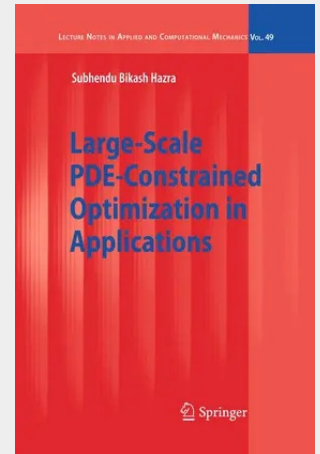


Large-Scale PDE-Constrained Optimization in Applications

With continuous development of modern computing hardware and applicable - merical methods, computational fluid dynamics (CFD) has reached certain level of maturity so that it is being used routinely by scientists and engineers for fluid flow analysis. Since most of the real-life applications involve some kind of optimization, it has been natural to extend the use of CFD tools from flow simulation to simulation based optimization. However, the transition from simulation to optimization is not straight forward, it requires proper interaction between advanced CFD methodologies and state-of-the-art optimization algorithms. The ultimate goal is to achieve optimal solution at the cost of few flow solutions. There is growing number of research activities to achieve this goal. This book results from my work done on simulation based optimization problems at the Department of Mathematics, University of Trier, and reported in my postdoctoral thesis ("Habilitationsschrift") accepted by the Faculty-IV of this University in 2008. The focus of the work has been to develop mathematical methods and algorithms which lead to efficient and high performance computational techniques to solve such optimization problems in real-life applications. Systematic development of the methods and algorithms are presented here. Practical aspects of implementations are discussed at each level as the complexity of the problems increase, supporting with enough number of computational examples.

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106,99 €
99,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9783642015014
Medium: Buch
ISBN: 978-3-642-01501-4
Verlag: Springer
Erscheinungstermin: 24.06.2010
Sprache(n): Englisch
Auflage: 1. Auflage 2010
Serie: Lecture Notes in Applied and Computational Mechanics
Produktform: Gebunden
Gewicht: 345 g
Seiten: 202
Format (B x H): 155 x 235 mm

