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BOOK REVIEW

Roman G. Strongin and Yaroslav D. Sergeyev, Global Optimization with Non-Convex Constraints: Sequential and Parallel Algorithms [Nonconvex Optimization and Its Applications Series Vol. 45], Kluwer Academic Publishers, Dordrecht, 2000, 728 pp.

Global optimization is becoming widely used in a variety of application areas. This is a high-tech field requiring advanced computer facilities and powerful numerical algorithms. The rapidly growing interest to the field is explained by advantages that can be enjoyed in practice using globally optimal solutions instead of local ones supplied by traditional local optimization approaches.

The primary objective of the book under review is to develop an original self-contained approach to the Lipschitz global optimization problem in one of its most complex formulations very often arising in practice. Namely, it is assumed that the objective function can be "black-box", multidimensional, non-differentiable, with many global and local minima, with unknown Lipschitz constant, and undefined outside the admissible region. Similar assumptions on the constraints yield feasible regions being collections of disjoint non-convex subsets.

The approach developed by the authors provides the reader with a number of new powerful tools allowing for a reduction of the problem stated above to a one-dimensional problem over a closed interval that can be efficiently solved on traditional or parallel computers. Particularly, the multidimensional problem is reduced to one-dimensional by approximations of Peano space-filling curves (a C++ package for such a reduction is given). The constrained problem is reduced to an unconstrained one by a new interesting index scheme that does not require additional parameters for treating constraints. The authors introduce non-redundant parallel computations and

active usage of local information during the global search opening new frontiers for acceleration of the search (theoretical estimates on the speed up which can be obtained are given). All of the algorithms presented in the book are deeply studied theoretically and tested numerically.

The book is well written and self-contained. It consists of the following three parts:

Part 1. Global optimization algorithms as decision procedures. Theoretical background and core univariate case.
Part 2. Generalizations for parallel computing, constrained and multiple criteria problems.
Part 3. Global optimization in many dimensions. Generalizations through Peano curves.

The book contains many numerical examples illustrating performance of the proposed algorithms. It is well equipped with various indexes facilitating reading: lists of algorithms, tables figures, terminology index, and an impressive bibliography. Particularly, the list of algorithms pointing to more than 50 numerical methods proposed by the authors is a nice tool for the readers looking for global optimization algorithms better fitting their specific problems.

In summary, the book presents the major development of theory and practice of numerical global optimization algorithms. It is certainly a very useful and interesting book and I strongly recommend it to anyone dealing with global optimization, parallel computing, decision making, and their applications.

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