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Generalized Difference Methods for Differential Equations Domain Decomposition Methods - Algorithms and Theory Numerical Analysis and Its Applications Automated Solution of Differential Equations by the Finite Element Method Proceedings of the Ninth International Conference on Management Science and Engineering Management Mathematical Representation at the Interface of Body and Culture Computational Science – ICCS 2023 Developments in Macro-Finance Yield Curve Modelling Proceedings of the 19th International Meshing Roundtable Numerical Modeling in Materials Science and Engineering One-dimensional Hyperbolic Conservation Laws And Their Applications Mathematics in Science and Technology Fluid Properties at Nano/Meso Scale Analytical and Numerical Methods for Convection-dominated and Singularly Perturbed Problems Technology-Assisted Guided Discovery to Support Learning Introduction to Inverse Problems for Differential Equations Advanced Finite Element Technologies Nonlinear Analysis Optimization and Control for Partial Differential Equations Introduction to the Numerical Analysis of Incompressible Viscous Flows Floer Homology Groups in Yang-Mills Theory BEM-based Finite Element Approaches on Polytopal Meshes Green's Functions and Finite Elements Numerical Methods for Nonlinear Partial Differential Equations Optimal Modified Continuous Galerkin CFD Analysis of Monge–Ampère Equations An Optimization Primer Singular Linear-Quadratic Zero-Sum Differential Games and H∞ Control Problems Meshfree and Particle Methods Incentives Numerical Methods for Partial Differential Equations Control and Estimation of Distributed Parameter Systems Virtual Element Methods in Engineering Sciences Mathematical Methods of the Theory of Elasticity Finite Element Methods Advanced Numerical Approximation of Nonlinear Hyperbolic Equations Global Optimization Scientific Computing with Case Studies Numerical Simulation of Incompressible Viscous Flow Models and Measurement of Welfare and Inequality

Generalized Difference Methods for Differential Equations

2000-01-03

this text presents a comprehensive mathematical theory for elliptic parabolic and hyperbolic differential equations it compares finite element and finite difference methods and illustrates applications of generalized difference methods to elastic bodies electromagnetic fields underground water pollution and coupled sound heat flows

Domain Decomposition Methods - Algorithms and Theory

2006-06-20

this book offers a comprehensive presentation of some of the most successful and popular domain decomposition preconditioners for finite and spectral element approximations of partial differential equations it places strong emphasis on both algorithmic and mathematical aspects it covers in detail important methods such as feti and balancing neumann neumann methods and algorithms for spectral element methods

Numerical Analysis and Its Applications

2009-02-07

this book constitutes the thoroughly refereed post conference proceedings of the 4th international conference on numerical analysis and its applications naa 2008 held in lozenetz bulgaria in june 2008 the 61 revised full papers presented together with 13 invited papers were carefully selected during two rounds of reviewing and improvement the papers address all current aspects of numerical analysis and discuss a wide range of problems concerning recent achievements in physics chemistry engineering and economics a special focus is given to numerical approximation and computational geometry numerical linear algebra and numerical solution of transcendental equations numerical methods for differential equations numerical modeling and high performance scientific computing

Automated Solution of Differential Equations by

the Finite Element Method

2012-02-24

this book is a tutorial written by researchers and developers behind the fenics project and explores an advanced expressive approach to the development of mathematical software the presentation spans mathematical background software design and the use of fenics in applications theoretical aspects are complemented with computer code which is available as free open source software the book begins with a special introductory tutorial for beginners following are chapters in part i addressing fundamental aspects of the approach to automating the creation of finite element solvers chapters in part ii address the design and implementation of the fenics software chapters in part iii present the application of fenics to a wide range of applications including fluid flow solid mechanics electromagnetics and geophysics

Proceedings of the Ninth International Conference on Management Science and Engineering Management

2015-05-20

this is the proceedings of the ninth international conference on management science and engineering management icmsem held from july 21 23 2015 at karlsruhe germany the goals of the conference are to foster international research collaborations in management science and engineering management as well as to provide a forum to present current findings these proceedings cover various areas in management science and engineering management it focuses on the identification of management science problems in engineering and innovatively using management theory and methods to solve engineering problems effectively it also establishes a new management theory and methods based on experience of new management issues in engineering readers interested in the fields of management science and engineering management will benefit from the latest cutting edge innovations and research advances presented in these proceedings and will find new ideas and research directions a total number of 132 papers from 15 countries are selected for the proceedings by the conference scientific committee through rigorous referee review the selected papers in the first volume are focused on intelligent system and management science covering areas of intelligent systems logistics engineering information technology and risk management the selected papers in the second volume are focused on computing and engineering management covering areas of computing methodology project management industrial engineering and decision making systems

Mathematical Representation at the Interface of Body and Culture

2009-06-01

over the past two decades the theoretical interests of mathematics educators have changed substantially as any brief look at the titles and abstracts of articles shows largely through the work of paul cobb and his various collaborators mathematics educators came to be attuned to the intricate relationship between individual and the social configuration of which she or he is part that is this body of work running alongside more traditional constructivist and psychological approaches showed that what happens at the collective level in a classroom both constrains and affords opportunities for what individuals do their practices increasingly researchers focused on the mediational role of sociomathematical norms and how these emerged from the enacted lessons a second major shift in mathematical theorizing occurred during the past decade there is an increasing focus on the embodied and bodily manifestation of mathematical knowing e g lakoff núñez 2000 mathematics educators now working from this perspective have come to their position from quite different bodies of literatures for some linguistic concerns and mathematics as material praxis lay at the origin for their concerns others came to their position through the literature on the situated nature of cognition and yet another line of thinking emerged from the work on embodiment that humberto maturana and francisco varela advanced whatever the historical origins of their thinking mathematics educators taking an embodiment perspective presuppose that it is of little use to think of mathematical knowing in terms of transcendental concepts somehow recorded in the brain but rather that we need to conceptual knowing as mediated by the human body which because of its senses is at the origin of sense one of the question seldom asked is how the two perspectives one that focuses on the bodily embodied nature of mathematical cognition and the other that focuses on its social nature can be thought together this edited volume situates itself at the intersection of theoretical and focal concerns of both of these lines of work in all chapters the current culture both at the classroom and at the societal level comes to be expressed and provides opportunities for expressing oneself in particular ways and these expressions always are bodily expressions of body minds as a collective the chapters focus on mathematical knowledge as an aspect or attribute of mathematical performance that is mathematical knowing is in the doing rather than attributable to some mental substrate structured in particular ways as conceived by conceptual change theorists or traditional cognitive psychologists the collection as a whole shows readers important aspects of mathematical cognition that are produced and observable at the interface between the body both human and those of inherently material inscriptions and culture drawing on cultural historical activity theory the editor develops an integrative perspective that serves as a background to a narrative that runs through and pulls together the book into an integrated whole

Computational Science – ICCS 2023

2023-06-30

the five volume set lncs 14073 14077 constitutes the proceedings of the 23rd international conference on computational science iccs 2023 held in prague czech republic during july 3 5 2023 the total of 188 full papers and 94 short papers presented in this book set were carefully reviewed and selected from 530 submissions 54 full and 37 short papers were accepted to the main track 134 full and 57 short papers were accepted to the workshops thematic tracks the theme for 2023 computation at the cutting edge of science highlights the role of computational science in assisting multidisciplinary research this conference was a unique event focusing on recent developments in scalable scientific algorithms advanced software tools computational grids advanced numerical methods and novel application areas these innovative novel models algorithms and tools drive new science through efficient application in physical systems computational and systems biology environmental systems finance and others

Developments in Macro-Finance Yield Curve Modelling

2014-02-06

state of the art research from academics and policymakers on the role of and challenges to monetary policy during the ongoing financial crisis

Proceedings of the 19th International Meshing Roundtable

2010-09-30

the papers in this volume were selected for presentation at the 19th international meshing roundtable imr held october 3 6 2010 in chattanooga tennessee usa the conference was started by sandia national laboratories in 1992 as a small meeting of organizations striving to establish a common focus for research and development in the field of mesh generation now after 19 consecutive years the international meshing roundtable has become recognized as an international focal point annually attended by researchers and developers from dozens of co tries around the world the 19th international meshing roundtable consists of technical presentations from contributed papers research notes keynote and invited talks short course presentations and a poster session and competition the program committee would like to express its appreciation to all who participate to make the imr a successful and enriching

experience the papers in these proceedings were selected by the program committee from among numerous submissions based on input from peer reviews the committee selected these papers for their perceived quality originality and appropriateness to the theme of the international meshing roundtable we would like to thank all who submitted papers we would also like to thank the colleagues who provided reviews of the submitted papers the names of the reviewers are acknowledged in the following pages we extend special thanks to jacqueline hunter for her time and effort to make the 19th imr another outstanding conference

Numerical Modeling in Materials Science and Engineering

2002-11-05

computing application to materials science is one of the fastest growing research areas this book introduces the concepts and methodologies related to the modeling of the complex phenomena occurring in materials processing it is intended for undergraduate and graduate students in materials science and engineering mechanical engineering and physics and for engineering professionals or researchers

One-dimensional Hyperbolic Conservation Laws And Their Applications

2019-01-08

this book is a collection of lecture notes for the liasfma shanghai summer school on one dimensional hyperbolic conservation laws and their applications which was held during august 16 to august 27 2015 at shanghai jiao tong university shanghai china this summer school is one of the activities promoted by sino french international associate laboratory in applied mathematics liasfma in short liasfma was established jointly by eight institutions in china and france in 2014 which is aimed at providing a platform for some of the leading french and chinese mathematicians to conduct in depth researches extensive exchanges and student training in the field of applied mathematics this summer school has the privilege of being the first summer school of the newly established liasfma which makes it significant

Mathematics in Science and Technology

2011

this unique volume presents reviews of research in several important areas of applications of mathematical concepts to science and technology for example

applications of inverse problems and wavelets to real world systems the book provides a comprehensive overview of current research of several outstanding scholars engaged in diverse fields such as complexity theory vertex coupling in quantum graphs mixing of substances by turbulence network dynamics and architecture processes with rate oco independent hysteresis numerical analysis of hamilton jacobi oco bellman equations simulations of complex stochastic differential equations optimal flow control shape optimal flow control shape optimization and aircraft designing mathematics of brain nanotechnology and dna structure and mathematical models of environmental problems the volume also contains contributory talks based on current researches of comparatively young researchers participating in the conference

Fluid Properties at Nano/Meso Scale

2008-09-15

today s scientific and engineering community has a good grasp on how to model fluid flows at macro and molecular scales with well developed theory and supporting technologies between these two extremes lies the nano meso scale i e in the range of 50nm 500nm where fluid flow models continue to be problematic continuum models used at macro scales assume a negligible influence from molecular interactions while molecular models do not predict flow well at nano meso dimensions the solution and the subject of this book is to use elements from both to capture correctly the proper physics from the molecular scale and provide a description in terms of useful fluid properties as characterized on the continuum scale fluid properties at nano meso scale is based on the authors past five years research that has yielded new innovations in fluid simulation strategies at the nano meso scale the authors approach this subject in a straightforward and easy to understand format providing a first step into the subject for researchers at all levels they present new tools that allow the numerical computation of fluid properties from first principles enabling the reader to begin to model successfully fluids at nano meso scale it is hoped that these first steps will engender the further development and advancement of simulation techniques at this scale and keep engineering simulation at the cutting edge of technology presents internationally leading developments in the field of fluid properties at nano meso scale provides the reader with the first steps to fluid modelling at nano meso scales as well as state of the art applications includes innovative and new simulation techniques along with a detailed examination of existing numerical methods

Analytical and Numerical Methods for Convection-dominated and Singularly Perturbed Problems

2000

this volume is the proceedings of the workshop on analytical and computational

methods for convection dominated and singularly perturbed problems which took place in lozenetz bulgaria 27 31 august 1998 the workshop attracted about 50 participants from 12 countries the volume includes 13 invited lectures and 19 contributed papers presented at the workshop and thus gives an overview of the latest developments in both the theory and applications of advanced numerical methods to problems having boundary and interior layers there was an emphasis on experiences from the numerical analysis of such problems and on theoretical developments the aim of the workshop was to provide an opportunity for scientists from the east and the west who develop robust methods for singularly perturbed and related problems and also who apply these methods to real life problems to discuss recent achievements in this area and to exchange ideas with a view of possible research co operation

Technology-Assisted Guided Discovery to Support Learning

2021-02-23

technology is becoming more and more integrated in mathematics teaching and the use of technology is explicitly demanded by the curricula technology can be for example integrated while conceptualizing parameters of quadratic functions in this thesis three technical visualizations classic function plotter drag mode and sliders for the manipulation of parameters of quadratic functions shall be compared with an access without the possibility of technical visualization for this purpose a guided discovery environment was developed which was conducted in an intervention study with 14 classes of grade 9 n 383 different strengths and weaknesses of the individual visualizations in favor of the dynamic visualizations by drag mode and slider are shown also different potentials and constraints of the use of technology are visible for example the students use the technology to test their own hypotheses that were generated through the use of technology the author lisa göbel completed her dissertation as a research assistant under prof dr bärbel barzel in the mathematics education department at the university of duisburg essen her interests include functional thinking and the use of technology in mathematics teaching

Introduction to Inverse Problems for Differential Equations

2017-07-31

this book presents a systematic exposition of the main ideas and methods in treating inverse problems for pdes arising in basic mathematical models though it makes no claim to being exhaustive mathematical models of most physical phenomena are governed by initial and boundary value problems for pdes and inverse problems

governed by these equations arise naturally in nearly all branches of science and engineering the book s content especially in the introduction and part i is self contained and is intended to also be accessible for beginning graduate students whose mathematical background includes only basic courses in advanced calculus pdes and functional analysis further the book can be used as the backbone for a lecture course on inverse and ill posed problems for partial differential equations in turn the second part of the book consists of six nearly independent chapters the choice of these chapters was motivated by the fact that the inverse coefficient and source problems considered here are based on the basic and commonly used mathematical models governed by pdes these chapters describe not only these inverse problems but also main inversion methods and techniques since the most distinctive features of any inverse problems related to pdes are hidden in the properties of the corresponding solutions to direct problems special attention is paid to the investigation of these properties

Advanced Finite Element Technologies

2016-05-19

the book presents an overview of the state of research of advanced finite element technologies besides the mathematical analysis the finite element development and their engineering applications are shown to the reader the authors give a survey of the methods and technologies concerning efficiency robustness and performance aspects the book covers the topics of mathematical foundations for variational approaches and the mathematical understanding of the analytical requirements of modern finite element methods special attention is paid to finite deformations adaptive strategies incompressible isotropic or anisotropic material behavior and the mathematical and numerical treatment of the well known locking phenomenon beyond that new results for the introduced approaches are presented especially for challenging nonlinear problems

Nonlinear Analysis

2012-06-02

the volume will consist of about 40 articles written by some very influential mathematicians of our time and will expose the latest achievements in the broad area of nonlinear analysis and its various interdisciplinary applications

Optimization and Control for Partial Differential

Equations

2022-03-07

this book highlights new developments in the wide and growing field of partial differential equations pde constrained optimization optimization problems where the dynamics evolve according to a system of pdes arise in science engineering and economic applications and they can take the form of inverse problems optimal control problems or optimal design problems this book covers new theoretical computational as well as implementation aspects for pde constrained optimization problems under uncertainty in shape optimization and in feedback control and it illustrates the new developments on representative problems from a variety of applications

Introduction to the Numerical Analysis of Incompressible Viscous Flows

2008-12-04

a unified treatment of fluid mechanics analysis and numerical analysis appropriate for first year graduate students

Floer Homology Groups in Yang-Mills Theory

2002-01-10

the concept of floer homology was one of the most striking developments in differential geometry it yields rigorously defined invariants which can be viewed as homology groups of infinite dimensional cycles the ideas led to great advances in the areas of low dimensional topology and symplectic geometry and are intimately related to developments in quantum field theory the first half of this book gives a thorough account of floer s construction in the context of gauge theory over 3 and 4 dimensional manifolds the second half works out some further technical developments of the theory and the final chapter outlines some research developments for the future including a discussion of the appearance of modular forms in the theory the scope of the material in this book means that it will appeal to graduate students as well as those on the frontiers of the subject

BEM-based Finite Element Approaches on Polytopal Meshes

2019-07-18

this book introduces readers to one of the first methods developed for the numerical treatment of boundary value problems on polygonal and polyhedral meshes which it subsequently analyzes and applies in various scenarios the bem based finite element approaches employs implicitly defined trial functions which are treated locally by means of boundary integral equations a detailed construction of high order approximation spaces is discussed and applied to uniform adaptive and anisotropic polytopal meshes the main benefits of these general discretizations are the flexible handling they offer for meshes and their natural incorporation of hanging nodes this can especially be seen in adaptive finite element strategies and when anisotropic meshes are used moreover this approach allows for problem adapted approximation spaces as presented for convection dominated diffusion equations all theoretical results and considerations discussed in the book are verified and illustrated by several numerical examples and experiments given its scope the book will be of interest to mathematicians in the field of boundary value problems engineers with a mathematical background in finite element methods and advanced graduate students

Green's Functions and Finite Elements

2012-08-01

this book elucidates how finite element methods look like from the perspective of green s functions and shows new insights into the mathematical theory of finite elements practically this new view on finite elements enables the reader to better assess solutions of standard programs and to find better model of a given problem the book systematically introduces the basic concepts how finite elements fulfill the strategy of green s functions and how approximating of green s functions it discusses in detail the discretization error and shows that are coherent with the strategy of goal oriented refinement the book also gives much attention to the dependencies of fe solutions from the parameter set of the model

Numerical Methods for Nonlinear Partial Differential Equations

2015-01-19

the description of many interesting phenomena in science and engineering leads to infinite dimensional minimization or evolution problems that define nonlinear partial differential equations while the development and analysis of numerical methods for linear partial differential equations is nearly complete only few results are available in the case of nonlinear equations this monograph devises numerical methods for nonlinear model problems arising in the mathematical description of phase transitions large bending problems image processing and inelastic material behavior for each of these problems the underlying mathematical model is discussed the essential

analytical properties are explained and the proposed numerical method is rigorously analyzed the practicality of the algorithms is illustrated by means of short implementations

Optimal Modified Continuous Galerkin CFD

2014-05-05

covers the theory and applications of using weak form theory in incompressible fluid thermal sciences giving you a solid foundation on the galerkin finite element method fem this book promotes the use of optimal modified continuous galerkin weak form theory to generate discrete approximate solutions to incompressible thermal navier stokes equations the book covers the topic comprehensively by introducing formulations theory and implementation of fem and various flow formulations the author first introduces concepts terminology and methodology related to the topic before covering topics including aerodynamics the navier stokes equations vector field theory implementations and large eddy simulation formulations introduces and addresses many different flow models navier stokes full potential potential compressible incompressible from a unified perspective focuses on galerkin methods for cfd beneficial for engineering graduate students and engineering professionals accompanied by a website with sample applications of the algorithms and example problems and solutions this approach is useful for graduate students in various engineering fields and as well as professional engineers

Analysis of Monge–Ampère Equations

2024-03-08

this book presents a systematic analysis of the monge ampère equation the linearized monge ampère equation and their applications with emphasis on both interior and boundary theories starting from scratch it gives an extensive survey of fundamental results essential techniques and intriguing phenomena in the solvability geometry and regularity of monge ampère equations it describes in depth diverse applications arising in geometry fluid mechanics meteorology economics and the calculus of variations the modern treatment of boundary behaviors of solutions to monge ampère equations a very important topic of the theory is thoroughly discussed the book synthesizes many important recent advances including savin s boundary localization theorem spectral theory and interior and boundary regularity in sobolev and hölder spaces with optimal assumptions it highlights geometric aspects of the theory and connections with adjacent research areas this self contained book provides the necessary background and techniques in convex geometry real analysis and partial differential equations presents detailed proofs of all theorems explains subtle constructions and includes well over a hundred exercises it can serve as an accessible

text for graduate students as well as researchers interested in this subject

An Optimization Primer

2022-03-28

this richly illustrated book introduces the subject of optimization to a broad audience with a balanced treatment of theory models and algorithms through numerous examples from statistical learning operations research engineering finance and economics the text explains how to formulate and justify models while accounting for real world considerations such as data uncertainty it goes beyond the classical topics of linear nonlinear and convex programming and deals with nonconvex and nonsmooth problems as well as games generalized equations and stochastic optimization the book teaches theoretical aspects in the context of concrete problems which makes it an accessible onramp to variational analysis integral functions and approximation theory more than 100 exercises and 200 fully developed examples illustrate the application of the concepts readers should have some foundation in differential calculus and linear algebra exposure to real analysis would be helpful but is not prerequisite

Singular Linear-Quadratic Zero-Sum Differential Games and H∞ Control Problems

2022-08-29

this monograph is devoted to the analysis and solution of singular differential games and singular h inf control problems in both finite and infinite horizon settings expanding on the authors previous work in this area this novel text is the first to study the aforementioned singular problems using the regularization approach after a brief introduction solvability conditions are presented for the regular differential games and h inf control problems in the following chapter the authors solve the singular finite horizon linear quadratic differential game using the regularization method next they apply this method to the solution of an infinite horizon type the last two chapters are dedicated to the solution of singular finite horizon and infinite horizon linear quadratic h inf control problems the authors use theoretical and real world examples to illustrate the results and their applicability throughout the text and have carefully organized the content to be as self contained as possible making it possible to study each chapter independently or in succession each chapter includes its own introduction list of notations a brief literature review on the topic and a corresponding bibliography for easier readability detailed proofs are presented in separate subsections singular linear quadratic zero sum differential games and h inf control problems will be of interest to researchers and engineers working in the areas of applied mathematics dynamic games control engineering mechanical and aerospace engineering electrical

engineering and biology this book can also serve as a useful reference for graduate students in these area

Meshfree and Particle Methods

2024-02-27

provides thorough coverage of essential concepts and state of the art developments in the field meshfree and particle methods is the first book of its kind to combine comprehensive up to date information on the fundamental theories and applications of meshfree methods with systematic guidance on practical coding implementation broad in scope and content this unique volume provides readers with the knowledge necessary to perform research and solve challenging problems in nearly all fields of science and engineering using meshfree computational techniques the authors provide detailed descriptions of essential issues in meshfree methods as well as specific techniques to address them while discussing a wide range of subjects and use cases topics include approximations in meshfree methods nonlinear meshfree methods essential boundary condition enforcement quadrature in meshfree methods strong form collocation methods and more throughout the book topics are integrated with descriptions of computer implementation and an open source code with a dedicated chapter for users to illustrate the connection between the formulations discussed in the text and their real world implementation and application this authoritative resource explains the fundamentals of meshfree methods their constructions and their unique capabilities as compared to traditional methods features an overview of the open source meshfree code rkpm2d including code and numerical examples describes all the variational concepts required to solve scientific and engineering problems using meshfree methods such as nitsche s method and the lagrange multiplier method includes comprehensive reviews of essential boundary condition enforcement quadrature in meshfree methods and nonlinear aspects of meshfree analysis discusses other galerkin meshfree methods strong form meshfree methods and their comparisons meshfree and particle methods fundamentals and applications is the perfect introduction to meshfree methods for upper level students in advanced numerical analysis courses and is an invaluable reference for professionals in mechanical aerospace civil and structural engineering and related fields who want to understand and apply these concepts directly or effectively use commercial and other production meshfree and particle codes in their work

Incentives

2018-02-22

this book examines incentives at work to see how and how well coordination is achieved by motivating individual decision makers

Numerical Methods for Partial Differential Equations

2016-04-25

numerical methods for partial differential equations an introduction vitoriano ruas sorbonne universités upmc université paris 6 france a comprehensive overview of techniques for the computational solution of pde s numerical methods for partial differential equations an introduction covers the three most popular methods for solving partial differential equations the finite difference method the finite element method and the finite volume method the book combines clear descriptions of the three methods their reliability and practical implementation aspects justifications for why numerical methods for the main classes of pde s work or not or how well they work are supplied and exemplified aimed primarily at students of engineering mathematics computer science physics and chemistry among others this book offers a substantial insight into the principles numerical methods in this class of problems are based upon the book can also be used as a reference for research work on numerical methods for pde s key features a balanced emphasis is given to both practical considerations and a rigorous mathematical treatment the reliability analyses for the three methods are carried out in a unified framework and in a structured and visible manner for the basic types of pde s special attention is given to low order methods as practitioner s overwhelming default options for everyday use new techniques are employed to derive known results thereby simplifying their proof supplementary material is available from a companion website

Control and Estimation of Distributed Parameter Systems

2012-12-06

consisting of 23 refereed contributions this volume offers a broad and diverse view of current research in control and estimation of partial differential equations topics addressed include but are not limited to control and stability of hyperbolic systems related to elasticity linear and nonlinear control and identification of nonlinear parabolic systems exact and approximate controllability and observability pontryagin s maximum principle and dynamic programming in pde and numerics pertinent to optimal and suboptimal control problems this volume is primarily geared toward control theorists seeking information on the latest developments in their area of expertise it may also serve as a stimulating reader to any researcher who wants to gain an impression of activities at the forefront of a vigorously expanding area in applied mathematics

Virtual Element Methods in Engineering Sciences

2023-11-29

this book provides a comprehensive treatment of the virtual element method vem for engineering applications focusing on its application in solid mechanics starting with a continuum mechanics background the book establishes the necessary foundation for understanding the subsequent chapters it then delves into the vem s ansatz functions and projection techniques both for solids and the poisson equation which are fundamental to the method the book explores the virtual element formulation for elasticity problems offering insights into its advantages and capabilities moving beyond elasticity the vem is extended to problems in dynamics enabling the analysis of dynamic systems with accuracy and efficiency the book also covers the virtual element formulation for finite plasticity providing a framework for simulating the behavior of materials undergoing plastic deformation furthermore the vem is applied to thermo mechanical problems where it allows for the investigation of coupled thermal and mechanical effects the book dedicates a significant portion to the virtual elements for fracture processes presenting techniques to model and analyze fractures in engineering structures it also addresses contact problems showcasing the vem s effectiveness in dealing with contact phenomena the virtual element method s versatility is further demonstrated through its application in homogenization offering a means to understand the effective behavior of composite materials and heterogeneous structures finally the book concludes with the virtual elements for beams and plates exploring their application in these specific structural elements throughout the book the authors emphasize the advantages of the virtual element method over traditional finite element discretization schemes highlighting its accuracy flexibility and computational efficiency in various engineering contexts

Mathematical Methods of the Theory of Elasticity

1984

based on the proceedings of the first conference on superconvergence held recently at the university of jyvaskyla finland presents reviewed papers focusing on superconvergence phenomena in the finite element method surveys for the first time all known superconvergence techniques including their proofs

Finite Element Methods

2017-11-22

this volume contains the texts of the four series of lectures presented by b cockburn c johnson c w shu and e tadmor at a c i m e summer school it is aimed at providing a

comprehensive and up to date presentation of numerical methods which are nowadays used to solve nonlinear partial differential equations of hyperbolic type developing shock discontinuities the most effective methodologies in the framework of finite elements finite differences finite volumes spectral methods and kinetic methods are addressed in particular high order shock capturing techniques discontinuous galerkin methods adaptive techniques based upon a posteriori error analysis

Advanced Numerical Approximation of Nonlinear Hyperbolic Equations

2006-11-14

this volume contains a thorough overview of the rapidly growing field of global optimization with chapters on key topics such as complexity heuristic methods derivation of lower bounds for minimization problems and branch and bound methods and convergence the final chapter offers both benchmark test problems and applications of global optimization such as finding the conformation of a molecule or planning an optimal trajectory for interplanetary space travel an appendix provides fundamental information on convex and concave functions intended for ph d students researchers and practitioners looking for advanced solution methods to difficult optimization problems it can be used as a supplementary text in an advanced graduate level seminar

Global Optimization

2013-10-16

this book is a practical guide to the numerical solution of linear and nonlinear equations differential equations optimization problems and eigenvalue problems it treats standard problems and introduces important variants such as sparse systems differential algebraic equations constrained optimization monte carlo simulations and parametric studies stability and error analysis are emphasized and the matlab algorithms are grounded in sound principles of software design and understanding of machine arithmetic and memory management nineteen case studies provide experience in mathematical modeling and algorithm design motivated by problems in physics engineering epidemiology chemistry and biology the topics included go well beyond the standard first course syllabus introducing important problems such as differential algebraic equations and conic optimization problems and important solution techniques such as continuation methods the case studies cover a wide variety of fascinating applications from modeling the spread of an epidemic to determining truss configurations

Scientific Computing with Case Studies

2009-03-19

this book on finite element based computational methods for solving incompressible viscous fluid flow problems shows readers how to apply operator splitting techniques to decouple complicated computational fluid dynamics problems into a sequence of relatively simpler sub problems at each time step such as hemispherical cavity flow cavity flow of an oldroyd b viscoelastic flow and particle interaction in an oldroyd b type viscoelastic fluid efficient and robust numerical methods for solving those resulting simpler sub problems are introduced and discussed interesting computational results are presented to show the capability of methodologies addressed in the book

Numerical Simulation of Incompressible Viscous Flow

2022-09-20

the literature on economic problems connected with measuring and modelling of welfare and inequality has grown rapidly within the last decade since this literature is scattered throughout a great number of journals on economics economic theory econometrics and statisties it is difficult to get an adequate picture of the present state of the art therefore books should appear from time to time which offer a representative cross section of the latest results of research on the subject this book offers such material it contains 54 articles by 84 authors from four of the five continents each paper has been reviewed by two referees as a conse quence the contributions of this book are revised versions or in many cases revised revisions of the original papers the book is divided into four parts part i measurement of inequality and poverty this part contains eleven papers on theory and empirical applications of inequa lity and or poverty measures two contributions deal with among other things experimental findings on questions concerning the acceptance of distributional axioms part ii taxation and redistribution distributional or rather redistributional aspects play an important role in part ii the topics of the 14 papers included in this part range from tax progressivity and redistribution allocative consequences of splitting under income taxation and connections between income tax and cost of living indices to merit goods and welfarism as well as to welfare aspects of tax reforms

Models and Measurement of Welfare and Inequality

2012-12-06

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