1. Record Nr. UNINA9910438142403321

Titolo	Advances in applied mathematics, modeling, and computational science / / Roderick Melnik, Ilias Kotsireas, editors
Pubbl/distr/stampa	New York, : Fields Institute for Research in the Mathematical Sciences, : Springer, 2013
ISBN	1-283-90974-X 1-4614-5389-5
Edizione	[1st ed.]
Descrizione fisica	1 online resource (247 p.)
Collana	Fields Institute communications, , 1069-5265 ; ; v. 66
Altri autori (Persone)	MelnikRoderick KotsireasIlias
Disciplina	510
Soggetti	Mathematics Computer simulation Mathematical models Computer science Computer science - Mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Advances in Applied Mathematics, Modeling, and Computational Science; Preface; Contents; Interconnected Challenges and New Perspectives in Applied Mathematical and Computational Sciences; 1 Mathematical Models and Algorithms; 2 Mathematical Modeling and Computational Experiments; 3 What Is Next; 4 What This Book Is About; 5 Concluding Remarks; References; Dynamic Blocking Problems for a Model of Fire Propagation; 1 Introduction; 1.1 A Model for Fire Propagation; 1.2 Barriers; 1.3 Blocking and Optimization Problems; 2 An Equivalent Formulation; 3 Existence of Blocking Strategies 3.1 The Isotropic Case3.2 The Non-isotropic Case; 4 Existence of Optimal Strategies; 5 Necessary Conditions for Optimality; 5.1 Free Arcs; 5.2 A Single Boundary Arc; 5.3 Several Boundary Arcs Constructed Simultaneously; 5.4 Necessary Conditions at Junctions; 6 Sufficient Conditions for Optimality; 7 Numerical Computation of Optimal Barriers; 8 Open Problems; 8.1 Isotropic Blocking Problem; 8.2 Existence of Optimal Strategies; 8.3 Sufficient Conditions for

Optimality; 8.4 Regularity; References

Inverse Lax-Wendroff Procedure for Numerical Boundary Conditions of Hyperbolic Equations: Survey and New Developments1 Introduction; 2 Interior Finite Difference Schemes; 3 1D Scalar Conservation Laws; 3.1 Robust and High Order Extrapolation for Outflow Boundary Conditions; 3.2 The ILW Procedure for Inflow Boundary Conditions; 3.3 Computational Results; 4 2D Euler Equations in Static Geometries; 4.1 General Framework; 4.2 No-Penetration Boundary Condition; 4.3 Algorithm Flow Chart; 4.4 Computational Results; 5 2D Euler Equations in Moving Geometries; 6 Concluding Remarks; References

Elliptic Curves over Finite Fields: Number Theoretic and Cryptographic Aspects1 Introduction; 1.1 Motivation; 1.2 Arranging a Group Structure on Elliptic Curves; 1.3 General Notation; 1.4 Basic Facts on Elliptic Curves; 2 Structure of Elliptic Curves over Finite Fields; 2.1 Isogeny and Isomorphism Classes in Various Families; 2.2 Finding the Group Structure; 2.3 Groups Represented by Elliptic Curves; 2.4 Exponent; 2.5 Prime Cardinalities; 2.6 Smooth and Easily Factorable Cardinalities; 2.7 Endomorphism Rings; 2.8 Ranks; 3 Cryptographic Applications of Elliptic Curves over Finite Fields

3.1 Embedding Degree3.2 Pairing-Friendly Curves; 3.3 Elliptic Twins; 3.4 Pseudorandom Number Generators and Hash Functions; 4 Concluding Remarks; References; Random Matrix Theory and Its Innovative Applications; 1 Random Matrix Theory in the Press; 2 Famous Laws in RMT with MATLAB Experiments; 2.1 The Most Famous Semi-circle Law; 2.2 Marcenko-Pastur Law (Special Case: Quarter Circle Law); 2.3 Circular Law; 2.4 Tracy-Widom Distribution (Law); 3 Random Matrix Factorization; 3.1 The Chi-Distribution and Orthogonal Invariance; 3.2 The QR Decomposition of randn(n)

3.2.1 Haar Measure on Orthogonal Matrices

Sommario/riassunto

This volume presents a selection of in-depth studies and state-of-the-art surveys of several challenging topics that are at the forefront of modern applied mathematics, mathematical modeling, and computational science. These three areas represent the foundation upon which the methodology of mathematical modeling and computational experiment is built as a tool in all areas of applications of mathematics. The articles cover both fundamental and applied research, and provide the reader with state-of-the-art achievements in the development and application of new theories at the interfaces of applied mathematics, modeling, and computational science. The book can serve as a reference on several important current topics in modern applied mathematics and modeling, including random matrix theory with its innovative applications, and dynamic blocking problems. Other important areas covered include: energy stable weighted essentially non-oscillatory schemes with applications in fluid dynamics and aerospace sciences; elliptic curves over finite fields and their applications in cryptography; multiple scale methods coupling network and continuum models and their applications in various areas involving porous media; new and efficient finite difference schemes for hyperbolic equations; statistical geometric and topological techniques and their applications in the life sciences; optimal control applications combining discrete and continuous features. The material presented in this book aims at fostering interdisciplinary collaborations required to meet the modern challenges of applied mathematics, modeling and computational science. At the same time, the contributions combine rigorous mathematical and computational procedures and examples from a variety of applications ranging from engineering to life sciences, and provide a rich source for graduate student projects.