Time Domain Finite Element Methods For Maxwells Equations In Metamaterials Springer Series In Computational Mathematics

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Time Domain Finite Element Methods
In finite-difference time-domain method, "Yee lattice" is used to discretize Maxwell's equations in space. This scheme involves the placement of electric and magnetic fields on a staggered grid. Finite-difference time-domain (FDTD) or Yee's method (named after the Chinese American applied mathematician Kane S. Yee, born 1934) is a numerical analysis technique used for modeling computational electrodynamics (finding approximate solutions to the associated system of differential equations).

Finite-difference time-domain method - Wikipedia
The Finite Element Time Domain Method The finite-element time-domain (FETD or TDFEM) method combines the advantages of a time-domain technique with the versatile spatial discretization options of the finite element method. A variety of FETD methods have been proposed. These schemes generally fall into two categories.

The Finite Element Time Domain Method - Clemson CECAS
The purpose of this book is to provide an up-to-date introduction to the time-domain finite element methods for Maxwell's equations involving metamaterials. Since the first successful construction of a metamaterial with both negative permittivity and permeability in 2000, the study of metamaterials has attracted significant attention from researchers across many disciplines.

Time-Domain Finite Element Methods for Maxwell's Equations ...
In this paper, various time-domain finite-element methods for the simulation of transient electromagnetic wave phenomena are discussed. Detailed descriptions of test/trial spaces, explicit and...

(PDF) Time-domain finite-element methods - ResearchGate
Abstract: In this paper, time-domain finite element methods for the full system of Maxwell's equations with cubic nonlinearities in 3D are presented, including a selection of computational experiments. The new capabilities of these methods are to efficiently model linear and nonlinear effects of the electrical polarization.

Energy-Stable Time-Domain Finite Element Methods for the ...

In this paper, we proposed a time-domain finite element method for modeling wave propagation in graphene materials. The stability of the proposed method is investigated, and numerical results are presented to demonstrate the effectiveness of the proposed graphene model in simulating the propagation of SPPs along graphene.

Time-domain finite element method and analysis for ...

This research develops a dynamic viscoelastic model, a Galerkin based time-domain finite element method, and computer program for simulating layered half-space responses under loading pulses. A combined Houbolt, central finite-difference (FD) and forward FD method is proposed for time discretization of acceleration and velocity to reduce time-step lengths.

A time-domain finite element method for dynamic ...

General form of the finite element method. One chooses a grid for Ω. {\displaystyle \Omega } . In the preceding treatment, the grid consisted of triangles, but one can also use squares or ... Then, one chooses basis functions. In our discussion, we used piecewise linear basis functions, but it is ...

Finite element method - Wikipedia

In time-domain finite-element methods (TDFEMs), a number of unconditionally stable schemes have been developed to remove the dependence of the time step on the space step.

Explicit and Unconditionally Stable Time-Domain Finite ...

The time-domain transient method in structural finite element analysis Transient structural analysis (also known as dynamic analysis) is a method used to determine the dynamic response of a structure over time.

The time-domain transient method in structural finite ...

(2020) Time-domain finite element method and analysis for modeling of surface plasmon polaritons. Computer Methods in Applied Mechanics and Engineering 372, 113349. (2020) Finite Element Analysis of the Uncertainty of Physical Response of Acoustic Metamaterials with Interval Parameters.

Modeling Backward Wave Propagation in Metamaterials by the ...

Lee, Woochan Ph.D., Purdue University, December 2016. Fast Time- and Frequency-Domain Finite-Element Methods for Electromagnetic Analysis. Major Professor: Dan Jiao. Fast electromagnetic analysis in time and frequency domain is of critical im-portance to the design of integrated circuits (IC) and other advanced engineering products and systems.

Fast time- and frequency-domain finite-element methods for ...

An iterative finite element time-domain (FETD) method has been developed for simulating transient electromagnetic fields in 3-D diffusive earth media and has been verified through comparisons with analytic and finite-difference time-domain solutions.

iterative finite element time-domain method for simulating ...

The time domain methods include the FDTD, the time domain integral equations, or the singularity expansion methods (SEM), the time domain FEM. On the other hand, the frequency domain methods include the Method of Moments (MoM) for solving the integral equations and the Finite Element Method (FEM), for example.

Finite Difference Time Domain simulation program ...

Overview. The purpose of this book is to provide an up-to-date introduction to the time-domain finite element methods for Maxwell's equations involving metamaterials. Since the first successful construction of a metamaterial with both negative permittivity and permeability in 2000, the study of metamaterials has attracted significant attention from researchers across many disciplines.

Time-Domain Finite Element Methods for Maxwell's Equations ...

An Introduction to the Finite Element Method. The description of the laws of physics for space- and time-dependent problems are usually expressed in terms of partial differential equations (PDEs). For the vast majority of geometries and problems, these PDEs cannot be solved with analytical methods.

Detailed Explanation of the Finite Element Method (FEM)

Abstract— A time-domain, finite element–boundary integral (FE–BI) method is presented for analyzing electromagnetic (EM) scattering from two-dimensional (2-D) inhomogeneous objects.

A fast time-domain finite element~boundary integral method ...

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