

# 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.

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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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Extensions and Applications

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