

Thomas Lengauer (Ed.)

Algorithms – ESA '93

First Annual European Symposium
Bad Honnef, Germany
September 30 - October 2, 1993
Proceedings

Springer-Verlag

Berlin Heidelberg New York
London Paris Tokyo
Hong Kong Barcelona
Budapest

Series Editors

Gerhard Goos
Universität Karlsruhe
Postfach 69 80
Vincenz-Priessnitz-Straße 1
D-76131 Karlsruhe, Germany

Juris Hartmanis
Cornell University
Department of Computer Science
4130 Upson Hall
Ithaca, NY 14853, USA

Volume Editor

Thomas Lengauer
Gesellschaft für Mathematik und Datenverarbeitung mbH
Institut für methodische Grundlagen (I1)
Schloß Birlinghoven, D-53732 Sankt Augustin, Germany

CR Subject Classification (1991): F.2, G, I.3.5

**ISBN 3-540-57273-2 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-57273-2 Springer-Verlag New York Berlin Heidelberg**

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 1993
Printed in Germany

Typesetting: Camera-ready by author
Printing and binding: Druckhaus Beltz, Hembsbach/Bergstr.
45/3140-543210 - Printed on acid-free paper

Preface

The papers in this volume were presented at the First Annual European Symposium on Algorithms (ESA'93), held September 30–October 2, 1993, in Bad Honnef/Bonn, Germany. The symposium is intended to be an annual series of international conferences, held in early fall, that cover the field of algorithms. Within the scope of the symposium lies all research on algorithms, theoretical as well as applied, that is carried out in the fields of computer science and discrete applied mathematics. The symposium aims to cater to both of these research communities and to intensify the exchange between them.

The program committee met April 30, 1993, and selected the 35 contributed papers in this volume from 101 abstracts submitted in response to the call for papers. The selection was based on originality, quality, and relevance to the study of algorithms. It is anticipated that most of the submissions will appear in a more polished and complete form in scientific journals. The conference program also included invited lectures by Michael Paterson (Coventry): Evolution of an Algorithm, Alexander Schrijver (Amsterdam): Complexity of Disjoint Paths Problems in Planar Graphs, and Michael S. Waterman (Los Angeles): Sequence Comparison and Statistical Significance in Molecular Biology.

We wish to thank all members of the program committee, all those who submitted abstracts for consideration, our referees and colleagues who helped in the evaluations of the abstracts, and the many individuals who contributed to the success of the conference.

We would like to acknowledge the help of the following sponsoring institutions and corporations: Gesellschaft für Informatik (GI), Rheinische Friedrich-Wilhelms-Universität Bonn, Gesellschaft für Mathematik und Datenverarbeitung (GMD), Association for Computing Machinery (ACM) Special Interest Group for Algorithms and Computation Theory, and European Association for Theoretical Computer Science (EATCS).

Finally we would like to thank the following people for their extraordinary engagement in organizing the conference: Christine Harms, Brigitte Höning, Luzia Sassen-Heßeler, and Egon Wanke.

Bonn, September 1993

Thomas Lengauer

Program Committee

Rainer Burkard (Graz)	Jiří Matoušek (Praha)
Andras Frank (Budapest)	Kurt Mehlhorn (Saarbrücken)
Gaston Gonnet (Zürich)	Michel Minoux (Paris)
Mark Jerrum (Edinburgh)	Miklos Santha (Orsay)
Jan van Leeuwen (Utrecht)	Paul Spirakis (Patras)
Thomas Lengauer (Bonn, Chairman)	Esko Ukkonen (Helsinki)
Fabrizio Luccio (Pisa)	

Additional Referees

J. Almeida	S. Irani	M. Regnier
G. Benson	A. Joux	F. Rendl
A. Bertossi	K. Kalorkoti	G. Rote
S. Boucheron	S. Kannan	R. Rudolf
L. Caudal	C. Kenyon	R. Saad
J.M. Couveignes	B. Klinz	A. Slissenko
C. Crepeau	M. Leoncini	M. Teillaud
M. Crochemore	Y. Manoussakis	P. Tsigas
H. de Fraysseix	O. Nurmi	J. van der Veen
T. Elomaa	M. Nykänen	J. Vilo
M. Farach	L. Pagli	B. von Stengel
P. Ferragina	M. Papatriantafillou	J. von zur Gathen
P. Fiorini	T. Pasanen	G.J. Wöginger
J.L. Fouquet	V. Paschos	T. Wanrow
L. Gargano	U. Pferschy	V. Zissimopoulos
D. Gpuyou-Beauchamps	P. Raghavan	
R. Grossi	S. Rao	

Table of Contents

S. Albers	
The Influence of Lookahead in Competitive Paging Algorithms	1
M.J. Atallah, D.Z. Chen, D.T. Lee	
An Optimal Algorithm for Shortest Paths on Weighted Interval and Circular-Arc Graphs, with Applications	13
Y. Ben-Asher, D. Gordon, A. Schuster	
Efficient Self Simulation Algorithms for Reconfigurable Arrays	25
P. Bertolazzi, G. Di Battista, C. Mannino, R. Tamassia	
Optimal Upward Planarity Testing of Single-Source Digraphs	37
S.N. Bhatt, G. Bilardi, G. Pucci, A. Ranade, A.L. Rosenberg, E.J. Schwabe	
On Bufferless Routing of Variable-Length Messages in Leveled Networks	49
D. Breslauer	
Saving Comparisons in the Crochemore-Perrin String Matching Algorithm	61
A. Brüggemann-Klein	
Unambiguity of Extended Regular Expressions in SGML Document Grammars	73
N.H. Bshouty	
On the Direct Sum Conjecture in the Straight Line Model	85
R.F. Cohen, R. Tamassia	
Combine and Conquer: a General Technique for Dynamic Algorithms	97
A. Datta, A. Maheshwari, J.-R. Sack	
Optimal CREW-PRAM Algorithms for Direct Dominance Problems	109
M. de Berg, M. van Kreveld	
Trekking in the Alps Without Freezing or Getting Tired	121
O. Devillers, M. Golin	
Dog Bites Postman: Point Location in the Moving Voronoi Diagram and Related Problems	133
J. Díaz, M.J. Serna, J. Torán	
Parallel Approximation Schemes for Problems on Planar Graphs	145
M.R. Fellows, M.T. Hallett, H.T. Wareham	
DNA Physical Mapping: Three Ways Difficult	157
P. Flajolet, P. Zimmermann, B. van Cutsem	
A Calculus of Random Generation	169
O. Gerstel, S. Zaks	
The Bit Complexity of Distributed Sorting	181

J. Hagauer, G. Rote Three-Clustering of Points in the Plane	192
J. Hromkovič, R. Klasing, E.A. Stöhr, H. Wagener Gossiping in Vertex-Disjoint Paths Mode in d-Dimensional Grids and Planar Graphs	200
G.F. Italiano, J.A. La Poutré, M.H. Rauch Fully Dynamic Planarity Testing in Planar Embedded Graphs	212
Z. Ivković, E.L. Lloyd Fully Dynamic Algorithms for Bin Packing: Being (Mostly) Myopic Helps	224
T. Jordán Increasing the Vertex-Connectivity in Directed Graphs	236
B. Klinz, R. Rudolf, G.J. Woeginger On the Recognition of Permuted Bottleneck Monge Matrices	248
T. Kloks, H. Bodlaender, H. Müller, D. Kratsch Computing Treewidth and Minimum Fill-In: All You Need are the Minimal Separators	260
M. Kunde Block Gossiping on Grids and Tori: Deterministic Sorting and Routing Match the Bisection Bound	272
J.K. Lenstra, M. Veldhorst, B. Veltman The Complexity of Scheduling Trees with Communication Delays	284
E.W. Mayr, R. Werchner Optimal Tree Contraction on the Hypercube and Related Networks	295
M. Paterson (Invited Lecture) Evolution of an Algorithm	306
S. Rajasekaran Mesh Connected Computers with Fixed and Reconfigurable Buses: Packet Routing, Sorting, and Selection	309
V. Ramachandran, H. Yang An Efficient Parallel Algorithm for the Layered Planar Monotone Circuit Value Problem	321
J.F. Sibeyn, M. Kaufmann, R. Raman Randomized Routing on Meshes with Buses	333
K. Simon, D. Crippa, F. Collenberg On the Distribution of the Transitive Closure in a Random Acyclic Digraph	345
A. Schrijver (Invited Lecture) Complexity of Disjoint Paths Problems in Planar Graphs	357

A. Srivastav, P. Stangier	
Integer Multicommodity Flows with Reduced Demands	360
S. Subramanian	
A Fully Dynamic Data Structure for Reachability in Planar Digraphs	372
D. Wagner, K. Weihe	
A Linear-Time Algorithm for Edge-Disjoint Paths in Planar Graphs	384
M.S. Waterman (Invited Lecture)	
Sequence Comparison and Statistical Significance in Molecular Biology	396
E. Welzl, B. Wolfers	
Surface Reconstruction Between Simple Polygons via Angle Criteria	397
X. Zhou, S. Nakano, T. Nishizeki	
A Linear Algorithm for Edge-Coloring Partial k -Trees	409
Author Index	419