

THE OPTIMUM SHAPE

Automated Structural Design

Edited by

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General Motors Research Laboratories



Springer

Optimum Shape Automated Structural Design

H. Adeli

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Optimum Shape Automated Structural Design:

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Software Systems for Structural Optimization H.R. Hörnlein, K. Schnittkowski, 2013-03-07 Herbert Hornlein Klaus Schittkowski The finite element method FEM has been used successfully for many years to simulate and analyse mechanical structural problems The results are accepted or rejected by means of comparison of state variables stresses displacements natural frequencies etc and user requirements In further analyses the design variables will be updated until the user specifications are met and the design is feasible This is the primary aim of the design process On this set of feasible designs the additional requirement given by an objective function e g weight stiffness efficiency etc defines the structural optimization problem In recent years more and

more finite element based analysis systems were extended and offer now optimization modules They proceed from the design model as defined for structural analysis to perform an internal adaption of design parameters based on formal mathematical methods Despite of many common features there are significant differences in the selected optimization strategy the current implementation and the numerical results

Optimizing the Shape of Mechanical Elements and Structures Shirley Seireg,1997-01-02 This work introduces a wide variety of practical approaches to the synthesis and optimization of shapes for mechanical elements and structures The simplest methods for achieving the best results without mathematical complexity especially computer solutions are emphasized The authors present detailed case studies of structures subjected to different types of static and dynamic loading including load bearing structures with arbitrary support conditions rotating disks layered structures pressure vessels elastic bodies and structural elements subjected to impulsive loading

The Optimum Shape James Bennett,1986-10-01

Advances in Structural Optimization J. Herskovits,2012-12-06 Advances in Structural Optimization presents the techniques for a wide set of applications ranging from the problems of size and shape optimization historically the first to be studied to topology and material optimization Structural models are considered that use both discrete and finite elements Structural materials can be classical or new Emerging methods are also addressed such as automatic differentiation intelligent structures optimization integration of structural optimization in concurrent engineering environments and multidisciplinary optimization For researchers and designers in industries such as aerospace automotive mechanical civil nuclear naval and offshore A reference book for advanced undergraduate or graduate courses on structural optimization and optimum design

Structural Shape Optimization in Multidisciplinary System Synthesis Jaroslaw Sobieszczanski-Sobieski,1988

Current Advances in Mechanical Design & Production IV Y. H. Kabil,M. E. Said,2017-05-04 Presents an overview of the state of the art in mechanical design and production Both basic and applied research papers highlight recent trends techniques and case studies in two major fields analysis and design of mechanical systems and components production and industrial engineering This volume also includes all the invited keynote lectures presented at the conference Contains 73 papers

Boundary Element Methods in Engineering Balkrishna S. Annigeri,Kadin Tseng,2012-12-06 The Boundary Element Method BEM has become established as an effective tool for the solutions of problems in engineering science The salient features of the BEM have been well documented in the open literature and therefore will not be elaborated here The BEM research has progressed rapidly especially in the past decade and continues to evolve worldwide This Symposium was organized to provide an international forum for presentation of current research in BEM for linear and nonlinear problems in solid and fluid mechanics and related areas To this end papers on the following topics were included rotary wing aerodynamics unsteady aerodynamics design and optimization elasticity elasto dynamics and elastoplasticity fracture mechanics acoustics diffusion and wave motion thermal analysis mathematical aspects and boundary finite element coupled methods A special

session was devoted to parallel vector supercomputing with emphasis on massive parallelism This Symposium was sponsored by United Technologies Research Center UTRC NASA Langley Research Center and the International Association of Boundary Element Methods IABEM We thank the UTRC management for their permission to host this Symposium In particular we thank Dr Arthur S Kesten and Mr Robert E Olson for their encouragement and support We gratefully acknowledge the support of Dr E Carson Yates Jr of NASA Langley Prof Luigi Morino Dr Thomas A Engineering Optimization in Design Processes Hans A. Eschenauer, Claus Mattheck, Niels Olhoff, 2012-12-06 These proceedings contain the texts of 37 contributions presented at the International Conference on Engineering Optimization in an Industrial Environment which took place on 3-4 September 1990 at the Karlsruhe Nuclear Research Center I H Germany The presentations consisted of oral and poster contributions arranged in five sessions Shape and layout optimization Structural optimization with advanced materials Optimal designs with special structural and material behaviour Sensitivity analysis Programme systems Optimization with stability constraints Special problems The editors wish to express their appreciation to all authors and invited speakers for their interesting contributions The proceedings cover a wide range of topics in structural optimization representing the present state of the art in the fields of research and in the industrial environment as well The editors hope that this book will also contribute towards new ideas and concepts in a world of ever decreasing natural resources and ever increasing demands for lighter and yet stronger and safer technical components Finally the editors wish to thank all colleagues who helped in the organisation of the conference especially Mrs E Schroder and Dr K Kletthge as well as Mr A von Ilagen and Mrs E Haufelder Springer Publishing Company Heidelberg for the good cooperation and help in the publication of these proceedings Progress In Astronautics and Aeronautics Manohar P. Kamat, 1993 Applied Mechanics Reviews, 1971 Advances in Design Optimization H. Adeli, 2002-09-11 This book summarizes advances in a number of fundamental areas of optimization with application in engineering design The selection of the best or optimum design has long been a major concern of designers and in recent years interest has grown in applying mathematical optimization techniques to design of large engineering and industrial systems and in using the computer aided design packages with optimization capabilities which are now available **Computational Grids** Graham F. Carey, 1997-05-01 In this comprehensive volume a treatment of grid generation adaptive refinement and redistribution techniques is developed together with supporting mathematical algorithmic and software concepts Efficient solution strategies that exploit grid hierarchies are also described and analyzed Emphasis is on the fundamental ideas but the presentation includes practical guidelines for designing and implementing grid strategies **The finite element method in the 1990's** Eugenio Onate, J. Periaux, A. Samuelsson, 2013-11-11 Edited on the occasion of Prof Olgierd C Zienkiewicz 70th birthday this book contains original contributions from eminent scientists dealing with a wide range of theoretical aspects of the Finite Element Method and its application to a variety of engineering problems The book provides an overview of the

state of the art of finite element technology in the last decade of the 20th century Sensitivity Analysis in Engineering, 1987 *The 34th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Adaptive Structures Forum: 93-1520 - 93-1587*, 1993 **Concurrent Engineering** Andrew Kusiak, 1993-01-12 Presents a top down approach to the design development testing and recyclability of products components and systems across a wide range of industries Starting with the desired result and working back through the details it shows how to produce goods taking into account the challenges of actual manufacture what the reliability requirements should be quality control associated costs customer needs and more Additional features include case studies and team negotiating Also well illustrated with figures photographs charts and tables and includes an extensive bibliography **Structural Optimization** Franklin Y. Cheng, Kevin Z. Truman, 2017-12-21 Today's biggest structural engineering challenge is to design better structures and a key issue is the need to take an integrated approach which balances control of costs with the requirement for handling earthquakes and other dynamic forces Structural optimization is based on rigorous mathematical formulation and requires computation algorithms for sizing structural elements and synthesizing systems Now that the right software and enough computing power are readily available professionals can now develop a suite of alternative designs and select a suitable one A thoroughly written and practical book on structural optimization is long overdue This solid book comprehensively presents current optimization strategies illustrated with sufficient examples of the design of elements and systems and presenting descriptions of the process and results Emphasis is given to dynamic loading in particular to seismic forces Researchers and practising engineers will find this book an excellent reference and advanced undergraduates or graduate students can use it as a resource for structural optimization design *Advances in Design Automation*, 1993 Brian J. Gilmore, 1993

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