My T. Thai
Sartaj Sahni (Eds.)

LNCS 6196

Computing and Combinatorics

16th Annual International Conference, COCOON 2010
Nha Trang, Vietnam, July 2010
Proceedings

Springer

Lecture Notes in Computer Science 6196

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

My T. Thai Sartaj Sahni (Eds.)

Computing and Combinatorics

16th Annual International Conference, COCOON 2010
Nha Trang, Vietnam, July 19-21, 2010
Proceedings

Springer

Volume Editors

My T. Thai
University of Florida, CSE Building, Room 566
P.O. Box 116120, Gainesville, Florida 32611-6120, USA
E-mail: mythai@cise.ufl.edu

Sartaj Sahni
University of Florida, CSE Building, Room 305
P.O. Box 116120, Gainesville, Florida 32611-6120, USA
E-mail: sahni@cise.ufl.edu

Library of Congress Control Number: 2010929275

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

ISSN 0302-9743
ISBN-10 3-642-14030-0 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-14030-3 Springer Berlin Heidelberg New York

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper 06/3180

Preface

The papers in this volume were selected for presentation at the 16th Annual International Computing and Combinatorics Conference (COCOON 2010), held during July 19–21, 2010 in Nha Trang, Vietnam. Previous meetings of this conference were held in Singapore (2002), Big Sky (2003), Jeju Island (2004), Kunming (2005), Taipei (2006), Alberta (2007), Dalian (2008) and New York (2009).

COCOON 2010 provided a forum for researchers working in the areas of algorithms, theory of computation, computational complexity, and combinatorics related to computing. In all, 133 papers were submitted from 40 countries and regions, of which 54 were accepted. Authors of the submitted papers were from Australia (10), Bangladesh (11), Belgium (1), Canada (23), Chile (1), China (20), Colombia (1), Czech Republic (6), Denmark (1), France (25), France(1), Germany (13), Greece (2), Hong Kong (7), Hungary (2), India (18), Indonesia (8), Islamic Republic of Iran (2), Ireland (1), Israel (6), Italy (6), Japan (31), Republic of Korea(4), Malaysia (1), The Netherlands (2), New Zealand (2), Norway (3), Pakistan (1), Poland (1), Portugal (1), Russian Federation (3), Singapore (6), Slovakia (1), Spain (7), Sweden (2), Taiwan (19), Thailand (2), UK (2), USA (44), and Vietnam (15).

The submitted papers were evaluated by an international Technical Program Committee (TPC). Each paper was evaluated by at least three TPC members, with possible assistance of the external referees, as indicated by the referee list found in the proceedings. Some of these 54 accepted papers will be selected for publication in a special issue of *Algorithmica*, *Journal of Combinatorial Optimization*, and *Discrete Mathematics, Algorithms, and Application* under the standard refereeing procedure. In addition to the selected papers, the conference also included two invited presentations by Manuel Blum (Carnegie Mellon University) and Oscar H. Ibarra (University of California Santa Barbara).

We are extremely thankful to all the TPC members, each of whom reviewed about 14 papers despite a very tight schedule. The time and effort spent per TPC member were tremendous. By the same token, we profusely thank all the external referees who helped review the submissions. The TPC and external referees not only helped select a strong program for the conference, but also gave very informative feedback to the authors of all submitted papers. We also thank the local Organizing Committee for their contribution to making the conference a success. Many thanks are due to the two invited speakers and all the authors who submitted papers for consideration, all of whom contributed to the quality of COCOON 2010.

July 2010

My T. Thai
Sartaj Sahni

Organization

Executive Committee

Conference and Program Chair	My T. Thai (University of Florida) Sartaj Sahni (University of Florida)
Local Organizing Committee Chair	Anh-Vu Duc-Dinh (HCM University of Technology)
Local Organizing Committee Members	Thoai Nam (HCM University of Technology) Thuan Dinh Nguyen (Nha Trang University) Nguyen-Phan Nguyen-Thai (VNPT Khanh Hoa)

Technical Program Committee

Tetsuo Asano	Japan Advanced Institute of Science and Technology, Japan
Mike Atallah	Purdue University, USA
Nikhil Bansal	IBM Research, USA
Therese Biedl	University of Waterloo, Canada
Amit Chakrabarti	Dartmouth College, USA
Chandra Chekuri	University of Illinois at Urbana-Champaign, USA
Siu-Wing Cheng	Hong Kong University of Science and Technology, Hong Kong
Peter Eades	University of Sydney, Australia
Uriel Feige	Weizmann Institute of Science, Israel
Greg N. Frederickson	Purdue University, USA
Raffaele Giancarlo	University of Palermo, Italy
Ashish Goel	Stanford University, USA
Carsten Gutwenger	Dortmund University of Technology, Germany
MohammadTaghi Hajiaghayi	AT&T Research, USA
Pinar Heggernes	University of Bergen, Norway
Wen-Lian Hsu	Academia Sinica, Taiwan
Hiro Ito	Kyoto University, Japan
Valentine Kabanets	Simon Fraser University, Canada
Sanjeev Khanna	University of Pennsylvania, USA
James R. Lee	University of Washington, USA
Ming Li	University of Waterloo, Canada
Xiang-Yang Li	Illinois Institute of Technology, USA
Prabhat K. Mahanti	University of New Brunswick, CA
Greg Plaxton	University of Texas at Austin, USA

Sartaj Sahni	University of Florida, USA, Co-chair
Daniel Stefankovic	University of Rochester, USA
Cliff Stein	Columbia University, USA
Martin Strauss	University of Michigan, USA
Chaitanya Swamy	University of Waterloo, Canada
My T. Thai	University of Florida, USA, Co-chair
Chris Umans	California Institute of Technology, USA
Lisa Zhang	Bell Laboratories, Alcatel-Lucent, USA
Yun Zhang	Pioneer Hi-Bred International Inc., USA

External Referees

Christian Komusiewicz	Takashi Horiyama	Ashwin Nayak
Peyman Afshani	Tsan-sheng Hsu	Jesper Nederlof
Mohamed Aly	Toshimasa Ishii	Hirotaka Ono
Yuichi Asahiro	Volkan Isler	Shayan Oveis Gharan
Dave Bacon	David Johnson	Charis Papadopoulos
M. Bateni	Marcin Kaminski	Ian Post
Hoda Bidkhori	Karsten Klein	Anup Rao
Punya Biswal	Jochen Koenemann	Saket Saurabh
Melissa Chase	Dieter Kratsch	Marinella Sciortino
Markus Chimani	Sara Krehbiel	Yaoyun Shi
Elad Cohen	Amit Kumar	Quentin Stout
Graham Cormode	Biagio Lenzitti	Zoya Svitkina
Chiara Epifanio	Vahid Liaghat	Takeyuki Tamura
Jiri Fiala	Dan Luu	Dimitrios Thilikos
Mathew Francis	Bin Ma	Akihiro Uejima
Takuro Fukunaga	Hamid Mahini	Cesare Valenti
Philippe Gambette	Sven Mallach	Erik Jan Van Leeuwen
Anna Gilbert	Evangelos Markakis	Kasturi Varadarajan
Petr Golovach	Jiri Matousek	Hoi-Ming Wong
Anupam Gupta	Daniel Meister	Yulai Xie
Walter Gutjahr	Ankur Moitra	Yuichi Yoshida
Toru Hasunuma	Hiroki Morizumi	M. Zadimoghaddam
Hiroshi Hirai	Mitsuo Motoki	Bernd Zey

Table of Contents

Invited Talks

Complexity and Inapproximability

Approximation Algorithms

Graph Theory and Algorithms

Graph Drawing and Coloring

Computational Geometry

Automata, Logic, Algebra and Number Theory

Network Optimization and Scheduling Algorithm

Computational Biology and Bioinformatics

Data Structure and Sampling Theory

Cryptography, Security, Coding and Game Theory