

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

Joachim Gudmundsson Julián Mestre
Taso Viglas (Eds.)

Computing and Combinatorics

18th Annual International Conference
COCOON 2012
Sydney, Australia, August 20-22, 2012
Proceedings



Springer

Volume Editors

Joachim Gudmundsson

Julián Mestre

Taso Viglas

University of Sydney

School of IT, Building J12

Sydney, NSW 2006, Australia

E-mail: joachim.gudmundsson@sydney.edu.au

E-mail: julian.mestre@sydney.edu.au

E-mail: taso.viglas@sydney.edu.au

ISSN 0302-9743

ISBN 978-3-642-32240-2

DOI 10.1007/978-3-642-32241-9

e-ISSN 1611-3349

e-ISBN 978-3-642-32241-9

Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012942913

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 2012

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 papers in this volume were selected for publication in the 18th Annual International Computing and Combinatorics Conference, held during August 20–22, 2012, in Sydney, Australia. The Annual International Computing and Combinatorics Conference is a forum for researchers working in the areas related to theoretical aspects of computing.

Typical topics covered by this conference include (but are not restricted to): algorithms, data structures, algorithmic game theory, online algorithms, automatas, languages, logic, computability, complexity theory, computational learning theory, knowledge discovery, cryptography, parallel and distributed computing, reliability and security, database theory, computational biology, computational algebra, computational geometry, graph drawing, information visualization, graph theory, communication networks and optimization.

This year the conference received 121 submissions. Each paper received a minimum of three independent expert reviews by the Program Committee members or reviewers. The reviews were thoroughly discussed by the Program Committee, and 50 papers were selected for presentation during the conference.

In addition to these presentations, the program also included three invited presentations by Kamal Jain, Joseph Mitchell, and János Pach.

We would like to express our gratitude for the authors of all papers submitted to COCOON 2012, the Program Committee members and the reviewers, for their contribution to making this conference possible.

Finally, we would like to acknowledge and thank the sponsors of this event, Google and National ICT Australia, for their generous support for COCOON 2012.

June 2012

Joachim Gudmundsson
Julián Mestre
Taso Viglas

Organization

Program Committee

Eric Allender	Rutgers University, USA
Giorgos Christodoulou	University of Liverpool, UK
Giovanni Di Crescenzo	Telcordia, USA
David Eppstein	University of California, Irvine, USA
Rudolf Fleischer	GUtech, Oman
Mordecai Golin	Hong Kong UST, Hong Kong, SAR China
Joachim Gudmundsson	University of Sydney, Australia
Anupam Gupta	Carnegie Mellon University, USA
Thore Husfeldt	IT University of Copenhagen and Lund University, Denmark and Sweden
Kazuo Iwama	Kyoto University, Japan
Julián Mestre	University of Sydney, Australia
Peter Bro Miltersen	Aarhus University, Denmark
Pat Morin	Carleton University, Canada
Gonzalo Navarro	University of Chile, Chile
Kunihiko Sadakane	National Institute of Informatics, Tokyo, Japan
Saket Saurabh	The Institute of Mathematical Sciences, Chennai, India
Christian Sohler	TU Dortmund, Germany
Xiaoming Sun	Tsinghua University, China
Kavitha Telikepalli	Indian Institute of Science, India
Anke Van Zuylen	Max Planck Institute for Informatics, Germany
Anastasios Viglas	University of Sydney, Australia
Dorothea Wagner	University of Karlsruhe, Germany
Gerhard Woeginger	TU Eindhoven, The Netherlands
Prudence Wong	University of Liverpool, UK

Additional Reviewers

Aggarwal, Divesh	Bose, Prosenjit
Asahiro, Yuichi	Bu, Dongbo
Badanidiyuru, Ashwinkumar	Burcea, Mihai
Barbay, Jérémy	Campos, Sérgio
Baum, Moritz	Canzar, Stefan
Bläsius, Thomas	Cheng, Yongxi
Bogdanov, Andrej	Chiu, Man Kwun
Bollig, Beate	Chrobak, Marek
Bonsma, Paul	Cicalese, Ferdinando

Collins, Andrew
 Cormode, Graham
 Crowston, Robert
 Data, Deepesh
 Dibbelt, Julian
 Dujmovic, Vida
 Dutta, Kunal
 Ehsanfar, Ebrahim
 Ferreira, Rui
 Fortunato, Santo
 Fotakis, Dimitris
 Frati, Fabrizio
 Gao, Xi Alice
 Gaspers, Serge
 Gemsa, Andreas
 Giannakopoulos, Yiannis
 Gille, Marc
 Gorry, Thomas
 Halldorsson, Magnus M.
 Hellweg, Frank
 Hernandez, Cecilia
 Jager, Tibor
 Jansson, Jesper
 Jin, Jiongxin
 Jones, Mark
 Jordan, Tibor
 Kane, Daniel M.
 Kawarabayashi, Ken-Ichi
 Keszegh, Balázs
 Kida, Takuya
 Kiyomi, Masashi
 Klauck, Hartmut
 Kloks, Ton
 Kolay, Sudeshna
 Kovacs, Annamaria
 Kratsch, Stefan
 Krivosija, Amer
 Krug, Marcus
 Kupferman, Orna
 Lam, Chi Kit
 Lambert, Nicolas S.
 Lammersen, Christiane
 Lan, Yu
 Leung, Henry C.M.
 Levin, Asaf
 Li, Rongbin
 Liedloff, Mathieu
 Lin, Chuang-Chieh
 M.S., Ramanujan
 Ma, Bin
 Madry, Aleksander
 Maheshwari, Anil
 Markakis, Evangelos
 Martin, Russell
 Mchedlidze, Tamara
 Mertzios, George
 Mikalački, Mirjana
 Misra, Pranabendu
 Miyata, Hiroyuki
 Mnich, Matthias
 Munteanu, Alexander
 Mustafa, Nabil
 Muthu, Rahul
 Narayanan, Narayanan
 Nasre, Meghana
 Nekrich, Yakov
 Niedermeier, Rolf
 Nikiforov, Vladimir
 Noellenburg, Martin
 O'Donnell, Ryan
 Ojiaku, Jude-Thaddeus
 Oren, Sigal
 Otachi, Yota
 Pajor, Thomas
 Papadopoulos, Charis
 Papakonstantinou, Periklis
 Pavan, Aduri
 Piliouras, Georgios
 Popa, Alexandru
 Pérez-Lantero, Pablo
 Rajagopalan, S. Raj
 Raman, Venkatesh
 Randall, Dana
 Russo, Luis M.S.
 Rutter, Ignaz
 Sabharwal, Yogish
 Sach, Benjamin
 Saeidinvar, Reza
 Saitoh, Toshiki
 Schalekamp, Frans

Schmidt, Melanie
Schumm, Andrea
Schwiegelshohn, Chris
Shalom, Mordechai
Shi, Yaoyun
Skopalik, Alexander
Smid, Michiel
Sprugnoli, Renzo
Stamoulis, Georgios
Stewart, Iain
Suchy, Ondrej
Suzuki, Yasuhiro
Tamaki, Suguru
Tang, Bo
Tantau, Till
Tazari, Siamak
Telelis, Orestis
Trapnell, Cole
van Leeuwen, Erik Jan

van Stee, Rob
Varma, Nithin Mahendra
Ventre, Carmine
Vollmer, Heribert
Voloshin, Ariella
Wahlström, Magnus
Wan, Andrew
Wang, Yajun
Wiese, Andreas
Wolfler-Calvo, Roberto
Wuhrer, Stefanie
Wulff-Nilsen, Christian
Xia, Lirong
Xiao, Mingyu
Yamazaki, Koichi
Yon, Juyoung
Yu, Wei
Zhang, Shengyu

Table of Contents

A Linear Time Algorithm for Computing Minmax Regret 1-Median on a Tree	1
<i>Binay Bhattacharya and Tsunehiko Kameda</i>	
A Simple D^2 -Sampling Based PTAS for k -Means and other Clustering Problems	13
<i>Ragesh Jaiswal, Amit Kumar, and Sandeep Sen</i>	
Speed Scaling for Maximum Lateness	25
<i>Evrpidis Bampis, Dimitrios Letsios, Ioannis Milis, and Georgios Zois</i>	
Induced Subgraph Isomorphism: Are Some Patterns Substantially Easier Than Others?	37
<i>Peter Floderus, Mirosław Kowaluk, Andrzej Lingas, and Eva-Marta Lundell</i>	
Contiguous Minimum Single-Source-Multi-Sink Cuts in Weighted Planar Graphs	49
<i>Ivona Bezáková and Zachary Langley</i>	
Online Knapsack Problem with Removal Cost	61
<i>Xin Han, Yasushi Kawase, and Kazuhisa Makino</i>	
An Improved Exact Algorithm for TSP in Degree-4 Graphs	74
<i>Mingyu Xiao and Hiroshi Nagamochi</i>	
Dynamic Programming for H -minor-free Graphs (Extended Abstract)	86
<i>Juanjo Rué, Ignasi Sau, and Dimitrios M. Thilikos</i>	
Restricted Max-Min Fair Allocations with Inclusion-Free Intervals	98
<i>Monaldo Mastrolilli and Georgios Stamoulis</i>	
An Improved Algorithm for Packing T -Paths in Inner Eulerian Networks	109
<i>Maxim A. Babenko, Kamil Salikhov, and Stepan Artamonov</i>	
Towards Optimal and Expressive Kernelization for d -Hitting Set	121
<i>René van Bevern</i>	

Maximum Number of Minimal Feedback Vertex Sets in Chordal Graphs and Cographs	133
<i>Jean-François Couturier, Pinar Heggernes, Pim van 't Hof, and Yngve Villanger</i>	
A Local Algorithm for Finding Dense Bipartite-Like Subgraphs	145
<i>Pan Peng</i>	
Algorithms for the Strong Chromatic Index of Halin Graphs, Distance-Hereditary Graphs and Maximal Outerplanar Graphs	157
<i>Ton Kloks, Sheung-Hung Poon, Chin-Ting Ung, and Yue-Li Wang</i>	
On the Minimum Degree Hypergraph Problem with Subset Size Two and the Red-Blue Set Cover Problem with the Consecutive Ones Property	169
<i>Bing-Feng Wang and Chih-Hsuan Li</i>	
Rainbow Colouring of Split and Threshold Graphs	181
<i>L. Sunil Chandran and Deepak Rajendraprasad</i>	
Approximating the Rainbow – Better Lower and Upper Bounds	193
<i>Alexandru Popa</i>	
Ramsey Numbers for Line Graphs and Perfect Graphs	204
<i>Rémy Belmonte, Pinar Heggernes, Pim van 't Hof, and Reza Saei</i>	
Geodesic Order Types	216
<i>Oswin Aichholzer, Matias Korman, Alexander Pilz, and Birgit Vogtenhuber</i>	
Computing Partitions of Rectilinear Polygons with Minimum Stabbing Number	228
<i>Stephane Durocher and Saeed Mehrabi</i>	
Monotone Paths in Planar Convex Subdivisions	240
<i>Adrian Dumitrescu, Günter Rote, and Csaba D. Tóth</i>	
The Cost of Bounded Curvature	252
<i>Hyo-Sil Kim and Otfried Cheong</i>	
Optimally Solving a Transportation Problem Using Voronoi Diagrams	264
<i>Darius Geiß, Rolf Klein, and Rainer Penninger</i>	
Unexplored Steiner Ratios in Geometric Networks	275
<i>Paz Carmi and Lilach Chaitman-Yerushalmi</i>	
Geometric RAC Simultaneous Drawings of Graphs	287
<i>Evmorfia Argyriou, Michael Bekos, Michael Kaufmann, and Antonios Symvonis</i>	

Simultaneous Embeddings with Vertices Mapping to Pre-specified Points	299
<i>Taylor Gordon</i>	
Multilevel Drawings of Clustered Graphs	311
<i>Fabrizio Frati</i>	
Outerplanar Graph Drawings with Few Slopes	323
<i>Kolja Knauer, Piotr Micek, and Bartosz Walczak</i>	
Fáry's Theorem for 1-Planar Graphs	335
<i>Seok-Hee Hong, Peter Eades, Giuseppe Liotta, and Sheung-Hung Poon</i>	
Constant Time Enumeration of Bounded-Size Subtrees in Trees and Its Application	347
<i>Kunihiro Wasa, Yusaku Kaneta, Takeaki Uno, and Hiroki Arimura</i>	
External Memory Soft Heap, and Hard Heap, a Meldable Priority Queue	360
<i>Alka Bhushan and Sajith Gopalan</i>	
Partially Specified Nearest Neighbor Search	372
<i>Tomas Hruz and Marcel Schöngens</i>	
Multi-pattern Matching with Bidirectional Indexes	384
<i>Simon Gog, Kalle Karhu, Juha Kärkkäinen, Veli Mäkinen, and Niko Välimäki</i>	
Succinct Representations of Binary Trees for Range Minimum Queries	396
<i>Pooya Davoodi, Rajeev Raman, and Srinivasa Rao Satti</i>	
Lower Bounds against Weakly Uniform Circuits	408
<i>Ruiwen Chen and Valentine Kabanets</i>	
On TC^0 Lower Bounds for the Permanent	420
<i>Jeff Kinne</i>	
Formula Complexity of Ternary Majorities	433
<i>Kenya Ueno</i>	
On the Kernelization Complexity of Problems on Graphs without Long Odd Cycles	445
<i>Fahad Panolan and Ashutosh Rai</i>	
The Complexity of Unary Subset Sum	458
<i>Nutan Limaye, Meena Mahajan, and Karteek Sreenivasaiyah</i>	

On the Advice Complexity of Tournaments	470
<i>Sebastian Ben Daniel</i>	
A Remark on One-Wayness versus Pseudorandomness	482
<i>Periklis A. Papakonstantinou and Guang Yang</i>	
Integral Mixed Unit Interval Graphs	495
<i>Van Bang Le and Dieter Rautenbach</i>	
Complementary Vertices and Adjacency Testing in Polytopes	507
<i>Benjamin A. Burton</i>	
Online Coloring of Bipartite Graphs with and without Advice	519
<i>Maria Paola Bianchi, Hans-Joachim Böckenhauer,</i> <i>Juraj Hromkovič, and Lucia Keller</i>	
Deep Coalescence Reconciliation with Unrooted Gene Trees: Linear Time Algorithms	531
<i>Paweł Górecki and Oliver Eulenstein</i>	
On the 2-Central Path Problem	543
<i>Yongding Zhu and Jinhui Xu</i>	
Making Profit in a Prediction Market	556
<i>Jen-Hou Chou, Chi-Jen Lu, and Mu-En Wu</i>	
Computing Shapley Value in Supermodular Coalitional Games	568
<i>David Liben-Nowell, Alexa Sharp, Tom Wexler, and Kevin Woods</i>	
Equilibria of GSP for Range Auction	580
<i>H.F. Ting and Xiangzhong Xiang</i>	
Stretch in Bottleneck Games	592
<i>Costas Busch and Rajgopal Kannan</i>	
Author Index	605