

Computer Aided Design Of Analog Integrated Circuits And Systems

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Computer-aided Design of Analog Networks Springer Science & Business Media

It is a great honor to provide a few words of introduction for Dr. Georges Gielen's and Prof. Willy Sansen's book "Symbolic analysis for automated design of analog integrated circuits". The symbolic analysis method presented in this book represents a significant step forward in the area of analog circuit design. As demonstrated in this book, symbolic analysis opens up new possibilities for the development of computer-aided design (CAD) tools that can analyze an analog circuit topology and automatically size the components for a given set of specifications. Symbolic analysis even has the potential to improve the training of young analog circuit designers and to guide more experienced designers through second-order phenomena such as distortion. This book can also serve as an excellent reference for researchers in the analog circuit design area and creators of CAD tools, as it provides a comprehensive overview and comparison of various approaches for analog circuit design automation and an extensive bibliography. The world is essentially analog in nature, hence most electronic systems involve both analog and digital circuitry. As the number of transistors that can be integrated on a single integrated circuit (IC) substrate steadily increases over time, an ever increasing number of systems will be implemented with one, or a few, very complex ICs because of their lower production costs.

Computer-Aided Design of Analog Integrated Circuits Springer
Very large scale integration (VLSI) technologies are now

maturing with a current emphasis toward submicron structures and sophisticated applications combining digital as well as analog circuits on a single chip. Abundant examples are found on today's advanced systems for telecom munications, robotics, automotive electronics, image processing, intelli gent sensors, etc .. Exciting new applications are being unveiled in the field of neural computing where the massive use of analog/digital VLSI technologies will have a significant impact. To match such a fast technological trend towards single chip ana logi digital VLSI systems, researchers worldwide have long realized the vital need of producing advanced computer aided tools for designing both digital and analog circuits and systems for silicon integration. Architecture and circuit compilation, device sizing and the layout genera tion are but a few familiar tasks on the world of digital integrated circuit design which can be efficiently accomplished by matured computer aided tools. In contrast, the art of tools for designing and producing analog or even analogi digital integrated circuits is quite primitive and still lack ing the industrial penetration and acceptance already achieved by digital counterparts. In fact, analog design is commonly perceived to be one of the most knowledge-intensive design tasks and analog circuits are still designed, largely by hand, by expert intimately familiar with nuances of the target application and integrated circuit fabrication process. The techniques needed to build good analog circuits seem to exist solely as expertise invested in individual designers.

A Design Platform for Computer-aided Design of Analog Amplifiers
Bentham Science Publishers

As MOS devices are scaled to meet increasingly demanding circuit specifications, process variations have a greater effect on the reliability of circuit performance. For this reason, statistical techniques are required to design integrated circuits with maximum yield. Statistical Modeling for Computer-Aided Design of MOS VLSI Circuits describes a

statistical circuit simulation and optimization environment for VLSI circuit designers. The first step toward accomplishing statistical circuit design and optimization is the development of an accurate CAD tool capable of performing statistical simulation. This tool must be based on a statistical model which comprehends the effect of device and circuit characteristics, such as device size, bias, and circuit layout, which are under the control of the circuit designer on the variability of circuit performance. The distinctive feature of the CAD tool described in this book is its ability to accurately model and simulate the effect in both intra- and inter-die process variability on analog/digital circuits, accounting for the effects of the aforementioned device and circuit characteristics. Statistical Modeling for Computer-Aided Design of MOS VLSI Circuits serves as an excellent reference for those working in the field, and may be used as the text for an advanced course on the subject.

[Selected Papers on Computer-aided Design of Analog Networks](#) Springer Science & Business Media

Computer-Aided Design of Analog Circuits and SystemsSpringer Science & Business Media

Computer Aided Analog Design and Analysis CRC Press

The algorithms necessary for the computer aided design of digital filters from lowpass prototypes has been developed and compared, then implemented in a computer program to aid in the instruction of digital filter design. The procedure for the design of lowpass, highpass, bandpass, and bandstop digital filters from lowpass prototypes is well established, and is based on transforming the prototype frequency response to meet desired characteristics. This transformation can be accomplished in either the analog (s) domain or the digital (z) domain. Therefore, the two classical design techniques, analog-digital and digital-digital design, are based on doing the frequency response transformations in their respective analog or digital domains. Since the theory for the standard filter types (Butterworth, Chebyshev, and elliptic) is developed in the analog or 's' domain, the two methods for designing digital filters differ basically in the sequence of the

design steps. In the analog-digital method the analog prototype is transformed and then digitized, while in the digital-digital method the analog prototype is digitized and then transformed. Keywords: Theses. (kr). Machine Learning in VLSI Computer-Aided Design Springer Science & Business Media

Computer-Aided Design of Analog Circuits and Systems brings together in one place important contributions and state-of-the-art research results in the rapidly advancing area of computer-aided design of analog circuits and systems. This book serves as an excellent reference, providing insights into some of the most important issues in the field.

Low-Noise, Low-Power, Low-Voltage: Mixed-Mode Design with CAD Tools; Voltage, Current and Time References Wiley-IEEE Press

"Symbolic analyzers have the potential to offer knowledge to sophomores as well as practitioners of analog circuit design. Actually, they are an essential complement to numerical simulators, since they provide insight into circuit behavior which numerical "

20 Years of Excellence in Computer-Aided Design Springer Science & Business Media

Many interesting design trends are shown by the six papers on operational amplifiers (Op Amps). Firstly, there is the line of stand-alone Op Amps using a bipolar IC technology which combines high-frequency and high voltage. This line is represented in papers by Bill Gross and Derek Bowers. Bill Gross shows an improved high-frequency compensation technique of a high quality three stage Op Amp. Derek Bowers improves the gain and frequency behaviour of the stages of a two-stage Op Amp. Both papers also present trends in current-mode feedback Op Amps. Low-voltage bipolar Op Amp design is presented by leroen Fonderie. He shows how multipath nested Miller compensation can be applied to turn rail-to-rail input and output stages into high quality low-voltage Op Amps. Two papers on CMOS Op Amps by Michael Steyaert and Klaas Bult show how high speed and high gain VLSI building blocks can be realised. Without departing from a single-stage OT A structure with a folded cascode output, a thorough high frequency design technique and a gain-boosting technique contributed to the high-speed and the high-gain achieved with these Op Amps. . Finally, Rinaldo Castello shows us how to provide output power with CMOS buffer amplifiers. The combination of class A and AB stages in a multipath nested Miller structure provides the required linearity and bandwidth. Analog Circuit Technique and Computer Aided Design Springer Science & Business Media

This book 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; (2) a complete, clear definition of the AMS reusable block; (3) the design for a reusability set of tools, methods, and guidelines. The book features a detailed tutorial and in-depth coverage of all issues and must-have properties of reusable AMS blocks.

Computer-aided Design of Microelectronic Circuits and Systems: General introduction and analog-circuit aspects Springer Science & Business Media

This book provides readers with an up-to-date account of the use of machine learning frameworks, methodologies, algorithms and techniques in the context of computer-aided design (CAD) for very-large-scale integrated circuits (VLSI). Coverage includes the various machine learning methods used in lithography, physical design, yield prediction, post-silicon performance analysis, reliability and failure analysis, power and thermal analysis, analog design, logic synthesis, verification, and neuromorphic design. Provides up-to-date information on machine learning in VLSI CAD for device modeling, layout verifications, yield prediction, post-silicon validation, and reliability; Discusses the use of machine learning techniques in the context of analog and digital synthesis; Demonstrates how to formulate VLSI CAD objectives as machine learning problems and provides a comprehensive treatment of their efficient solutions; Discusses the tradeoff between the cost of collecting data and prediction accuracy and provides a methodology for using prior data to reduce cost of data collection in the design, testing and validation of both analog and digital VLSI designs. From the Foreword As the semiconductor industry embraces the rising swell of cognitive systems and edge intelligence, this book could serve as a harbinger and example of the osmosis that will exist between our cognitive structures and methods, on the one hand, and the hardware architectures and technologies that will support them, on the other....As we transition from the computing era to the cognitive one, it behooves us to remember the success story of VLSI CAD and to earnestly seek the help of the invisible hand so that our future cognitive systems are used to design more powerful cognitive systems. This book is very much aligned with this on-going transition from computing to cognition, and it is with deep pleasure that I recommend it to all those who are actively engaged in this exciting transformation. Dr. Ruchir Puri, IBM Fellow, IBM Watson CTO & Chief Architect, IBM T. J. Watson Research Center

Design of Analog Circuits Through Symbolic Analysis Springer Science & Business Media

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.

Computer-Aided Design of Analog Circuits and Systems Springer Science & Business Media

Reliability concerns and the limitations of process technology can sometimes restrict the innovation process involved in designing nano-scale analog circuits. The success of nano-scale analog circuit design requires repeat experimentation, correct analysis of the device physics, process technology, and adequate use of the knowledge database. Starting with the basics, Nano-Scale CMOS Analog Circuits: Models and CAD Techniques for High-Level Design introduces the essential fundamental concepts for designing analog circuits with optimal performances. This book explains the links between the physics and technology of scaled MOS transistors and the design and simulation of nano-scale analog circuits. It also explores the development of structured computer-aided design (CAD) techniques for architecture-level and circuit-level design of analog circuits. The book outlines the general trends of technology scaling with respect to device geometry, process parameters, and supply voltage. It describes models and optimization techniques, as well as the compact modeling of scaled MOS transistors for VLSI circuit simulation. • Includes two learning-based methods: the artificial neural network (ANN) and the least-squares support vector machine (LS-SVM) method • Provides case studies demonstrating the practical use of these two methods • Explores circuit sizing and specification translation tasks • Introduces the particle swarm optimization technique and provides examples of sizing analog circuits • Discusses the advanced effects of scaled MOS transistors like narrow width effects, and vertical and lateral channel engineering Nano-Scale CMOS

Analog Circuits: Models and CAD Techniques for High-Level Design describes the models and CAD techniques, explores the physics of MOS transistors, and considers the design challenges involving statistical variations of process technology parameters and reliability constraints related to circuit design.

The Best of ICCAD Springer

Modern System-on-Chip designs are increasingly mixed-signal designs that require efficient systematic design methodologies and supporting computer-aided design (CAD) tools to manage the design complexity in the available design time, that is ever decreasing due to tightening time-to-market constraints. The purpose of Low-Power Design Techniques and CAD Tools for Analog and RF Integrated Circuits is to provide an overview of very recent research results that have been achieved as part of the Low-Power Initiative of the European Union, in the field of analog, RF and mixed-signal design methodologies and CAD tools. It is a representative sampling of the current state of the art in this area, with special focus on low-power design methodologies and tools for analog and RF circuits and architectures. Concrete designs, mainly for telecommunication applications, such as low-noise amplifiers, oscillators, filters, but also complete transceiver front-ends, are discussed and analyzed in a methodological way, and their modeling and simulation, both at the circuit level and at the architectural level, are treated. In this way, the eleven contributions of this book combine in a unique way designs with methodologies and CAD that will be interesting to designers and CAD developers, both in industry and academia.

A Computer-Aided Design and Synthesis Environment for Analog Integrated Circuits Elsevier

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.

Computer-Aided Design of Analog Integrated Circuits and Systems John Wiley & Son Limited

Johan H. Huijsing This book contains 18 tutorial papers concentrated on 3 topics, each topic being covered by 6 papers. The topics are: Low-Noise, Low-Power, Low-Voltage Mixed-Mode Design with CAD Tools Voltage, Current, and Time References The papers of this book were written by top experts in the field, currently working at leading European and American universities and companies. These papers are the reviewed versions of the papers

presented at the Workshop on Advances in Analog Circuit Design. which was held in Villach, Austria, 26-28 April 1995. The chairman of the Workshop was Dr. Franz Dielacher from Siemens, Austria. The program committee existed of Johan H. Huijsing from the Delft University of Technology, Prof. Willy Sansen from the Catholic University of Leuven, and Dr. Rudy 1. van der Plassche from Philips Eindhoven. This book is the fourth of a series dedicated to the design of analog circuits. The topics which were covered earlier were: Operational Amplifiers Analog to Digital Converters Analog Computer Aided Design Mixed AID Circuit Design Sensor Interface Circuits Communication Circuits Low-Power, Low-Voltage Integrated Filters Smart Power As the Workshop will be continued year by year, a valuable series of topics will be built up from all the important areas of analog circuit design. I hope that this book will help designers of analog circuits to improve their work and to speed it up.

Machine Learning in VLSI Computer-Aided Design Springer Science & Business Media

This book introduces a design methodology that can help to bridge the productivity gap. Two different types of designs, depending on the design challenge, have been identified. To validate the presented methodologies, the authors have selected and designed accordingly three different industrial-strength applications.

A Computer-aided Design Tool for Analog Integrated Circuit Building Blocks Realization Springer

Theory and Design of Broadband Matching Networks centers on the network theory and its applications to the design of broadband matching networks and amplifiers. Organized into five chapters, this book begins with a description of the foundation of network theory. Chapter 2 gives a fairly complete exposition of the scattering matrix associated with an n-port network. Chapter 3 considers the approximation problem along with a discussion of the approximating functions. Chapter 4 explains the Youla's theory of broadband matching by illustrating every phase of the theory with fully worked out examples. The extension of Youla's theory to active load impedance is taken up in Chapter 5. This book will be useful as a reference for practicing engineers who wish to learn how the modern network theory can be applied to the design of many practical circuits.

Computer-aided Design and Analysis of Short-channel Analog MOS Integrated Circuits CRC Press

In 2002, the International Conference on Computer Aided Design (ICCAD) celebrates its 20th anniversary. This book commemorates contributions made by ICCAD to the broad field of design automation during that time. The foundation of ICCAD in 1982 coincided with the growth of Large Scale Integration. The sharply

increased functionality of board-level circuits led to a major demand for more powerful Electronic Design Automation (EDA) tools. At the same time, LSI grew quickly and advanced circuit integration became widely available. This, in turn, required new tools, using sophisticated modeling, analysis and optimization algorithms in order to manage the evermore complex design processes. Not surprisingly, during the same period, a number of start-up companies began to commercialize EDA solutions, complementing various existing in-house efforts. The overall increased interest in Design Automation (DA) required a new forum for the emerging community of EDA professionals; one which would be focused on the publication of high-quality research results and provide a structure for the exchange of ideas on a broad scale. Many of the original ICCAD volunteers were also members of CANDE (Computer-Aided Network Design), a workshop of the IEEE Circuits and System Society. In fact, it was at a CANDE workshop that Bill McCalla suggested the creation of a conference for the EDA professional. (Bill later developed the name). An Environment for Computer-aided Design of Analog Integrated Circuits Springer Science & Business Media Microelectronic Switched-Capacitor Filters with ISICAP : a computer-aided-design package H. Baher Switched-capacitor (S-C) filters and the associated metal-oxide-semiconductor (MOS) integrated circuits are now an established technology finding applications in the telecommunication and instrumentation fields. With unrivalled breadth of coverage, this book surveys the design techniques of an important class of analog signal processing systems. From fundamental MOS transistor theory through sophisticated circuit design, the style is highly coherent and sharply-focused. Including topics of essential importance to all types of filter, the author sets S-C filters in perspective relative to analog integrated circuits and VLSI circuits. An accompanying diskette containing a comprehensive computer-aided design package (ISICAP) enables readers to gain a greater depth of understanding of the described techniques. Containing both source code files and an executable version of the main design package, this alone will be an indispensable tool for many circuit designers. Filling an important gap in the literature, this work describes switched-capacitor filter design from two complementary stand-points: those of the filter design specialist and the integrated (VLSI) circuit design engineer. The text is suitable for incorporation in senior undergraduate and graduate level courses, as well as professional courses. Electronic circuit design engineers in industry and research will also find this an

invaluable reference source.

Special Issue on Computer-aided Design of Analog Circuits and Systems
IEEE

This book provides readers with an up-to-date account of the use of machine learning frameworks, methodologies, algorithms and techniques in the context of computer-aided design (CAD) for very-large-scale integrated circuits (VLSI). Coverage includes the various machine learning methods used in lithography, physical design, yield prediction, post-silicon performance analysis, reliability and failure analysis, power and thermal analysis, analog design, logic synthesis, verification, and neuromorphic design. Provides up-to-date information on machine learning in VLSI CAD for device modeling, layout verifications, yield prediction, post-silicon validation, and reliability; Discusses the use of machine learning techniques in the context of analog and digital synthesis; Demonstrates how to formulate VLSI CAD objectives as machine learning problems and provides a comprehensive treatment of their efficient solutions; Discusses the tradeoff between the cost of collecting data and prediction accuracy and provides a methodology for using prior data to reduce cost of data collection in the design, testing and validation of both analog and digital VLSI designs. From the Foreword As the semiconductor industry embraces the rising swell of cognitive systems and edge intelligence, this book could serve as a harbinger and example of the osmosis that will exist between our cognitive structures and methods, on the one hand, and the hardware architectures and technologies that will support them, on the other....As we transition from the computing era to the cognitive one, it behooves us to remember the success story of VLSI CAD and to earnestly seek the help of the invisible hand so that our future cognitive systems are used to design more powerful cognitive systems. This book is very much aligned with this on-going transition from computing to cognition, and it is with deep pleasure that I recommend it to all those who are actively engaged in this exciting transformation. Dr. Ruchir Puri, IBM Fellow, IBM Watson CTO & Chief Architect, IBM T. J. Watson Research Center