

International Series of Numerical Mathematics

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Günter Leugering
Editors

New Trends in Shape Optimization

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New Trends In Shape Optimization International Series Of Numerical Mathematics

Michael Hoelscher



New Trends In Shape Optimization International Series Of Numerical Mathematics:

New Trends in Shape Optimization Aldo Pratelli, Günter Leugering, 2015-12-01 This volume reflects New Trends in Shape Optimization and is based on a workshop of the same name organized at the Friedrich Alexander University Erlangen Nürnberg in September 2013 During the workshop senior mathematicians and young scientists alike presented their latest findings The format of the meeting allowed fruitful discussions on challenging open problems and triggered a number of new and spontaneous collaborations As such the idea was born to produce this book each chapter of which was written by a workshop participant often with a collaborator The content of the individual chapters ranges from survey papers to original articles some focus on the topics discussed at the Workshop while others involve arguments outside its scope but which are no less relevant for the field today As such the book offers readers a balanced introduction to the emerging field of shape optimization

Handbook of Mathematical Models and Algorithms in Computer Vision and Imaging Ke Chen, Carola-Bibiane Schönlieb, Xue-Cheng Tai, Laurent Younes, 2023-02-24 This handbook gathers together the state of the art on mathematical models and algorithms for imaging and vision Its emphasis lies on rigorous mathematical methods which represent the optimal solutions to a class of imaging and vision problems and on effective algorithms which are necessary for the methods to be translated to practical use in various applications Viewing discrete images as data sampled from functional surfaces enables the use of advanced tools from calculus functions and calculus of variations and nonlinear optimization and provides the basis of high resolution imaging through geometry and variational models Besides optimization naturally connects traditional model driven approaches to the emerging data driven approaches of machine and deep learning No other framework can provide comparable accuracy and precision to imaging and vision Written by leading researchers in imaging and vision the chapters in this handbook all start with gentle introductions which make this work accessible to graduate students For newcomers to the field the book provides a comprehensive and fast track introduction to the content to save time and get on with tackling new and emerging challenges For researchers exposure to the state of the art of research works leads to an overall view of the entire field so as to guide new research directions and avoid pitfalls in moving the field forward and looking into the next decades of imaging and information services This work can greatly benefit graduate students researchers and practitioners in imaging and vision applied mathematicians medical imagers engineers and computer scientists

System Modeling and Optimization Lorena Bociu, Jean-Antoine Désidéri, Abderrahmane Habbal, 2017-04-10 This book is a collection of thoroughly refereed papers presented at the 27th IFIP TC 7 Conference on System Modeling and Optimization held in Sophia Antipolis France in June July 2015 The 48 revised papers were carefully reviewed and selected from numerous submissions They cover the latest progress in their respective areas and encompass broad aspects of system modeling and optimization such as modeling and analysis of systems governed by Partial Differential Equations PDEs or Ordinary Differential Equations ODEs control of PDEs ODEs nonlinear optimization stochastic

optimization multi objective optimization combinatorial optimization industrial applications and numerics of PDEs

Numerical Methods for Optimal Control Problems Maurizio Falcone, Roberto Ferretti, Lars Grüne, William M. McEneaney, 2019-01-26 This work presents recent mathematical methods in the area of optimal control with a particular emphasis on the computational aspects and applications Optimal control theory concerns the determination of control strategies for complex dynamical systems in order to optimize some measure of their performance Started in the 60 s under the pressure of the space race between the US and the former USSR the field now has a far wider scope and embraces a variety of areas ranging from process control to traffic flow optimization renewable resources exploitation and management of financial markets These emerging applications require more and more efficient numerical methods for their solution a very difficult task due the huge number of variables The chapters of this volume give an up to date presentation of several recent methods in this area including fast dynamic programming algorithms model predictive control and max plus techniques This book is addressed to researchers graduate students and applied scientists working in the area of control problems differential games and their applications Geometric Science of Information Frank Nielsen, Frederic Barbaresco, 2015-10-24 This book constitutes the refereed proceedings of the Second International Conference on Geometric Science of Information GSI 2015 held in Palaiseau France in October 2015 The 80 full papers presented were carefully reviewed and selected from 110 submissions and are organized into the following thematic sessions Dimension reduction on Riemannian manifolds optimal transport optimal transport and applications in imagery statistics shape space and diffeomorphic mappings random geometry homology Hessian information geometry topological forms and Information information geometry optimization information geometry in image analysis divergence geometry optimization on manifold Lie groups and geometric mechanics thermodynamics computational information geometry Lie groups novel statistical and computational frontiers geometry of time series and linear dynamical systems and Bayesian and information geometry for inverse problems Trends in PDE Constrained Optimization Günter Leugering, Peter Benner, Sebastian Engell, Andreas Griewank, Helmut Harbrecht, Michael Hinze, Rolf Rannacher, Stefan Ulbrich, 2014-12-22 Optimization problems subject to constraints governed by partial differential equations PDEs are among the most challenging problems in the context of industrial economical and medical applications Almost the entire range of problems in this field of research was studied and further explored as part of the Deutsche Forschungsgemeinschaft DFG priority program 1253 on Optimization with Partial Differential Equations from 2006 to 2013 The investigations were motivated by the fascinating potential applications and challenging mathematical problems that arise in the field of PDE constrained optimization New analytic and algorithmic paradigms have been developed implemented and validated in the context of real world applications In this special volume contributions from more than fifteen German universities combine the results of this interdisciplinary program with a focus on applied mathematics The book is divided into five sections on Constrained Optimization Identification and Control Shape

and Topology Optimization Adaptivity and Model Reduction Discretization Concepts and Analysis and Applications Peer reviewed research articles present the most recent results in the field of PDE constrained optimization and control problems Informative survey articles give an overview of topics that set sustainable trends for future research This makes this special volume interesting not only for mathematicians but also for engineers and for natural and medical scientists working on processes that can be modeled by PDEs

Global Riemannian Geometry: Curvature and Topology Ana Hurtado, Steen Markvorsen, Maung Min-Oo, Vicente Palmer, 2020-08-19 This book contains a clear exposition of two contemporary topics in modern differential geometry distance geometric analysis on manifolds in particular comparison theory for distance functions in spaces which have well defined bounds on their curvature the application of the Lichnerowicz formula for Dirac operators to the study of Gromov's invariants to measure the K theoretic size of a Riemannian manifold It is intended for both graduate students and researchers

Spectral and High Order Methods for Partial Differential Equations ICOSAHOM 2020+1 Jens M. Melenk, Ilaria Perugia, Joachim Schöberl, Christoph Schwab, 2023-06-30 The volume features high quality papers based on the presentations at the ICOSAHOM 2020 1 on spectral and high order methods The carefully reviewed articles cover state of the art topics in high order discretizations of partial differential equations The volume presents a wide range of topics including the design and analysis of high order methods the development of fast solvers on modern computer architecture and the application of these methods in fluid and structural mechanics computations

New Trends in Geometric Analysis Antonio Alarcón, Vicente Palmer, César Rosales, 2023-10-18 The aim of this book is to provide an overview of some of the progress made by the Spanish Network of Geometric Analysis REAG by its Spanish acronym since its born in 2007 REAG was created with the objective of enabling the interchange of ideas and the knowledge transfer between several Spanish groups having Geometric Analysis as a common research line This includes nine groups at Universidad Autónoma de Barcelona Universidad Autónoma de Madrid Universidad de Granada Universidad Jaume I de Castellón Universidad de Murcia Universidad de Santiago de Compostela and Universidad de Valencia The success of REAG has been substantiated with regular meetings and the publication of research papers obtained in collaboration between the members of different nodes On the occasion of the 15th anniversary of REAG this book aims to collect some old and new contributions of this network to Geometric Analysis The book consists of thirteen independent chapters all of them authored by current members of REAG The topics under study cover geometric flows constant mean curvature surfaces in Riemannian and sub Riemannian spaces integral geometry potential theory and Riemannian geometry among others Some of these chapters have been written in collaboration between members of different nodes of the network and show the fruitfulness of the common research atmosphere provided by REAG The rest of the chapters survey a research line or present recent progresses within a group of those forming REAG Surveying several research lines and offering new directions in the field the volume is addressed to researchers including postdocs and PhD students in Geometric Analysis in the large

Anisotropic Isoperimetric Problems

and Related Topics Valentina Franceschi, Alessandra Pluda, Giorgio Saracco, 2024-12-18 This book contains contributions from speakers at the Anisotropic Isoperimetric Problems hence it also appears in describing systems of particles where a balance between attractive and repulsive forces appears A prominent example is that of Gamow's liquid drop model for atomic nuclei where protons are subject to the strong nuclear attractive force represented by the perimeter and the electromagnetic repulsive force represented by a nonlocal term Such a model has been shown to be sound as it explains the basic characteristics of the nuclei and it successfully predicts nuclear fission for nuclei with a large atomic number Similar energy functionals model various physical and biological systems showcasing the competition between short range interfacial and long range nonlocal terms leading to pattern formation The authors mention e.g. the Ohta-Kawasaki model for microphase separation of diblock copolymers and the Yukawa potential for colloidal systems Despite diverse systems the emergence of microphases follows similar patterns although rigorously proving this phenomenon remains a challenge The book collects several contributions within these topics shedding light on the current state of the art Advances in Structural and Multidisciplinary Optimization Axel Schumacher, Thomas Vietor, Sierk Fiebig, Kai-Uwe Bletzinger, Kurt Maute, 2017-12-04 The volume includes papers from the WSCMO conference in Braunschweig 2017 presenting research of all aspects of the optimal design of structures as well as multidisciplinary design optimization where the involved disciplines deal with the analysis of solids fluids or other field problems Also presented are practical applications of optimization methods and the corresponding software development in all branches of technology **Software Systems for Structural Optimization** H.R. Hörnlein, K. Schittkowski, 2013-03-07 Herbert Hörnlein 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 Progress in Optimization Xiao-qi Yang, Alistair I. Mees, Mike Fisher, Les Jennings, 2013-12-01 Optimization Day OD has been a series of annual mini conferences in Australia since 1994 The purpose of this series of events is to gather researchers in optimization and its related areas from Australia and their collaborators in order to exchange new developments of optimization theories methods and their applications The first four OD mini conferences were held in The University of Ballarat 1994 The University of New South Wales 1995 The University of Melbourne 1996 and

Royal Melbourne Institute of Technology 1997 respectively They were all on the eastern coast of Australia The fifth mini conference Optimization Days was held at the Centre for Applied Dynamics and Optimization CADO Department of Mathematics and Statistics The University of Western Australia Perth from 29 to 30 June 1998 This is the first time the OD mini conference has been held at the western coast of Australia This fifth OD preceded the International Conference on Optimization Techniques and Applications ICOTA held at Curtin University of Technology Many participants attended both events There were 28 participants in this year's mini conference and 22 presentations in the mini conference The presentations in this volume are refereed contributions based on papers presented at the fifth Optimization Days mini conference The volume is divided into the following parts Global Optimization Nonsmooth Optimization Optimization Methods and Applications **Seasonal Adjustment Methods and Real Time Trend-Cycle Estimation** Estela Bee Dagum, Silvia Bianconcini, 2016-06-20 This book explores widely used seasonal adjustment methods and recent developments in real time trend cycle estimation It discusses in detail the properties and limitations of X12ARIMA TRAMO SEATS and STAMP the main seasonal adjustment methods used by statistical agencies Several real world cases illustrate each method and real data examples can be followed throughout the text The trend cycle estimation is presented using nonparametric techniques based on moving averages linear filters and reproducing kernel Hilbert spaces taking recent advances into account The book provides a systematical treatment of results that to date have been scattered throughout the literature Seasonal adjustment and real time trend cycle prediction play an essential part at all levels of activity in modern economies They are used by governments to counteract cyclical recessions by central banks to control inflation by decision makers for better modeling and planning and by hospitals manufacturers builders transportation and consumers in general to decide on appropriate action This book appeals to practitioners in government institutions finance and business macroeconomists and other professionals who use economic data as well as academic researchers in time series analysis seasonal adjustment methods filtering and signal extraction It is also useful for graduate and final year undergraduate courses in econometrics and time series with a good understanding of linear regression and matrix algebra as well as ARIMA modelling

American Book Publishing Record, 2003 *Impact of Scientific Computing on Science and Society* Pekka Neittaanmäki, Marja-Leena Rantalainen, 2023-07-07 This book analyzes the impact of scientific computing in science and society over the coming decades It presents advanced methods that can provide new possibilities to solve scientific problems and study important phenomena in society The chapters cover Scientific computing as the third paradigm of science as well as the impact of scientific computing on natural sciences environmental science economics social science humanistic science medicine and engineering Moreover the book investigates scientific computing in high performance computing quantum computing and artificial intelligence environment and what it will be like in the 2030s and 2040s Analysis and Simulation of Fluid Dynamics Caterina Calgaro, Jean-François Coulombel, Thierry Goudon, 2007-12-27 This volume collects the

contributions of a Conference held in June 2005 at the laboratoire Paul Painleve UMR CNRS 8524 in Lille France The meeting was intended to review hot topics and future trends in fluid dynamics with the objective to foster exchanges of various viewpoints e g theoretical and numerical on the addressed questions It comprises a collection of research articles on recent advances in the analysis and simulation of fluid dynamics *Applied mechanics reviews* ,1948

Supersonic Wing and Wing-body Shape Optimization Using an Adjoint Formulation James Reuther, Research Institute for Advanced Computer Science (U.S.), 1995 Abstract This paper describes the implementation of optimization techniques based on control theory for wing and wing body design of supersonic configurations The work represents an extension of our earlier research in which control theory is used to devise a design procedure that significantly reduces the computational cost by employing an adjoint equation In previous studies it was shown that control theory could be used to devise transonic design methods for air foils and wings in which the shape and the surrounding body fitted mesh are both generated analytically and the control is the mapping function 5 6 8 The method has also been implemented for both transonic potential flows and transonic flows governed by the Euler equations using an alternative formulation which employs numerically generated grids so that it can treat more general configurations 16 9 17 Here results are presented for three dimensional design cases subject to supersonic flows governed by the Euler equation

Rough Sets and Current Trends in Computing Salavatore Greco, Yukata Hata, Shoji Hirano, Masahiro Inuiguchi, Sadaaki Miyamoto, Hung Son Nguyen, Roman Slowiński, 2006-10-26 This book constitutes the refereed proceedings of the 5th International Conference on Rough Sets and Current Trends in Computing RSCTC 2006 held in Kobe Japan in November 2006 The 91 revised full papers presented together with five invited papers and two commemorative papers were carefully reviewed and selected from 332 submissions

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