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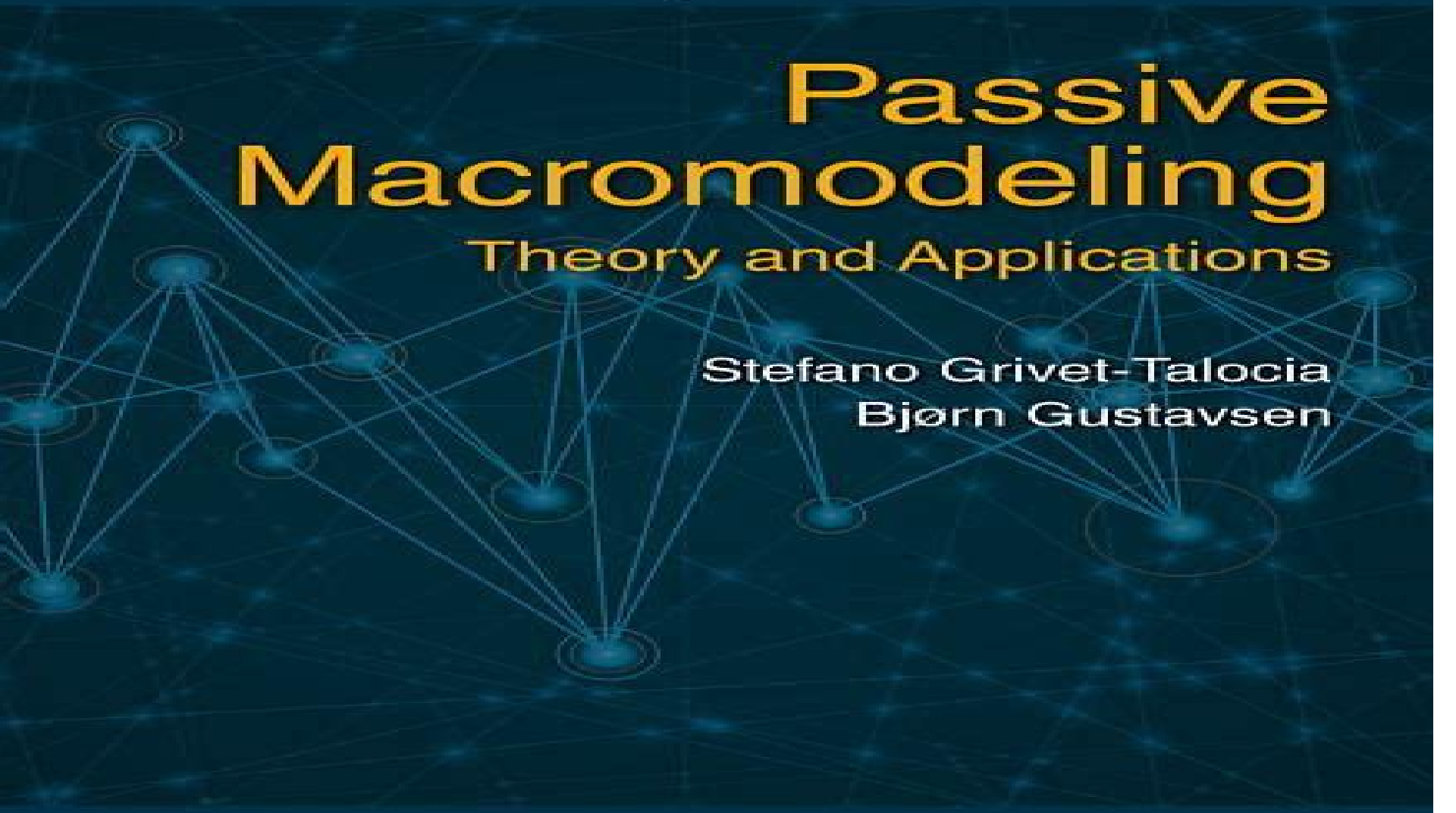

Passive Macromodeling

Theory and Applications

Stefano Grivet-Talocia
Bjørn Gustavsen

WILEY

Passive Macromodeling Applications Microwave Engineering

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Passive Macromodeling Applications Microwave Engineering:

Passive Macromodeling Stefano Grivet-Talocia,Bjorn Gustavsen,2015-10-19 Offers an overview of state of the art passive macromodeling techniques with an emphasis on black box approaches This book offers coverage of developments in linear macromodeling with a focus on effective proven methods After starting with a definition of the fundamental properties that must characterize models of physical systems the authors discuss several prominent passive macromodeling algorithms for lumped and distributed systems and compare them under accuracy efficiency and robustness standpoints The book includes chapters with standard background material such as linear time invariant circuits and systems basic discretization of field equations state space systems as well as appendices collecting basic facts from linear algebra optimization templates and signals and transforms The text also covers more technical and advanced topics intended for the specialist which may be skipped at first reading Provides coverage of black box passive macromodeling an approach developed by the authors Elaborates on main concepts and results in a mathematically precise way using easy to understand language Illustrates macromodeling concepts through dedicated examples Includes a comprehensive set of end of chapter problems and exercises Passive Macromodeling Theory and Applications serves as a reference for senior or graduate level courses in electrical engineering programs and to engineers in the fields of numerical modeling simulation design and optimization of electrical electronic systems Stefano Grivet Talocia PhD is an Associate Professor of Circuit Theory at the Politecnico di Torino in Turin Italy and President of IdemWorks Dr Grivet Talocia is author of over 150 technical papers published in international journals and conference proceedings He invented several algorithms in the area of passive macromodeling making them available through IdemWorks Bj rn Gustavsen PhD is a Chief Research Scientist in Energy Systems at SINTEF Energy Research in Trondheim Norway More than ten years ago Dr Gustavsen developed the original version of the vector fitting method with Prof Semlyen at the University of Toronto The vector fitting method is one of the most widespread approaches for model extraction Dr Gustavsen is also an IEEE fellow *Circuit Oriented Electromagnetic Modeling Using the PEEC Techniques* Albert Ruehli,Giulio Antonini,Lijun Jiang,2017-05-30 Bridges the gap between electromagnetics and circuits by addressing electrometric modeling EM using the Partial Element Equivalent Circuit PEEC method This book provides intuitive solutions to electromagnetic problems by using the Partial Element Equivalent Circuit PEEC method This book begins with an introduction to circuit analysis techniques laws and frequency and time domain analyses The authors also treat Maxwell s equations capacitance computations and inductance computations through the lens of the PEEC method Next readers learn to build PEEC models in various forms equivalent circuit models non orthogonal PEEC models skin effect models PEEC models for dielectrics incident and radiate field models and scattering PEEC models The book concludes by considering issues like stability and passivity and includes five appendices some with formulas for partial elements Leads readers to the solution of a multitude of practical problems in the areas of signal and power integrity and electromagnetic interference

Contains fundamentals applications and examples of the PEEC method Includes detailed mathematical derivations Circuit Oriented Electromagnetic Modeling Using the PEEC Techniques is a reference for students researchers and developers who work on the physical layer modeling of IC interconnects and Packaging PCBs and high speed links Enabling Technologies for High Spectral-efficiency Coherent Optical Communication Networks Xiang Zhou,Chongjin Xie,2016-04-29 Enabling Technologies for High Spectral efficiency Coherent Optical Communication Networks Presents the technological advancements that enable high spectral efficiency and high capacity fiber optic communication systems and networks This book examines key technology advances in high spectral efficiency fiber optic communication systems and networks enabled by the use of coherent detection and digital signal processing DSP The first of this book s 16 chapters is a detailed introduction Chapter 2 reviews the modulation formats while Chapter 3 focuses on detection and error correction technologies for coherent optical communication systems Chapters 4 and 5 are devoted to Nyquist WDM and orthogonal frequency division multiplexing OFDM In chapter 6 polarization and nonlinear impairments in coherent optical communication systems are discussed The fiber nonlinear effects in a non dispersion managed system are covered in chapter 7 Chapter 8 describes linear impairment equalization and Chapter 9 discusses various nonlinear mitigation techniques Signal synchronization is covered in Chapters 10 and 11 Chapter 12 describes the main constraints put on the DSP algorithms by the hardware structure Chapter 13 addresses the fundamental concepts and recent progress of photonic integration Optical performance monitoring and elastic optical network technology are the subjects of Chapters 14 and 15 Finally Chapter 16 discusses spatial division multiplexing and MIMO processing technology a potential solution to solve the capacity limit of single mode fibers Contains basic theories and up to date technology advancements in each chapter Describes how capacity approaching coding schemes based on low density parity check LDPC and spatially coupled LDPC codes can be constructed by combining iterative demodulation and decoding Demonstrates that fiber nonlinearities can be accurately described by some analytical models such as GN EGN model Presents impairment equalization and mitigation techniques Enabling Technologies for High Spectral efficiency Coherent Optical Communication Networks is a reference for researchers engineers and graduate students *Mathematical Optimization for Machine Learning* Konstantin Fackeldey,Aswin Kannan,Sebastian Pokutta,Kartikey Sharma,Daniel Walter,Andrea Walther,Martin Weiser,2025-05-06 Mathematical optimization and machine learning are closely related This proceedings volume of the Thematic Einstein Semester 2023 of the Berlin Mathematics Research Center MATH collects recent progress on their interplay in topics such as discrete optimization nonlinear programming optimal control first order methods multilevel optimization machine learning in optimization physics informed learning and fairness in machine learning **Advanced Chipless RFID** Nemai Chandra Karmakar,Mohammad Zomorrodi,Chamath Divarathne,2016-08-03 Introduces advanced high capacity data encoding and throughput improvement techniques for fully printable multi bit Chipless RFID tags and reader systems The book proposes

new approaches to chipless RFID tag encoding and tag detection that supersede their predecessors in signal processing tag design and reader architectures The text is divided into two main sections the first section introduces the fundamentals of electromagnetic EM imaging at mm wave band to enhance the content capacity of Chipless RFID systems The EM Imaging through Synthetic Aperture Radar SAR technique is used for data extraction The second section presents a few smart tag detection techniques for existing chipless RFID systems A Multiple Input and Multiple Output MIMO based tag detection technique improves the spectral efficiency and increases data bit capacity The book concludes with a discussion of how the MIMO approach can be combined with the image based technique to introduce a complete solution with a fast imaging approach to chipless RFID systems The book has the following salient features Discusses new approaches to chipless RFID tags such as EM imaging high capacity data encoding and robust tag detection techniques Presents techniques to enhance data content capacity of tags and reliable tag detection for the readers at unlicensed microwave and mm wave 2 45 24 and 60 GHz instrumentation scientific and medical ISM frequency bands Includes case studies of real world applications

Balanced Microwave Filters Ferran Martín,Lei Zhu,Jiasheng Hong,Francisco Medina,2018-02-26 This book presents and discusses strategies for the design and implementation of common mode suppressed balanced microwave filters including narrowband wideband and ultra wideband filters This book examines differential mode or balanced microwave filters by discussing several implementations of practical realizations of these passive components Topics covered include selective mode suppression designs based on distributed and semi lumped approaches multilayer technologies defect ground structures coupled resonators metamaterials interference techniques and substrate integrated waveguides among others Divided into five parts Balanced Microwave Filters begins with an introduction that presents the fundamentals of balanced lines circuits and networks Part 2 covers balanced transmission lines with common mode noise suppression including several types of common mode filters and the application of such filters to enhance common mode suppression in balanced bandpass filters Next Part 3 examines wideband and ultra wideband UWB balanced bandpass filters with intrinsic common mode suppression Narrowband and dual band balanced bandpass filters with intrinsic common mode suppression are discussed in Part 4 Finally Part 5 covers other balanced circuits such as balanced power dividers and combiners and differential mode equalizers with common mode filtering In addition the book Explores a research topic of increasing interest due to the growing demand of balanced transmission lines and circuits in modern communication systems Includes contributions from prominent worldwide experts in the field Provides readers with the necessary knowledge to analyze and synthesize balanced filters and circuits Balanced Microwave Filters is an important text for R D engineers professionals and specialists working on the topic of microwave filters Post graduate students and Masters students in the field of microwave engineering and wireless communications especially those involved in courses related to microwave filters and balanced filters and circuits will also find it to be a vital resource **Passive Macromodeling** Stefano Grivet-Talocia,Bjørn Gustavsen,2016 In the first

comprehensive treatment of passive macromodeling on the market macromodeling experts Stefano Grivet Talocia and Bjorn Gustavsen address the complex subject with examples of effective proven methods Finally students and researchers may turn to a text that tends to the theoretical background essential to comprehending the algorithms advantages and disadvantages With the latest information on black box passive macromodeling and software implementation this book is a foolproof guide to both the basics and complexities of passive macromodeling R sum de l diteur *Inverse Synthetic Aperture Radar Imaging With MATLAB Algorithms* Caner Ozdemir,2021-03-24 Build your knowledge of SAR ISAR imaging with this comprehensive and insightful resource The newly revised Second Edition of Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms covers in greater detail the fundamental and advanced topics necessary for a complete understanding of inverse synthetic aperture radar ISAR imaging and its concepts Distinguished author and academician Caner zdemir describes the practical aspects of ISAR imaging and presents illustrative examples of the radar signal processing algorithms used for ISAR imaging The topics in each chapter are supplemented with MATLAB codes to assist readers in better understanding each of the principles discussed within the book This new edition incudes discussions of the most up to date topics to arise in the field of ISAR imaging and ISAR hardware design The book provides a comprehensive analysis of advanced techniques like Fourier based radar imaging algorithms and motion compensation techniques along with radar fundamentals for readers new to the subject The author covers a wide variety of topics including Radar fundamentals including concepts like radar cross section maximum detectable range frequency modulated continuous wave and doppler frequency and pulsed radar The theoretical and practical aspects of signal processing algorithms used in ISAR imaging The numeric implementation of all necessary algorithms in MATLAB ISAR hardware emerging topics on SAR ISAR focusing algorithms such as bistatic ISAR imaging polarimetric ISAR imaging and near field ISAR imaging Applications of SAR ISAR imaging techniques to other radar imaging problems such as thru the wall radar imaging and ground penetrating radar imaging Perfect for graduate students in the fields of electrical and electronics engineering electromagnetism imaging radar and physics Inverse Synthetic Aperture Radar Imaging With MATLAB Algorithms also belongs on the bookshelves of practicing researchers in the related areas looking for a useful resource to assist them in their day to day professional work

Interpolatory Methods for Model Reduction A. C. Antoulas,C. A. Beattie,S. Gü?ercin,2020-01-13 Dynamical systems are a principal tool in the modeling prediction and control of a wide range of complex phenomena As the need for improved accuracy leads to larger and more complex dynamical systems direct simulation often becomes the only available strategy for accurate prediction or control inevitably creating a considerable burden on computational resources This is the main context where one considers model reduction seeking to replace large systems of coupled differential and algebraic equations that constitute high fidelity system models with substantially fewer equations that are crafted to control the loss of fidelity that order reduction may induce in the system response Interpolatory methods are among the most widely used model reduction

techniques and Interpolatory Methods for Model Reduction is the first comprehensive analysis of this approach available in a single extensive resource It introduces state of the art methods reflecting significant developments over the past two decades covering both classical projection frameworks for model reduction and data driven nonintrusive frameworks This textbook is appropriate for a wide audience of engineers and other scientists working in the general areas of large scale dynamical systems and data driven modeling of dynamics Chipless Radio Frequency Identification Reader Signal Processing Nemai Chandra Karmakar,Prasanna Kalansuriya,Rubayet E. Azim,Randka Koswatta,2016-03-17 Presents a comprehensive overview and analysis of the recent developments in signal processing for Chipless Radio Frequency Identification Systems This book presents the recent research results on Radio Frequency Identification RFID and provides smart signal processing methods for detection signal integrity multiple access and localization tracking and collision avoidance in Chipless RFID systems The book is divided into two sections The first section discusses techniques for detection and denoising in Chipless RFID systems These techniques include signal space representation detection of frequency signatures using UWB impulse radio interrogation time domain analysis singularity expansion method for data extraction and noise reduction and filtering techniques The second section covers collision and error correction protocols multi tag identification through time frequency analysis FMCW radar based collision detection and multi access for Chipless RFID tags as we as localization and tag tracking Describes the use of UWB impulse radio interrogation to remotely estimate the frequency signature of Chipless RFID tags using the backscatter principle Reviews the collision problem in both chipped and Chipless RFID systems and summarizes the prevailing anti collision algorithms to address the problem Proposes state of the art multi access and signal integrity protocols to improve the efficacy of the system in multiple tag reading scenarios Features an industry approach to the integration of various systems of the Chipless RFID reader integration of physical layers middleware and enterprise software Chipless Radio Frequency Identification Reader Signal Processing is primarily written for researchers in the field of RF sensors but can serve as supplementary reading for graduate students and professors in electrical engineering and wireless communications **Multigrid Finite Element Methods for Electromagnetic Field Modeling** Yu Zhu,Andreas C. Cangellaris,2006-02-17 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 *Simulation-driven Design Optimization And Modeling For Microwave Engineering* Qi-jun Zhang,2013-03-14 Computer aided full wave electromagnetic EM analysis has been used in microwave engineering for the past decade Initially its main application area was design verification Today EM simulation driven optimization and design closure become increasingly important due to the complexity of microwave structures and increasing demands for accuracy In many situations theoretical models of microwave structures can only be used to yield the initial designs that need to be further fine tuned to meet given performance requirements In addition EM based design is a must for a growing number of microwave devices such as ultra wideband UWB antennas dielectric resonator antennas and substrate integrated circuits For circuits like these no design ready theoretical models are available so design improvement can only be obtained through geometry adjustments based on repetitive time consuming simulations On the other hand various interactions between microwave devices and their environment such as feeding structures and housing must be taken into account and this is only possible through full wave EM analysis Electromagnetic simulations can be highly accurate but they tend to be computationally expensive Therefore practical design optimization methods have to be computationally efficient so that the number of CPU intensive high fidelity EM simulations is reduced as much as possible during the design process For the same reasons techniques for creating fast yet accurate models of microwave structures become crucially important In this edited book the authors strive to review the state of the art simulation driven microwave design optimization and modeling A group of international experts specialized in various aspects of microwave computer aided design summarize and review a wide range of the latest developments and real world applications Topics include conventional and surrogate based design optimization techniques methods exploiting adjoint sensitivity simulation based tuning space mapping and several modeling methodologies such as artificial neural networks and kriging Applications and case studies include microwave filters antennas substrate integrated structures and various active components and circuits The book also contains a few introductory chapters highlighting the fundamentals of

optimization and modeling gradient based and derivative free algorithms metaheuristics and surrogate based optimization techniques as well as finite difference and finite element methods a **Scientific Computing in Electrical Engineering SCEE 2008** Luis R.J. Costa,Janne Roos,2010-06-14 This book is a collection of 65 selected papers presented at the 7th International Conference on Scientific Computing in Electrical Engineering SCEE held in Espoo Finland in 2008 The aim of the SCEE 2008 conference was to bring together scientists from academia and industry e g mathematicians electrical engineers computer scientists and physicists with the goal of intensive discussions on industrially relevant mathematical problems with an emphasis on modeling and numerical simulation of electronic circuits and devices electromagnetic fields and coupled problems This extensive reference work is divided into five parts 1 Computational electromagnetics 2 Circuit simulation 3 Coupled problems 4 Mathematical and computational methods and 5 Model order reduction Each part starts with an general introduction followed by the actual papers **Scientific Computing in Electrical Engineering** G. Ciuprina,D. Ioan,2007-05-30 This book is a collection of selected papers presented at the last Scientific Computing in Electrical Engineering SCEE Conference held in Sinaia Romania in 2006 The series of SCEE conferences aims at addressing mathematical problems which have a relevance to industry with an emphasis on modeling and numerical simulation of electronic circuits electromagnetic fields but also coupled problems and general mathematical and computational methods

Tutorials on Emerging Methodologies and Applications in Operations Research Institute for Operations Research and the Management Sciences. National Meeting,2005 Operations Research emerged as a quantitative approach to problem solving in World War II Its founders who were physicists mathematicians and engineers quickly found peace time uses for this new field Moreover we can say that Operations Research OR was born in the same incubator as computer science and through the years it has spawned many new disciplines including systems engineering health care management and transportation science Fundamentally Operations Research crosses discipline domains to seek solutions on a range of problems and benefits diverse disciplines from finance to bioengineering Many disciplines routinely use OR methods Many scientific researchers engineers and others will find the methodological presentations in this book useful and helpful in their problem solving efforts OR s strengths are modeling analysis and algorithm design It provides a quantitative foundation for a broad spectrum of problems from economics to medicine from environmental control to sports from e commerce to computational geometry The primary purpose of TUTORIALS ON EMERGING METHODOLOGIES AND APPLICATIONS IN OPERATIONS RESEARCH is to provide a reference for practitioners and academics who seek a clear concise presentation of developing methodologies hence providing themselves with the capability to apply these methods to new problems The field of Operations Research is always changing Its changes are driven by the technology it uses and that it extends and the applications that it affects Relevant changes in the field have a permanent effect on the conduct of OR and are vital to anyone who wants to be current in the field Each chapter presents a new developing methodology in Operations Research Each

chapter examines each topic with clarity and depth and organizes the examination around the following questions 1 What the developing methodology basically is about 2 Why is it important and 3 Where can I learn more *Model Reduction for Circuit Simulation* Peter Benner,Michael Hinze,E. Jan W. ter Maten,2011-03-25 Simulation based on mathematical models plays a major role in computer aided design of integrated circuits ICs Decreasing structure sizes increasing packing densities and driving frequencies require the use of refined mathematical models and to take into account secondary parasitic effects This leads to very high dimensional problems which nowadays require simulation times too large for the short time to market demands in industry Modern Model Order Reduction MOR techniques present a way out of this dilemma in providing surrogate models which keep the main characteristics of the device while requiring a significantly lower simulation time than the full model With Model Reduction for Circuit Simulation we survey the state of the art in the challenging research field of MOR for ICs and also address its future research directions Special emphasis is taken on aspects stemming from miniturisations to the nano scale Contributions cover complexity reduction using e g balanced truncation Krylov techniques or POD approaches For semiconductor applications a focus is on generalising current techniques to differential algebraic equations on including design parameters on preserving stability and on including nonlinearity by means of piecewise linearisations along solution trajectories TPWL and interpolation techniques for nonlinear parts Furthermore the influence of interconnects and power grids on the physical properties of the device is considered and also top down system design approaches in which detailed block descriptions are combined with behavioral models Further topics consider MOR and the combination of approaches from optimisation and statistics and the inclusion of PDE models with emphasis on MOR for the resulting partial differential algebraic systems The methods which currently are being developed have also relevance in other application areas such as mechanical multibody systems and systems arising in chemistry and to biology The current number of books in the area of MOR for ICs is very limited so that this volume helps to fill a gap in providing the state of the art material and to stimulate further research in this area of MOR Model Reduction for Circuit Simulation also reflects and documents the vivid interaction between three active research projects in this area namely the EU Marie Curie Action ToK project O MOORE NICE members in Belgium The Netherlands and Germany the EU Marie Curie Action RTN project COMSON members in The Netherlands Italy Germany and Romania and the German federal project System reduction in nano electronics SyreNe **Recent Advances In Computational Science And Engineering - Proceedings Of The International Conference On Scientific And Engineering Computation (Ic-sec) 2002** Justin Kwok,Heow-pueh Lee,Kurichi Kumar,2002-12-02 IC SEC 2002 serves as a forum for engineers and scientists who are involved in the use of high performance computers advanced numerical strategies computational methods and simulation in various scientific and engineering disciplines The conference creates a platform for presenting and discussing the latest trends and findings about the state of the art in their particular field s of interest IC SEC also provides a forum for the interdisciplinary blending of

computational efforts in various diversified areas of science such as biology chemistry physics and materials science as well as all branches of engineering The proceedings cover a broad range of topics and an application area which involves modelling and simulation work using high performance computers **Advances in Electromagnetics Empowered by Artificial Intelligence and Deep Learning** Sawyer D. Campbell,Douglas H. Werner,2023-09-26 Authoritative reference on the state of the art in the field with additional coverage of important foundational concepts Advances in Electromagnetics Empowered by Artificial Intelligence and Deep Learning presents cutting edge research advances in the rapidly growing areas in optical and RF electromagnetic device modeling simulation and inverse design The text provides a comprehensive treatment of the field on subjects ranging from fundamental theoretical principles and new technological developments to state of the art device design as well as examples encompassing a wide range of related sub areas The content of the book covers all dielectric and metallodielectric optical metasurface deep learning accelerated inverse design deep neural networks for inverse scattering applications of deep learning for advanced antenna design and other related topics To aid in reader comprehension each chapter contains 10 15 illustrations including prototype photos line graphs and electric field plots Contributed to by leading research groups in the field sample topics covered in Advances in Electromagnetics Empowered by Artificial Intelligence and Deep Learning include Optical and photonic design including generative machine learning for photonic design and inverse design of electromagnetic systems RF and antenna design including artificial neural networks for parametric electromagnetic modeling and optimization and analysis of uniform and non uniform antenna arrays Inverse scattering target classification and other applications including deep learning for high contrast inverse scattering of electrically large structures Advances in Electromagnetics Empowered by Artificial Intelligence and Deep Learning is a must have resource on the topic for university faculty graduate students and engineers within the fields of electromagnetics wireless communications antenna RF design and photonics as well as researchers at large defense contractors and government laboratories Peterson's Graduate Programs in Engineering and Applied Sciences, 1996 Peterson's Guides,Peterson's Guides Staff,Peterson's,1995-12-10 Graduate students depend on this series and ask for it by name Why For over 30 years it s been the only one stop source that supplies all of their information needs The new editions of this six volume set contain the most comprehensive information available on more than 1 500 colleges offering over 31 000 master s doctoral and professional degree programs in more than 350 disciplines New for 1997 Non degree granting research centers institutes and training programs that are part of a graduate degree program Five discipline specific volumes detail entrance and program requirements deadlines costs contacts and special options such as distance learning for each program if available Each Guide features The Graduate Adviser which discusses entrance exams financial aid accreditation and more Interest in these fields has never been higher And this is the source to the 3 400 programs currently available from bioengineering and computer science to construction management *Symposium Record* ,2004

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