

SIGMA DELTA MODULATORS

Nonlinear Decoding Algorithms and Stability Analysis

Edited by

Jonathan Allen



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Sigma Delta Modulators Nonlinear Decoding Algorithms And Stability Analysis

**Roland Airiau, Jean-Michel
Bergé, Vincent Olive**



Sigma Delta Modulators Nonlinear Decoding Algorithms And Stability Analysis:

Sigma Delta Modulators Søren Hein, Avidah Zakhor, 2012-12-06 Analog to digital A/D converters are key components in digital signal processing DSP systems and are therefore receiving much attention as DSP becomes increasingly prevalent in telephony audio video consumer products etc The varying demands on conversion rate resolution and other characteristics have inspired a large number of competing A/D conversion techniques Sigma Delta Modulators Nonlinear Decoding Algorithms and Stability Analysis is concerned with the particular class of A/D techniques called oversampled noise shaping ONS that has recently come into prominence for a number of applications The popularity of ONS converters is due to their ease of implementation and robustness to circuit imperfections An ONS converter consists of an encoder that generates a high rate low resolution digital signal and a decoder that produces a low rate high resolution digital approximation to the analog encoder input The conventional decoding approach is based on linear filtering Sigma Delta Modulators presents the optimal design of an ONS decoder for a given encoder It is shown that nonlinear decoding can achieve gains in signaling ratio and the encoder architecture The book then addresses the instability problem that plagues higher order ONS encoders A new stability concept is introduced that is well suited to ONS encoders and it is applied to the double loop encoder as well as to the class of interpolative encoders It is shown that there exists a trade off between stability and SNR performance Based on the results explicit design examples are presented Sigma Delta Modulators Nonlinear Decoding Algorithms and Stability Analysis is a valuable reference source for researchers and engineers in industry and academia working on or interested in design and analysis of A/D converters particularly to those working in quantization theory and signal reconstruction and can serve as a text for advanced courses on the subjects treated

Functional Processing of Delta-Sigma Bit-Stream Djuro G. Zrilic, 2020-06-29 This book discusses non conventional digital signal processing based on direct processing of delta sigma modulated bit stream The main attributes of low pass delta sigma analog to digital converters are simple and inexpensive design robustness of design to component tolerances low power consumption high input impedance high resolution more than 20 bits and possibility of direct arithmetic operation on its bit stream The author presents a number of theoretical and simulation results related to newly proposed linear and non linear circuits such as delta sigma adders delta sigma rectifiers delta sigma RMS and AGC circuits delta sigma frequency deviation meters etc The proposed circuits are not application limited and can be used in instrumentation sensor application bio medical application communications etc Presents novel linear and nonlinear circuits for direct processing of delta sigma modulated bit stream The proposed circuits are supported by theoretical and simulation results Recommends potential applications of the proposed circuits and proposes ideas for further investigation

Digital Signal Processing for Communication Systems Tadeusz Wysocki, Hashem Razavi, Bahram Honary, 2013-04-17 Digital Signal Processing for Communication Systems examines the plans for the future and the progress that has already been made in the field of DSP and its applications to communication systems The book

pursues the progression from communication and information theory through to the implementation evaluation and performance enhancing of practical communication systems using DSP technology Digital Signal Processing for Communication Systems looks at various types of coding and modulation techniques describing different applications of Turbo Codes BCH codes and general block codes pulse modulations and combined modulation and coding in order to improve the overall system performance The book examines DSP applications in measurements performed for channel characterisation pursues the use of DSP for design of effective channel simulators and discusses equalization and detection of various signal formats for different channels A number of system design issues are presented where digital signal processing is involved reporting on the successful implementation of the system components using DSP technology and including the problems involved with implementation of some DSP algorithms Digital Signal Processing for Communication Systems serves as an excellent resource for professionals and researchers who deal with digital signal processing for communication systems and may serve as a text for advanced courses on the subject

Algorithms for Synthesis and Testing of Asynchronous Circuits Luciano Lavagno,Alberto L. Sangiovanni-Vincentelli,2012-12-06 Since the second half of the 1980s asynchronous circuits have been the subject of a great deal of research following a period of relative oblivion The lack of interest in asynchronous techniques was motivated by the progressive shift towards synchronous design techniques that had much more structure and were much easier to verify and synthesize System design requirements made it impossible to eliminate totally the use of asynchronous circuits Given the objective difficulty encountered by designers the asynchronous components of electronic systems such as interfaces became a serious bottleneck in the design process The use of new models and some theoretical breakthroughs made it possible to develop asynchronous design techniques that were reliable and effective This book describes a variety of mathematical models and of algorithms that form the backbone and the body of a new design methodology for asyn chronous design The book is intended for asynchronous hardware designers for computer aided tool experts and for digital designers interested in ex ploring the possibility of designing asynchronous circuits It requires a solid mathematical background in discrete event systems and algorithms While the book has not been written as a textbook nevertheless it could be used as a reference book in an advanced course in logic synthesis or asynchronous design

Modern Communications Receiver Design and Technology Cornell Drentea,2010 This comprehensive sourcebook thoroughly explores the state of the art in communications receivers providing detailed practical guidance for constructing an actual high dynamic range receiver from system design to packaging You also find clear explanations of the technical underpinnings that you need to understand for your work in the field This cutting edge reference presents the latest information on modern superheterodyne receivers dynamic range mixers oscillators complex coherent synthesizers automatic gain control DSP and software radios You find in depth discussions on system design including coverage of all pertinent data and tools Moreover the book offers you a solid understanding of packaging and mechanical considerations as

well as a look at tomorrow's receiver technology including new Bragg cell applications for ultra wideband electronic warfare receivers This one stop resource is packed with over 300 illustrations that support critical topics throughout

Motion Analysis and Image Sequence Processing M. Ibrahim Sezan, Reginald L. Lagendijk, 2012-12-06 An image or video sequence is a series of two dimensional 2 D images sequentially ordered in time Image sequences can be acquired for instance by video motion picture X ray or acoustic cameras or they can be synthetically generated by sequentially ordering 2 D still images as in computer graphics and animation The use of image sequences in areas such as entertainment visual communications multimedia education medicine surveillance remote control and scientific research is constantly growing as the use of television and video systems are becoming more and more common The boosted interest in digital video for both consumer and professional products along with the availability of fast processors and memory at reasonable costs has been a major driving force behind this growth Before we elaborate on the two major terms that appear in the title of this book namely motion analysis and image sequence processing we like to place them in their proper contexts within the range of possible operations that involve image sequences In this book we choose to classify these operations into three major categories namely i image sequence processing ii image sequence analysis and iii visualization The interrelationship among these three categories is pictorially described in Figure 1 below in the form of an image sequence triangle

Asymptotic Waveform Evaluation Eli Chiprout, Michel S. Nakhla, 2012-12-06 The intense drive for signal integrity has been at the forefront of rapid and new developments in CAD algorithms Thousands of engineers intent on achieving the best design possible use SPICE on a daily basis for analog simulation and general circuit analysis But the strained demand for high data speeds coupled with miniaturization on an unprecedented scale has highlighted the previously negligible effects of interconnect effects which are not always handled appropriately by the present levels of SPICE Signals at these higher speeds may be degraded by long interconnect lengths compared to the increasingly shorter signal rise times Interconnect structures can be diverse pins connectors leads microstrips striplines etc and present at any of the hierarchical packaging levels integrated circuits printed circuit boards multi chip modules or system backplanes Analysis of these effects in any CAD package has become a necessity Asymptotic waveform evaluation AWE and other moment matching techniques have recently proven useful in the analysis of interconnect structures and various networks containing large linear structures with nonlinear terminations Previously all that was available to the designer was a full SPICE simulation or a quick but uncertain timing estimation Moment matching used in linear systems analysis as a method of model reduction describes a method to extract a small set of dominant poles from a large network The information is obtained from the Taylor series coefficients moments of that system

Timed Boolean Functions William K.C. Lam, Robert K. Brayton, 2012-12-06 Timing research in high performance VLSI systems has advanced at a steady pace over the last few years while tools especially theoretical mechanisms lag behind Much present timing research relies heavily on timing diagrams which although intuitive are

inadequate for analysis of large designs with many parameters Further timing diagrams offer only approximations not exact solutions to many timing problems and provide little insight in the cases where temporal properties of a design interact intricately with the design's logical functionalities This book presents a methodology for timing research which facilitates analysis and design of circuits and systems in a unified temporal and logical domain In the first part we introduce an algebraic representation formalism Timed Boolean Functions TBF's which integrates both logical and timing information of digital circuits and systems into a single formalism We also give a canonical form TBF BDD's for them which can be used for efficient manipulation In the second part we apply Timed Boolean Functions to three problems in timing research for which exact solutions are obtained for the first time 1 computing the exact delays of combinational circuits and the minimum cycle times of finite state machines 2 analysis and synthesis of wavepipelining circuits a high speed architecture for which precise timing relations between signals are essential for correct operations 3 verification of circuit and system performance and coverage of delay faults by testing

An Analog VLSI System for Stereoscopic Vision Misha Mahowald, 2012-12-06 An Analog VLSI System for Stereoscopic Vision investigates the interaction of the physical medium and the computation in both biological and analog VLSI systems by synthesizing a functional neuromorphic system in silicon In both the synthesis and analysis of the system a point of view from within the system is adopted rather than that of an omniscient designer drawing a blueprint This perspective projects the design and the designer into a living landscape The motivation for a machine centered perspective is explained in the first chapter The second chapter describes the evolution of the silicon retina The retina accurately encodes visual information over orders of magnitude of ambient illumination using mismatched components that are calibrated as part of the encoding process The visual abstraction created by the retina is suitable for transmission through a limited bandwidth channel The third chapter introduces a general method for interchip communication the address event representation which is used for transmission of retinal data The address event representation takes advantage of the speed of CMOS relative to biological neurons to preserve the information of biological action potentials using digital circuitry in place of axons The fourth chapter describes a collective circuit that computes stereodisparity In this circuit the processing that corrects for imperfections in the hardware compensates for inherent ambiguity in the environment The fifth chapter demonstrates a primitive working stereovision system An Analog VLSI System for Stereoscopic Vision contributes to both computer engineering and neuroscience at a concrete level Through the construction of a working analog of biological vision subsystems new circuits for building brain style analog computers have been developed Specific neuropsychological and psychophysical results in terms of underlying electronic mechanisms are explained These examples demonstrate the utility of using biological principles for building brain style computers and the significance of building brain style computers for understanding the nervous system

Wave Pipelining: Theory and CMOS Implementation C. Thomas Gray, Wentai Liu, Ralph K. Cavin, III, 2012-12-06 The quest for higher performance digital systems for applications such as general purpose

computing signal image processing and telecommunications and an increasing cost consciousness have led to a major thrust for high speed VLSI systems implemented in inexpensive and widely available technologies such as CMOS This monograph based on the first author s doctoral dissertation concentrates on the technique of wave pipelining as one method toward achieving this goal The primary focus of this monograph is to provide a coherent presentation of the theory of wave pipelined operation of digital circuits and to discuss practical design techniques for the realization of wave pipelined circuits in the CMOS technology Wave pipelining can be applied to a variety of circuits for increased performance For example many architectures that support systolic computation lend themselves to wave pipelined realization Also the wave pipeline design methodology emphasizes the role of controlled clock skew in extracting enhanced performance from circuits that are not deeply pipelined Wave pipelining also known as maximal rate pipelining is a timing methodology used in digital systems to increase the number of effective pipeline stages without increasing the number of physical registers in the pipeline Using this technique new data is applied to the inputs of a combinational logic block before the outputs due to previous inputs are available thus effectively pipelining the combinational logic and maximizing the utilization of the logic

Connectionist Speech Recognition Hervé A. Bourlard, Nelson Morgan, 2012-12-06 Connectionist Speech Recognition A Hybrid Approach describes the theory and implementation of a method to incorporate neural network approaches into state of the art continuous speech recognition systems based on hidden Markov models HMMs to improve their performance In this framework neural networks and in particular multilayer perceptrons or MLPs have been restricted to well defined subtasks of the whole system i e HMM emission probability estimation and feature extraction The book describes a successful five year international collaboration between the authors The lessons learned form a case study that demonstrates how hybrid systems can be developed to combine neural networks with more traditional statistical approaches The book illustrates both the advantages and limitations of neural networks in the framework of a statistical systems Using standard databases and comparison with some conventional approaches it is shown that MLP probability estimation can improve recognition performance Other approaches are discussed though there is no such unequivocal experimental result for these methods Connectionist Speech Recognition is of use to anyone intending to use neural networks for speech recognition or within the framework provided by an existing successful statistical approach This includes research and development groups working in the field of speech recognition both with standard and neural network approaches as well as other pattern recognition and or neural network researchers The book is also suitable as a text for advanced courses on neural networks or speech processing

Analog Device-Level Layout Automation John M. Cohn, David J. Garrod, Rob A. Rutenbar, Rick Carley, 2012-12-06 This book presents a detailed summary of research on automatic layout of device level analog circuits that was undertaken in the late 1980s and early 1990s at Carnegie Mellon University We focus on the work behind the creation of the tools called KOAN and ANAGRAM II which form part of the core of the CMU ACACIA analog CAD system KOAN is a device placer for custom analog

cells ANANGRAM II a detailed area router for these analog cells We strive to present the motivations behind the architecture of these tools including detailed discussion of the subtle technology and circuit concerns that must be addressed in any successful analog or mixed signal layout tool Our approach in organizing the chapters of the book has been to present our algorithms as a series of responses to these very real and very difficult analog layout problems Finally we present numerous examples of results generated by our algorithms This research was supported in part by the Semiconductor Research Corporation by the National Science Foundation by Harris Semiconductor and by the International Business Machines Corporation Resident Study Program Finally just for the record John Cohn was the designer of the KOAN placer David Garrod was the designer of the ANAGRAM II router and its predecessor ANAGRAM I This book was architected by all four authors edited by John Cohn and Rob Rutenbar and produced in finished form by John Cohn

BiCMOS Technology and Applications Antonio R. Alvarez, 2012-12-06 BiCMOS Technology and Applications Second Edition provides a synthesis of available knowledge about the combination of bipolar and MOS transistors in a common integrated circuit BiCMOS In this new edition all chapters have been updated and completely new chapters on emerging topics have been added In addition BiCMOS Technology and Applications Second Edition provides the reader with a knowledge of either CMOS or Bipolar technology design a reference with which they can make educated decisions regarding the viability of BiCMOS in their own application BiCMOS Technology and Applications Second Edition is vital reading for practicing integrated circuit engineers as well as technical managers trying to evaluate business issues related to BiCMOS As a textbook this book is also appropriate at the graduate level for a special topics course in BiCMOS A general knowledge in device physics processing and circuit design is assumed Given the division of the book it lends itself well to a two part course one on technology and one on design This will provide advanced students with a good understanding of tradeoffs between bipolar and MOS devices and circuits

VLSI Design Methodologies for Digital Signal Processing Architectures Magdy A. Bayoumi, 2012-12-06 Designing VLSI systems represents a challenging task It is a transposition among different specifications corresponding to different levels of design abstraction behavioral structural and physical The behavioral level describes the functionality of the design It consists of two components static and dynamic The static component describes operations whereas the dynamic component describes sequencing and timing The structural level contains information about components control and connectivity The physical level describes the constraints that should be imposed on the floor plan the placement of components and the geometry of the design Constraints of area speed and power are also applied at this level To implement such multilevel transposition a design methodology should be devised taking into consideration the constraints limitations and properties of each level The mapping process between any of these domains is non isomorphic A single behavioral component may be transposed into more than one structural component Design methodologies are the most recent evolution in the design automation era which started off with the introduction and subsequent usage of module generation

especially for regular structures such as PLA s and memories A design methodology should offer an integrated design system rather than a set of separate unrelated routines and tools A general outline of a desired integrated design system is as follows Decide on a certain unified framework for all design levels Derive a design method based on this framework Create a design environment to implement this design method

Mathematics Unlimited - 2001 and Beyond Björn Engquist,Wilfried Schmid,2017-04-05 This is a book guaranteed to delight the reader It not only depicts the state of mathematics at the end of the century but is also full of remarkable insights into its future development as we enter a new millennium True to its title the book extends beyond the spectrum of mathematics to include contributions from other related sciences You will enjoy reading the many stimulating contributions and gain insights into the astounding progress of mathematics and the perspectives for its future One of the editors Björn Engquist is a world renowned researcher in computational science and engineering The second editor Wilfried Schmid is a distinguished mathematician at Harvard University Likewise the authors are all foremost mathematicians and scientists and their biographies and photographs appear at the end of the book Unique in both form and content this is a must read for every mathematician and scientist and in particular for graduates still choosing their specialty

Application-Driven Architecture Synthesis Francky Catthoor,Lars-Gunnar Svensson,2012-12-06 Application Driven Architecture Synthesis describes the state of the art of architectural synthesis for complex real time processing In order to deal with the stringent timing requirements and the intricacies of complex real time signal and data processing target architecture styles and target application domains have been adopted to make the synthesis approach feasible These approaches are also heavily application driven which is illustrated by many realistic demonstrations used as examples in the book The focus is on domains where application specific solutions are attractive such as significant parts of audio telecom instrumentation speech robotics medical and automotive processing image and video processing TV multimedia radar sonar Application Driven Architecture Synthesis is of interest to both academics and senior design engineers and CAD managers in industry It provides an excellent overview of what capabilities to expect from future practical design tools and includes an extensive bibliography

Circuit Synthesis with VHDL Roland Airiau,Jean-Michel Bergé,Vincent Olive,2012-12-06 One of the main applications of VHDL is the synthesis of electronic circuits Circuit Synthesis with VHDL is an introduction to the use of VHDL logic RTL synthesis tools in circuit design The modeling styles proposed are independent of specific market tools and focus on constructs widely recognized as synthesizable by synthesis tools A statement of the prerequisites for synthesis is followed by a short introduction to the VHDL concepts used in synthesis Circuit Synthesis with VHDL presents two possible approaches to synthesis the first starts with VHDL features and derives hardware counterparts the second starts from a given hardware component and derives several description styles The book also describes how to introduce the synthesis design cycle into existing design methodologies and the standard synthesis environment Circuit Synthesis with VHDL concludes with a case study providing a realistic example of the design flow from behavioral

description down to the synthesized level Circuit Synthesis with VHDL is essential reading for all students researchers design engineers and managers working with VHDL in a synthesis environment *VHDL '92* Jean-Michel Bergé, Alain Fonkoua, Serge Maginot, Jacques Rouillard, 2012-12-06 An open process of restandardization conducted by the IEEE has led to the definitions of the new VHDL standard The changes make VHDL safer more portable and more powerful VHDL also becomes bigger and more complete The canonical simulator of VHDL is enriched by new mechanisms the predefined environment is more complete and the syntax is more regular and flexible Discrepancies and known bugs of VHDL 87 have been fixed However the new VHDL 92 is compatible with VHDL 87 with some minor exceptions This book presents the new VHDL 92 for the VHDL designer New features are explained and classified Examples are provided each new feature is given a rationale and its impact on design methodology and performance is analysed Where appropriate pitfalls and traps are explained The VHDL designer will quickly be able to find the feature needed to evaluate the benefits it brings to modify previous VHDL 87 code to make it more efficient more portable and more flexible VHDL 92 is the essential update for all VHDL designers and managers involved in electronic design

Hot-Carrier Reliability of MOS VLSI Circuits Yusuf Leblebici, Sung-Mo (Steve) Kang, 2012-12-06 As the complexity and the density of VLSI chips increase with shrinking design rules the evaluation of long term reliability of MOS VLSI circuits is becoming an important problem The assessment and improvement of reliability on the circuit level should be based on both the failure mode analysis and the basic understanding of the physical failure mechanisms observed in integrated circuits Hot carrier induced degradation of MOS transistor characteristics is one of the primary mechanisms affecting the long term reliability of MOS VLSI circuits It is likely to become even more important in future generation chips since the downward scaling of transistor dimensions without proportional scaling of the operating voltage aggravates this problem A thorough understanding of the physical mechanisms leading to hot carrier related degradation of MOS transistors is a prerequisite for accurate circuit reliability evaluation It is also being recognized that important reliability concerns other than the post manufacture reliability qualification need to be addressed rigorously early in the design phase The development and use of accurate reliability simulation tools are therefore crucial for early assessment and improvement of circuit reliability Once the long term reliability of the circuit is estimated through simulation the results can be compared with predetermined reliability specifications or limits If the predicted reliability does not satisfy the requirements appropriate design modifications may be carried out to improve the resistance of the devices to degradation

A Formal Approach to Hardware Design Jørgen Staunstrup, 2012-12-06 A Formal Approach to Hardware Design discusses designing computations to be realised by application specific hardware It introduces a formal design approach based on a high level design language called Synchronized Transitions The models created using Synchronized Transitions enable the designer to perform different kinds of analysis and verification based on descriptions in a single language It is for example possible to use exactly the same design description both for mechanically supported verification

and synthesis Synchronized Transitions is supported by a collection of public domain CAD tools These tools can be used with the book in presenting a course on the subject A Formal Approach to Hardware Design illustrates the benefits to be gained from adopting such techniques but it does so without assuming prior knowledge of formal design methods The book is thus not only an excellent reference it is also suitable for use by students and practitioners

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