provided a point of departure for the development of new methods, topological in nature, that take advantage of the mixed topology inherent in the optimal control problem: the fact that the control space has a weak topology and the state space a strong topology. Apparently, this remains to be exploited: the yield in terms of generality and computational efficiency may be considerable. But this is a small disappointment for one reader who, being stimulated, naturally wishes for more.

This book is an important contribution to the literature on mathematics of computation and has gone a good distance toward filling a serious gap in the field.

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48[3].—J. B. ROSEN, O. L. MANGASARIAN & K. RITTER, Editors, *Nonlinear Programming*, Academic Press, New York, 1970, xii + 490 pp., 24 cm. Price $10.50.

This book presents the proceedings of a Symposium in Nonlinear Programming held at the University of Wisconsin at Madison, on May 4–6, 1970. According to the preface, ". . . one of the main purposes of this Symposium was to further strengthen the existing relationship between theory and computational aspects of this subject." In this, the editors have succeeded admirably.

Of the 17 papers listed below, the first nine are devoted primarily to computational algorithms. The emphasis in this group of papers is nicely balanced between the practical and algorithmic and the theoretical. This is especially true of the papers by Powell, McCormick, and Ritter. Particularly noteworthy is the paper by Bartels, Golub and Saunders. It applies numerically stable and efficient LU and QR matrix decomposition techniques to linearly constrained problems. Until recently, such techniques have gone practically unnoticed by mathematical programmers. The paper by Zoutendijk is a very clear and concise summary of his feasible directions approach applied to several algorithms. Daniel's paper extends to constrained problems the results on steplength algorithms contained in Chapter 4 of his book "The Approximate Minimization of Functionals", and Polak's paper presents the basic ideas for implementing algorithms that he expounds in particular cases in his book, "Computational Methods in Optimization".

The next four papers deal with theoretical aspects of nonlinear programming. Lemke's paper is a good summary of recent results relating to the complementarity problem.

The last four papers consider the application of nonlinear programming to areas such as mathematical analysis and the physical sciences, statistics and probability, and l_p approximation. These papers do not give nonlinear programming solutions to specific problems, rather they indicate how some of the problems that arise in these basic areas can be viewed in terms of nonlinear programming.

A Method of Centers by Upper-Bounding Functions with Applications
P. HUARD

A New Algorithm for Unconstrained Optimization . . . . . M. J. D. POWELL

A Class of Methods for Nonlinear Programming: II Computational Experience
R. FLETCHER, SHIRLEY A. LILL

D.G.

49[3.25, 13.40].—W. ALLEN SPIVEY & ROBERT M. THRALL, *Linear Optimization*, Holt, Rinehart & Winston, Inc., New York, 1970, xii + 530 pp., 24 cm. Price $15.75.

This is a well written and leisurely paced book that should appeal to application-oriented management and computer scientists who still insist on a mathematically sound presentation. A pleasant feature of the book is the extended set of appendices, approximately 25 percent of the whole book, which cover all the needed background material such as sets, functions, foundation and linear algebra. Another useful feature is the abundance of problems at the end of each chapter. The core of the book is the simplex algorithm for solving linear programs. It is presented in this book at three levels: a geometrical and application-oriented level in the first chapters, a second level consisting of the conventional constructive simplex algorithm itself and, finally, in the condensed Tucker tableau form. The book also includes some special topics and applications such as the assignment problem, the capacitated transportation problem, game theory, decomposition and upper-bound constraints. The book is highly recommended as a textbook for a first course in linear programming in operations research and industrial engineering departments and, especially, for students with limited mathematics background.

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