

ALLEN TAFLOVE • SUSAN C. HAGNESS



# computational electrodynamics

THE FINITE-DIFFERENCE TIME-DOMAIN METHOD

THIRD EDITION

# Computational Electrodynamics The Finite Difference Time Domain Method Third Edition

**Ensheng Dong**



### **Computational Electrodynamics The Finite Difference Time Domain Method Third Edition:**

**Computational Electrodynamics** Allen Taflove,1995 This work represents a university text and professional research reference on the finite difference time domain computational solution method for Maxwell s equations Sections cover numerical stability numerical dispersion and dispersive nonlinear and gain methods of FD TD and antenna analysis

**Advances in Computational Electrodynamics** Allen Taflove,1998 Finite Difference Time Domain FD TD modeling is arguably the most popular and powerful means available to perform detailed electromagnetic engineering analyses Edited by the pioneer and foremost authority on the subject here is the first book to assemble in one resource the latest techniques and results of the leading theoreticians and practitioners of FD TD computational electromagnetics modeling **Time Domain**

**Methods in Electrodynamics** Peter Russer,Uwe Siart,2008-09-26 This book consists of contributions given in honor of Wolfgang J R Hoefer Space and time discretizing time domain methods for electromagnetic full wave simulation have emerged as key numerical methods in computational electromagnetics Time domain methods are versatile and can be applied to the solution of a wide range of electromagnetic field problems Computing the response of an electromagnetic structure to an impulsive excitation localized in space and time provides a comprehensive characterization of the electromagnetic properties of the structure in a wide frequency range The most important methods are the Finite Difference Time Domain FDTD and the Transmission Line Matrix TLM methods The contributions represent the state of the art in dealing with time domain methods in modern engineering electrodynamics for electromagnetic modeling in general the Transmission Line Matrix TLM method the application of network concepts to electromagnetic field modeling circuit and system applications and finally with broadband devices systems and measurement techniques Computational

Electrodynamics Allen Taflove,Susan C. Hagness,2005 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

**Photovoltaic Modeling Handbook** Monika Freunek Muller,2018-09-05 This book provides the reader with a solid understanding of the fundamental modeling of photovoltaic devices After the material independent limit of photovoltaic conversion the readers are introduced to the most well known theory of classical silicon modeling Based on this for each of the most important PV materials their performance under different conditions is modeled This book also covers different modeling approaches from very fundamental theoretic investigations to applied numeric simulations based on experimental

values The book concludes with a chapter on the influence of spectral variations The information is supported by providing the names of simulation software and basic literature to the field The information in the book gives the user specific application with a solid background in hand to judge which materials could be appropriate as well as realistic expectations of the performance the devices could achieve

**Silicon Photonics Design** Lukas Chrostowski, Michael Hochberg, 2015-03-12 From design and simulation through to testing and fabrication this hands on introduction to silicon photonics engineering equips students with everything they need to begin creating foundry ready designs In depth discussion of real world issues and fabrication challenges ensures that students are fully equipped for careers in industry Step by step tutorials straightforward examples and illustrative source code fragments guide students through every aspect of the design process providing a practical framework for developing and refining key skills Offering industry ready expertise the text supports existing PDKs for CMOS UV lithography foundry services OpSIS ePIXfab imec LETI IME and CMC and the development of new kits for proprietary processes and clean room based research Accompanied by additional online resources to support students this is the perfect learning package for senior undergraduate and graduate students studying silicon photonics design and academic and industrial researchers involved in the development and manufacture of new silicon photonics systems

**Multiband Integrated Antennas for 4G Terminals** David A. Sánchez-Hernández, 2008 The book serves as a comprehensive one stop resource including in depth coverage of multiband integrated antenna design simulation testing and manufacturing This practical book helps you solve integration problems for ever increasing multiband requirements You find discussions on important considerations regarding future handset MIMO terminals such as efficiency and the effect of the user The book also shows you how to avoid tweaking for fractal multiband designs and printed dipole design

[Mechanisms for enhancing the optical transmission through a single subwavelength hole](#) Sol Carretero Palacios, 2012

[Handbook of Antennas in Wireless Communications](#) Lal Chand Godara, 2018-10-03 The move toward worldwide wireless communications continues at a remarkable pace and the antenna element of the technology is crucial to its success With contributions from more than 30 international experts the Handbook of Antennas in Wireless Communications brings together all of the latest research and results to provide engineering professionals and students with a one stop reference on the theory technologies and applications for indoor hand held mobile and satellite systems Beginning with an introduction to wireless communications systems it offers an in depth treatment of propagation prediction and fading channels It then explores antenna technology with discussion of antenna design methods and the various antennas in current use or development for base stations hand held devices satellite communications and shaping beams The discussions then move to smart antennas and phased array technology including details on array theory and beamforming techniques Space diversity direction of arrival estimation source tracking and blind source separation methods are addressed as are the implementation of smart antennas and the results of field trials of systems using smart antennas implemented Finally the hot media topic of the safety

of mobile phones receives due attention including details of how the human body interacts with the electromagnetic fields of these devices Its logical development and extensive range of diagrams figures and photographs make this handbook easy to follow and provide a clear understanding of design techniques and the performance of finished products Its unique comprehensive coverage written by top experts in their fields promises to make the Handbook of Antennas in Wireless Communications the standard reference for the field

A Novel High Order Time Domain Vector Finite Element Method for the Simulation of Electromagnetic Devices Robert N. Rieben,2004

*Transport and Optical Properties of Nanomaterials* Mahi R. Singh,Robert H. Lipson,2009-07-08 The conference was a forum to discuss recent developments in the growth and characterization of nano structured materials the synthesis of novel materials and their incorporation into devices with optical and electronic properties determined by nanoscale features and the theoretical modeling of electronic optical magnetic and thermal properties of such systems

*Materials Transactions* ,2009 *ESAIM.* ,2008 □□□□ ,2008

*Chemical journal of Chinese universities* ,2008

**Electrical Overstress/Electrostatic Discharge Symposium Proceedings** ,1995

The Finite Element Method in Electromagnetics Jian-Ming Jin,2015-02-18 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

**A Three Dimensional Finite Difference Time Domain Sub-Gridding Method** Kevin Quy Tanh Luong,2019 The finite difference time domain method has long been one of the most widely used numerical methods for solving Maxwell s equations due in part to its accuracy explicit nature and simplicity of implementation Modern research interests have created a need for this method to be extended to handle multi

scale multi physics problems where numerous physical phenomena are coupled with classical electrodynamics. These phenomena typically occur on vastly different spatial scales; however, the conventional finite difference time domain method requires a uniform spatial discretization across the entire simulation space. Additionally, the maximum time evolution that may be solved in a single iteration of the algorithm is proportional to the smallest discretization length. Consequently, properly resolving the smallest feature of a multiscale problem causes phenomena of a larger scale to be over resolved, resulting in an unnecessarily large amount of memory and often an impractical number of computations required for simulation. The development of a capability for sub gridding where local domains of fine resolution may be incorporated into a simulation space of coarser resolution is imperative to treat this issue. This thesis proposes a new algorithm to implement sub gridding. The results of comprehensive numerical evaluations show promise for this algorithm to be of general use in solving multi scale multi physics problems.

Time Domain Finite Difference Computation for Maxwell's Equations Jiayuan Fang, 1989 *Development of a Time Domain Hybrid Finite Difference/finite Element Method for Solutions to Maxwell's Equations in Anisotropic Media* Christopher W. Kung, 2009 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.

The book delves into Computational Electrodynamics The Finite Difference Time Domain Method Third Edition. Computational Electrodynamics The Finite Difference Time Domain Method Third Edition is a vital topic that needs to be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Computational Electrodynamics The Finite Difference Time Domain Method Third Edition, encompassing both the fundamentals and more intricate discussions.

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  - Chapter 3: Computational Electrodynamics The Finite Difference Time Domain Method Third Edition in Everyday Life
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  - Chapter 5: Conclusion
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This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Computational Electrodynamics The Finite Difference Time Domain Method Third Edition.

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