Book Reviews

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In this section, the IEEE Computer Group publishes reviews of books in the computer field and related areas. Readers are invited to send comments on these reviews for possible publication in the Correspondence section of this TRANSACTIONS. Please address your comments and suggestions to the Book Reviews Editor: Louis A. Schmittroth, Department of Computer Science, Montana State University, Bozeman, Mont. 59715. The Computer Group does not necessarily endorse the opinions of the reviewers.


The book consists of selected papers presented at the Second International Conference on Computing Methods in Optimization Problems held in San Remo, Italy, September 9-13, 1968. The purpose of the conference was to review recent advances in computational techniques of optimization problems, applied in a variety of technical areas. Thirty-one papers presented at the conference were selected to be included in this publication. These papers can be subdivided into eight basic categories. This classification and the contents of the papers will be discussed next.

1) General Optimization Techniques and Optimal Control (8 Papers): Two of the papers, one by Hestenes and another by Moiseev constitute surveys of numerical methods utilized in the solution of optimal-control problems. Of particular interest and usefulness is the paper by Hestenes dealing with multiplier and gradient methods. This paper presents an important contribution concerning an improvement of a penalty method by multipliers. Penaltyization techniques, from the theoretical standpoint, is also the subject of a paper by Cullum. Two papers, one by Luenberger and one by Polak, are dedicated to the presentation of primal-dual algorithms for the computation of optimal-control problems. A paper by Kuhn discusses approximate search for fixed points and a paper by Phenicichii discusses acceleration of convergence of algorithms for computational solutions of optimal-control problems. Jizmagian presents a novel computational algorithm implementing generalized programming in solving linear continuous-time optimal-control problems.

2) Optimal Flow and Transportation Problems, Utilizing the Principle of Optimality (6 Papers): The papers classified in this category use graph theory for problem representation and modeling. The principle of optimality and dynamic programming techniques are used in solving the optimization problems involved. Two papers, one by Biondi et al., the other by Vlach, discuss transportation problems. A paper by Gill and Traiger and one by Yen present algorithms for computing optimal paths in finite graphs and networks, in particular, finding the shortest route. A paper by Finkbeiner et al. solves an optimal policy making problem, producing a value iteration algorithm for Markov renewal programming. Klinger discusses a sequential decisions problem, where decisions are made at random points in time, generated by a Poisson process.

3) Identification Problems (4 Papers): A paper by Aoki and Staley and a paper by Taylor and Liif solve parameter identification problems utilizing gradient techniques. Two other papers, one by Bensousan and the other by Phillipson and Mitter, address themselves to the identification of distributed parameter systems, governed by partial differential equations.

4) Optimization of Computer Organization and Operation (3 Papers): Marzollo and Sipala solve the problem of minimal threshold-on realization by modeling it as a quadratic assignment problem. A quadratic integer programming algorithm is then applied. Maurer applies minimum redundancy coding to the file compression problem, stressing the usefulness in time-sharing environment. A paper by Luccio discusses optimal index register loading and variable allocation, given a restricted number of working positions. An optimal allocation algorithm is presented.

5) Pattern Recognition and Picture Processing (3 Papers): A very interesting survey of optimality considerations in picture processing is presented by Narasimhan. The main topics discussed are classification problems and picture languages. Applications of picture-processing techniques in the classification of fingerprints and wheat chromosomes are reviewed by Grasselli. Gurel discusses planning of layout of patterns using graph theory.

6) Optimization of Distributed Parameter Systems (3 Papers): Two of the papers, one by de Julio and the other by Kenneth et al., address themselves to the problem of implementing penalty techniques in optimal control of distributed parameter systems. In the third paper, Bossavit solves a particular case of a distributed parameter system utilizing gradient projection and conjugate direction techniques. Prior to the numerical solution, existence and uniqueness conditions are derived.

7) Optimization of Nuclear and Chemical Reactors (3 Papers): A paper by Mohler et al. discusses the problems of optimal neutron kinetics, neutron level, and power reactor control in nuclear reactors. Pontryagin's maximum principle and linear programming are utilized in several examples. A paper by Becker surveys some variational problems associated with nuclear reactor systems. Zahradnik and Parkin give a suboptimal approximate solution, involving algebraic instead of differential equations in the computation of optimal temperature profiles for a tubular reactor.

8) Game Theory (1 Paper): Danskin presents a gradient-finding algorithm for solving concave-convex games over two polyhedra.

From the geographical standpoint the papers are subdivided as follows: U.S.A.—18 papers, Italy—5 papers, France—3 papers, U.S.S.R.—2 papers, Switzerland, Czechoslovakia, India—1 paper each.

Most of the papers are written in a congested and not easily followed style. In view of this and of the diversification of subjects touched upon, the book cannot be utilized as a textbook. It can serve as a reference source on specific subjects, mentioned above, just like any other journal or conference proceedings.

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