Colliding Bodies Optimization

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Extensions and Applications

Springer

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ISBN 978-3-319-19658-9 ISBN 978-3-319-19659-6 (eBook)
DOI 10.1007/978-3-319-19659-6

Library of Congress Control Number: 2015941122

Springer Cham Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media (www.springer.com)

Preface

Recent advances in structural technology require greater accuracy, efficiency and speed in the design of structural systems. It is therefore not surprising that new methods have been developed for optimal design of real-life structures and models with complex configurations and a large number of elements.

This book explores various applications of the recently developed meta-heuristic algorithm colliding bodies optimization (CBO) for optimal design of skeletal structures. The concepts presented in this book are not only applicable to the design of skeletal structures and finite element models, but can equally be used in different optimization techniques in civil engineering. These concepts are also applicable in the optimal design of other systems such as hydraulic and electrical networks.

The first author and his graduate students have been involved in various developments and applications of meta-heuristic algorithms to structural optimization in the last two decades. The present book contains one of these methods suitable for various aspects of optimization problems.

The book is likely to be of interest to civil, industrial, mechanical, and electrical engineers who use optimization methods for design, as well as to those students and researchers in structural optimization who will find it to be necessary professional reading.

This book consists of two parts. Part I contains the theoretical aspect of the most recently developed meta-heuristic algorithm known as the CBO, and Part II consists of various applications of the CBO and its enhanced variants.

In Chap. 1, a short introduction is provided for the development of optimization and different meta-heuristic algorithms. Chapter 2 contains one of the theoretical aspects of the CBO. Chapter 3 provides enhanced versions of the CBO algorithm.

In Chap. 4, CBO is applied for optimal design of structures with continuous variables. Chapter 5 contains the application of CBO for optimal design of structures with discrete variables. Chapter 6 provides a comparative study of CBO and ECBO for optimal design of structures. Chapter 7 contains optimum design of castellated beams using CBO. In Chap. 8, CBO is utilized for optimal design of various concrete structures. In Chap. 9, domain decomposition of finite element models and bandwidth reduction of sparse matrices are presented. Finally, Chap. 10

can be considered as a brief introduction to multi-objective optimization. In this chapter, a multi-objective optimization algorithm is presented and applied to a construction management problem.

We would like to take this opportunity to acknowledge a deep sense of gratitude to a number of colleagues and friends who in different ways have helped in the preparation of this book. Prof. Josef Eberhardsteiner encouraged and supported the first author to write this book. Our special thanks are due to Mrs. Silvia Schilgerius, the senior editor of the Applied Sciences of Springer, for her constructive comments, editing, and unfailing kindness in the course of the preparation of this book. Our sincere appreciation is extended to our Springer colleague Ms. Abirami Purushothaman.

The first author would like to thank his Ph.D. students Mr. M. Ilchi Ghazaan, Mrs. Sh. Bijari, Mr. M. Alipour, and his M.Sc. students Mr. F. Shokohi and Ms. N. Soleimani for using our joint papers and for their help in various stages of writing this book. We would like to thank the publishers who permitted some of our papers to be utilized in the preparation of this book, consisting Springer and Elsevier.

Our warmest gratitude is due to our families for their continued support in the course of preparing this book.

Every effort has been made to render the book error free. However, the authors would appreciate any remaining errors being brought to their attention through by their email addresses:

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June 2015

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