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MLI Physics Collection
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Time-Domain Finite Element Methods for Maxwell's Equations in Metamaterials
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Numerical Electromagnetics
Antenna Theory
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FDTD Analysis of Guided Electromagnetic Wave Interaction with Time-Modulated Dielectric Medium
Scientific and Engineering Applications Using MATLAB
Computational Electromagnetics
Advanced Computational Electromagnetic Methods
Electromagnetic Simulation Using the FDTD Method with Python
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Computational Photonic Sensors
Computational Electromagnetics for RF and Microwave Engineering

BRODY RIVERS

MLI Physics Collection CRC Press
This new resource covers the latest developments in computational electromagnetic methods, with emphasis on cutting-edge applications. This book is designed to extend existing literature to the latest development in computational electromagnetic methods, which are of interest to readers in both academic and industrial areas. The topics include advanced techniques in MoM, FEM and FDTD, spectral domain method, GPU and Phi hardware acceleration, metamaterials, frequency and time domain integral equations, and statistics methods in bio-electromagnetics.

Introduction to Radar Using Python and MATLAB CRC Press
Simulation and modeling using numerical methods is one of the key instruments in any scientific work. In the field of photonics, a wide range of numerical methods are used for studying both fundamental optics and applications such as design, development, and optimization of photonic components. Modeling is key for developing improved photonic devices and reducing development time and cost. Choosing the appropriate computational method for a photonics modeling problem requires a clear understanding of the pros and cons of the available numerical methods. Numerical Methods in Photonics presents six of the most frequently used methods: FDTD, FDFD, 1+1D nonlinear propagation, modal method, Green's function, and FEM. After an introductory chapter outlining the basics of Maxwell's equations, the book includes self-contained chapters that focus on each of the methods. Each method is accompanied by a review of the mathematical principles in which it is based, along with sample scripts, illustrative examples of characteristic problem solving, and exercises. MATLAB® is used throughout the text. This book provides a solid basis to practice writing your own codes. The theoretical formulation is complemented by sets of exercises, which allow you to grasp the essence of the modeling tools.
Time-Domain Finite Element Methods for Maxwell's Equations in Metamaterials Artech House
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

Computational Electrodynamics John Wiley & Sons
This unique book presents simple, easy-to-use, but effectiveshort codes as well as virtual tools that can be used byelectrical, electronic, communication, and computer engineers in abroad range of electrical engineering problems Electromagnetic modeling is essential to the design and modelingof antenna, radar, satellite, medical imaging, and otherapplications. In this book, author Levent Sevgi explains techniquesfor solving real-time complex physical problems using MATLAB-basedshort scripts and comprehensive virtual tools. Unique in coverage and tutorial approach, ElectromagneticModeling and

Simulation covers fundamental analytical andnumerical models that are widely used in teaching, research, andengineering designs—including mode and ray summationapproaches with the canonical 2D nonpenetrable parallel platewaveguide as well as FDTD, MoM, and SSPE scripts. The book alsoestablishes an intelligent balance among the essentials of EMMODSIM: The Problem (the physics), The Theory and Models(mathematical background and analytical solutions), and TheSimulations (code developing plus validation, verification, andcalibration). Classroom tested in graduate-level and short courses,Electromagnetic Modeling and Simulation: Clarifies concepts through numerous worked problems and quizzesprovided throughout the book Features valuable MATLAB-based, user-friendly, effectiveengineering and research virtual design tools Includes sample scenarios and video clips recorded duringcharacteristic simulations that visually impactlearning—available on wiley.com Provides readers with their first steps in EM MODSIM as well astools for medium and high-level code developers and users Electromagnetic Modeling and Simulation thoroughly coversthe physics, mathematical background, analytical solutions, andcode development of electromagnetic modeling, making it an idealresource for electrical engineers and researchers.

Advanced Methodologies and Technologies in Artificial Intelligence, Computer Simulation, and Human-Computer Interaction John Wiley & Sons

The discipline of antenna theory has experienced vast technological changes. In response, Constantine Balanis has updated his classic text, Antenna Theory, offering the most recent look at all the necessary topics. New material includes smart antennas and fractal antennas, along with the latest applications in wireless communications. Multimedia material on an accompanying CD presents PowerPoint viewgraphs of lecture notes, interactive review questions, Java animations and applets, and MATLAB features. Like the previous editions, Antenna Theory, Third Edition meets the needs of electrical engineering and physics students at the senior undergraduate and beginning graduate levels, and those of practicing engineers as well. It is a benchmark text for mastering the latest theory in the subject, and for better understanding the technological applications. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

Numerical Electromagnetics John Wiley & Sons

This hands-on introduction to computational electromagnetics (CEM) links theoretical coverage of the three key methods - the FDTD, MoM and FEM - to open source MATLAB codes (freely available online) in 1D, 2D and 3D, together with many practical hints and tips gleaned from the author's 25 years of experience in the field. Updated and extensively revised, this second edition includes a new chapter on 1D FEM analysis, and extended 3D treatments of the FDTD, MoM and FEM, with entirely new 3D MATLAB codes. Coverage of higher-order finite elements in 1D, 2D and 3D is also provided, with supporting code, in addition to a detailed 1D example of the FDTD from a FEM perspective. With running examples through the book and end-of-chapter problems to aid understanding, this is ideal for professional engineers and

senior undergraduate/graduate students who need to master CEM and avoid common pitfalls in writing code and using existing software.

Antenna Theory Mercury Learning and Information

Advanced Electromagnetic Computation with MATLAB® discusses commercial electromagnetic software, widely used in the industry. Algorithms of Finite Differences, Moment method, Finite Element method and Finite Difference Time Domain method are illustrated. Hand-computed simple examples and MATLAB-coded examples are used to explain the concepts behind the algorithms. Case studies of practical examples from transmission lines, waveguides, and electrostatic problems are given so students are able to develop the code and solve the problems. Two new chapters including advanced methods based on perturbation techniques and three dimensional finite element examples from radiation scattering are included.

Research Developments in Geotechnics, Geo-Informatics and Remote Sensing CRC Press

This book provides a comprehensive overview of the photonic sensing field by covering plasmonics, photonic crystal, and SOI techniques from theory to real sensing applications. A literature review of ultra-sensitive photonic sensors, including their design and application in industry, makes this a self-contained and comprehensive resource for different types of sensors, with high value to the biosensor sector in particular. The book is organized into four parts: Part I covers the basic theory of wave propagation, basic principles of sensing, surface plasmon resonance, and silicon photonics; Part II details the computational modeling techniques for the analysis and prediction of photonic sensors; Part III and Part IV cover the various mechanisms and light matter interaction scenarios behind the design of photonic sensors including photonic crystal fiber sensors and SOI sensors. This book is appropriate for academics and researchers specializing in photonic sensors; graduate students in the early and intermediate stages working in the areas of photonics, sensors, biophysics, and biomedical engineering; and to biomedical, environmental, and chemical engineers.

Scattering Analysis of Periodic Structures using Finite-Difference Time-Domain Method Cambridge University Press

Introduction to the Finite-Difference Time-Domain (FDTD) Method for Electromagnetics provides a comprehensive tutorial of the most widely used method for solving Maxwell's equations -- the Finite Difference Time-Domain Method. This book is an essential guide for students, researchers, and professional engineers who want to gain a fundamental knowledge of the FDTD method. It can accompany an undergraduate or entry-level graduate course or be used for self-study. The book provides all the background required to either research or apply the FDTD method for the solution of Maxwell's equations to practical problems in engineering and science. Introduction to the Finite-Difference Time-Domain (FDTD) Method for Electromagnetics guides the reader through the foundational theory of the FDTD method starting with the one-dimensional transmission-line problem and then progressing to the solution of Maxwell's equations in three dimensions. It also provides step by step guides to modeling physical sources, lumped-circuit components, absorbing boundary

conditions, perfectly matched layer absorbers, and sub-cell structures. Post processing methods such as network parameter extraction and far-field transformations are also detailed. Efficient implementations of the FDTD method in a high level language are also provided. Table of Contents: Introduction / 1D FDTD Modeling of the Transmission Line Equations / Yee Algorithm for Maxwell's Equations / Source Excitations / Absorbing Boundary Conditions / The Perfectly Matched Layer (PML) Absorbing Medium / Subcell Modeling / Post Processing

Introduction to the Finite-Difference Time-Domain (FDTD) Method for Electromagnetics IGI Global

This book presents the selected peer-reviewed papers from the International Conference on Communication Systems and Networks (ComNet) 2019. Highlighting the latest findings, ideas, developments and applications in all areas of advanced communication systems and networking, it covers a variety of topics, including next-generation wireless technologies such as 5G, new hardware platforms, antenna design, applications of artificial intelligence (AI), signal processing and optimization techniques. Given its scope, this book can be useful for beginners, researchers and professionals working in wireless communication and networks, and other allied fields.

Advanced Electromagnetic Computation CRC Press

Provides an introduction to the Finite Difference Time Domain method and shows how Python code can be used to implement various simulations This book allows engineering students and practicing engineers to learn the finite-difference time-domain (FDTD) method and properly apply it toward their electromagnetic simulation projects. Each chapter contains a concise explanation of an essential concept and instruction on its implementation into computer code. Included projects increase in complexity, ranging from simulations in free space to propagation in dispersive media. This third edition utilizes the Python programming language, which is becoming the preferred computer language for the engineering and scientific community. Electromagnetic Simulation Using the FDTD Method with Python, Third Edition is written with the goal of enabling readers to learn the FDTD method in a manageable amount of time. Some basic applications of signal processing theory are explained to enhance the effectiveness of FDTD simulation. Topics covered in include one-dimensional simulation with the FDTD method, two-dimensional simulation, and three-dimensional simulation. The book also covers advanced Python features and deep regional hyperthermia treatment planning. Electromagnetic Simulation Using the FDTD Method with Python: Guides the reader from basic programs to complex, three-dimensional programs in a tutorial fashion Includes a rewritten fifth chapter that illustrates the most interesting applications in FDTD and the advanced graphics techniques of Python Covers peripheral topics pertinent to time-domain simulation, such as Z-transforms and the discrete Fourier transform Provides Python simulation programs on an accompanying website An ideal book for senior undergraduate engineering students studying FDTD, Electromagnetic Simulation Using the FDTD Method with Python will also benefit scientists and engineers interested in the subject.

Electromagnetic Simulation Using

the FDTD Method Springer Nature
Discover state-of-the-art time domain electromagnetic modeling and simulation algorithms Advances in Time-Domain Computational Electromagnetic Methods delivers a thorough exploration of recent developments in time domain computational methods for solving complex electromagnetic problems. The book discuses the main time domain computational electromagnetics techniques, including finite-difference time domain (FDTD), finite-element time domain (FETD), discontinuous Galerkin time domain (DGTD), time domain integral equation (TDIE), and other methods in electromagnetic, multiphysics modeling and simulation, and antenna designs. The book bridges the gap between academic research and real engineering applications by comprehensively surveying the full picture of current state-of-the-art time domain electromagnetic simulation techniques. Among other topics, it offers readers discussions of automatic load balancing schemes for DG DG-FETD/SETD methods and convolution quadrature time domain integral equation methods for electromagnetic scattering. Advances in Time-Domain Computational Electromagnetic Methods also includes: Introductions to cylindrical, spherical, and symplectic FDTD, as well as FDTD for metasurfaces with GSTC and FDTD for nonlinear metasurfaces Explorations of FETD for dispersive and nonlinear media and SETD-DDM for periodic/quasi-periodic arrays Discussions of TDIE, including explicit marching-on-in-time solvers for second-kind time domain integral equations, TD-SIE DDM, and convolution quadrature time domain integral equation methods for electromagnetic scattering Treatments of deep learning, including time domain electromagnetic forward and inverse modeling using a differentiable programming platform Ideal for undergraduate and graduate students studying the design and development of various kinds of communication systems, as well as professionals working in these fields, Advances in Time-Domain Computational Electromagnetic Methods is also an invaluable resource for those taking advanced graduate courses in computational electromagnetic methods and simulation techniques.
Computational Nanophotonics John Wiley & Sons
This hands-on introduction to silicon photonics engineering equips students with everything they need to begin creating foundry-ready designs.
Multiphysics Modeling Using COMSOL 5 and MATLAB Mercury Learning and Information
This forward-thinking book presents the finite-difference frequency-domain (FDFD) method. FDFD is the frequency-domain relative of the finite-difference time-domain (FDTD) method used for simulating electromagnetic and photonic devices. Special techniques in MATLAB(R) are presented that will allow readers to write their own FDFD programs, as well as review key concepts in electromagnetics. Guided modes in waveguides, photonic band diagrams, and isofrequency contours of periodic structures are explored. Readers learn how to simulate waves through diffraction gratings, beams through photonic crystals, and optical integrated circuits, as well as how to modify FDFD to easily perform parameter sweeps, such as plotting reflection and transmission through a device as a function of frequency. The book includes all of the required MATLAB

codes and a detailed explanation of the programs to explain how to simulate devices in the real world.

Digest CRC Press

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.

Advances in Communication Systems and Networks IET

This book is a self-contained, programming-oriented and learner-centered book on finite element method (FEM), with special emphasis given to developing MATLAB® programs for numerical modeling of electromagnetic boundary value problems. It provides a deep understanding and intuition of FEM programming by means of step-by-step MATLAB® programs with detailed descriptions, and eventually enabling the readers to modify, adapt and apply the provided programs and formulations to develop FEM codes for similar problems through various exercises. It starts with simple one-dimensional static and time-harmonic problems and extends the developed theory to more complex two- or three-dimensional problems. It supplies sufficient theoretical background on the topic, and it thoroughly covers all phases (pre-processing, main body and post-processing) in FEM. FEM formulations are obtained for boundary value problems governed by a partial differential equation that is expressed in terms of a generic unknown function, and then, these formulations are specialized to various electromagnetic applications together with a post-processing phase. Since the method is mostly described in a general context, readers from other disciplines can also use this book and easily adapt the provided codes to their engineering problems. After forming a solid background on the fundamentals of FEM by means of canonical problems, readers are guided to more advanced applications of FEM in electromagnetics

through a survey chapter at the end of the book. Offers a self-contained and easy-to-understand introduction to the theory and programming of finite element method. Covers various applications in the field of static and time-harmonic electromagnetics. Includes one-, two- and three-dimensional finite element codes in MATLAB®. Enables readers to develop finite element programming skills through various MATLAB® codes and exercises. Promotes self-directed learning skills and provides an effective instruction tool.

Pervasive Computing and the Networked World Cambridge University Press

Beginning with the development of finite difference equations, and leading to the complete FDTD algorithm, this is a coherent introduction to the FDTD method (the method of choice for modeling Maxwell's equations). It provides students and professional engineers with everything they need to know to begin writing FDTD simulations from scratch and to develop a thorough understanding of the inner workings of commercial FDTD software. Stability, numerical dispersion, sources and boundary conditions are all discussed in detail, as are dispersive and anisotropic materials. A comparative introduction of the finite volume and finite element methods is also provided. All concepts are introduced from first principles, so no prior modeling experience is required, and they are made easier to understand through numerous illustrative examples and the inclusion of both intuitive explanations and mathematical derivations.

Electromagnetic Modeling and Simulation BoD – Books on Demand

This reference offers tools for engineers, scientists, biologists, and others working with the computational techniques of nanophotonics. It introduces the key concepts of computational methods in a manner that is easily digestible for newcomers to the field. The book also examines future applications of nanophotonics in the technical industry and covers new developments and interdisciplinary research in engineering, science, and medicine. It provides an overview of the key computational nanophotonics and describes the technologies with an emphasis on how they work and their key benefits.

Perfectly Matched Layer (PML) for Computational Electromagnetics CRC Press

This extensively revised and expanded third edition of the Artech House bestseller, Computational Electrodynamics: The Finite-Difference Time-Domain Method, offers you the most up-to-date and definitive resource on this critical method for solving Maxwell's equations. There has been considerable advancement in FDTD computational technology over the past few years, and this new edition brings you the very latest details with four new invited chapters on advanced techniques for PSTD, unconditional stability, provably stable FDTD-FETD hybrids, and hardware acceleration. Moreover, you find many completely new sections throughout the book, including major updates on convolutional PML ABCs; dispersive, nonlinear, classical-gain, and quantum-gain materials; and micro-, nano-, and bio- photonics.

Electromagnetic and Photonic Simulation for the Beginner Artech House Antennas and Prop

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.