

Computational Electromagnetics (Texts in Applied Mathematics)

By Anders Bondeson, Thomas Rylander, Pär Ingelström

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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

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Editorial Review

Review

From the reviews:

"This book is an introductory textbook on computational electromagnetics. It was developed for an undergraduate level class for engineering students at Chalmers University of Technology, G"{o}teborg, Sweden. It is volume number 51 in the series Texts in Applied Mathematics, which encourages the teaching of new courses. The prerequisites are basic electromagnetic field theory, numerical analysis, and computer programming. The book begins with a brief introduction to Maxwell's equations of electromagnetism. This is followed by a brief chapter on numerical error, resolution, convergence, and extrapolation. Next, finite difference approximations of partial differential equations are presented. Some electromagnetic eigenvalue problems are discussed in the following chapter. With this foundation, the authors devote most of the rest of the book to three widely used methods in computational electromagnetics: the finite-difference time-domain method, the finite element method, and the method of moments. The final chapter contains a brief description of some of the other approaches to CEM and discusses some of the strengths and weaknesses of the various methods. Fifteen numerical algorithms that are presented in the book are implemented as MATLAB programs that may be downloaded from the authors' website. Chapter sections generally end with some review questions, while chapters generally end with a summary, and some problems and computer projects." (Philip Huddleston, Mathematical Reviews)

"The authors focus on the solution of Maxwell’s equations by means of the Finite Difference Method (FDM), and the Method of Moments (MoM). … In order to help the reader to check his knowledge and to understand the theory each of the Chapters … contains the parts Review Questions, Summary, Problems, and Computer Projects, the last with implementation tasks. The well-written monograph is devoted to students at the undergraduate level, but is also useful for practising engineers." (Georg Hebermehl, Zentralblatt MATH, Vol. 1111 (8), 2007)

"This book was conceived as a text in computational electromagnetics (CEM), and its intended audience includes senior undergraduate and graduate students. The material is closely related to the course that Professor Anders Bondeson taught at Chalmers University in Sweden … . Review questions, problems, and computer projects at the end of each chapter are helpful, and the MATLAB code included in the text is definitely a plus." (Igor Tsukerman, SIAM Review, Vol. 49 (1), 2007)

From the Back Cover

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.

The intended audience of this text consists of undergraduate and beginning graduate students with basic knowledge of electromagnetic field theory, numerical analysis, and MATLAB-programming.

Users Review

From reader reviews:

John Long:

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