Book Review

D.-Z. Du and J. Sun, eds.: Review of *Advances in Optimization and Approximation*, Nonconvex Optimization and its Applications Vol. 1, Kluwer Academic Publishers, 1994.

This volume is a collection of papers on optimization written on the occasion of fifty-year career mark of Prof. Minyi Yue of the Institute of Applied Mathematics, Beijing, China. There are a total of 21 papers from all over the world authors.

The volume has papers in several areas including polyhedral combinatorics, geometric placement problems, interior point methods for linear and quadratic programming, and applications.

In the area of polyhedral combinatorics, Coullard, Gamble and Liu have results about the k-walk problem (that is, the polyhedron determined by length-k walks in a graph) and Qi, Balas and Gwan have addressed the polyhedron associated with the three-index assignment problem.

Three papers address geometric placement problems. Dasgupta and Roychowdhury have written about rectangle covering problems in the plane. Du, Du, Gao and Qū have written a brief paper about Steiner trees on four points under different metrics. Xue and Wang have addressed the Euclidean facilities location problem, that is, the problem of locating one or more facilities in the plane given constraints imposed by existing facilities.

There are eight papers on interior point methods. Ding has looked at interior point methods for linear complementarity. Den Hertog, Roos and Terlaky describe an interior point method in which the constraints are not all introduced at the same time. A paper by Hu and another by Lin, Fang and Wu both propose interior algorithms for the semi-infinite linear programming problem. Osborne studies the relation between the decrease in the central path parameter from one iteration to the next versus the number of steps needed to recover proximity. Luo and Ye have an interior point method that achieves asymptotic one-step quadratic convergence.

This paper improves on known earlier results that established two-step quadratic convergence and later $(n+1)/n$-step quadratic convergence. Zhang shows how to compute a strictly-complementary tableau from an interior point solution. Zhao and Zhu obtain analytical results about derivatives of the central path.

In the area of applications, Jiang and Li look at the complexity of optimization problems related to computational biology and molecular sequencing, and propose some new problems. Yang looks at an optimization problem that arises in the design of a coal mine. Chen looks at scheduling flow shops.

Gu's paper applies continuous optimization algorithms to boolean satisfiability problems. This paper deserves special mention because, at 83 pages, it is the longest and most comprehensive in the book. It surveys all of the known continuous approaches to this NP-hard problem. It also presents many computational results. Finally, Gu's paper has a vast bibliography with 331 citations. Anyone interested in solving NP-hard combinatorial problems via continuous optimization will definitely want a copy of this paper.

Finally, there are four papers that address other classes of optimization problems. Güler has looked at proximal algorithms for general convex programming. Xu has looked at optimization problems from queuing theory. Rockafellar and Sun have proposed an active-set type method for piecewise quadratic programming. Finally, Zhen and Zhuang have looked at existence conditions and algorithms for fixed points of a general class of functions.

Overall, this volume is a good snapshot of the state of the art in several fields in optimization. Many of the papers contain excellent survey material. I'd recommend this book to anyone who is interested in this wide range of optimization problems.

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