Numerical Techniques In Electromagnetics Second Edition 2nd Edition By Sadiku Matthew No Published By Crc Press Hardcover

The two volumes LNCS 8805 and 8806 constitute the thoroughly refereed post-conference proceedings of 18 workshops held at the 20th International Conference on Parallel Computing, Euro-Par 2014, in Porto, Portugal, in August 2014. The 100 revised full papers presented were carefully reviewed and selected from 173 submissions. The volumes include papers from the following workshops: APCI&E (First Workshop on Applications of Parallel Computation in Industry and Engineering - BigDataCloud (Third Workshop on Big Data Management in Clouds) - DIHC (Second Workshop on Dependability and Interoperability in Heterogeneous Clouds) - FedICI (Second Workshop on Federative and Interoperable Cloud Infrastructures) - Hetero Par (12th International Workshop on Algorithms, Models and Tools for Parallel Computing on Heterogeneous Platforms) - HiBB (5th Workshop on High Performance Bioinformatics and Biomedicine) - LSDVE (Second Workshop on Large Scale Distributed Virtual Environments on Clouds and P2P) - MuCoCoS (7th International Workshop on Multi-/Many-core Computing Systems) - OMHI (Third Workshop on On-chip Memory Hierarchies and Interconnects) - PADAPS (Second Workshop on Parallel and Distributed Agent-Based Simulations) - PROPER (7th Workshop on Productivity and Performance) - Resilience (7th Workshop on Resiliency in High Performance Computing with Clusters, Clouds, and Grids) - REPPAR (First International Workshop on Reproducibility in Parallel Computing) - ROME (Second Workshop on Runtime and Operating Systems for the Many Core Era) - SPPEXA (Workshop on Software for Exascale Computing) - TASUS (First Workshop on Techniques and Applications for Sustainable Ultrascale Computing Systems) - UCHPC (7th Workshop on Un Conventional High Performance Computing) and VHPC (9th Workshop on Virtualization in High-Performance Cloud Computing.

Electromagnetics is the foundation of our electric technology. It describes the fundamental principles upon which electricity is generated and used. This includes electric machines, high voltage transmission, telecommunication, radar, and recording and digital computing. Numerical Methods in Electromagnetism will serve both as an introductory text for graduate students and as a reference book for professional engineers and researchers. This book leads the uninitiated into the realm of numerical methods for solving electromagnetic field problems by examples and illustrations. Detailed descriptions of advanced techniques are also included for the benefit of working engineers and research students. Comprehensive descriptions of numerical methods In-depth introduction to finite differences, finite elements, and integral equations Illustrations and applications of linear and nonlinear solutions for multi-dimensional analysis Numerical examples to facilitate understanding of the methods Appendices for quick reference of mathematical and numerical methods employed

Offers an overview of state of the art passive macromodeling techniques with an emphasis on black-box approaches This book offers coverage of developments in linear macromodeling, with a focus on effective, proven methods. After starting with a definition of the fundamental properties that must characterize models of physical systems, the authors discuss several prominent passive macromodeling algorithms for lumped and distributed systems and compare them under accuracy, efficiency, and robustness standpoints. The book includes chapters with standard background material (such as linear time-invariant circuits and systems, basic discretization of field equations, state-space systems), as well as appendices collecting basic facts from linear algebra, optimization templates, and signals and transforms. The text also covers more technical an advanced topics, intended for the specialist, which may be skipped at first reading. Provides coverage of black-box passive macromodeling, an approach developed by the authors Elaborates on main concepts and results in a mathematically precise way using easy-to-understand language Illustrates macromodeling concepts through dedicated examples Includes a comprehensive set of end-of-chapter problems and exercises Passive Macromodeling: Theory and Applications serves as a reference for senior or graduate level courses in electrical engineering programs, and to engineers in the fields of numerical modeling, simulation, design, and optimization of electrical/electronic systems. Stefano Grivet-Talocia, PhD, is an Associate Professor of Circuit Theory at the Politecnico di Torino in Turin, Italy, and President of IdemWorks. Dr. Grivet-Talocia is author of over 150 technical papers published in international journals and conference proceedings. He invented several algorithms in the area of passive macromodeling, making them available through IdemWorks. Bjørn Gustavsen, PhD, is a Chief Research Scientist in Energy Systems at SINTEF Energy Research in Trondheim, Norway. More than ten years ago, Dr. Gustavsen developed the original version of the vector fitting method with Prof. Semlyen at the University of Toronto. The vector fitting method is one of the most widespread approaches for model extraction. Dr. Gustavsen is also an IEEE fellow.

The revised and updated second edition of this textbook teaches students to create computer codes used to engineer antennas, microwave circuits, and other critical technologies for wireless communications and other applications of electromagnetic fields and waves. Worked code examples are provided for MATLAB technical computing software.

Ultra-Wideband, Short Pulse Electromagnetics 9

Design, Technology, and Diagnostics, Second Edition

Double-Grid Finite-Difference Frequency-Domain Method for Scattering from Chiral Objects

Analytical and Computational Methods in Electromagnetics

Numerical Techniques in Electromagnetics with MATLAB, Third Edition

In this work we solve the scattering, a problem of electromagnetic analysis, by mixed homogeneous linear and isotropic three-dimensional materials with the Method of Moments in the harmonic case.

This exciting new resource presents a comprehensive introduction to the fundamentals of diffraction of two-dimensional canonical structures, including wedge, strip, and triangular cylinder with different boundary conditions. Maxwell equations are discussed, along with wave equation and scattered, diffracted and fringe fields. Geometric optics, as well as the geometric theory of diffraction are explained. With MATLAB scripts included for several well-known electromagnetic diffraction problems, this book discusses diffraction fundamentals of two-dimensional structures with different boundary conditions and analytical numerical methods that are used to show diffraction. The book introduces fundamental concepts of electromagnetic problems, identities, and definitions for diffraction modeling. Basic coordinate systems, boundary conditions, wave equation, and Green's function problem are given. The scattered fields, diffracted fields, and fringe fields, radar cross section for diffraction modeling are presented. Behaviors of electromagnetic waves around the two-dimensional canonical wedge and canonical strip are also explored. Diffraction of trilateral cylinders and wedges with rounded edges is investigated as well as double tip diffraction using Finite Difference Time Domain and Method of Moments. A MATLAB based virtual tool, developed with graphical user interface (GUI), for the visualization of both fringe currents and fringe waves is included, using numerical FDTD and MoM algorithm and High-Frequency Asymptotics

approaches.

Ultra-wideband (UWB), short-pulse (SP) electromagnetics are now being used for an increasingly wide variety of applications, including collision avoidance radar, concealed object detection, and communications. Notable progress in UWB and SP technologies has been achieved by investigations of their theoretical bases and improvements in solid-state manufacturing, computers, and digitizers. UWB radar systems are also being used for mine clearing, oil pipeline inspections, archeology, geology, and electronic effects testing. Ultra-wideband Short-Pulse Electromagnetics 9 presents selected papers of deep technical content and high scientific quality from the UWB-SP9 Conference, which was held from July 21-25, 2008, in Lausanne, Switzerland. The wide-ranging coverage includes contributions on electromagnetic theory, time-domain computational techniques, modeling techniques, antennas, pulsed-power, UWB interactions, radar systems, UWB communications, broadband systems and components. This book serves as a state-of-the-art reference for scientists and engineers working in these applications areas.

Reviews the fundamental concepts behind the theory and computation of electromagnetic fields The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell's equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition theorems, and fields in layered media) in order to benefit students at all levels. The second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches for numerical analysis of electromagnetic fields: the finite difference method (the finite difference time-domain method in particular), the finite element method, and the integral equation-based moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of complicated electromagnetic problems. Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and understand more advanced topics Discusses electromagnetic analysis in rectangular, cylindrical and spherical coordinates Covers computational electromagnetics in both frequency and time domains Includes new and updated homework problems and examples Theory and Computation of Electromagnetic Fields, Second Edition is written for advanced undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning about analysis and computation skills.

Conjugate Gradient Algorithms and Finite Element Methods

Perfectly Matched Layer (PML) for Computational Electromagnetics

Advanced Computer Techniques in Applied Electromagnetics

Introduction to the Finite Element Method in Electromagnetics

Passive Macromodeling

"Antenna, wireless communication and other electrical engineers use asymptotic techniques for solving electromagnetic problems when the electrical size of a given scenario is large in comparison to the wavelength. This practical book offers in-depth coverage of this area, showing how to apply these techniques to the analysis of complex electromagnetic problems in order to obtain results with an exceptionally high degree of accuracy. Focusing on two highly-effective methods - the uniform theory of diffraction (UTD) and physical optics (PO), this book is unique in that it emphasizes how to solve real-world problems, rather than simply explaining theory like other books on the market. This first-of-its-kind resource show professionals how to apply this knowledge to a wide range of projects in the field, including antenna design, mobile communications, and RCS (radar cross section) computation. This authoritative book is supported with more than 100 illustrations and over 250 equations."

The focus of the presented investigations in this thesis is related to on glass printed antennas for a wide frequency band starting from 100 kHz up to 900 MHz. Different numerical methods based on the Method of Moments are compared to present a solution for virtual antenna development. To compare the proposed approaches, simulations using each one were performed. Furthermore, important details for antenna system and antenna environment modelling, especially those related to ground and antenna amplifiers are given. Also, keyless systems operating at low frequencies as well as roof antenna systems operating at very high frequencies beyond 700 MHz are investigated. All proposed virtual processes are validated by measurements. Valuable computation time can be saved as shown in this work by choosing adequate algorithms.

Nanoplasmonics is one of the most important growth areas of this century. It is part of nano-optics and nanophotonics and deals with oscillations of electrons in metallic nanoparticles and nanostructures. Also, it is a multidisciplinary subject covering atomic, molecular, and solid-state physics, as well as much of chemistry. Nanoplasmonics makes it possible to combine the nanoscale properties of smart devices with their optical frequencies of operation. Nanoplasmonics presents, for the first time, both the physical principles and mathematical descriptions of main nanoplasmonic effects that now are scattered over thousands of research articles. Importantly, it contains many methods, accompanied by diagrams, for fast estimations and calculations of main properties of nanoparticles of very different shapes and their clusters. It also presents the most important applications of nanoplasmonics, including in medicine, nanolasers, electronics, perfect lenses, and invisibility cloaks.

A new edition of the leading textbook on the finite element method, incorporating major advancements and further applications in the field of electromagnetics The finite element method (FEM) is a powerful simulation technique used to solve boundary-value problems in a variety of engineering circumstances. It has been widely used for analysis of electromagnetic fields in antennas, radar scattering, RF and microwave engineering, high-speed/high-frequency circuits, wireless communication, electromagnetic compatibility, photonics, remote sensing, biomedical engineering, and space exploration. The Finite Element Method in Electromagnetics, Third Edition explains the method's processes and techniques in careful, meticulous prose and covers not only essential finite element method theory, but also its latest developments and applications—giving engineers a methodical way to quickly master this very powerful numerical technique for solving practical, often complicated, electromagnetic problems. Featuring over thirty percent new material, the third edition of this essential and comprehensive text now includes: A wider range of applications, including antennas, phased arrays, electric machines, high-frequency circuits, and crystal photonics The finite element analysis of wave propagation, scattering, and radiation in periodic structures The time-domain finite element method for analysis of wideband antennas and transient electromagnetic phenomena Novel domain decomposition techniques for parallel computation and efficient simulation of large-scale problems, such as phased-array antennas and photonic crystals Along with a great many examples, The Finite Element Method in Electromagnetics is an ideal book for engineering students as well as for professionals in the field.

Microwave Circuit Modeling Using Electromagnetic Field Simulation

Theory and Computation of Electromagnetic Fields

Next Generation Networks

Computational Methods for Electromagnetics

Monte Carlo Methods for Electromagnetics

Now Covers Dielectric Materials in Practical Electromagnetic Devices The Method of Moments in Electromagnetics, Second Edition explains the solution of electromagnetic integral equations via the m moments (MOM). While the first edition exclusively focused on integral equations for conducting problems, this edition extends the integral equation framework to treat objects having conducting as we dielectric parts. New to the Second Edition Expanded treatment of coupled surface integral equations for conducting and composite conducting/dielectric objects, including objects having multiple diele regions with interfaces and junctions Updated topics to reflect current technology More material on the calculation of near fields Reformatted equations and improved figures Providing a bridge betwee and software implementation, the book incorporates sufficient background material and offers nuts-and-bolts implementation details. It first derives a generalized set of surface integral equations that c used to treat problems with conducting and dielectric regions. Subsequent chapters solve these integral equations for progressively more difficult problems involving thin wires, bodies of revolution, an and three-dimensional bodies. After reading this book, students and researchers will be well equipped to understand more advanced MOM topics.

"'Computational Methods for Electromagnetics' is an indispensable resource for making efficient and accurate formulations for electromagnetics applications and their numerical treatment. Employing a coherent approach that is unmatched in the field, the authors detail both integral and differential equations using the method of moments and finite-element procedures. In addition, readers will gain a t understanding of numerical solution procedures. Detail is provided to enable the reader to implement concepts in software and, in addition, a collection of related computer programs are available via th Internet. 'Computational Methods for Electromagnetics' is designed for graduate-level classroom use or self-study, and every chapter includes problems. It will also be of particular interest to engineers in the aerospace, defense, telecommunications, wireless, electromagnetic compatibility, and electronic packaging industries." -- Amazon.com.

Transformer Engineering: Design, Technology, and Diagnostics, Second Edition helps you design better transformers, apply advanced numerical field computations more effectively, and tackle operati maintenance issues. Building on the bestselling Transformer Engineering: Design and Practice, this greatly expanded second edition also emphasizes diagnostic aspects and transformer-system intera What's New in This Edition Three new chapters on electromagnetic fields in transformers, transformer-system interactions and modeling, and monitoring and diagnostics An extensively revised chapte recent trends in transformer technology An extensively updated chapter on short-circuit strength, including failure mechanisms and safety factors A step-by-step procedure for designing a transformer u throughout, reflecting advances in the field A blend of theory and practice, this comprehensive book examines aspects of transformer engineering, from design to diagnostics. It thoroughly explains electromagnetic fields and the finite element method to help you solve practical problems related to transformers. Coverage includes important design challenges, such as eddy and stray loss evaluatio control, transient response, short-circuit withstand and strength, and insulation design. The authors also give pointers for further research. Students and engineers starting their careers will appreciate t sample design of a typical power transformer. Presenting in-depth explanations, modern computational techniques, and emerging trends, this is a valuable reference for those working in the transforme industry, as well as for students and researchers. It offers guidance in optimizing and enhancing transformer design, manufacturing, and condition monitoring to meet the challenges of a highly compet market.

This volume includes contributions on: field theory and advanced computational electromagnetics; electrical machines and transformers; optimization and interactive design; electromagnetics in materi coupled field and electromagnetic components in mechatronics; induction heating systems; bioelectromagnetics; and electromagnetics in education.

The TLM Method

Formal Ontologies Meet Industry

An Introduction Using MATLAB® and Computational Electromagnetics Examples

Optical and Wireless Communications

The Method of Moments in Electromagnetics, Second Edition

Optical and wireless technologies are being introduced into the global communications infrastructure at an astonishing pace. Both are revolutionizing the industry and will undoubtedly dominate its future, yet in the crowded curricula in most electrical engineering programs, there is no room in typical data communications courses for proper coverage of these "next generation" technologies. Optical and Wireless Communications: Next Generation Networks covers both types of networks in a unique presentation designed for a one-semester course for senior undergraduate or graduate engineering students. Part I: Optical Networks covers optical fibers, transmitters, receivers, multiplexers, amplifiers, and specific networks, including FDDI, SONET, fiber channel, and wavelength-routed networks. Part II:Wireless Networks examines fundamental concepts and specific wireless networks, such as LAN, ATM, wireless local loop, and wireless PBXs. This section also explores cellular technologies and satellite communications. Eventually, next generation networks will be as ubiquitous as traditional telephone networks, and today's engineering students must be prepared to meet the challenges of optical and wireless systems development and deployment. Filled with illustrations, examples, and end-of-chapter problems, Optical and Wireless Communications: Next Generation Networks provides a brief but comprehensive introduction to these technologies that will help future engineers build the foundation they need for success.

Describes most popular computational methods used to solve problems in electromagnetics Matlab code is included throughout, so that the reader can implement the various techniques discussed Exercises included

Despite the dramatic growth in the availability of powerful computer resources, the EM community lacks a comprehensive text on the computational techniques used to solve EM problems. The first edition of Numerical Techniques in Electromagnetics filled that gap and became the reference of choice for thousands of engineers, researchers, and students. This third edition of the bestselling text reflects the continuing increase in awareness and use of numerical techniques and incorporates advances and refinements made in recent years. Most notable among these are the improvements made to the standard algorithm for the finite-difference time-domain (FDTD) method and treatment of absorbing boundary conditions in FDTD, finite element, and transmission-line-matrix methods. The author also has added a chapter on the method of lines. Numerical Techniques in Electromagnetics with MATLAB®, Third Edition continues to teach readers how to pose, numerically analyze, and solve EM problems, to give them the ability to expand their problem-solving skills using a variety of methods, and to prepare them for research in electromagnetism. Now the Third Edition goes even further toward providing a comprehensive resource that addresses all of the most useful computation methods for EM problems and includes MATLAB code instead of FORTRAN.

Abstract: The finite difference time domain (FDTD) and finite element numerical methods are two popular time domain computational methods in electromagnetics, but the two numerical methods have certain tradeoffs. FDTD is a fast explicit method with second order accuracy, but the method's accuracy is reduced when analyzing structures that are not conforming to a Cartesian grid. The finite element method on the other hand excels at examining domains with non-conforming structures, but its method of solution usually requires a matrix inverse operation, which is computationally expensive. Fortunately, research in hybrid methods have shown that the FDTD method for isotropic materials can be viewed upon as a subset of finite elements, and from this viewpoint, the FDTD and finite element method in the time domain can be hybridized together to the advantages of both methods while mitigating the disadvantages.

EM Modeling of Antennas and RF Components for Wireless Communication Systems

Solutions Manual

Numerical Methods for Engineering

Electromagnetic Diffraction Modeling and Simulation with MATLAB

Integration of Numerical Simulation Approaches in the Virtual Development of Automotive Antenna Systems

Achieve optimal microwave system performance by mastering the principles and methods underlying today's powerful computational tools and commercial software in electromagnetics. This authoritative resource offers you clear and complete explanation of this essential electromagnetics knowledge, providing you with the analytical background you need to understand such key approaches as MoM (method of moments), FDTD (Finite Difference Time Domain) and FEM (Finite Element Method), and Green's functions. This comprehensive book includes all math necessary to master the material. Moreover, it features numerous solved problems that help ensure your understanding of key concepts throughout the book.

Annotation This practical "how to" book is an ideal introduction to electromagnetic field-solvers. Where most books in this area are strictly theoretical, this unique resource provides engineers with helpful advice on selecting the right tools for their RF (radio frequency) and high-speed digital circuit design work

This book is a collection of papers addressing the multi-shaped character of knowledge, new studies and applications in the field of ontology and semantic technology. The semantic dimension of information plays an increasingly central role in a networked, knowledge-centred economy and the need to encode information into computer systems has led to a bias towards Knowledge Engineering (KE) solutions as opposed to Knowledge Management (KM). Although the intersection between KE and KM has led to a general improvement of information systems, the overlap between these two fields has tended to eclipse interest in genuine knowledge processes. For this reason, the fourth FOMI workshop was held to coincide with the 10th European Conference of Knowledge Management (ECKM), with the explicit aim of bringing together KR and KM (sub)-communities, providing a platform for discussion of these topics. Subjects covered include: the evolution of ontologies in accordance with the evolution of the domain they are designed for; the study of the notions of functional composition and decomposition; modular ontologies for architecture; ontology infrastructure for electromagnetics; ontology of beliefs; enterprise modelling; the application of ontology-based methodologies and techniques to knowledge management issues; ontologies for standards and domain ontologies for biomedicine. The double focus on methodological and applicative issues represents the main feature of these FOMI 2009 articles. This comprehensive perspective will advance progress towards new frontiers in information systems and knowledge management, where research and development in formal ontology will play a leading role.

This lecture presents the perfectly matched layer (PML) absorbing boundary condition (ABC) used to simulate free space when solving the Maxwell equations with such finite methods as the finite difference time domain (FDTD) method or the finite element method. The frequency domain and the time domain equations are

derived for the different forms of PML media, namely the split PML, the CPML, the NPML, and the uniaxial PML, in the cases of PMLs matched to isotropic, anisotropic, and dispersive media. The implementation of the PML ABC in the FDTD method is presented in detail. Propagation and reflection of waves in the discretized FDTD space are derived and discussed, with a special emphasis on the problem of evanescent waves. The optimization of the PML ABC is addressed in two typical applications of the FDTD method: first, wave-structure interaction problems, and secondly, waveguide problems. Finally, a review of the literature on the application of the PML ABC to other numerical techniques of electromagnetics and to other partial differential equations of physics is provided. In addition, a software package for computing the actual reflection from a FDTD-PML is provided. It is available here.

Computational Electromagnetics

Advances in the Formulations and Accuracy of the Method of Moments Applied to Electromagnetics

Practical Applications of Asymptotic Techniques in Electromagnetics

Euro-Par 2014: Parallel Processing Workshops

Direct and Inverse Electromagnetic Scattering

Includes contributions on electromagnetic fields in electrical engineering which intends at joining theory and practice. This book helps the world-wide electromagnetic community, both academic and engineering, in understanding electromagnetism itself and its application to technical problems.

Computational Electromagnetics is a young and growing discipline, expanding as a result of the steadily increasing demand for software for the design and analysis of electrical devices. This book introduces three of the most popular numerical methods for simulating electromagnetic fields: the finite difference method, the finite element method and the method of moments. In particular it focuses on how these methods are used to obtain valid approximations to the solutions of Maxwell's equations, using, for example, "staggered grids" and "edge elements." The main goal of the book is to make the reader aware of different sources of errors in numerical computations, and also to provide the tools for assessing the accuracy of numerical methods and their solutions. To reach this goal, convergence analysis, extrapolation, von Neumann stability analysis, and dispersion analysis are introduced and used frequently throughout the book. Another major goal of the book is to provide students with enough practical understanding of the methods so they are able to write simple programs on their own. To achieve this, the book contains several MATLAB programs and detailed description of practical issues such as assembly of finite element matrices and handling of unstructured meshes. Finally, the book aims at making the students well-aware of the strengths and weaknesses of the different methods, so they can decide which method is best for each problem. In this second edition, extensive computer projects are added as well as new material throughout. Reviews of previous edition: "The well-written monograph is devoted to students at the undergraduate level, but is also useful for practising engineers." (Zentralblatt MATH, 2007)

This book focuses on practical computational electrodynamics, guiding the reader step-by-step through the modeling process from the initial "what question must the model answer?", through the setting up of a computer model, to post processing, validation and optimization. The book offers a realistic view of the capabilities and limits of current 3-D field simulators and how to apply this knowledge efficiently to EM analysis and design of RF applications in modern communication systems.

This series lecture is an introduction to the finite element method with applications in electromagnetics. The finite element method is a numerical method that is used to solve boundary-value problems characterized by a partial differential equation and a set of boundary conditions. The geometrical domain of a boundary-value problem is discretized using sub-domain elements, called the finite elements, and the differential equation is applied to a single element after it is brought to a "weak" integro-differential form. A set of shape functions is used to represent the primary unknown variable in the element domain. A set of linear equations is obtained for each element in the discretized domain. A global matrix system is formed after the assembly of all elements. This lecture is divided into two chapters. Chapter 1 describes one-dimensional boundary-value problems with applications to electrostatic problems described by the Poisson's equation. The accuracy of the finite element method is evaluated for linear and higher order elements by computing the numerical error based on two different definitions. Chapter 2 describes two-dimensional boundary-value problems in the areas of electrostatics and electrodynamics (time-harmonic problems). For the second category, an absorbing boundary condition was imposed at the exterior boundary to simulate undisturbed wave propagation toward infinity. Computations of the numerical error were performed in order to evaluate the accuracy and effectiveness of the method in solving electromagnetic problems. Both chapters are accompanied by a number of Matlab codes which can be used by the reader to solve one- and two-dimensional boundary-value problems. These codes can be downloaded from the publisher's URL: www.morganclaypool.com/page/polycarpou This lecture is written primarily for the nonexpert engineer or the undergraduate or graduate student who wants to learn, for the first time, the finite element method with applications to electromagnetics. It is also targeted for research engineers who have knowledge of other numerical techniques and want to familiarize themselves with the finite element method. The lecture begins with the basics of the method, including formulating a boundary-value problem using a weighted-residual method and the Galerkin approach, and continues with imposing all three types of boundary conditions including absorbing boundary conditions. Another important topic of emphasis is the development of shape functions including those of higher order. In simple words, this series lecture provides the reader with all information necessary for someone to apply successfully the finite element method to one- and two-dimensional boundary-value problems in electromagnetics. It is suitable for newcomers in the field of finite elements in electromagnetics.

Numerical Techniques in Electromagnetics with MATLAB

Development of a Time Domain Hybrid Finite Difference/finite Element Method for Solutions to Maxwell's Equations in Anisotropic Media

Electromagnetic Fields in Electrical Engineering

The Method of Moments in Electromagnetics

Advanced Electromagnetic Waves

This special volume provides a broad overview and insight in the way numerical methods are being used to solve the wide variety of problems in the electronics industry. Furthermore its aim is to give researchers from other fields of application the opportunity to benefit from the results wich have been obtained in the electronics industry. * Complete survey of numerical methods used in the electronic industry * Each chapter is selfcontained * Presents state-of-the-art applications and methods * Internationally recognised authors

Provides a review of developments in the fields of direct and inverse electromagnetic wave scattering. Contributions from leading researchers

in these fields from all over the world are gathered in this book to discuss the state of the topic and directions for future research, starting from the fundamental structure of wave scattering problems and finishing with an assessment of the impact of this structure in applications

The aim of this book is to give a broad overview of the TLM(Transmission Line Matrix) method, which is one of the“time-domain numerical methods”. These methods arereputed for their significant reliance on computer resources.However, they have the advantage of being highly general. The TLM method has acquired a reputation for being a powerful andeffective tool by numerous teams and still benefits today fromsignificant theoretical developments. In particular, in recentyears, its ability to simulate various situations with excellentprecision, including complex materials, has beendemonstrated. Application examples are included in the last two chapters of thebook, enabling the reader to draw conclusions regarding theperformance of the implemented techniques and, at the same time, tovalidate them. Contents 1. Basis of the TLM Method: the 2D TLM Method. 2. 3D Nodes. 3. Introduction of Discrete Elements and Thin Wires in the TLMMethod. 4. The TLM Method in Matrix Form and the Z Transform. Appendix A. Development of Maxwell’s Equations using the ZTransform with a Variable Mesh. Appendix B. Treatment of Plasma using the Z Transform for the TLMMethod.

Until now, novices had to painstakingly dig through the literature to discover how to use Monte Carlo techniques for solving electromagnetic problems. Written by one of the foremost researchers in the field, Monte Carlo Methods for Electromagnetics provides a solid understanding of these methods and their applications in electromagnetic computation. Including much of his own work, the author brings together essential information from several different publications. Using a simple, clear writing style, the author begins with a historical background and review of electromagnetic theory. After addressing probability and statistics, he introduces the finite difference method as well as the fixed and floating random walk Monte Carlo methods. The text then applies the Exodus method to Laplace’s and Poisson’s equations and presents Monte Carlo techniques for handing Neumann problems. It also deals with whole field computation using the Markov chain, applies Monte Carlo methods to time-varying diffusion problems, and explores wave scattering due to random rough surfaces. The final chapter covers multidimensional integration. Although numerical techniques have become the standard tools for solving practical, complex electromagnetic problems, there is no book currently available that focuses exclusively on Monte Carlo techniques for electromagnetics. Alleviating this problem, this book describes Monte Carlo methods as they are used in the field of electromagnetics.

Numerical Techniques in Electromagnetics, Second Edition

Numerical Techniques in Electromagnetics

Euro-Par 2014 International Workshops, Porto, Portugal, August 25-26, 2014, Revised Selected Papers, Part I

Transformer Engineering

Theory and Applications

As the availability of powerful computer resources has grown over the last three decades, the art of computation of electromagnetic (EM) problems has also grown - exponentially. Despite this dramatic growth, however, the EM community lacked a comprehensive text on the computational techniques used to solve EM problems. The first edition of Numerical Techniques in Electromagnetics filled that gap and became the reference of choice for thousands of engineers, researchers, and students. The Second Edition of this bestselling text reflects the continuing increase in awareness and use of numerical techniques and incorporates advances and refinements made in recent years. Most notable among these are the improvements made to the standard algorithm for the finite difference time domain (FDTD) method and treatment of absorbing boundary conditions in FDTD, finite element, and transmission-line-matrix methods. The author also added a chapter on the method of lines. Numerical Techniques in Electromagnetics continues to teach readers how to pose, numerically analyze, and solve EM problems, give them the ability to expand their problem-solving skills using a variety of methods, and prepare them for research in electromagnetism. Now the Second Edition goes even further toward providing a comprehensive resource that addresses all of the most useful computation methods for EM problems.

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 Method of Moments in Electromagnetics, Third Edition details the numerical solution of electromagnetic integral equations via the Method of Moments (MoM). Previous editions focused on the solution of radiation and scattering problems involving conducting, dielectric, and composite objects. This new edition adds a

significant amount of material on new, state-of-the art compressive techniques. Included are new chapters on the Adaptive Cross Approximation (ACA) and Multi-Level Adaptive Cross Approximation (MLACA), advanced algorithms that permit a direct solution of the MoM linear system via LU decomposition in compressed form. Significant attention is paid to parallel software implementation of these methods on traditional central processing units (CPUs) as well as new, high performance graphics processing units (GPUs). Existing material on the Fast Multipole Method (FMM) and Multi-Level Fast Multipole Algorithm (MLFMA) is also updated, blending in elements of the ACA algorithm to further reduce their memory demands. The Method of Moments in Electromagnetics is intended for students, researchers, and industry experts working in the area of computational electromagnetics (CEM) and the MoM. Providing a bridge between theory and software implementation, the book incorporates significant background material, while presenting practical, nuts-and-bolts implementation details. It first derives a generalized set of surface integral equations used to treat electromagnetic radiation and scattering problems, for objects comprising conducting and dielectric regions. Subsequent chapters apply these integral equations for progressively more difficult problems such as thin wires, bodies of revolution, and two- and three-dimensional bodies. Radiation and scattering problems of many different types are considered, with numerical results compared against analytical theory as well as measurements.

This book presents the application of the overlapping grids approach to solve chiral material problems using the FDFD method. Due to the two grids being used in the technique, we will name this method as Double-Grid Finite Difference Frequency-Domain (DG-FDFD) method. As a result of this new approach the electric and magnetic field components are defined at every node in the computation space. Thus, there is no need to perform averaging during the calculations as in the aforementioned FDFD technique [16]. We formulate general 3D frequency-domain numerical methods based on double-grid (DG-FDFD) approach for general bianisotropic materials. The validity of the derived formulations for different scattering problems has been shown by comparing the obtained results to exact and other solutions obtained using different numerical methods.

Nanoplasmonics

Numerical Methods in Electromagnetics

Special Volume

Numerical Analysis in Electromagnetics

The Finite Element Method in Electromagnetics

This book endeavors to give the reader a strong base in the advanced theory of electromagnetic waves and its applications, while keeping pace with research in various other disciplines that apply electrostatics/electrodynamics theory. The treatment is highly mathematical, which tends to obscure the principles involved.

Numerical Methods in Electromagnetism