

# Preface

Simplicial global optimization focuses on deterministic covering methods for global optimization partitioning the feasible region by simplices. Although rectangular partitioning is used most often in global optimization, simplicial covering has advantages shown in this book. The purpose of the book is to present global optimization methods based on simplicial partitioning in one volume. The book describes features of simplicial partitioning and demonstrates its advantages in global optimization.

A simplex is a polyhedron in a multidimensional space, which has the minimal number of vertices. Therefore simplicial partitions are preferable in global optimization when the values of the objective function at all vertices of partitions are used to evaluate subregions.

The feasible region defined by linear constraints may be covered by simplices and therefore simplicial optimization algorithms may cope with linear constraints in a delicate way by initial covering. This makes simplicial partitions very attractive for optimization problems with linear constraints.

There are optimization problems where the objective functions have symmetries which may be taken into account for reducing the search space significantly by setting linear inequality constraints. The resulted search region may be covered by simplices.

Applications benefiting from simplicial partitioning are examined in the book: nonlinear least squares regression, center-based clustering of data having one feature, and pile placement in grillage-type foundations. In the examples shown, the search region reduced taking into account symmetries of the objective functions is a simplex thus simplicial global optimization algorithms may use it as a starting partition.

The book provides exhaustive experimental investigation and shows the impact of various bounds, types of subdivision, and strategies of candidate selection on the performance of global optimization algorithms. Researchers and engineers will benefit from simplicial partitioning algorithms presented in the book: Lipschitz branch-and-bound, Lipschitz optimization without the Lipschitz constant. We hope

the readers will be inspired to develop simplicial versions of other algorithms for global optimization and even use other non-rectangular partitions for special applications.

The book deals with theoretical, computational, and application aspects of simplicial global optimization. It is intended for scientists and researchers in optimization and may also serve as a useful research supplement for Ph.D. students in mathematics, computer science, and operations research.

The authors are very grateful to Prof. Panos Pardalos, Distinguished Professor at the University of Florida and Director of the Center for Applied Optimization, for his continuing encouragement and support. The authors highly appreciate Springer's initiative to publish SpringerBriefs on Optimization and the given opportunity to publish their book in this series. The authors would like to thank Springer's publishing editor Razia Amzad for guiding us to publication of the book.

Postdoctoral fellowship of R. Paulavičius is being funded by European Union Structural Funds project "Postdoctoral Fellowship Implementation in Lithuania" within the framework of the Measure for Enhancing Mobility of Scholars and Other Researchers and the Promotion of Student Research (VP1-3.1-ŠMM-01) of the Program of Human Resources Development Action Plan.

Vilnius, Lithuania

Remigijus Paulavičius  
Julius Žilinskas

<http://www.springer.com/978-1-4614-9092-0>

Simplicial Global Optimization

Paulavičius, R.; Žilinskas, J.

2014, X, 137 p. 51 illus. in color., Softcover

ISBN: 978-1-4614-9092-0