorithms, with an Application to Digraph Decomposition	331
Matching and P_2 -Packing: Weighted Versions	343
On Totally Unimodularity of Edge-Edge Adjacency Matrices Yusuke Matsumoto, Naoyuki Kamiyama, and Keiko Imai	354
The Topology Aware File Distribution Problem	366
Exploiting the Robustness on Power-Law Networks Yilin Shen, Nam P. Nguyen, and My T. Thai	379
Competitive Algorithms for Online Pricing	391
Making Abstraction-Refinement Efficient in Model Checking	402
An Integer Programming Approach for the Rural Postman Problem with Time Dependent Travel Times	414
Property Testing for Cyclic Groups and Beyond	432
Canonizing Hypergraphs under Abelian Group Action	444

Linear Time Algorithms for the Basis of Abelian Groups	456
Characterizations of Locally Testable Linear- and Affine-Invariant Families	467
A New Conditionally Anonymous Ring Signature	479
On the Right-Seed Array of a String Michalis Christou, Maxime Crochemore, Ondrej Guth, Costas S. Iliopoulos, and Solon P. Pissis	492
Compressed Directed Acyclic Word Graph with Application in Local Alignment	503
Unavoidable Regularities in Long Words with Bounded Number of Symbol Occurrences	519
Summing Symbols in Mutual Recurrences	531
Flipping Triangles and Rectangles	543
Unconstrained and Constrained Fault-Tolerant Resource Allocation Kewen Liao and Hong Shen	555
Finding Paths with Minimum Shared Edges	567
Combinatorial Group Testing for Corruption Localizing Hashing	579
Task Ordering and Memory Management Problem for Degree of Parallelism Estimation	592
Computing Majority with Triple Queries	604
A New Variation of Hat Guessing Games	616

Table of	Contents XIII
Oblivious Transfer and n-Variate Linear Function Evaluation Yeow Meng Chee, Huaxiong Wang, and Liang Feng Zhang	627
Optimal Online Algorithms on Two Hierarchical Machines wit Resource Augmentation	
Author Index	649