Matlab Code Rcwa

Grating-assisted Glass Waveguide Devices and Fiber-optic Parametric Amplifiers for Optical Communication Systems
Introduction to the Finite-difference Time-domain (FDTD) Method for Electromagnetics
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The Transfer-Matrix Method in Electromagnetics and Optics

Fast Algorithms for the Digital Computation of Linear Canonical Transforms
Precision Dimensional Measurements

TAYLOR JOHNS

Grating-assisted Glass Waveguide Devices and Fiber-optic Parametric Amplifiers for Optical Communication Systems
John Wiley & Sons
The transfer-matrix method (TMM) in electromagnetics and optics is a powerful and convenient mathematical formalism for determining the planewave reflection and transmission characteristics of an infinitely extended slab of a linear material. While the TMM was introduced for a homogeneous uniaxial dielectric-magnetic material in the 1960s, and subsequently extended for multilayered slabs, it has more recently been developed for the most general linear materials, namely bianisotropic materials. By means of the rigorous coupled-wave approach, slabs that are periodically nonhomogeneous in the thickness direction can also be accommodated by the TMM. In this book an overview of the TMM is presented for the most general contexts as well as for some for illustrative simple cases. Key theoretical results are given; for derivations, the reader is referred to the references at the end of each chapter. Albums of numerical results are also provided, and the computer code used to generate these results are provided in an appendix.
Introduction to the Finite-difference Time-domain (FDTD) Method for Electromagnetics Springer
Structural colorations originate from self-organized microstructures, which interact with light in a complex way to produce brilliant colors seen everywhere in nature. Research in this field is extremely new and has been rapidly growing in the last 10 years, because the elaborate structures created in nature can now be fabricated through various types of nanotechnologies. Indeed, a fundamental book covering this field from biological, physical, and engineering viewpoints has long been expected.Coloring in nature comes mostly from inherent colors of materials, though it sometimes has a purely physical origin such as diffraction or interference of light. The latter, called structural color or iridescence, has long been a problem of scientific interest. Recently, structural colors have attracted great interest because various photonic architectures, now developing in modern technologies, have been spontaneously created in the self-organization process and have been extensively used as one of the important visual functions. In this book, the fundamental optical properties underlying structural colors are explained, and these mysteries of nature are surveyed from the viewpoint of biological diversity and according to their sophisticated structures. The book proposes a general principle of structural colors based on the structural hierarchy and presents up-to-date applications.
Optics Letters World Scientific
A straightforward, easy-to-read introduction to the finite-difference time-domain (FDTD) method Finite-difference time-domain (FDTD) is one of the primary computational electrodynamics modeling techniques available. Since it is a time-domain method, FDTD solutions can cover a wide frequency range with a single simulation run and treat nonlinear material properties in a natural way. Written in a tutorial fashion, starting with the simplest programs and guiding the reader up from one-dimensional to the more complex, three-dimensional programs, this book provides a simple, yet comprehensive introduction to the most widely used method for electromagnetic simulation. This fully updated edition presents many new applications, including the FDTD method being used in the design and analysis of highly resonant radio frequency (RF) coils often used for MRI. Each chapter contains a concise explanation of an essential concept and instruction on its implementation into computer code. Projects that increase in complexity are included, ranging from simulations in free space to propagation in dispersive media. Additionally, the text offers downloadable MATLAB and C programming languages from the book support site (http://booksupport.wiley.com). Simple to read and classroom-tested, Electromagnetic Simulation Using the FDTD Method is a useful reference for practicing engineers as well as undergraduate and graduate engineering students.
Gratings: Theory and Numeric Applications Springer Science & Business Media
This text examines the technology behind the plethora of modern industrial and domestic technologies which incorporate micro-optics eg. CDs, cameras, automated manufacturing systems, mobile communications etc. It includes a simple but comprehensive introduction to micro-optical developments design, and an overview of fabrication and replication technology. The theoretical, practical and industrial developments in micro-scale optoelectronics continue apace in the late 1990s. In this book, a distinguished group of physicists and engineers describe the current state of research and applications in micro-optics. It provides the theoretical background and an overview of current technology, with several chapters taking a deeper look at specific recent applications and future trends. The book concentrates on diffractive and refractive micro- optical elements, such as lenses, fan-out gratings, optimized phase elements and polarisers. Sections are included on the simulation and optimization of design for micro-optics and subsequently the efficient transformation from design to real optical elements, using techniques such as e-beam writing, laser beam writing, lithography, etching and thin film deposition.
Elementary science -5 American Institute of Physics
This book provides a cutting-edge research overview on the latest developments in the field of Optics and Photonics. All chapters are authored by the pioneers in their field and will cover the developments in Quantum Photonics, Optical properties of 2D Materials, Optical Sensors, Organic Opto-electronics, Nanophotonics, Metamaterials, Plasmonics, Quantum Cascade lasers, LEDs, Biophotonics and biomedical photonics and spectroscopy.
Physics, Theory, and Applications of Periodic Structures in Optics MDPI
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

Metrology, Inspection, and Process Control for Microlithography XVIII MDPI

A comprehensive presentation of the theory and simulation of optical waveguides and wave propagations in a guided environment, Guided Wave Photonics: Fundamentals and Applications with MATLAB supplies fundamental and advanced understanding of integrated optical devices that are currently employed in modern optical fiber communications systems and p

Guided Wave Photonics Springer Nature

This collection represents successful invited submissions from the papers presented at the 8th Annual Conference of Energy Economics and Management held in Beijing, China, 22–24 September 2017. With over 500 participants, the conference was co-hosted by the Management Science Department of National Natural Science Foundation of China, the Chinese Society of Energy Economics and Management, and Renmin University of China on the subject area of “Energy Transition of China: Opportunities and Challenges”. The major strategies to transform the energy system of China to a sustainable model include energy/economic structure adjustment, resource conservation, and technology innovation. Accordingly, the conference and its associated publications encourage research to address the major issues faced in supporting the energy transition of China. Papers published in this collection cover the broad spectrum of energy economics issues, including building energy efficiency, industrial energy demand, public policies to promote new energy technologies, power system control technology, emission reduction policies in energy-intensive industries, emission measurements of cities, energy price movement, and the impact of new energy vehicle.

The Generalized Multipole Technique for Light Scattering CRC Press

This book includes high-quality research papers presented at the Fourth International Conference on Innovative Computing and Communication (ICICC 2021), which is held at the Shaheed Sukhdev College of Business Studies, University of Delhi, Delhi, India, on February 20–21, 2021. Introducing the innovative works of scientists, professors, research scholars, students and industrial experts in the field of computing and communication, the book promotes the transformation of fundamental research into institutional and industrialized research and the conversion of applied exploration into real-time applications.

Structural Colors in the Realm of Nature Wiley-Interscience

Although it is straightforward to determine the relationship between the in-focus image and the object of a simple optical system such as a lens, it is far more challenging to compute the input/output relationships of general first-order and astigmatic optical systems. Such optical systems are known as quadratic-phase systems (QPS) and they include the Fresnel propagation in free space, propagation in graded-index media, passage through thin lenses, and arbitrary concatenations of any number of these, including anamorphic, astigmatic, nonorthogonal elements. Such computation is accomplished by representing the physical system with a general mathematical framework of integrations against kernels and then distilling the entire system into one input-output relationship that can be represented by a linear integral transform. The underlying mathematical integral transforms can be applied to a wider field of signal processing where they are known as the linear canonical transform (LCT) of a signal. Conventional numerical integration methods have a computational complexity of O(N^2) where N is the space-bandwidth product of the sampling scheme, e.g. the number of pixels in the field for an optical system. The algorithms described here yield a complexity of only O(Nlog N). The key is the use of different decompositions (or factorizations) of a given input/output relationship into simpler ones. Instead of following the general physical subparts in cascaded systems and computing input-output relations separately, these algorithms use the simplest possible decompositions to represent the entire system in terms of least possible number of steps. The algorithms are Fast Fourier Transform (FFT) based methods and the only essential deviation from exactness arises from approximating a continuous Fourier transform (FT) with the discrete Fourier transform (DFT). Thus the algorithms work with a performance similar to that of the fast Fourier transform algorithm in computing the Fourier transform, both in terms of speed and accuracy. Unlike conventional techniques these algorithms also track and control the space-bandwidth products, in order to achieve information that is theoretically sufficient but not wastefully redundant.

The New Physical Optics Notebook Cambridge University Press

Approaches the topic of physical optics with examples drawn from the physical processes described. Includes chapters on Fourier transforms, image formation, optical coherence, diffraction, interference, holography, interferometry, analog optical computing, synthetic aperture imaging, and others. Contains more than 600 photographs and line drawings and more than 650 references.

Topology Optimization Springer Science & Business Media

Annotation Tiny structures measurable on the nanometer scale (one-billionth of a meter) are known as nanostructures, and nanotechnology is the emerging application of these nanostructures into useful nanoscale devices. As we enter the 21st century, more and more professional are using nanotechnology to create semiconductors for a variety of applications, including communications, information technology, medical, and transportation devices. Written by today's best researchers of semiconductor nanostructures, this cutting-edge resource provides a snapshot of this exciting and fast-changing field. The book covers the latest advances in nanotechnology and discusses the applications of nanostructures to optoelectronics, photonics, and electronics.

Foundations of Optical System Analysis and Design CRC Press

This book presents the Generalized Multipole Technique as a fast and powerful theoretical and computation tool to simulate light scattering by nonspherical particles. It also demonstrates the considerable potential of the method. In recent years, the concept has been applied in new fields, such as simulation of electron energy loss spectroscopy and has been used to extend other methods, like the null-field method, making it more widely applicable. The authors discuss particular implementations of the GMT methods, such as the Discrete Sources Method (DSM), Multiple Multipole Program (MMP), the Method of Auxiliary Sources (MAS), the Filamentary Current Method (FCM), the Method of Fictitious Sources (MFS) and the Null-Field Method with Discrete Sources (NFM-DS). The Generalized Multipole Technique is a surface-based method to find the solution of a boundary-value problem for a given differential equation by expanding the fields in terms of fundamental or other singular solutions of this equation. The amplitudes of these fundamental solutions are determined from the boundary condition at the particle surface. Electromagnetic and light scattering by particles or systems of particles has been the subject of intense research in various scientific and engineering fields, including astronomy, optics, meteorology, remote sensing, optical particle sizing and electromagnetics, which has led to the development of a large number of modelling methods based on the Generalized Multipole Technique for quantitative evaluation of electromagnetic scattering by particles of various shapes and compositions. The book describes these methods in detail.

Numerical Methods for Metamaterial Design Springer Science & Business Media

Describes how laser radiation propagates in natural and artificial materials and how the state of radiation can be controlled and manipulated (phase intensity, polarization) by various means. New concepts and useful techniques are described in the problems. Includes many figures, tables, and examples.

Non-Equilibrium Reacting Gas Flows Springer Science & Business Media

This book is a printed edition of the Special Issue "ZnO and TiO_2 Based Nanostructures" that was published in Nanomaterials

Advances in Sensors: Reviews, Vol. 3 Springer

This book describes the physics behind the optical properties of plasmonic nanostructures focusing on chiral aspects. It explains in detail how the geometry determines chiral near-fields and how to tailor their shape and strength. Electromagnetic fields with strong optical chirality interact strongly with chiral molecules and, therefore, can be used for enhancing the sensitivity of chiroptical spectroscopy techniques. Besides a short review of the latest results in the field of plasmonically enhanced enantiomer discrimination, this book introduces the concept of chiral plasmonic near-field sources for enhanced chiroptical spectroscopy. The discussion of the fundamental properties of these light sources provides the theoretical basis for further optimizations and is of interest for researchers at the intersection of nano-optics, plasmonics and stereochemistry.

Applied Digital Optics Lulu.com

Electromagnetic (EM) wave scattering is of fundamental importance to antenna and radar design engineering, and the increasing interest in metamaterials has created a need for new approaches to solving scattering problems for characterizing engineered media. This book lays the theoretical foundation for new computer programs in computational electromagnetics (CEM) and meets the need of today s researchers. This book represents over 30 years of the author s experience teaching this topic, with extensive lectures notes expanded to include advanced concepts and mathematical solutions to cover moderneffects on metamaterials and related advanced complexities.Problems and solutions at the end of each chapter help to reinforce concepts and highlight applications. This is an ideal text for advanced graduate students and researchers in EM and applied physics."

Nano/Microscale Heat Transfer World Scientific

Remote sensing is a fast-growing field with many important applications as demonstrated in the numerous scientific missions of the Earth Observation System (EOS) worldwide. Given the inter-disciplinary nature of remote sensing technologies, the fulfillment of these scientific goals calls for, among other things, a fundamental understanding of the complex interaction between electromagnetic waves and the targets of interest.Using a systematic treatment, Electromagnetic Scattering: A Remote Sensing Perspective presents some of the recently advanced methods in electromagnetic scattering, as well as updates on the current progress on several important aspects of such an interaction. The book covers topics including scattering from random rough surfaces of both terranean and oceanic natures, scattering from typical man-made targets or important canonical constituents of natural scenes, such as a dielectric finite cylinder or dielectric thin disk, the characterization of a natural scene as a whole represented as a random medium, and the extraction of target features with a polarimetric radar.

Moment Tensor Solutions Springer Science & Business Media

Since the incorporation of scientific approach in tackling problems of optical instrumentation, analysis and design of optical systems constitute a core area of optical engineering. A large number of software with varying level of scope and applicability is currently available to facilitate the task. However, possession of an optical design software, per se, is no guarantee for arriving at correct or optimal solutions. The validity and/or optimality of the solutions depend to a large extent on proper formulation of the problem, which calls for correct application of principles and theories of optical engineering. On a different note, development of proper experimental setups for investigations in the burgeoning field of optics and photonics calls for a good understanding of these principles and theories. With this backdrop in view, this book presents a holistic treatment of topics like paraxial analysis, aberration theory, Hamiltonian optics, ray-optical and wave-optical theories of image formation, Fourier optics, structural design, lens design optimization, global optimization etc. Proper stress is given on exposition of the foundations. The proposed book is designed to provide adequate material for ‘self-learning’ the subject. For practitioners in related fields, this book is a handy reference. Foundations of Optical System Analysis and Synthesis provides A holistic approach to lens system analysis and design with stress on foundations Basic knowledge of ray and wave optics for tackling problems of instrumental optics Proper explanation of approximations made at different stages Sufficient illustrations for facilitation of understanding Techniques for reducing the role of heuristics and empiricism in optical/lens design A sourcebook on chronological development of related topics across the globe This book is composed as a reference book for graduate students, researchers, faculty, scientists and technologists in R & D centres and industry, in pursuance of their understanding of related topics and concepts during problem solving in the broad areas of optical, electro-optical and photonic system analysis and design.

International Conference on Innovative Computing and

Communications John Wiley & Sons
The Fifth International Conference on Automatic Differentiation held from August 11 to 15, 2008 in Bonn, Germany, is the most recent one in a series that began in Breckenridge, USA, in 1991 and continued in Santa Fe, USA, in 1996, Nice, France, in 2000 and Chicago, USA, in 2004. The 31 papers included in these proceedings re?ect the state of the art in automatic differentiation (AD) with respect to theory, applications, and tool development. Overall, 53 authors from institutions in 9 countries contributed, demonstrating the worldwide acceptance of AD technology in computational science. Recently it was shown that the problem underlying AD is indeed NP-hard, f- mally proving the inherently challenging nature of this technology. So, most likely, no deterministic “silver bullet” polynomial algorithm can be devised that delivers optimum performance for general codes. In this context, the exploitation of doma- speci?c structural information is a driving issue in advancing practical AD tool and algorithm development. This trend is prominently re?ected in many of the pub- cations in this volume, not only in a better understanding of the interplay of AD and certain mathematical paradigms, but in particular in the use of hierarchical AD approaches that judiciously employ general AD techniques in application-speci?c - gorithmic harnesses. In this context, the understanding of structures such as sparsity of derivatives, or generalizations of this concept like scarcity, plays a critical role, in particular for higher derivative computations.