

P T I M A

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39
March
1993

MATHEMATICAL PROGRAMMING SOCIETY NEWSLETTER

Ann Arbor 1994

The Mathematical Programming Society will hold its triennial scientific meeting, the 15th International Symposium on Mathematical Programming, in Ann Arbor, MI, USA, on the campus of the University of Michigan Aug. 15-19, 1994.

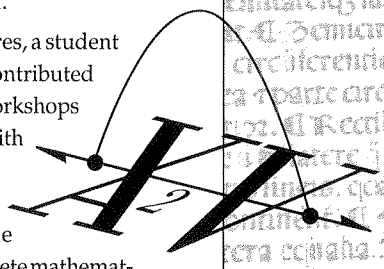
The meeting is sponsored by the Mathematical Programming Society and the University of Michigan College of Engineering. The University of Michigan is close to local museums, restaurants, clubs and coffeehouses. The location is within 30 minutes of Detroit Metropolitan Airport, with direct service to major airports throughout North America, Europe and Asia.

The meeting will offer a series of tutorial lectures, a student program and parallel sessions of invited and contributed talks. Computer demonstrations and topical workshops also will be organized. The meeting will open with a plenary session featuring the awarding of the George B. Dantzig Prize (for significant research in mathematical programming), the Fulkerson Prize (for outstanding papers in discrete mathematics), the Orchard-Hays Prize (for excellence in computational mathematical programming), and the A.W. Tucker Prize (for an outstanding paper by a student). A reception and banquet at the historic Greenfield Village are planned.

Sessions will be organized around the following topics. Linear, integer, mixed-integer programming; Interior point and pathfollowing methods; Convex programming; Nonlinear, nonconvex, nonsmooth optimization; Automatic differentiation; Complementarity (linear and nonlinear), fixed point methods; Dynamic programming and optimal control; Graphs, networks, matroids, greedoids; Combinatorial optimization; Game theory and multiobjective programming; Heuristic and approximate methods, global optimization; Mathematical programming in medical imaging; Computational complexity; Routing, scheduling, sequencing; Mathematical programming in manufacturing; VLSI design; Computer

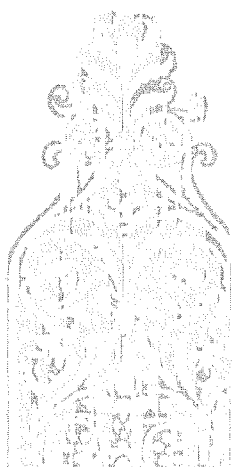
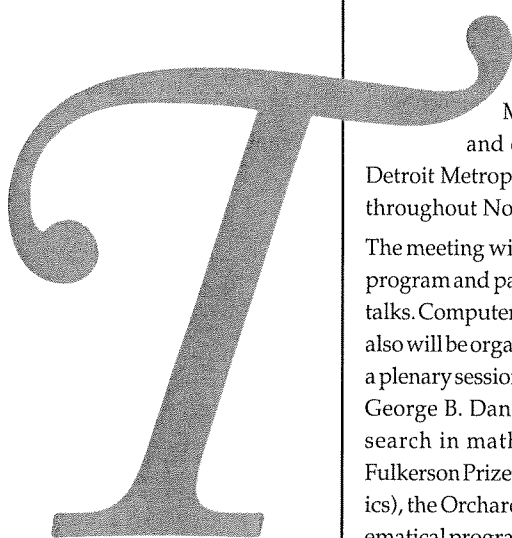
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NUMBER 39

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1992 LANCHESTER PRIZE *Call for Nominations*

¶Each year since 1954, the Council of the Operations Research Society of America has offered the Lanchester Prize for the best published contribution to operations research in the English language. For 1992, the prize is \$5,000 and a commemorative medallion. ¶To be eligible for the Lanchester Prize, a book, paper or a group of books or papers must meet the following requirements:

- 1) It must be on an operations research subject;
- 2) it must have been published in 1992; or two years prior to 1992, or, in the case of a group, at least one member of a group must have been published in 1992, or the two years prior to 1992;
- 3) it must be written in the English language; and
- 4) it must have appeared in the open literature.

Nominations should be sent by March 30, 1993, to:

Clyde L. Monma
Chair, Lanchester Prize
Committee
Bellcore, Room 2L-387
Mathematics and Operations
Research
445 South St.
Morristown, NJ 07962-1910

CONTINUED

15TH Symposium at Ann Arbor

implementations, software; Stochastic and chance-constrained programming; Large-scale optimization; Decision support systems; Parallel and massively parallel algorithms; Teaching mathematical programming; Nonlinear models in molecular design, computational chemistry; Engineering design optimization; Chemical process optimization; and Applications of mathematical programming. Suggestions for other areas also are welcome.

Papers on all theoretical, computational and practical aspects of mathematical programming are welcome. Presentation of recent results is especially encouraged. A late abstract deadline is set to enable such timely discussions.

A second announcement will be mailed in September 1993 to all respondents. That announcement will include early registration forms and information on paper submission. The deadline for these submissions will be:

April 1, 1994: Early registration and contributed paper topic

June 1, 1994: Final titles and abstracts

Aug. 15-19, 1994: On-site registration at the Symposium

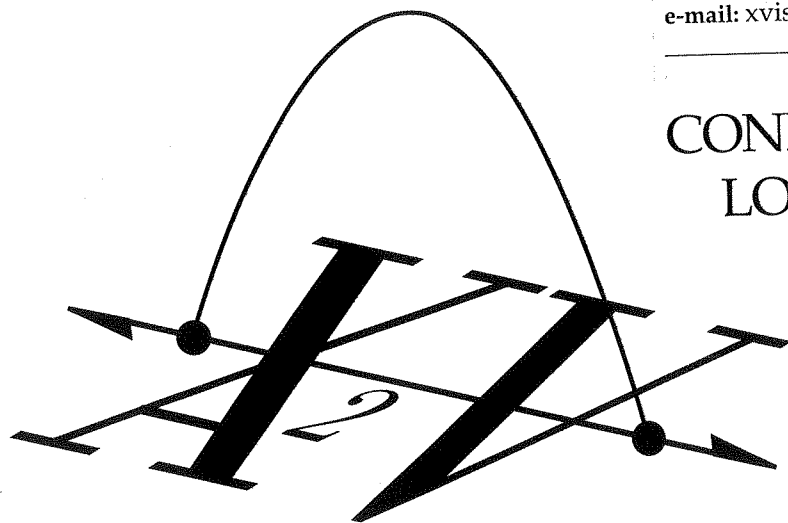
For further information, contact:

**15th International Symposium on Mathematical Programming
Conferences and Seminars
541 Thompson St., Room 112
University of Michigan
Ann Arbor, MI 48109-1360
USA**

Tel: (313) 764-5305

FAX: (313) 764-2990

e-mail: xvismp@um.cc.umich.edu.



CONFERENCE LOGO WINS AWARD

THE LOGO FOR THE 15TH INTERNATIONAL SYMPOSIUM ON MATHEMATICAL PROGRAMMING TIED FOR FIRST PLACE AS BEST LOGO IN THE 1992 DESIGN CONTEST, SPONSORED BY ALDUS MAGAZINE. AARON KING, ONE OF FOUR GRAPHIC DESIGNERS IN THE MARKETING COMMUNICATIONS GROUP AT THE UNIVERSITY OF MICHIGAN IN ANN ARBOR, CREATED THE LOGO FOR THE CONFERENCE.

THE LETTERS XV SHOW THAT THIS IS THE 15TH SYMPOSIUM; THE PARABOLIC ARC IS FOR PEOPLE COMING TOGETHER FROM AROUND THE WORLD TO ATTEND THE SYMPOSIUM; AND THE A² IS AN ABBREVIATION OF ANN ARBOR.

O P T I M A

CONFERENCE

Notes

**CONFERENCE ON
LARGE-SCALE
OPTIMIZATION**
University of Florida
Gainesville, FL
Feb. 15-17, 1993

A conference on large-scale optimization, hosted by the Center for Applied Optimization, was held at the University of Florida during mid-February. The conference received sponsorship from the National Science Foundation and the U.S. Army Research Office and endorsements from MPS, SIAM, ORSA and IMACS. Forty-one invited speakers presented papers on topics in mathematical programming and optimal control, with an emphasis on algorithm development and numerical computation.

Many of the papers included applications in such areas as molecular configuration, protein folding, economic growth models, airline crew scheduling, location theory, telecommunications network planning, multitarget tracking and traffic network models.

Speakers from Japan, Canada and several European countries gave the meeting an important international component. Attendees also included representatives from American Airlines, Argonne Labs, AT&T, IBM, Thinking Machines and USAir. A unique feature of the meeting was the NSF-sponsored attendance of 13 graduate students from universities in the United States.

A conference publication based on the theme of large-scale optimization is planned by Kluwer Academic Press.

— W.W. HAGER, D.W. HEARN, P. FARDALOS

OPTIMIZATION**DAYS 1993**

Montréal, Canada
May 12-14, 1993

All those interested in optimization methods and their present or potential applications are kindly invited to participate. The languages of the conference will be English and French. Plenary speakers will be:

- M. Ball, University of Maryland
C. Daganzo, University of California at Berkeley
G. Laporte, École des Hautes Études Commerciales and C.R.T.
A. Nagurney, University of Massachusetts at Amherst.

A 100-200 word summary defining clearly the content of the talk, together with the registration form, should be forwarded as soon as possible to:

André Langevin and
Brunilde Sansó
GERAD
5255, avenue Decelles
Montréal, Canada, H3T 1V6
Telephone: (514) 340-6043
e-mail: jopt93@crt.umontreal.ca
Fax: (514) 340-5665

Authors are particularly encouraged to send a copy of their summary via e-mail to the above address.

DIMACS Workshop on Quadratic Assignment Problems

Rutgers University
May 20-21, 1993

A workshop on Quadratic Assignment and Related Problems is to be held May 20-21, 1993, at the DIMACS (Discrete Mathematics and Theoretical Computer Science) Center at Rutgers University.

The quadratic assignment problem (the traveling salesman problem is a special case) belongs to a class of combinatorial optimization problems that have many practical applications, but are computationally very difficult to solve. Applications of the quadratic assignment problem can be found in location theory, scheduling, manufacturing, VLSI and process communication.

In this workshop, about 20 invited speakers will present recent results on many different aspects of quadratic assignment problems, including algorithms, applications, software development, efficient algorithms for certain classes of problems, complexity and collection of test data.

If you want to participate or you have any questions, you may get information by sending e-mail to: center@dimacs.rutgers.edu or to the organizers: pardalos@math.ufl.edu and henry@orange.princeton.edu.

— P. PARDALOS

Fifteenth Symposium on Mathematical Programming with Data Perturbations

George Washington
University
May 27-28, 1993

A fifteenth Symposium on Mathematical Programming with Data Perturbations will be held at George Washington University's Marvin Center May 27-28, 1993. This symposium is designed to bring together practitioners who use mathematical programming optimization models and deal with questions of sensitivity analysis, with researchers who are developing techniques applicable to these problems.

CONTRIBUTED papers in mathematical programming are solicited in the following areas:

- 1) Sensitivity and stability analysis results and their applications.
- 2) Solution methods for problems involving implicitly defined problem functions.
- 3) Solution methods for problems involving deterministic or stochastic parameter changes.
- 4) Solution approximation techniques and error analysis.

"CLINICAL" presentations that describe problems in sensitivity or stability analysis encountered in applications also are invited.

ABSTRACTS of papers intended for presentation at the Symposium should be sent in triplicate to Professor Anthony V. Fiacco.

Abstracts should provide a good technical summary of key results, avoid the use of mathematical symbols and references, not exceed 500 words, and include a title and the name and full mailing address of each author. The deadline for submission of abstracts is March 15, 1993.

Approximately 30 minutes will be allocated for the presentation of each paper. A blackboard and overhead projector will be available.

Anthony V. Fiacco, organizer.

Sponsored by the Department of Operations Research and the Institute for Management Science and Engineering, School of Engineering and Applied Science, The George Washington University, Washington, D.C. 20052. Phone: (202) 994-7511.

— A.V. FIACCO

Symposium on Parallel Optimization 3

Center for Parallel Optimization
Computer Science Department
University of Wisconsin, Madison, WI

July 7-9, 1993

A three-day symposium of invited presentations on state-of-the-art algorithms and theory for the parallel solution of optimization and related problems will be held at the University of Wisconsin at Madison. The symposium is supported by the AFOSR and is sponsored by the Mathematical Programming Society. Emphasis will be on algorithms implementable on parallel architectures. Referred proceedings will be published by SIAM. Speakers include:

- Kristin P. Bennett** University of Connecticut, Storrs
Ranato De Leone Universities of Wisconsin and Camerino, Madison and Camerino, Italy
John E. Dennis Jr. Rice University, Houston
Jonathan Eckstein Thinking Machines Corp., Cambridge
Michael C. Ferris University of Wisconsin, Madison
Alexei A. Gaivoronski ITALTEL and University of Milan, Italy
Luigi Grippo University of Rome "La Sapienza," Italy
Joseph R. Litko Scott Air Force Base, Illinois
Z.-Q. (Tom) Luo McMaster University, Hamilton, Canada
Rich Maclin University of Wisconsin, Madison
Sanjay Mehrotra Northwestern University, Evanston
Jorge J. Moré Argonne National Laboratory, Argonne
John M. Mulvey Princeton University, Princeton
Jong-Shi Pang The Johns Hopkins University, Baltimore
Klaus Ritter Technical University of Munich, Germany
J. Ben Rosen University of California at San Diego, La Jolla
Jude W. Shavlik University of Wisconsin, Madison
Paul Y. Tseng University of Washington, Seattle
Margaret H. Wright AT&T Bell Laboratories, Murray Hill
Stephen J. Wright Argonne National Laboratories, Argonne
Stavros Zenios University of Pennsylvania, Philadelphia
Xiru Zhang Thinking Machines Corp., Cambridge

Talks will be by invitation only, but the symposium is open to all persons wishing to attend. For more information, contact the SPO3 Secretary, Laura Cuccia, or one of the organizers, O.L. Mangasarian, or R.R. Myer, at Center for Parallel Optimization, Computer Sciences Department, University of Wisconsin, 1210 W. Dayton St., Madison, WI 53706, USA. Secretary (608) 262-0017, e-mail laura@cs.wisc.edu, FAX: (608) 262-9777.

FOURTH STOCKHOLM OPTIMIZATION DAYS

KTH (Royal Institute
of Technology)
Stockholm, Sweden

Aug. 16-17, 1993.

Invited speakers include:

- M. Bendsoe** DTH, Copenhagen
R. Bixby Rice University, Houston
A. Conn IBM, Yorktown Heights
J. Desrosiers HEC, Montreal
P. Gill UCSD, San Diego
J.-L. Goffin McGill, Montreal
N. Gould CERFACS, Toulouse
S. Graves MIT, Boston
W. Hager University of Florida, Gainesville
D. Hearn University of Florida, Gainesville
C. Kiwiel Systems Research Institute, Warsaw
C. Lemarechal INRIA, Paris
W. Murray Stanford University, Palo Alto
A. Nemirovski CMI, Moscow
J. Nocedal Northwestern University, Evanston
P. Pardalos University of Florida, Gainesville
C. Sherbrooke Logistics Management Institute, Bethesda
P. Toint UNDP, Namur
Y. Zheng University of Pennsylvania, Philadelphia

Abstracts should be sent by June 1 (preferably by e-mail) to optdays@math.kth.se

or by mail to

Optimization Days, Division of Optimization and Systems Theory, KTH, 100 44 Stockholm, Sweden.

Any questions should be directed to the same addresses.

The organizing committee:

P.O. Lindberg, U. Brannlund, A. Forsgren and K. Svanberg.

We invite theoretical, computational and applied papers. We plan to have sessions on dual optimization methods, inventory control, structural optimization, power planning and large-scale nonlinear programming, among other areas.

FOURTH INTERNATIONAL WORKSHOP ON GENERALIZED CONVEXITY

Janus Pannonius
University
Pécs, Hungary

Aug. 31-Sept. 2, 1992

The conference, which was organized by S. Komlósi (Pécs), T. Rapcsák (Budapest) and S. Schaible (Riverside), followed previous workshops in Vancouver (1980), Canton (1986) and Pisa (1988). It was attended by some 90 participants, who gave a total of 46 lectures.

Topics included characterization of various kinds of generalized convex functions; nonsmooth optimization; optimality and duality; generalized monotone maps; fractional programming; multicriteria optimization; solution methods; and applications in management, economics and applied sciences. Proceedings will be published in *Lecture Notes in Economics and Mathematical Systems*, Springer-Verlag.

- S. SCHAIBLE

Sixth International Conference in Stochastic Programming and Meeting of The Committee on Stochastic Programming

Udine, Italy
September 1992

The Sixth International Conference in Stochastic Programming took place in Udine, Italy in September 1992. The meeting was run on behalf of The Committee on Stochastic Programming (COSP) and follows the tradition of having such a conference every three years. The next conference will take place in Haifa, Israel, in 1995 under the leadership of Aharon Ben-Tal.

The Udine meeting was successful, both from a scientific and an organizational point of view. It showed that the field had moved forward since the previous conference. This is particularly true with respect to applications and algorithmic developments.

Thanks are due to the local committee consisting of Giovanni Andreatta (University of Padova, chairman), Gabriella Salinetti (University of Rome) and Paolo Serafini (University of Udine). Thanks also go to COSP and its chairman Roger J.-B. Wets (University of California, Davis) and secretary Jitka Dupačová (Charles University, Prague). The conference was sponsored by UNESCO, CNR (Italian National Research Council), Committee for

Economics and Committee for Mathematics, CISM (Udine) and Department of Pure and Applied Mathematics (University of Padova, Italy).

A COSP meeting was held during the conference. Yves Smeers and Roger J.-B. Wets resigned from COSP. Aharon Ben-Tal (Israel), John Mulvey (USA), Andrzej Ruszczyński (Poland) and Stein W. Wallace (Norway) were elected to join COSP. On the recommendation of the nominating committee, chaired by Kurt Marti, Stein W. Wallace was elected as chair. Andrzej Ruszczyński accepted the position of secretary for the next three years.

The present composition of COSP is thus:

Aharon Ben-Tal, John R. Birge, Michael Dempster, Jitka Dupačová, Kurt Marti, John Mulvey, András Prekopa, Andrzej Ruszczyński (secretary), Tamas Szantai, Stein W. Wallace (chair), William Ziemba and Yuri Ermoliev.

A major concern of the stochastic programming community is the establishment of a database for test examples. Also, some concerns exist

about the appropriateness of the present standard input format. It is now clear that Karl Frauendorfer, K193302@CZHRZU1A.bitnet, and David Gay, dmg@research.att.com, will make a joint effort on these issues. Frauendorfer will take the main responsibility for the contents of the base, whereas Gay will run it. Gay already administers netlib's lp/data and lp/generators collections (linear programming test problems). Together, they also will consider the possibility of adding features to the standard input format. Anyone with ideas on the input format or with problems they think fit the problem base, should contact Frauendorfer or Gay. It is the hope of the present COSP chair that COSP, during the next three years, will be able to establish this problem base, and, that way, follow up work initiated by the previous COSP chair, Roger J.-B. Wets.

An electronic mailing list for people interested in stochastic programming will be set up. Anyone interested in being on the list should contact Andrzej Ruszczyński at rusz@iiasa.ac.at.

Technical Reports

Working Papers

UNIVERSITY OF
SOUTHAMPTON
Faculty of
Mathematical Studies
Highfield
Southampton SO9 5NH, UK
OR Preprint Series

V.J.D. Baston, M.K. Rahmouni,
and H.P. Williams, "The Practical
Conversion of Linear Programs to
Network Flow Models," OR10.

I.H. Osman and C.N. Potts,
"Simulated Annealing for Permutation
Flow-Stop Scheduling," OR17.

A.K. Shahani and S.C.
Brailsford, "A Computer Simulation
Model for AIDS," OR18.

H.P. Williams, "Constructing the
Value Function for an Integer
Linear Program Over a Cone,"
OR19.

H.P. Williams, "The Elimination
of Integer Variables," OR20.

J.D. Hawkins and A. K. Shahani,
"Simulation Modeling of the
Infectious Disease Trachoma,"
OR21.

H.P. Williams, "A Method of
Finding all Equilibrium Solutions
of a Two-Person Matrix Game,"
OR22.

S.C. Brailsford and A.K.
Shahani, "Operational Models for
the Natural History of HIV and
AIDS," OR 23.

Y. Maghsoodi, "Stochastic
Modeling and Computation of
Flood Risk in a Building," OR24.

H.P. Williams, "Computation
Logic and Integer Programming
Connections between the Methods
of Logic, AI and OR," OR25.

J. Potamianos and A.K. Shahani,
"An Interactive Dynamic Inventory
Production Control System,"
OR26.

J. Potamianos and A.K. Shahani,
"Modeling for a Dynamic Inventory
Production Control System,"
OR27.

S.C. Brailsford, A.K. Shahani,
R. Basu Roy, and S. Sivapalan,
"Simulation Models for HIV
Infection and AIDS," OR28.

R. Basu Roy, A.K. Shahani,
S.C. Brailsford, A. Aronstam,
S. Sivapalan, and J.C. Raison,
"Practical Help from Models of
HIV Infection and AIDS," OR29.

C.A. Glass, "Feasibility of
Scheduling Lot Sizes of Two
Frequencies on One Machine,"
OR30.

A.K. Shahani, "Scheduling of
Inspection for Monitoring the
Quality of Systems," OR31.

A.K. Shahani, "Importance of
Process and Control in Statistical
Process Control," OR32.

H.P. Williams, "An Alternative
Explanation of Disjunctive
Formulations," OR33.

C. Shaozhong and Y.
Maghsoodi, "To the Memory of
Andrei Nikolaevich Kolmogorov.
Derivation of Kolmogorov's
Equation for Multidimensional
Jump-Diffusion Process with
Absorbing Boundary Surfaces,"
OR 34.

N. Korve and A.K. Shahani, "A
Model for Preventing and Treating
Asthma Attack," OR 35.

C.A. Glass and N. Troll, "A
Review of Operational Research
Applications in the Transport
Industry," OR36.

S.C. Brailsford, "Review of AIDS
Modeling Work," OR37.

A.M.A. Hariri, C.N. Potts, and
L.N. Van Wassenhove, "Single
Machine Scheduling to Minimize
Total Weighted Late Work," OR38.

Y. Maghsoodi, "Time Varying
Jumps in Stock Prices and a New
Option Pricing Formula," OR39.

D.J. Gove and A.K. Shahani,
"Towards an Operational Model for
Dealing with Genital Chlamydial
Infections," OR40.

C.A. Glass, J.N.D. Gupta, and
C.N. Potts, "Lot Streaming in
Three-Stage Production Process,"
OR41.

A.K. Shahani, H.H.V. van der
Hoorn, and M.E. Ward, "Simulation
Modeling of Trachoma,"
OR42.

D.J. Gove and A.K. Shahani,
"Predicting Product Maturity,"
OR43.

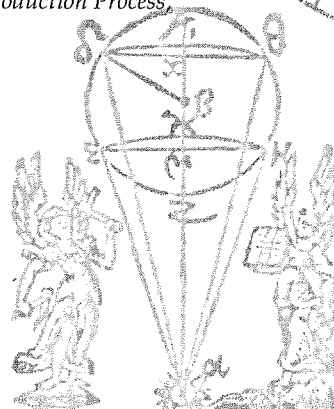
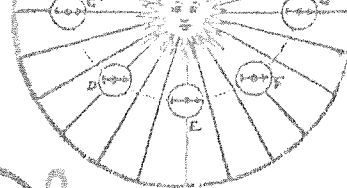
C.A. Glass, "Dynamic Program-
ming in a Pure Functional
Language," OR44.

C.A. Glass, "A Generalization of
Dynamic Programming to the
Multiple Objective Case: Theoretical
Basis," OR45.

H.P. Williams, "Duality in
Mathematics and Linear and
Integer Programming," OR46.

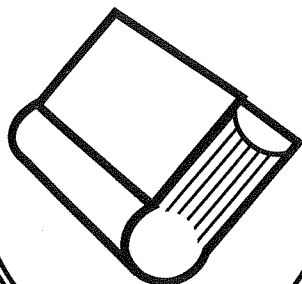
C.A. Glass, C.N. Potts, and P.
Shade, "Genetic Algorithms and
Neighborhood Search for Scheduling
Unrelated Parallel Machines,"
OR47.

H.P. Williams, "A Note: The
Equivalence of a Theorem of
Kronecker and a Theorem of
Williams," OR48.



BOOK

R E V I E W S



Eulerian Graphs and Related Topics

By H. Fleischner

Annals of
Discrete Mathematics 45
1990

ISBN 0-444-88395-9

This is the first monograph on eulerian trails in finite graphs, or, more exactly, the first part of a work announced to consist of at least two volumes. How wide-ranging the work is, one may imagine from the almost 30 pages of historical introduction. In the introduction, one can study, for instance, the original paper of L. Euler on the Königsberg Bridges Problem in Latin, and also in an English translation.

In Chapter III, the basic concepts and preliminary results are combined. The definitions often are formalized in a way that the reader will find it hard to continue. Well-known theorems of other branches of graph theory are quoted without proof. All special results used in the following are proved, but related generalizations are sometimes not mentioned. In Chapter IV, the fundamental results on eulerian trails are proved on graphs, digraphs and mixed graphs. Chapter V gives some generalizations and other characterizations of eulerian graphs, for instance, by the parity of the number of paths joining any distinct vertices. An outlook on covering problems is added.

Chapter VI deals with various types of eulerian trails. First considered are trails avoiding certain prescribed transitions, where a pair of adjacent edges (if parallel, with one vertex marked) is a transition of a trail, if one of these edges directly

succeeds to the other on the trail. For instance, the following interesting conjecture is proved for special graphs: Every connected, eulerian graph of minimum degree n has $n-2$ pairwise compatible eulerian trails, where two trails are called compatible, if a transition of one trail does not occur in the other. This would be best possible for $n > 2$, and it is proved that there are at least $\frac{n}{2} - 1$ such trails. Other conditions imposed on the trails are, for instance, in digraphs, that the trails are anti-directed, or in plane graphs, that the transitions occurring in the trail "correspond to the boundary" of the faces. This latter condition is considered in the greater part of Chapter VI.

The last chapter studies the transformation of eulerian trails defined by traversing a proper closed subtrail in the opposite direction. It is well known that every eulerian trail is reachable from any other by a sequence of such transformations. This may change if we consider classes of eulerian trails with properties as in Chapter VI and demand that we remain in this class in every step of the sequence of transformations. These investigations are the topic of Chapter VII.

The main chapters are complemented by a series of exercises. An extensive bibliography allows one to pursue special questions in the original papers.

-W. MADER.

Numerical Methods for Mathematics, Science, and Engineering, 2nd edition

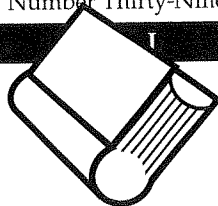
By J.H. Mathews

Prentice Hall
1992

ISBN 0-13-624990-6

The aim of this textbook is to introduce students of various backgrounds to the basic methods of numerical analysis. Emphasis is placed on easy understanding. The book contains many examples, exercises and algorithms in pseudo-code. It covers the standard topics of numerical mathematics: Nonlinear equations, solution of linear systems, interpolation and polynomial approximation, curve fitting, numerical differentiation, numerical integration, numerical optimization, solution of ordinary and partial differential equations, eigenvalues and eigenvectors.

Those who read this review might want to know what the student is expected to learn about numerical optimization. That chapter takes 23 pages of a total of about 600 pages. After the necessary definitions and a statement of first and second derivative conditions, the following methods are explained: Golden ratio and quadratic approximation search in one variable, the Nelder-Mead method for the case of two variables and (only with a statement of the method) steepest descent in N variables. Of course, there is no space for optimization under constraints.



"I have made no attempt to include everything known, or even everything which is important. I have included what I feel every 'literate' theoretical computer scientist (or mathematician) should know about linear programming."

- KARLOFF

Summarizing, the author has made a reasonable choice of subjects. Emphasis on easy understanding and simplification is a question of taste. The reviewer would prefer a more substantial presentation in a follow up.

- W. WETTERLING

Linear Programming

By Howard Karloff
Birkhauser Verlag
1991

ISBN 3-7643-3561-0

"Over the more than four decades that have elapsed since 1947, when the Simplex Algorithm was developed by George Dantzig, a voluminous theory of linear programming has been developed. This book is an attempt to present a small fraction of this theory to a 'mathematically sophisticated' reader. Here, a 'mathematically sophisticated' reader is an advanced undergraduate or graduate student who knows linear algebra and who has the ability to read and understand proofs. Except for a few exercises left to the reader, almost all details are included. I have tried to provide intuition and motivation as well.

"I have made no attempt to include everything known, or even everything which is important. I have included what I feel every 'literate' theoretical computer scientist (or mathematician) should know about linear programming. (Maybe a bit more.) I hope this short monograph will function as a self-contained, concise mathematical introduction to the theory of linear programming."

In these opening sentences the author rather precisely describes the aim of this book. But one is anxious to see what he means when saying that he has included what "every 'literate' theoretical computer scientist (or mathematician) should know about linear programming." So let us first cover what the book offers. After an introductory chapter (called The Basics) which clarifies the computational model used in this monograph, and some basic facts about linear programming, there are chapters on the Simplex Algorithm (26 pages), the Ellipsoid Algorithm (30 pages) and Karmarkar's Algorithm (28) pages. These three methods of solving linear programming problems are treated in an elementary way, close to earlier presentations of each of the methods. A separate chapter, after the Simplex Algorithm, is devoted to Duality (24 pages).

Given the limited size of the book, it will be no surprise that, indeed, not everything is discussed. For example, only the primal Simplex Algorithm is mentioned in the book. On the other hand, the end of each chapter contains a "Notes" section with a good number of relevant references to related literature, also on topics which are left aside in the book. In the "Notes" after the Ellipsoid Algorithm, for example, one finds the following sentences: "The discovery in 1979 of the Ellipsoid Algorithm opened up the ability that non-combinatorial methods might beat combinatorial ones for linear programming. Decades of work on Simplex had failed to yield a polynomial-time variant; in hindsight, it seems that myopically jumping from vertex to neighboring vertex was the wrong strategy, at least in theory, despite its success in practice."

The author honestly credits the work of others which he used in his presentation of the material. The book is well written, with only a few misprints. It seems that, given the author's choice of topics, the book will be a nice introduction to some major developments in the field of linear programming for theoretical computer scientists (or mathematicians) who are not already familiar with the subject. It will be clear that there is nothing new for those who know the book of A. Schrijver (*Theory of Linear and Integer Programming*, Wiley, New York, NY, 1986). As a textbook for graduate students, it seems to be quite appropriate, although in that case one would like to have had more than a few exercises included.

Finally, I hope that the book will have a next edition and that it will contain a bit more. Nowadays, a graduate (or advanced undergraduate) course in linear programming also should certainly include some more recent developments, namely in the field of interior point methods. Especially the concept of "central path," with its nice, theoretical properties as well as its crucial importance for the so-called pathfollowing methods (including the very efficient primal-dual methods), deserves a central place in any such course. Up till now, no textbook covers these topics, which is the more regrettable because these methods now are implemented in commercially available codes such as OB1 and OSL. I strongly recommend to extend further editions of the book with such a chapter.

- C. ROOS.

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Information on the Third Integer Programming and Combinatorial Optimization Conference (IPCO) to be held April 29-May 1, 1993 is now available in directory /pub/ipco3 via FTP at the internet address cattivik.iac.rm.cnr.it (account ftp). ¶A NATO Advance Study Institute on Algorithms for Continuous Optimization will be held Sept. 5-18, 1993. Contact Prof. Emilio Spedicato, Dipartimento Matematica, Università Piazza Rosate 9, 24100 Bergamo, Italy, Tel: +3935277514, Fax: +3935234693 or e-mail: teresa@ibguniv.bitnet. ¶NETFLOW93, A conference on Network Optimization Theory and Practice, will be held Oct. 3-7, 1993, in San Miniato, Italy. Contact: Federico Malucelli, Chairman, Local Organizing Committee, Netflow93, c/o Dipartimento di Informatica, Università di Pisa, Corso Italia 40, 56125 Pisa, Italy. e-mail: maluc@di.unipi.it. Phone: +39-50 510216. Fax: +39-50 510226. ¶Deadline for the next OPTIMA is June 1, 1993.

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