1. Record Nr. UNINA9910143416203321

Autore	Zhu Yu <1973->
Titolo	Multigrid finite element methods for electromagnetic field modeling / / Yu Zhu, Andreas C. Cangellaris
Pubbl/distr/stampa	Hoboken, New Jersey : , : Wiley-IEEE, , c2006 [Piscataqay, New Jersey] : , : IEEE Xplore, , [2006]
ISBN	1-280-34978-6 9786610349784 0-470-36254-5 0-471-78638-1 0-471-78637-3
Descrizione fisica	1 online resource (438 p.)
Collana	IEEE Press series on electromagnetic wave theory ; ; 28
Altri autori (Persone)	CangellarisAndreas C
Disciplina	530.141 621.38132
Soggetti	Electromagnetic fields - Mathematical models Multigrid methods (Numerical analysis)
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	List of Figures. -- List of Tables. -- Preface. -- Acknowledgments. -- 1. Introduction. -- 2. Hierarchical Basis Functions for Triangles and Tetrahedra. -- 3. Finite Element Formulations of Electromagnetic BVPs. -- 4. Iterative Methods, Preconditioners, and Multigrid. -- 5. Nested Multigrid Preconditioner. -- 6. Nested Multigrid Vector and Scaler Potential Preconditioner. -- 7. Hierarchical Multilevel and Hybrid Potential Preconditioners. -- 8. Krylov-Subspace Based Eigenvalue Analysis. -- 9. Two-Dimensional Eigenvalue Analysis of Waveguides. -- 10. Three-Dimensional Eigenvalue Analysis of Resonators. -- 11. Model Order Reduction of Electromagnetic Systems. -- 12. Finite Element Analysis of Periodic Structures. -- Appendix A: Identities and Theorems from Vector Calculus. -- Index.
Sommario/riassunto	This is the first comprehensive monograph that features state-of-the-art multigrid methods for enhancing the modeling versatility, numerical robustness, and computational efficiency of one of the most popular classes of numerical electromagnetic field modeling methods: the

method of finite elements. The focus of the publication is the development of robust preconditioners for the iterative solution of electromagnetic field boundary value problems (BVPs) discretized by means of finite methods. Specifically, the authors set forth their own successful attempts to utilize concepts from multigrid and multilevel methods for the effective preconditioning of matrices resulting from the approximation of electromagnetic BVPs using finite methods. Following the authors' careful explanations and step-by-step instruction, readers can duplicate the authors' results and take advantage of today's state-of-the-art multigrid/multilevel preconditioners for finite element-based iterative electromagnetic field solvers. Among the highlights of coverage are: * Application of multigrid, multilevel, and hybrid multigrid/multilevel preconditioners to electromagnetic scattering and radiation problems * Broadband, robust numerical modeling of passive microwave components and circuits * Robust, finite element-based modal analysis of electromagnetic waveguides and cavities * Application of Krylov subspace-based methodologies for reduced-order macromodeling of electromagnetic devices and systems * Finite element modeling of electromagnetic waves in periodic structures The authors provide more than thirty detailed algorithms alongside pseudo-codes to assist readers with practical computer implementation. In addition, each chapter includes an applications section with helpful numerical examples that validate the authors' methodologies and demonstrate their computational efficiency and robustness. This groundbreaking book, with its coverage of an exciting new enabling computer-aided design technology, is an essential reference for computer programmers, designers, and engineers, as well as graduate students in engineering and applied physics.