Augmented Lagrangian And Operator Splitting Methods In Nonlinear Mechanics Studies In Applied And Numerical Mathematics

The 9th Belgian-French-German Conference on Optimization has been held in Namur (Belgium) on September 7-11, 1998. This volume is a collection of papers presented at this Conference. Originally, this Conference was a French-German Conference but this year, in accordance with the organizers' wishes, a third country, Belgium, has joined the founding members of the Conference. Hence the name: Belgian French-German Conference on Optimization. Since the very beginning, the purpose of these Conferences has been to bring together researchers working in the area of Optimization and partic ularly to encourage young researchers to present their work. Most of the participants come from the organizing countries. However the general ten dancy is to invite outside researchers to attend the meeting. So this year, among the 101 participants at this Conference, twenty researchers came from other countries. The general theme of the Conference is everything that concerns the area of Optimization without specification of particular topics. So theoretical as pects of Optimization, in addition to applications and algorithms of Opti mization, will be developed. However, and this point was very important for the organizers, the Conference must retain its convivial character. No more than two parallel sessions are organized. This would allow useful contacts between researchers to be promoted. The editors express their sincere thanks to all those who took part in this Conference. Their invaluable discussions have made this volume possible.

Consisting of 16 refereed original contributions, this volume presents a diversified collection of recent results in control of distributed parameter systems. Topics addressed include - optimal control in fluid mechanics - numerical methods for optimal control of partial differential equations - modeling and control of shells - level set methods - mesh adaptation for parameter estimation problems - shape optimization Advanced graduate students and researchers will find the book an excellent guide to the forefront of control and estimation of distributed parameter systems.

The position taken in this collection of pedagogically written essays is that conjugate gradient algorithms and finite element methods complement each other extremely well. Via their combinations practitioners have been able to solve complicated, direct and inverse, multidemensional problems modeled by ordinary or partial differential equations and inequalities, not necessarily linear, optimal control and optimal design being part of these problems. The aim of this book is to present both methods in the context of complicated problems modeled by linear and nonlinear partial differential equations, to provide an in-depth discussion on their implementation aspects. The authors show that conjugate gradient methods and finite element methods apply to the solution of real-life problems. They address graduate students as well as experts in scientific computing.

The volume, devoted to variational analysis and its applications, collects selected and refereed contributions, which provide an outline of the field. The meeting of the title "Equilibrium Problems and Variational Models", which was held in Erice (Sicily) in the period June 23 - July 2 2000, was the occasion of the presentation of some of these papers; other results are a consequence of a fruitful and constructive atmosphere created during the meeting. New results, which enlarge the field of application of variational analysis, are presented in the book; they deal with the vectorial analysis, time dependent variational analysis, exact penalization, high order deriva tives, geometric aspects, distance functions and log-quadratic proximal methodology. The new theoretical results allow one to improve in a remarkable way the study of significant problems arising from the applied sciences, as continuum model of transportation, unilateral problems, multicriteria spatial price models, network equilibrium problems and many others. As noted in the previous book "Equilibrium Problems: Nonsmooth Optimization and Variational Inequality Models", edited by F. Giannessi, A. Maugeri and P.M. Pardalos, Kluwer Academic Publishers, Vol. 58 (2001), the progress obtained by variational analysis has permitted to han dle problems whose equilibrium conditions are not obtained by the mini mization of a functional. These problems obey a more realistic equilibrium condition expressed by a generalized orthogonality (complementarity) con dition, which enriches our knowledge of the equilibrium behaviour. Also this volume presents important examples of this formulation.

Conjugate Gradient Algorithms and Finite Element Methods

15th International Conference, CAIP 2013, York, UK, August 27-29, 2013, Proceedings, Part II

Proceedings of a Workshop Sponsored by the National Aeronautics and Space Administration, Washington, D.C., and Held in Williamsburg, Virginia, June 8-10, 1992

Splitting Methods in Communication, Imaging, Science, and Engineering

Fluid Mechanics of Viscoplasticity

Improved graph cut model with features of superpixels and neighborhood patches for myocardium segmentation from ultrasound image

On February 15-17, 1993, a conference on Large Scale Optimization, hosted by the Center for Applied Optimization, was held at the University of Florida. The con ference was supported by the National Science Foundation, the U. S. Army Research Office, and the University of Florida, with endorsements from SIAM, MPS, ORSA and IMACS. Forty one invited speakers presented papers on mathematical program ming and optimal control topics with an emphasis on algorithm development, real world applications and numerical results. Participants from Canada, Japan, Sweden, The Netherlands, Germany, Belgium, Greece, and Denmark gave the meeting an important international component. At tendees also included representatives from IBM, American Airlines, US Air, United Parcel Serice, AT & T Bell Labs, Thinking Machines, Army High Performance Com puting Research Center, and Argonne National Laboratory. In addition, the NSF sponsored attendance of thirteen graduate students from universities in the United States and abroad. Accurate modeling of scientific problems often leads to the formulation of large scale optimization problems involving thousands of continuous and/or discrete vari ables. Large scale optimization has seen a dramatic increase in activities in the past decade. This has been a natural consequence of new algorithmic developments and of the increased power of computers. For example, decomposition ideas proposed by G. Dantzig and P. Wolfe in the 1960's, are now implement able in distributed process ing systems, and today many optimization codes have been implemented on parallel machines.

This book constitutes the thoroughly refereed post-conference proceedings of the Third International Conference on Scale Space Methods and Variational Methods in Computer Vision, SSVM 2011, held in Ein-Gedi, Israel in May/June 2011. The 24 revised full papers presented together with 44 poster papers were carefully reviewed and selected from 78 submissions. The papers are organized in topical sections on denoising and enhancement, segmentation, image representation and invariants, shape analysis, and optical flow.

Augmented Lagrangian and Operator Splitting Methods in Nonlinear MechanicsSIAM

This volume presents the peer-reviewed proceedings of the international conference Imaging, Vision and Learning Based on Optimization and PDEs (IVLOPDE), held in Bergen, Norway, in August/September 2016. The contributions cover state-of-the-art research on mathematical techniques for image processing, computer vision and machine learning based on optimization and partial differential equations (PDEs). It has become an established paradigm to formulate problems within image processing and computer vision as PDEs, variational problems or finite dimensional optimization problems. This compact yet expressive framework makes it possible to incorporate a range of desired properties of the solutions and to design algorithms based on well-founded mathematical theory. A growing body of research has also approached more general problems within data analysis and machine learning from the same perspective, and demonstrated the advantages over earlier, more established algorithms. This volume will appeal to all mathematicians and computer scientists interested in novel techniques and analytical results for optimization, variational models and PDEs, together with experimental results on applications ranging from early image formation to high-level image and data analysis.

Multi-scale and High-contrast PDE

State of the Art

Control and Estimation of Distributed Parameter Systems

Level Set and PDE Based Reconstruction Methods in Imaging

Topics in Nonconvex Optimization

Proceedings of the Fifth SIAM Conference on Parallel Processing for Scientific Computing

Processing, Analyzing and Learning of Images, Shapes, and Forms: Part 2, Volume 20, surveys the contemporary developments relating to the analysis and learning of images, shapes and forms, covering mathematical models and quick computational techniques. Chapter cover Alternating Diffusion: A Geometric Approach for Sensor Fusion, Generating Structured TV-based Priors and Associated Primal-dual Methods, Graph-based Optimization Approaches for Machine Learning, Uncertainty Quantification and Networks, Extrinsic Shape Analysis from Boundary Representations, Efficient Numerical Methods for Gradient Flows and Phase-field Models, Recent Advances in Denoising of Manifold-Valued Images, Optimal Registration of Images, Surfaces and Shapes, and much more. Covers contemporary developments relating to the analysis and learning of images, shapes and forms Presents mathematical models and quick computational techniques relating to the topic Provides broad coverage, with sample chapters presenting content on Alternating Diffusion and Generating Structured TV-based Priors and Associated Primal-dual Methods

Non-Newtonian flows and their numerical simulations have generated an abundant literature, as well as many publications and references to which can be found in this volume ' s articles. This abundance of publications can be explained by the fact that non-Newtonian fluids occur in many real life situations: the food industry, oil & gas industry, chemical, civil and mechanical engineering, the bio-Sciences, to name just a few. Mathematical and numerical analysis of non-Newtonian fluid flow models provide challenging problems to partial differential equations specialists and applied computational mathematicians alike. This volume offers investigations. Results and conclusions that will no doubt be useful to engineers and computational and applied mathematicians who are focused on various aspects of non-Newtonian Fluid Mechanics. New review of well-known computational methods for the simulation viscoelastic and viscoplastic types.; Discusses new numerical methods that have proven to be more efficient and more accurate than traditional methods.; Articles that discuss the numerical simulation of particulate flow for viscoelastic fluids.;

Compressive sensing is a new signal processing paradigm that aims to encode sparse signals by using far lower sampling rates than those in the traditional Nyquist approach. It helps acquire, store, fuse and process large data sets efficiently and accurately. This method, which links data acquisition, compression, dimensionality reduction and optimization, has attracted significant attention from researchers and engineers in various areas. This comprehensive reference develops a unified view on how to incorporate efficiently the idea of compressive sensing over assorted wireless network scenarios, interweaving concepts from signal processing, optimization, information theory, communications and networking to address the issues in question from an engineering perspective. It enables students, researchers and communications engineers to develop a working knowledge of compressive sensing, including background on the basics of compressive sensing theory, an understanding of its benefits and limitations, and the skills needed to take advantage of compressive sensing in wireless networks.

An up-to-date account of the interplay between optimization and machine learning, accessible to students and researchers in both communities. The interplay between optimization and machine learning is one of the most important developments in modern computational science. Optimization formulations and methods are proving to be vital in designing algorithms to extract essential knowledge from huge volumes of data. Machine learning, however, is not simply a consumer of optimization technology but a rapidly evolving field that is itself generating new optimization ideas. This book captures the state of the art of the interaction between optimization and machine learning in a way that is accessible to researchers in both fields. Optimization approaches have enjoyed prominence in machine learning because of their wide applicability and attractive theoretical properties. The increasing complexity, size, and variety of today's machine learning models call for the reassessment of existing assumptions. This book starts the process of reassessment. It describes the resurgence in novel contexts of established frameworks such as first-order methods, stochastic approximations, convex relaxations, interior-point methods, and proximal methods. It also devotes attention to newer themes such as regularized optimization, robust optimization, gradient and subgradient methods, splitting techniques, and second-order methods. Many of these techniques draw inspiration from other fields, including operations research, theoretical computer science, and subfields of optimization. The book will enrich the ongoing cross-fertilization between the machine learning community and these other fields, and within the broader optimization community.

Variational Methods for the Numerical Solution of Nonlinear Elliptic Problem

Numerical Mathematics and Advanced Applications - ENUMATH 2013

Proceedings of ENUMATH 2013, the 10th European Conference on Numerical Mathematics and Advanced Applications, Lausanne, August 2013

Computer Analysis of Images and Patterns

Computer Vision -- ECCV 2010

Special Volume

Quadratic programming (QP) is one advanced mathematical technique that allows for the optimization of a quadratic function in several variables in the presence of linear constraints. This book presents recently devel algorithms for solving large QP problems and focuses on algorithms which are, in a sense optimal, i.e., they can solve important classes of problems at a cost proportional to the number of unknowns. For each algorith presented, the book details its classical predecessor, describes its drawbacks, introduces modifications that improve its performance, and demonstrates these improvements through numerical experiments. This self-c monograph can serve as an introductory text on quadratic programming for graduate students and researchers. Additionally, since the solution of many nonlinear problems can be reduced to the solution of a sequence problems, it can also be used as a convenient introduction to nonlinear programming.

This volume contains thirteen articles on advances in applied mathematics and computing methods for engineering problems. Six papers are on optimization methods and algorithms with emphasis on problems with m criteria; four articles are on numerical methods for applied problems modeled with nonlinear PDEs; two contributions are on abstract estimates for error analysis; finally one paper deals with rare events in the context o

uncertainty quantification. Applications include aerospace, glaciology and nonlinear elasticity. Herein is a selection of contributions from speakers at two conferences on applied mathematics held in June 2012 at the U of Jyväskylä, Finland. The first conference, “Optimization and PDEs with Industrial Applications” celebrated the seventieth birthday of Professor Jacques Périaux of the University of Jyväskylä and Polytechnic Universit Catalonia (Barcelona Tech) and the second conference, “Optimization and PDEs with Applications” celebrated the seventy-fifth birthday of Professor Roland Glowinski of the University of Houston. This work should be interest to researchers and practitioners as well as advanced students or engineers in computational and applied mathematics or mechanics.

Nonconvex Optimization is a multi-disciplinary research field that deals with the characterization and computation of local/global minima/maxima of nonlinear, nonconvex, nonsmooth, discrete and continuous functions Nonconvex optimization problems are frequently encountered in modeling real world systems for a very broad range of applications including engineering, mathematical economics, management science, financial eng and social science. This contributed volume consists of selected contributions from the Advanced Training Programme on Nonconvex Optimization and Its Applications held at Banaras Hindu University in March 2009. bring together new concepts, theoretical developments, and applications from these researchers. Both theoretical and applied articles are contained in this volume which adds to the state of the art research in this field Nonconvex Optimization is suitable for advanced graduate students and researchers in this area.

This book brings together research articles and state-of-the-art surveys in broad areas of optimization and numerical analysis with particular emphasis on algorithms. The discussion also focuses on advances in monot operator theory and other topics from variational analysis and nonsmooth optimization, especially as they pertain to algorithms and concrete, implementable methods. The theory of monotone operators is a central fram for understanding and analyzing splitting algorithms. Topics discussed in the volume were presented at the interdisciplinary workshop titled Splitting Algorithms, Modern Operator Theory, and Applications held in Oaxa Mexico in September, 2017. Dedicated to Jonathan M. Borwein, one of the most versatile mathematicians in contemporary history, this compilation brings theory together with applications in novel and insightful ways.

Fluid-Structure Interaction

NASA Workshop on Distributed Parameter Modeling and Control of Flexible Aerospace Systems

Domain Decomposition Methods for the Numerical Solution of Partial Differential Equations

11th European Conference on Computer Vision, Heraklion, Crete, Greece, September 5-11, 2010, Proceedings, Part III

Mathematical Methods in Image Processing and Inverse Problems

International Conference in Maria Trost (Austria), July 15–21, 2001

These are the proceedings of the 22nd International Conference on Domain Decomposition Methods, which was held in Lugano, Switzerland. With 172 participants from over 24 countries, this conference continued a long-standing tradition of internationally oriented meetings on Domain Decomposition Methods. The book features a well-balanced mix of established and new topics, such as the manifold theory of Schwarz Methods, Isogeometric Analysis, Discontinuous Galerkin Methods, exploitation of modern HPC architectures and industrial applications. As the conference program reflects, the growing capabilities in terms of theory and available hardware allow increasingly complex non-linear and multi-physics simulations, confirming the tremendous potential and flexibility of the domain decomposition concept.

The 2010 edition of the European Conference on Computer Vision was held in Heraklion, Crete. The call for papers attracted an absolute record of 1,174 submissions. We describe here the selection of the accepted papers: Thirty-eight area chairs were selected coming from Europe (18), USA and Canada (16), and Asia (4). Their selection was based on the following criteria: (1) Researchers who had served at least two times as Area Chairs within the past two years at major vision conferences were excluded; (2) Researchers who served as Area Chairs at the 2010 Computer Vision and Pattern Recognition were also excluded (exception: ECCV 2012 Program Chairs); (3) Minimization of overlap introduced by Area Chairs being former student and advisors; (4) 20% of the Area Chairs had never served before in a major conference; (5) The Area Chair selection process made all possible efforts to achieve a reasonable geographic distribution between countries, thematic areas and trends in computer vision. Each Area Chair was assigned by the Program Chairs between 28□32 papers. Based on paper content, the Area Chair recommended up to seven potential reviewers per paper. Such assignment was made using all reviewers in the database including the conflicting ones. The Program Chairs manually entered the missing conflict domains of approximately 300 reviewers. Based on the recommendation of the Area Chairs, three reviewers were selected per paper (with at least one being of the top three suggestions), with 99.

Domain decomposition methods are divide and conquer computational methods for the parallel solution of partial differential equations of elliptic or parabolic type. The methodology includes iterative algorithms, and techniques for non-matching grid discretizations and heterogeneous approximations. This book serves as a matrix oriented introduction to domain decomposition methodology. A wide range of topics are discussed include hybrid formulations, Schwarz, and many more.

The two volume set LNCS 8047 and 8048 constitutes the refereed proceedings of the 15th International Conference on Computer Analysis of Images and Patterns, CAIP 2013, held in York, UK, in August 2013. The 142 papers presented were carefully reviewed and selected from 243 submissions. The scope of the conference spans the following areas: 3D TV, biometrics, color and texture, document analysis, graph-based methods, image and video indexing and database retrieval, image and video processing, image-based modeling, kernel methods, medical imaging, mobile multimedia, model-based vision approaches, motion analysis, natural computation for digital imagery, segmentation and grouping, and shape representation and analysis.

Handbook of Numerical Analysis

Imaging, Vision and Learning Based on Optimization and PDEs

Theory and Applications

Modeling, Simulation and Optimization for Science and Technology

Cetraro, Italy 2008, Editors: Martin Burger, Stanley Osher

Optimization

This monograph discusses modeling, adaptive discretisation techniques and the numerical solution of fluid structure interaction. An emphasis in part I lies on innovative discretisation and advanced interface resolution techniques. The second part covers the efficient and robust numerical solution of fluid-structure interaction. In part III, recent advances in the application fields vascular flows, binary-fluid-solid interaction, and coupling to fractures in the solid part are presented. Moreover each chapter provides a comprehensive overview in the respective topics including many references to concurring state-of-the art work. Contents Part I: Modeling and discretization On the implementation and benchmarking of an extended ALE method for FSI problems The locally adapted parametric finite element method for interface problems on triangular meshes An accurate Eulerian approach for fluid-structure interactions Part II: Solvers Numerical methods for unsteady thermal fluid structure interaction Recent development of robust monolithic fluid-structure interaction solvers A monolithic FSI solver applied to the FSI 1,2,3 benchmarks Part III: Applications Fluid-structure interaction for vascular flows: From supercomputers to laptops Binary-fluid–solid interaction based on the Navier–Stokes–Cahn–Hilliard Equations Coupling fluid-structure interaction with phase-field fracture: Algorithmic details

This book constitutes the refereed proceedings of the Second International Conference on Scale Space Methods and Variational Methods in Computer Vision, SSVM 2009, emanated from the joint edition of the 5th International Workshop on Variational, Geometric and Level Set Methods in Computer Vision, VLSM 2009 and the 7th International Conference on Scale Space and PDE Methods in Computer Vision, Scale-Space 2009, held in Voss, Norway in June 2009. The 71 revised full papers presented were carefully reviewed and selected numerous submissions. The papers are organized in topical sections on segmentation and detection; image enhancement and reconstruction; motion analysis, optical flow, registration and tracking; surfaces and shapes; scale space and feature extraction.

This book contains the results in numerical analysis and optimization presented at the ECCOMAS thematic conference "Computational Analysis and Optimization" (CAO 2011) held in Jyväskylä, Finland, June 9–11, 2011. Both the conference and this volume are dedicated to Professor Pekka Neittaanmäki on the occasion of his sixtieth birthday. It consists of five parts that are closely related to his scientific activities and interests: Numerical Methods for Nonlinear Problems; Reliable Methods for Computer Simulation; Analysis of Noised and Uncertain Data; Optimization Methods; Mathematical Models Generated by Modern Technological Problems. The book also includes a short biography of Professor Neittaanmäki.

Convex optimization is at the core of many of today's analysis tools for large datasets, and in particular machine learning methods. This thesis will develop approximate versions of the alternating directrion of multipliers (ADMM) for the general setting of minimizing the sum of two convex functions. The alternating direction method of multipliers is a form of augmented Lagrangian algorithm that has experienced a renaissance in recent years due to its applicability to optimization problems arising from ``big data'' and image processing applications, and the relative ease with which it may be implemented in parallel and distributed computational environments. There are two fundamental approaches for proving the convergence of the ADMM, each based on a different form of two-way emph{splitting}, that is, expressing a mapping as the sum of two simpler mappings. The first approach is based on Douglas-Rachford operator splitting theory, and yields considerable insight into the convergence of the ADMM. The second convergence proof approach is at its core based on the Lagrangian splitting analysis. We present three new approximate versions of ADMM based on both convergence analyses, all of which require only knowledge of subgradients of the subproblem objectives, rather bounds on the distance to the exact subproblem solution. One version, which applies only to certain common special cases, is based on combining the operator splitting analysis of the ADMM with a relative-error proximal point algorithm of Solodov and Svaiter. A byproduct of this analysis is a new, relative-error version of the Douglas-Rachford splitting algorithm for monotone operators. The other two approximate versions of the ADMM are more general and based on the Lagrangian splitting analysis of the ADMM: one uses a summable absolute error criterion, and the other uses a relative error criterion and an auxiliary iterate sequence. We experimentally compare our new algorithms to an essentially exact form of the ADMM and to an inexact form that can be easily derived from prior theory (but again applies only to certain common special cases). These experiments show that our methods can significantly reduce total computational effort when iterative methods are used to solve ADMM subproblems.

Splitting Algorithms, Modern Operator Theory, and Applications

From Modelling, to Mathematical Analysis, to Inversion : Conference on Multi-scale and High-contrast PDE: from Modelling, to Mathematical Analysis, to Inversion, June 28-July 1, 2011, University of Oxford, United Kingdom

Processing, Analyzing and Learning of Images, Shapes, and Forms:

Optimization for Machine Learning

Proceedings of the 9th Belgian-French-German Conference on Optimization Namur, September 7–11, 1998

Augmented Lagrangian and Operator Splitting Methods in Nonlinear Mechanics

This volume deals with the numerical simulation of the behavior of continuous media by augmented Lagrangian and operator-splitting methods.

This book presents a comprehensive and self-contained treatment of the authors' newly developed scalable algorithms for the solutions of multibody contact problems of linear elasticity. The brand new feature of these algorithms is theoretically supported numerical scalability and parallel scalability demonstrated on problems discretized by billions of degrees of freedom. The theory supports solving multibody frictionless contact problems, contact problems with possibly orthotropic Tresca's friction, and transient contact problems. It covers BEM discretization, jumping coefficients, floating bodies, mortar non-penetration conditions, etc. The exposition is divided into four parts, the first of which reviews appropriate facets of linear algebra, optimization, and analysis. The most important algorithms and optimality results are presented in the third part of the volume. The presentation is complete, including continuous formulation, discretization, decomposition, optimality results, and numerical experiments. The final part includes extensions to contact shape optimization, plasticity, and HPC implementation. Graduate students and researchers in mechanical engineering, computational engineering, and applied mathematics, will find this book of great value and interest.

This book contains eleven original and survey scientific research articles arose from presentations given by invited speakers at International Workshop on Image Processing and Inverse Problems, held in Beijing Computational Science Research Center, Beijing, China, April 21–24, 2018. The book was dedicated to Professor

Raymond Chan on the occasion of his 60th birthday. The contents of the book cover topics including image reconstruction, image segmentation, image registration, inverse problems and so on. Deep learning, PDE, statistical theory based research methods and techniques were discussed. The state-of-the-art developments on mathematical analysis, advanced modeling, efficient algorithm and applications were presented. The collected papers in this book also give new research trends in deep learning and optimization for imaging science. It should be a good reference for researchers working on related problems, as well as for researchers working on computer vision and visualization, inverse problems, image processing and medical imaging.

While domain decomposition methods have a long history dating back well over one hundred years, it is only during the last decade that they have become a major tool in numerical analysis of partial differential equations. This monograph emphasizes domain decomposition methods in the context of so-called virtual optimal control problems and treats optimal control problems for partial differential equations and their decompositions using an all-at-once approach.

IPIP 2018, Beijing, China, April 21–24

Equilibrium Problems and Variational Models

Big Data over Networks

With Applications to Variational Inequalities

Fixed-Point Algorithms for Inverse Problems in Science and Engineering

IVLOPDE, Bergen, Norway, August 29 – September 2, 2016

Utilising both key mathematical tools and state-of-the-art research results, this text explores the principles underpinning large-scale information processing over networks and examines the crucial interaction between big data and its associated communication, social and biological networks. Written by experts in the diverse fields of machine learning, optimisation, statistics, signal processing, networking, communications, sociology and biology, this book employs two complementary approaches: first analysing how the underlying network constrains the upper-layer of collaborative big data processing, and second, examining how big data processing may boost performance in various networks. Unifying the broad scope of the book is the rigorous mathematical treatment of the subjects, which is enriched by in-depth discussion of future directions and numerous open-ended problems that conclude each chapter. Readers will be able to master the fundamental principles for dealing with big data over large systems, making it essential reading for graduate students, scientific researchers and industry practitioners alike.

Handbook of Numerical Methods for Hyperbolic Problems explores the changes that have taken place in the past few decades regarding literature in the design, analysis and application of various numerical algorithms for solving hyperbolic equations. This volume provides concise summaries from experts in different types of algorithms, so that readers can find a variety of algorithms under different situations and readily understand their relative advantages and limitations.

Ultrasound (US) imaging has the technical advantages for the functional evaluation of myocardium compared with other imaging modalities. However, it is a challenge of extracting the myocardial tissues from the background due to low quality of US imaging. To better extract the myocardial tissues, this study proposes a semi-supervised segmentation method of fast Superpixels and Neighborhood Patches based Continuous Min-Cut (fSP-CMC).

Variational Methods for the Numerical Solution of Nonlinear Elliptic Problems?addresses computational methods that have proven efficient for the solution of a large variety of nonlinear elliptic problems. These methods can be applied to many problems in science and engineering, but this book focuses on their application to problems in continuum mechanics and physics. This book differs from others on the topic by presenting examples of the power and versatility of operator-splitting methods; providing a detailed introduction to alternating direction methods of multipliers and their applicability to the solution of nonlinear (possibly nonsmooth) problems from science and engineering; and showing that nonlinear least-squares methods, combined with operator-splitting and conjugate gradient algorithms, provide efficient tools for the solution of highly nonlinear problems. The book provides useful insights suitable for advanced graduate students, faculty, and researchers in applied and computational mathematics as well as research engineers, mathematical physicists, and systems engineers.

Domain Decomposition Methods in Optimal Control of Partial Differential Equations

Compressive Sensing for Wireless Networks

Approximate Versions of the Alternating Direction Method of Multipliers

Third International Conference, SSVM 2011, Ein-Gedi, Israel, May 29 -- June 2, 2011, Revised Selected Papers

Dedicated to Professor P. Neittaanmäki on His 60th Birthday

This book takes readers on a tour through modern methods in image analysis and reconstruction based on level set and PDE techniques, the major focus being on morphological and geometric structures in images. The aspects covered include edge-sharpening image reconstruction and denoising, segmentation and shape analysis in images, and image matching. For each, the lecture notes provide insights into the basic analysis of modern variational and PDE-based techniques, as well as computational aspects and applications.

"Fixed-Point Algorithms for Inverse Problems in Science and Engineering" presents some of the most recent work from top-notch researchers studying projection and other first-order fixed-point algorithms in several areas of mathematics and the applied sciences. The material presented provides a survey of the state-of-the-art theory and practice in fixed-point algorithms, identifying emerging problems driven by applications, and discussing new approaches for solving these problems. This book incorporates diverse perspectives from broad-ranging areas of research including, variational analysis, numerical linear algebra, biotechnology, materials science, computational solid-state physics, and chemistry. Topics presented include: Theory of Fixed-point algorithms: convex analysis, convex optimization, subdifferential calculus, nonsmooth analysis, proximal point methods, projection methods, resolvent and related fixed-point theoretic methods, and monotone operator theory. Numerical analysis of fixed-point algorithms: choice of step lengths, of weights, of blocks for block-iterative and parallel methods, and of relaxation parameters; regularization of ill-posed problems; numerical comparison of various methods. Areas of Applications: engineering (image and signal reconstruction and decompression problems), computer tomography and radiation treatment planning (convex feasibility problems), astronomy (adaptive optics), crystallography

(molecular structure reconstruction), computational chemistry (molecular structure simulation) and other areas. Because of the variety of applications presented, this book can easily serve as a basis for new and innovated research and collaboration.
This volume contains the proceedings of the conference “Multi-Scale and High-Contrast PDE: From Modelling, to Mathematical Analysis, to Inversion", held June 28-July 1, 2011, at the University of Oxford.

The mathematical analysis of PDE modelling materials, or tissues, presenting multiple scales has been an active area of research for more than 40 years. The study of the corresponding imaging, or reconstruction, problem is a more recent one. If the material parameters of the PDE present high contrast ratio, then the solution to the PDE becomes particularly challenging to analyse, or compute. Similar difficulties occur in time dependent equations in high frequency regimes. Over the last decade the analysis of the inversion problem at moderate frequencies, the rigourous derivation of asymptotics at high frequencies, and the regularity properties of solutions of elliptic PDE in highly heterogeneous media have received a lot of attention.

The focus of this volume is on recent progress towards a complete understanding of the direct problem with high contrast or high frequencies, and unified approaches to the inverse and imaging problems for both small and large contrast or frequencies. The volume also includes contributions on the inverse problem, both on its analysis and on numerical reconstructions. It offers the reader a good overview of current research and direction for further pursuit on multiscale problems, both in PDE and in signal processing, and in the analysis of the equations or the computation of their solutions. Special attention is devoted to new models and problems coming from physics leading to innovative imaging methods.
This text gives the proceedings for the fifth conference on parallel processing for scientific computing.
Vortex Dynamics and Vortex Methods
Optimal Quadratic Programming Algorithms
Second International Conference, SSVM 2009, Voss, Norway, June 1-5, 2009. Proceedings
Numerical Methods for Non-Newtonian Fluids
Domain Decomposition Methods in Science and Engineering XXII
Numerical Methods for Differential Equations, Optimization, and Technological Problems

Understanding vortex dynamics is the key to understanding much of fluid dynamics. For this reason, many researchers, using a great variety of different approaches--analytical, computational, and experimental--have studied the dynamics of vorticity. The AMS-SIAM Summer Seminar on Vortex Dynamics and Vortex Methods, held in June 1990 at the University of Washington in Seattle, brought together experts with a broad range of viewpoints and areas of specialization. This volume contains the proceedings from that seminar. The focus here is on the numerical computation of high Reynolds number incompressible flows. Also included is a smaller selection of important experimental results and analytic treatments. Many of the articles contain valuable introductory and survey material as well as open problems. Readers will appreciate this volume for its coverage of a wide variety of numerical, analytical, and experimental tools and for its treatment of interesting important discoveries made with these tools.
This book is about computational methods based on operator splitting. It consists of twenty-three chapters written by recognized splitting method contributors and practitioners, and covers a vast spectrum of topics and application areas, including computational mechanics, computational physics, image processing, wireless communication, nonlinear optics, and finance. Therefore, the book presents very versatile aspects of splitting methods and their applications, motivating the cross-fertilization of ideas.
This book gathers a selection of invited and contributed lectures from the European Conference on Numerical Mathematics and Advanced Applications (ENUMATH) held in Lausanne, Switzerland, August 26-30, 2013. It provides an overview of recent developments in numerical analysis, computational mathematics and applications from leading experts in the field. New results on finite element methods, multiscale methods, numerical linear algebra and discretization techniques for fluid mechanics and optics are presented. As such, the book offers a valuable resource for a wide range of readers looking for a state-of-the-art overview of advanced techniques, algorithms and results in numerical mathematics and scientific computing.
Scale Space and Variational Methods in Computer Vision
Large Scale Optimization
Scalable Algorithms for Contact Problems
Modeling, Adaptive Discretisations and Solvers