Lecture Notes in Computer Science 10398

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

Editorial Board

David Hutchison
Lancaster University, Lancaster, 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, Zurich, Switzerland
John C. Mitchell
Stanford University, Stanford, CA, USA
Moni Naor
Weizmann Institute of Science, Rehovot, Israel
C. Pandu Rangan
Indian Institute of Technology, Madras, India
Bernhard Steffen
TU Dortmund University, Dortmund, Germany
Demetri Terzopoulos
University of California, Los Angeles, CA, USA
Doug Tygar
University of California, Berkeley, CA, USA
Gerhard Weikum
Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at http://www.springer.com/series/7407

S. Arumugam · Jay Bagga
Lowell W. Beineke · B.S. Panda (Eds.)

Theoretical Computer Science and Discrete Mathematics

First International Conference, ICTCSDM 2016
Krishnankoil, India, December 19–21, 2016
Revised Selected Papers

Springer

Editors
S. Arumugam
Kalasalingam University
Krishnankoil
India

Lowell W. Beineke
Indiana University – Purdue University
Fort Wayne, IN
USA

Jay Bagga
Ball State University
Muncie, IN
USA

B.S. Panda
Indian Institute of Technology
New Delhi
India

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-64418-9 ISBN 978-3-319-64419-6 (eBook)
DOI 10.1007/978-3-319-64419-6

Library of Congress Control Number: 2017948183

LNCS Sublibrary: SL1 – Theoretical Computer Science and General Issues

© Springer International Publishing AG 2017
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, 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.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This volume contains selected papers presented at ICTCSDM 2016, the International Conference on Theoretical Computer Science and Discrete Mathematics. ICTCSDM 2016 was held during December 19–21, 2016, at Kalasalingam University in rural Tamil Nadu, India. The conference was jointly organized by the National Centre for Advanced Research in Discrete Mathematics (n-CARDMATH), Kalasalingam University, India, Department of Computer Science, Ball State University, USA, and Department of Mathematics, Indiana University-Purdue University, Fort Wayne, USA.

The conference was sponsored and financially supported by the Science and Engineering Research Board, Government of India, New Delhi, the National Board for Higher Mathematics, Mumbai, the Council of Scientific and Industrial Research, New Delhi, the Indian National Science Academy, New Delhi, and Kalasalingam University.

The conference attracted around 150 participants from all over the world. The nations represented were USA, Indonesia, Czech Republic, Slovakia, South Africa, Malaysia, Dubai, Iran, and India.

Twelve experts from outside India and 14 experts from leading institutions within India delivered invited talks on various topics such as line graphs and their generalizations, large graphs of given degree and diameter, graphoidal covers, adjacency spectrum, distance spectrum, b-coloring, separation dimension of graphs and hypergraphs, domination in graphs, graph labeling problems, subsequences of words and Parike matrices, λ-design conjecture, graph algorithms and interference model for wireless sensor networks.

The call for papers for ICTCSDM 2016 was distributed around the world, resulting in 210 submission. After the review process a total of 57 papers (27%) were accepted subject to revision for publication in this volume.

We thank the authors for their valuable contributions and the Program Committee members and other referees for their constructive and enlightening comments on the manuscripts. We thank Springer for publishing the proceedings in the *Lecture Notes in Computer Science* series. We thank the Organizing Committee from Kalasalingam University for the excellent arrangements and for its efficient management of the conference-related activities. We thank all the sponsors for their financial support.

June 2017

S. Arumugam
Jay Bagga
L.W. Beineke
B.S. Panda

Organization

Program Committee

S. Arumugam (Chair)	Kalasalingam University, India
Jay Bagga (Co-chair)	Ball Sate University, USA
R. Balakrishnan	Bharathidasan University, India
L.W. Beineke (Co-chair)	Indiana University-Purdue University, USA
S. Francis Raj	Pondicherry University, India
Bruce W. Watson	Stellenbosch University, South Africa
G.L. Chia	Universiti Tunku Abdul Rahman, Malaysia
Daniela Ferrero	Texas State University, USA
Dominique Haughton	Bentley University, USA
T. Karthick	Indian Statistical Institute, Chennai, India
Kiki Ariyanti Sugeng	University of Indonesia, Indonesia
Kiran R. Bhutani	The Catholic University of America, USA
L. Lesniak	Western Michigan University, USA
N.S. Narayanaswamy	Indian Institute of Technology Madras, Chennai, India
B.S. Panda	Indian Institute of Technology Delhi, New Delhi, India
Petr Kovar	VSB, Technical University of Ostrava, Czech Republic
Purnima Gupta	University of Delhi, India
Rinovia Simanjuntak	Institut Teknologi Bandung, Indonesia
Saeid Alikhani	Yazd University, Iran
E. Sampathkumar	University of Mysore, India
S.S. Sane	Indian Institute of Technology Bombay, Mumbai, India
T. Singh	BITS-Pilani K.K. Birla Goa Campus, India
K.G. Subramanian	Madras Christian College, Chennai, India
L. Sunil Chandran	Indian Institute of Science, Bangalore, India
Stanislav Jendrol	Pavol Jozef Safarik University in Kosice, Kosice
Sona Pavlikova	Slovak University of Technology, Slovak Republic
Tao-Ming Wang	Tunghai University, Taichung, Taiwan
P. Titus	University College of Engineering Nagercoil, India
Siba K. Udgata	University of Hyderabad, India
Venkatesh Raman	Institute of Mathematical Sciences, Chennai, India
A. Vijayakumar	Cochin University of Science and Technology, India

Organizing Committee (Kalasalingam University, Tamil Nadu, India)

K. Sridharan (Chancellor, Chief Patron)
S. Shasi Anand (Director, Patron)
S. Arjun Kalasalingam (Director, Patron)
S. Saravanasankar (Vice-chancellor, President)
S. Arumugam (Organizing Chair)
Jay Bagga (Co-chair)
L.W. Beineke (Co-chair)
V. Vasudevan
D. Devaraj
K. Sundar
M. Venkatesulu
C. Sivapragasam
S.R. Srikumar
P. Paulraja
K. Vaikundamoorthy
K. Karuppasamy
A. Thuraiswamy
P. Thangaraj
K. Raja Chandrasekar

Additional Reviewers

Martin Bača
Andrea Feňovčíková
M. Venkatesulu
Joe Ryan
S. Slamin
J. Paulraj Joseph
R. Kala
T. Tamizh Chelvam
K. Raja Chandrasekar
P. Paulraja
A.P. Santhakumaran
S. Ramachandran
Lakshmana Gomathinayagam
T. Rajaretnam
M.G. Karunambigai
K. Suthendran
K. Thulasiraman
A. Somasundaram

Contents

Degree Associated Reconstruction Number of Biregular Bipartite Graphs Whose Degrees Differ by at Least Two 1
A. Anu and S. Monikandan

1-Normal DRA for Insertion Languages 10
Abhisek Midya, Lakshmanan Kuppusamy, V.S. Sumitha, and Alok Kumar Pani

Formal Language Representation and Modelling Structures Underlying RNA Folding Process 20
Anand Mahendran and Lakshmanan Kuppusamy

Homometric Number of a Graph and Some Related Concepts 30
Anu V. and Aparna Lakshmanan S.

Forbidden Subgraphs of Bigraphs of Ferrers Dimension 2 38
Ashok Kumar Das and Ritapa Chakraborty

Global Secure Domination in Graphs 50
S.V. Divya Rashmi, S. Arumugam, and A. Somasundaram

A Novel Reversible Data Hiding Method in Teleradiology to Maximize Data Capacity in Medical Images 55
S. Fepslin Athish Mon, K. Suthendran, K. Arjun, and S. Arumugam

Indicated Coloring of Cartesian Product of Graphs 63
P. Francis and S. Francis Raj

A Bi-level Security Mechanism for Efficient Protection on Graphs in Online Social Network 69
D. Franklin Vinod and V. Vasudevan

On Nearly Distance Magic Graphs 76
Aloysius Godinho, T. Singh, and S. Arumugam

Evenly Partite Directed Bigraph Factorization of Wreath Product of Graphs 83
P. Hemalatha

Minimum Layout of Circulant Graphs into Certain Height Balanced Trees . . . 90
Jessie Abraham and Micheal Arockiaraj

Dissecting Power of Certain Matrix Languages 98
J. Julie, J. Baskar Babujee, and V. Masilamani

Degree Associated Reconstruction Number of Split Graphs with Regular Independent Set 106
N. Kalai Mathi and S. Monikandan

Distance Antimagic Labelings of Graphs 113
N. Kamatchi, G.R. Vijayakumar, A. Ramalakshmi, S. Nilavarasi, and S. Arumugam

Probabilistic Conjunctive Grammar 119
K. Kanchan Devi and S. Arumugam

(1, 2)-Domination in Graphs. 128
K. Kayathri and S. Vallirani

New Construction on SD-Prime Cordial Labeling 134
A. Lourdusamy and F. Patrick

Dominator Coloring of Generalized Petersen Graphs 144
J. Maria Jeyaseeli, Nazanin Movarraei, and S. Arumugam

Super Edge-Antimagic Gracefulness of Disconnected Graphs 152
G. Marimuthu and P. Krishnaveni

Mixed Noise Elimination and Data Hiding for Secure Data Transmission. . . . 156
P. Mohanakrishnan, K. Suthendran, S. Arumugam, and T. Panneerselvam

Analysis of Particle Swarm Optimization Based 2D FIR Filter for Reduction of Additive and Multiplicative Noise in Images 165
V. Muneeswaran and M. Pallikonda Rajasekaran

Irregularity Strength of Corona of Two Graphs. 175
K. Muthu Guru Packiam, T. Manimaran, and A. Thuraiswamy

1-Distant Irregularity Strength of Graphs 182
K. Muthu Guru Packiam, T. Manimaran, and A. Thuraiswamy

Cloud Data Security Based on Data Partitions and Multiple Encryptions 191
B. Muthulakshmi and M. Venkatesulu

Upper Majority Domination Number of a Graph. 197
A. Muthuselvi and S. Arumugam

Super (a, 3)-edge Antimagic Total Labeling for Union of Two Stars 203
M. Nalliah and S. Arumugam

On Determinant of Laplacian Matrix and Signless Laplacian Matrix of a Simple Graph. 212
Olayiwola Babarinsa and Hailiza Kamarulhaili

On the Complexity of Minimum Cardinality Maximal Uniquely Restricted Matching in Graphs 218
B.S. Panda and Arti Pandey

Partial Grundy Coloring in Some Subclasses of Bipartite Graphs and Chordal Graphs 228
B.S. Panda and Shaily Verma

On Prime Distance Labeling of Graphs 238
A. Parthiban and N. Gnanamalar David

Dominator Colorings of Products of Graphs 242
P. Paulraja and K. Raja Chandrasekar

Efficient Hybrid Approach for Compression of Multi Modal Medical Images 251
B. Perumal, M. Pallikonda Rajasekaran, and T. Arun Prasath

The Median Problem on Symmetric Bipartite Graphs 262
K. Pravas and A. Vijayakumar

Intuitionistic Fuzzy Automaton with Unique Membership and Unique Nonmembership Transitions 271
K. Jency Priya and T. Rajaretnam

Independent 2-Point Set Domination in Graphs 281
Purnima Gupta and Deepti Jain

On Graphs Whose Graphoidal Length Is Half of Its Size 289
Purnima Gupta and Rajesh Singh

Point-Set Domination in Graphs. VIII: Perfect and Efficient PSD Sets 300
Purnima Gupta, Alka, and Rajesh Singh

Graphoidal Length and Graphoidal Covering Number of a Graph 305
Purnima Gupta, Rajesh Singh, and S. Arumugam

An Overview of the MapReduce Model 312
S. Rajeswari, K. Suthendran, K. Rajakumar, and S. Arumugam

Identification of Salinity Stress Tolerant Proteins in Sorghum Bicolor Computational Approach 318
S. Rajeswari, M. Indhumathy, A. Somasundaram, Neeru Sood, and S. Arumugam

On Total Roman Domination in Graphs 326
P. Roushini Leely Pushpam and S. Padmapriea

Restrained Differential of a Graph 332
P. Roushini Leely Pushpam and D. Yokesh

The Distinguishing Number of Kronecker Product of Two Graphs 341
Saeid Alikhani and Samaneh Soltani

Grammar Systems Based on Equal Matrix Rules and Alphabetic Flat Splicing 347
G. Samdanielthompson, N. Gnanamalar David, and K.G. Subramanian

3-Simple 2-Fold 5-Cycle Systems 357
R. Sangeetha and A. Muthusamy

ANN-Based Bias Correction Algorithm for Precipitation in the Yarra River Basin, Australia 362
P. Saravanan, C. Sivapragasam, M. Nitin, S. Balamurali, R.K. Ragul, S. Sundar Prakash, G. Selva Ganesan, and V. Vel Murugan

Some Diameter Notions of the Generalized Mycielskian of a Graph 371
K.S. Savitha, M.R. Chithra, and A. Vijayakumar

On Minimization of Deterministic Automaton with Rough Output. 383
B.K. Sharma, S. Sharan, and S.P. Tiwari

Statistical Approach to Trace the Source of Attack Based on the Variability in Data Flows 392
T. Subburaj, K. Suthendran, and S. Arumugam

Independent Resolving Number of Convex Polytopes 401
B. Suganya and S. Arumugam

Signed Cycle Domination in Planar Graphs 409
M. Sundarakannan and S. Arumugam

An Optimization Algorithm for Task Scheduling in Cloud Computing Based on Multi-Purpose Cuckoo Seek Algorithm 415
R. Sundarrajan and V. Vasudevan

P_3-Factorization of Triangulated Cartesian Product of Complete Graph of Odd Order 425
A. Tamil Elakkiya and A. Muthusamy

Further Progress on the Heredity of the Game Domination Number. 435
Tijo James, Paul Dorbec, and Ambat Vijayakumar

Modeling of Dissolved Oxygen Using Genetic Programming Approach 445
S. Vanitha, C. Sivapragasam, and N.V.N. Nampoothiri

A Stream Cipher for Real Time Applications 453
M. Venkatesulu and M. Ravi

Erratum to: On Total Roman Domination in Graphs E1
P. Roushini Leely Pushpam and S. Padmapriea

Author Index 457