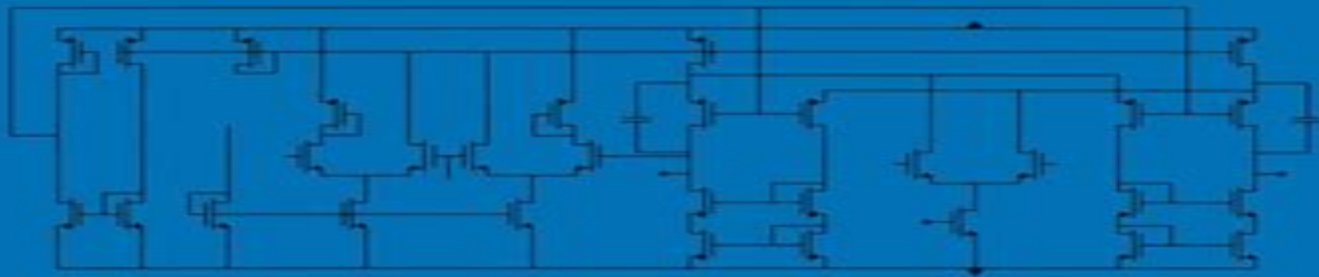


Practical Synthesis of High-Performance Analog Circuits



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Practical Synthesis Of High Performance Analog Circuits

Lance D. Chambers



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Practical Synthesis of High-Performance Analog Circuits Emil S. Ochotta, Tamal Mukherjee, Rob A. Rutenbar, L. Richard Carley, 2012-12-06 Practical Synthesis of High Performance Analog Circuits presents a technique for automating the design of analog circuits Market competition and the astounding pace of technological innovation exert tremendous pressure on circuit design engineers to turn ideas into products quickly and get them to market In digital Application Specific Integrated Circuit ASIC design computer aided design CAD tools have substantially eased this pressure by automating many of the laborious steps in the design process thereby allowing the designer to maximise his design expertise But the world is not solely digital Cellular telephones magnetic disk drives neural networks and speech recognition systems are a few of the recent technological innovations that rely on a core of analog circuitry and exploit the density and performance of mixed analog digital ASICs To maximize profit these mixed signal ASICs must also make it to market as quickly as possible However although the engineer working on the digital portion of the ASIC can rely on sophisticated CAD tools to automate much of the design process there is little help for the engineer working on the analog portion of the chip With the exception of simulators to verify the circuit design when it is complete there are almost no general purpose CAD tools that an analog design engineer can take advantage of to automate the analog design flow and reduce his time to market Practical Synthesis of High Performance Analog Circuits presents a new variation tolerant analog synthesis strategy that is a significant step towards ending the wait for a practical analog synthesis tool A new synthesis strategy is presented that can fully automate the path from a circuit topology and performance specifications to a sized variation tolerant circuit schematic This strategy relies on asymptotic waveform evaluation to predict circuit performance and simulated annealing to solve a novel non linear infinite programming optimization formulation of the circuit synthesis problem via a sequence of smaller optimization problems Practical Synthesis of High Performance Analog Circuits will be of interest to analog circuit designers CAD EDA industry professionals academics and students

Analog Circuit Design Michiel Steyaert, Arthur H.M. van Roermund, Johan Huijsing, 2007-05-08 In the 11th edition in this successful series the topics are structured mixed mode design multi bit sigma delta converters and short range RF circuits The book provides valuable information and excellent overviews of analogue circuit design CAD and RF systems

Reuse-Based Methodologies and Tools in the Design of Analog and Mixed-Signal Integrated Circuits Rafael Castro López, Francisco V. Fernández, Óscar Guerra-Vinuesa, Ángel Rodríguez-Vázquez, 2007-09-17 Aiming at the core of the problem Reuse Based Methodologies and Tools in the Design of Analog and Mixed Signal Integrated Circuits presents a framework for the reuse based design of AMS circuits The framework is founded on three key elements 1 a CAD supported hierarchical design flow that facilitates the incorporation of AMS reusable blocks reduces the overall design time and expedites the management of increasing AMS design complexity 2 a complete clear definition of the AMS reusable block structured into three separate facets or views the behavioral structural

and layout facets the first two for top down electrical synthesis and bottom up verification the latter used during bottom up physical synthesis 3 the design for reusability set of tools methods and guidelines that relying on intensive parameterization as well as on design knowledge capture and encapsulation allows to produce fully reusable AMS blocks Reuse Based Methodologies and Tools in the Design of Analog and Mixed Signal Integrated Circuits features a very detailed tutorial and in depth coverage of all issues and must have properties of reusable AMS blocks as well as a thorough description of the methods and tools necessary to implement them For the first time this has been done hierarchically covering one by one the different stages of the design flow allowing us to examine how the reusable block yields its benefits both in design time and correct performance

Analog Design Centering and Sizing Helmut E. Graeb, 2007-06-20 This book represents a compendium of fundamental problem formulations of analog design centering and sizing It provides a differentiated knowledge about the tasks of analog design centering and sizing In particular the worst case problem will be formulated It stands at the interface between process technology and design technology This book wants to point out that and how both process and design technology are required for its solution Algorithms based on the presented material are for instance available in the EDA tool WiCkeD 88 The intention is to enable analog and mixed signal designers to assess CAD solution methods that are presented to them On the other side the intention is to enable developers of analog CAD tools to formulate and develop solution approaches for analog design centering and sizing The structure of the book is geared towards a combination of a reference book and a textbook The presentation goes from general topics to the more specific details preceding material is usually a prerequisite for succeeding material The formulations of tasks and solution approaches by mathematical means makes the book suitable as well for students dealing with analog design and design methodology The contents is structured as follows Chapter 1 sketches the role of analog circuits and analog design in integrated circuits An overview of analog sizing tasks and the corresponding terminology is introduced Chapter 2 illustrates analog sizing and yield optimization design centering with the simplest example of an RC circuit Chapter 3 describes the basic input and output quantities of analog sizing

Computer-Aided Design of Analog Integrated Circuits and Systems Rob A. Rutenbar, Georges G. E. Gielen, 2002-05-06 The tools and techniques you need to break the analog design bottleneck Ten years ago analog seemed to be a dead end technology Today System on Chip SoC designs are increasingly mixed signal designs With the advent of application specific integrated circuits ASIC technologies that can integrate both analog and digital functions on a single chip analog has become more crucial than ever to the design process Today designers are moving beyond hand crafted one transistor at a time methods They are using new circuit and physical synthesis tools to design practical analog circuits new modeling and analysis tools to allow rapid exploration of system level alternatives and new simulation tools to provide accurate answers for analog circuit behaviors and interactions that were considered impossible to handle only a few years ago To give circuit designers and CAD professionals a better understanding of the history and the current state of the art in

the field this volume collects in one place the essential set of analog CAD papers that form the foundation of today's new analog design automation tools Areas covered are Analog synthesis Symbolic analysis Analog layout Analog modeling and analysis Specialized analog simulation Circuit centering and yield optimization Circuit testing Computer Aided Design of Analog Integrated Circuits and Systems is the cutting edge reference that will be an invaluable resource for every semiconductor circuit designer and CAD professional who hopes to break the analog design bottleneck

Differential Evolution Anyong Qing, 2009-07-23 Differential evolution is a very simple but very powerful stochastic optimizer Since its inception it has proved very efficient and robust in function optimization and has been applied to solve problems in many scientific and engineering fields In Differential Evolution Dr Qing begins with an overview of optimization followed by a state of the art review of differential evolution including its fundamentals and up to date advances He goes on to explore the relationship between differential evolution strategies intrinsic control parameters non intrinsic control parameters and problem features through a parametric study Findings and recommendations on the selection of strategies and intrinsic control parameter values are presented Lastly after an introductory review of reported applications in electrical and electronic engineering fields different research groups demonstrate how the methods can be applied to such areas as multicast routing multisite mapping in grid environments antenna arrays analog electric circuit sizing electricity markets stochastic tracking in video sequences and color quantization Contains a systematic and comprehensive overview of differential evolution Reviews the latest differential evolution research Describes a comprehensive parametric study conducted over a large test bed Shows how methods can be practically applied to mobile communications grid computing circuits image processing power engineering Sample applications demonstrated by research groups in the United Kingdom Australia Italy Turkey China and Eastern Europe Provides access to companion website with code examples for download Differential Evolution is ideal for application engineers who can use the methods described to solve specific engineering problems It is also a valuable reference for post graduates and researchers working in evolutionary computation design optimization and artificial intelligence Researchers in the optimization field or engineers and managers involved in operations research will also find the book a helpful introduction to the topic

The Practical Handbook of Genetic Algorithms Lance D. Chambers, 2000-12-07 Rapid developments in the field of genetic algorithms along with the popularity of the first edition precipitated this completely revised thoroughly updated second edition of The Practical Handbook of Genetic Algorithms Like its predecessor this edition helps practitioners stay up to date on recent developments in the field and provides material

Variation-Aware Analog Structural Synthesis Trent McConaghy, Pieter Palmers, Gao Peng, Michiel Steyaert, Georges Gielen, 2009-07-13 This book describes new tools for front end analog designers starting with global variation aware sizing and extending to novel variation aware topology design The tools aid design through automation but more importantly they also aid designer insight through automation We now describe four design tasks each

more general than the previous and how this book contributes design aids and insight aids to each The first designer task targeted is global robust sizing This task is supported by a design tool that does automated globally reliable variation aware sizing SANGRIA and an insight aiding tool that extracts designer interpretable whitebox models that relate sizings to circuit performance CAFFEINE SANGRIA searches on several levels of problem difficulty simultaneously from lower cheap to evaluate exploration layers to higher full evaluation exploitation layers structural homotopy SANGRIA makes maximal use of circuit simulations by performing scalable data mining on simulation results to choose new candidate designs CAFFEINE accomplishes its task by treating function induction as a tree search problem It constrains its tree search space via a canonical functional form grammar and searches the space with grammatically constrained genetic programming The second designer task is topology selection topology design Topology selection tools must consider a broad variety of topologies such that an appropriate topology is selected must easily adapt to new semiconductor process nodes and readily incorporate new topologies Topology design tools must allow designers to creatively explore new topology ideas as rapidly as possible

Performance Optimization Techniques in Analog, Mixed-Signal, and Radio-Frequency Circuit Design Fakhfakh, Mourad, Tlelo-Cuautle, Esteban, Fino, Maria Helena, 2014-10-31 Improving the performance of existing technologies has always been a focal practice in the development of computational systems However as circuitry is becoming more complex conventional techniques are becoming outdated and new research methodologies are being implemented by designers Performance Optimization Techniques in Analog Mixed Signal and Radio Frequency Circuit Design features recent advances in the engineering of integrated systems with prominence placed on methods for maximizing the functionality of these systems This book emphasizes prospective trends in the field and is an essential reference source for researchers practitioners engineers and technology designers interested in emerging research and techniques in the performance optimization of different circuit designs

Automated Design of Analog and High-frequency Circuits Bo Liu, Georges Gielen, Francisco V. Fernández, 2013-08-16 Computational intelligence techniques are becoming more and more important for automated problem solving nowadays Due to the growing complexity of industrial applications and the increasingly tight time to market requirements the time available for thorough problem analysis and development of tailored solution methods is decreasing There is no doubt that this trend will continue in the foreseeable future Hence it is not surprising that robust and general automated problem solving methods with satisfactory performance are needed

Application of Evolutionary Algorithms for Multi-objective Optimization in VLSI and Embedded Systems M.C. Bhuvaneshwari, 2014-08-20 This book describes how evolutionary algorithms EA including genetic algorithms GA and particle swarm optimization PSO can be utilized for solving multi objective optimization problems in the area of embedded and VLSI system design Many complex engineering optimization problems can be modelled as multi objective formulations This book provides an introduction to multi objective optimization using meta heuristic algorithms GA and PSO and how they can be applied to problems like

hardware software partitioning in embedded systems circuit partitioning in VLSI design of operational amplifiers in analog VLSI design space exploration in high level synthesis delay fault testing in VLSI testing and scheduling in heterogeneous distributed systems It is shown how in each case the various aspects of the EA namely its representation and operators like crossover mutation etc can be separately formulated to solve these problems This book is intended for design engineers and researchers in the field of VLSI and embedded system design The book introduces the multi objective GA and PSO in a simple and easily understandable way that will appeal to introductory readers Analog Circuit Design Johan Huijsing, Rudy J. van de Plassche, Willy M.C. Sansen, 2013-03-09 This volume of Analog Circuit Design concentrates on three topics Volt Electronics Design and Implementation of Mixed Mode Systems Low Noise and RF Power Amplifiers for Telecommunication The book comprises six papers on each topic written by internationally recognised experts These papers are tutorial in nature and together make a substantial contribution to improving the design of analog circuits The book is divided into three parts Part I Volt Electronics presents some of the circuit design challenges which are having to be met as the need for more electronics on a chip forces smaller transistor dimensions and thus lower breakdown voltages The papers cover techniques for 1 Volt electronics Part II Design and Implementation of Mixed Mode Systems deals with the various problems that are encountered in mixed analog digital design In the future all integrated circuits are bound to contain both digital and analog sub blocks Problems such as substrate bounce and other substrate coupling effects cause deterioration in signal integrity Both aspects of mixed signal design have been addressed in this section and it illustrates that careful layout techniques embedded in a hierarchical design methodology can allow us to cope with most of the challenges presented by mixed analog digital design Part III Low noise and RF Power Amplifiers for Telecommunication focuses on telecommunications systems In these systems low noise amplifiers are front ends of receiver designs At the transmitter part a high performance high efficiency power amplifier is a critical design Examples of both system parts are described in this section Analog Circuit Design is an essential reference source for analog design engineers and researchers wishing to keep abreast with the latest developments in the field The tutorial nature of the contributions also makes it suitable for use in an advanced course Analog VLSI Design Automation Sina Balkir, Günhan Dünder, A. Selçuk Ögrenci, 2003-06-27 The explosive growth and development of the integrated circuit market over the last few years have been mostly limited to the digital VLSI domain The difficulty of automating the design process in the analog domain the fact that a general analog design methodology remained undefined and the poor performance of earlier tools have left the analog *Analog Circuit Design* Arthur H.M. van Roermund, Michiel Steyaert, Johan Huijsing, 2005-12-30 Number 12 in the successful series of Analog Circuit Design provides valuable information and excellent overviews of analogue circuit design CAD and RF systems The series is an ideal reference for those involved in analogue and mixed signal design **Applications of Evolutionary Computing** Mario Giacobini, 2007

Top-Down Design of High-Performance Sigma-Delta Modulators Fernando Medeiro, Belén Pérez Verdú, Angel

Rodríguez-Vázquez,2013-04-18 The interest for I modulation based NO converters has significantly increased in the last years The reason for that is twofold On the one hand unlike other converters that need accurate building blocks to obtain high resolution I converters show low sensitivity to the imperfections of their building blocks This is achieved through extensive use of digital signal processing a desirable feature regarding the implementation of NO interfaces in mainstream CMOS technologies which are better suited for implementing fast dense digital circuits than accurate analog circuits On the other hand the number of applications with industrial interest has also grown In fact starting from the earliest in the audio band today we can find I converters in a large variety of NO interfaces ranging from instrumentation to communications These advances have been supported by a number of research works that have lead to a considerably large amount of published papers and books covering different sub topics from purely theoretical aspects to architecture and circuit optimization However so much material is often difficultly digested by those unexperienced designers who have been committed to developing a I converter mainly because there is a lack of methodology In our view a clear methodology is necessary in I modulator design because all related tasks are rather hard

A Computer-Aided Design and Synthesis Environment for Analog Integrated Circuits Geert Van der Plas, Georges Gielen, Willy M.C. Sansen,2005-12-27 This text addresses the design methodologies and CAD tools available for the systematic design and design automation of analogue integrated circuits Two complementary approaches discussed increase analogue design productivity demonstrated throughout using design times of the different design experiments undertaken

Big Data and Visual Analytics Sang C. Suh, Thomas Anthony,2018-01-15 This book provides users with cutting edge methods and technologies in the area of big data and visual analytics as well as an insight to the big data and data analytics research conducted by world renowned researchers in this field The authors present comprehensive educational resources on big data and visual analytics covering state of the art techniques on data analytics data and information visualization and visual analytics Each chapter covers specific topics related to big data and data analytics as virtual data machine security of big data big data applications high performance computing cluster and big data implementation techniques Every chapter includes a description of an unique contribution to the area of big data and visual analytics This book is a valuable resource for researchers and professionals working in the area of big data data analytics and information visualization Advanced level students studying computer science will also find this book helpful as a secondary textbook or reference

Analog Circuits and Devices Wai-Kai Chen,2003-03-26 The Principles and Application in Engineering Series is a new series of convenient economical references sharply focused on particular engineering topics and subspecialties Each volume in this series comprises chapters carefully selected from CRC s bestselling handbooks logically organized for optimum convenience and thoughtfully priced to fit

IEEE Transactions on Circuits and Systems ,2005

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