Lecture Notes in Computer Science 2081

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

Springer
Berlin
Heidelberg
New York
Barcelona
Hong Kong
London
Milan
Paris
Singapore
Tokyo

Karen Aardal Bert Gerards (Eds.)

Integer Programming and Combinatorial Optimization

8th International IPCO Conference
Utrecht, The Netherlands, June 13-15, 2001
Proceedings

Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Karen Aardal
Universiteit Utrecht, Instituut voor Informatica en Informatiekunde
Padualaan 14, 3584 CH Utrecht, The Netherlands
E-mail: aardal@cs.uu.nl

Bert Gerards
CWI
Kruislaan 413, 1098 SJ Amsterdam, The Netherlands
E-mail: bgerards@cwi.nl

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Integer programming and combinatorial optimization : proceedings / 8th International IPCO Conference, Utrecht, The Netherlands, June 13 - 15, 2001. Karen Aardal ; Bert Gerards (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ; Tokyo : Springer, 2001
(Lecture notes in computer science ; Vol. 2081)
ISBN 3-540-42225-0

CR Subject Classification (1998): G.1.6, G.2.1, F.2.2

ISSN 0302-9743
ISBN 3-540-42225-0 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 New York
a member of BertelsmannSpringer Science+Business Media GmbH

http://www.springer.de

© Springer-Verlag Berlin Heidelberg 2001
Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Stefan Sossna
Printed on acid-free paper SPIN: 10839281 06/3142 5 4 3 2 1 0

Preface

This volume contains the papers selected for presentation at IPCO VIII, the Eighth Conference on Integer Programming and Combinatorial Optimization, Utrecht, The Netherlands, 2001. This meeting is a forum for researchers and practitioners working on various aspects of integer programming and combinatorial optimization. The aim is to present recent developments in theory, computation, and application of integer programming and combinatorial optimization. Topics include, but are not limited to: approximation algorithms, branch and bound algorithms, computational biology, computational complexity, computational geometry, cutting plane algorithms, diophantine equations, geometry of numbers, graph and network algorithms, integer programming, matroids and submodular functions, on-line algorithms, polyhedral combinatorics, scheduling theory and algorithms, and semidefinite programs.

IPCO was established in 1988 when the first IPCO program committee was formed. The locations and years of the seven first IPCO conferences were: IPCO I, Waterloo (Canada) 1990, IPCO II, Pittsburgh (USA) 1992, IPCO III, Erice (Italy) 1993, IPCO IV, Copenhagen (Denmark) 1995, IPCO V, Vancouver (Canada) 1996, IPCO VI, Houston (USA) 1998, IPCO VII, Graz (Austria) 1999. IPCO is held every year in which no MPS (Mathematical Programming Society) International Symposium takes place. Since the MPS meeting is triennial, IPCO conferences are held twice in every three-year period. As a rule, IPCO is held somewhere in Northern America in even years, and somewhere in Europe in odd years.

In response to the call for papers for IPCO 2001, the program committee received 108 submissions, indicating a strong and growing interest in the conference. The program committee met on January 13 and 14, 2001, in Amsterdam, The Netherlands, and selected 32 contributed papers for inclusion in the scientific program of IPCO 2001. The selection was based on originality and quality, and reflects many of the current directions in integer programming and optimization research. The overall quality of the submissions was extremely high. As a result, many excellent papers could unfortunately not be chosen.

The organizing committee for IPCO 2001 consisted of Karen Aardal, Bert Gerards, Cor Hurkens, Jan Karel Lenstra, and Leen Stougie. IPCO 2001 was organized in cooperation with the Mathematical Programming Society, and was sponsored by BETA, CQM, CWI, DONET, The Netherlands Society for OR (NGB), EIDMA, ILOG, IPA, Philips Research Labs, Technische Universiteit Eindhoven, the Technology Foundation STW, and Universiteit Utrecht.

April 2001

Karen Aardal
Bert Gerards

IPCO VIII Program Committee

Bert Gerards (Chair), CWI Amsterdam and Technische Universiteit Eindhoven
Karen Aardal, Universiteit Utrecht
Imre Barany, Rényi Intézet, Magyar Tudományos Akadémia, Budapest and University College London
Dan Bienstock, Columbia University
Michele Conforti, Universita degli studi di Padova
Michel Goemans, Massachusetts Institute of Technology
Monique Laurent, CWI Amsterdam and CNRS, France
Gerhard Woeginger, Technische Universität Graz and Universiteit Twente

Table of Contents

Two $O(\log^* k)$-Approximation Algorithms for the Asymmetric $k-$Center Problem 1
A. Archer

Strongly Polynomial Algorithms for the Unsplittable Flow Problem 15
Y. Azar, O. Regev

Edge Covers of Setpairs and the Iterative Rounding Method 30
J. Cheriyan, S. Vempala

The Asymptotic Performance Ratio of an On-Line Algorithm for Uniform Parallel Machine Scheduling with Release Dates 45
C.-F.M. Chou, M. Queyranne, D. Simchi-Levi

Approximate k-MSTs and k-Steiner Trees via the Primal-Dual Method and Lagrangean Relaxation 60
F.A. Chudak, T. Roughgarden, D.P. Williamson

On the Rank of Mixed 0,1 Polyhedra 71
G. Cornuéjols, Y. Li

Fast 2-Variable Integer Programming 78
F. Eisenbrand, G. Rote

Approximating k-Spanner Problems for $k > 2$ 90
M. Elkin, D. Peleg

A Matroid Generalization of the Stable Matching Polytope 105
T. Fleiner

A 2-Approximation for Minimum Cost $\{0, 1, 2\}$ Vertex Connectivity 115
L. Fleischer

Combined Connectivity Augmentation and Orientation Problems 130
A. Frank, T. Király

An Extension of a Theorem of Henneberg and Laman 145
A. Frank, L. Szegő

Bisubmodular Function Minimization 160
S. Fujishige, S. Iwata

On the Integrality Gap of a Natural Formulation of the Single-Sink Buy-at-Bulk Network Design Problem 170
N. Garg, R. Khandekar, G. Konjevod, R. Ravi, F.S. Salman, A. Sinha

Circuit Mengerian Directed Graphs 185
B. Guenin

Integral Polyhedra Related to Even Cycle and Even Cut Matroids 196
B. Guenin

A Unified Framework for Obtaining Improved Approximation Algorithms for Maximum Graph Bisection Problems 210
E. Halperin, U. Zwick

Synthesis of 2-Commodity Flow Networks 226
R. Hassin, A. Levin

Bounds for Deterministic Periodic Routing Sequences 236
A. Hordijk, D.A. van der Laan

Cutting Planes for Mixed 0-1 Semidefinite Programs 251
G. Iyengar, M.T. Çezik

Independence Free Graphs and Vertex Connectivity Augmentation 264
B. Jackson, T. Jordán

The Throughput of Sequential Testing 280
M.S. Kodialam

An Explicit Exact SDP Relaxation for Nonlinear 0-1 Programs 293
J.B. Lasserre

Pruning by Isomorphism in Branch-and-Cut 304
F. Margot

Facets, Algorithms, and Polyhedral Characterizations for a Multi-item Production Planning Model with Setup Times 318
A.J. Miller, G.L. Nemhauser, M.W.P. Savelsbergh

Fences Are Futile: On Relaxations for the Linear Ordering Problem 333
A. Newman, S. Vempala

Generating Cuts from Multiple-Term Disjunctions 348
M. Perregaard, E. Balas

A $(2+\varepsilon)$-Approximation Algorithm for Generalized Preemptive Open Shop Problem with Minsum Objective 361
M. Queyranne, M. Sviridenko

Performance Guarantees of Local Search for Multiprocessor Scheduling . . . 370
P. Schuurman, T. Vredeveld

Connected Joins in Graphs 383
A. Sebő, E. Tannier

Two NP-Hardness Results for Preemptive Minsum Scheduling of Unrelated Parallel Machines 396
R. Sitters

Approximation Algorithms for the Minimum Bends Traveling Salesman Problem 406
C. Stein, D.P. Wagner

Author Index 423