

INTEGRATED VIDEO-FREQUENCY CONTINUOUS-TIME FILTERS

High-Performance Realizations in BiCMOS

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KLUWER ACADEMIC PUBLISHERS

Integrated Video Frequency Continuous Time Filters

Alireza Moini



Integrated Video Frequency Continuous Time Filters:

Integrated Video-Frequency Continuous-Time Filters Scott D. Willingham, Kenneth W. Martin, 2012-12-06 Advances in the state of the art mean the signal processing ICs of ever increasing complexity are being introduced While the typical portion of a large IC devoted to analog circuits has diminished the performance of those surviving analog signal processing circuits remains vital and their design challenging Moreover the emerging high definition TV technology has created a new area for IC development one with formidable signal processing requirements The antialiasing filters needed for one proposed HDTV decoder motivated the research documented in this book Sharply selective filters place tight constraints on the permitted excess phase shifts of their constituent circuits Combined with stringent requirements for low distortion at video frequencies these constraints challenge the IC filter designer Integrated Video Frequency Continuous Time Filters High Performance Realizations in BiCMOS deals with what is arguably the mainstay of analog signal processing circuits Prominent applications in computer disk drive read channels video receivers rf circuits and antialiasing and reconstruction in data converters testifies to their importance Moreover they are excellent benchmarks for more general analog signal processors Bipolar and MOSFET transistors freely combined at the lowest circuit levels provide the designer with an opportunity to develop potent variations on the standard idioms The book considers the general principles of BiCMOS circuit design through to a demanding design problem This case study approach allows a concrete discussion of the justification for and practical trade offs of each design decision Audience A reference work for experienced IC designers and a text for advanced IC design students [Integrated Video-Frequency Continuous-Time Filters](#) Scott D. Willingham, Kenneth W. Martin, 2012-10-06

Advances in the state of the art mean the signal processing ICs of ever increasing complexity are being introduced While the typical portion of a large IC devoted to analog circuits has diminished the performance of those surviving analog signal processing circuits remains vital and their design challenging Moreover the emerging high definition TV technology has created a new area for IC development one with formidable signal processing requirements The antialiasing filters needed for one proposed HDTV decoder motivated the research documented in this book Sharply selective filters place tight constraints on the permitted excess phase shifts of their constituent circuits Combined with stringent requirements for low distortion at video frequencies these constraints challenge the IC filter designer Integrated Video Frequency Continuous Time Filters High Performance Realizations in BiCMOS deals with what is arguably the mainstay of analog signal processing circuits Prominent applications in computer disk drive read channels video receivers rf circuits and antialiasing and reconstruction in data converters testifies to their importance Moreover they are excellent benchmarks for more general analog signal processors Bipolar and MOSFET transistors freely combined at the lowest circuit levels provide the designer with an opportunity to develop potent variations on the standard idioms The book considers the general principles of BiCMOS circuit design through to a demanding design problem This case study approach allows a concrete discussion of the

justification for and practical trade offs of each design decision Audience A reference work for experienced IC designers and a text for advanced IC design students **High Frequency Continuous Time Filters in Digital CMOS Processes**

Shanthi Pavan,Yannis Tsividis,2007-05-08 There is an ever increasing trend towards putting entire systems on a single chip This means that analog circuits will have to coexist on the same substrate along with massive digital systems Since technologies are optimized with these digital systems in mind designers will have to make do with standard CMOS processes in the years to come We address analog filter design from this perspective Filters form important blocks in applications ranging from computer disc drive chips to radio transceivers In this book we develop the theory and techniques necessary for the implementation of high frequency hundreds of megahertz programmable continuous time filters in standard CMOS processes Since high density poly poly capacitors are not available in these technologies alternative capacitor structures have to be found Met metal capacitors have low specific capacitance An alternative is to use the inherently nonlinear capacitance formed by MOSFET gates In Chapter 2 we focus on the use of MOS capacitors as integrating elements A physics based model which predicts distortion accurately is presented for a two terminal MOS structure in accumulation Distortion in these capacitors as a function of signal swing and bias voltage is computed Chapter 3 reviews continuous time filter architectures in the light of bias dependent integrating capacitors We also discuss the merits and demerits of various CMOS transconductance elements The problems encountered in designing high frequency programmable filters are discussed in detail

Design of Low-Voltage, Low-Power Operational Amplifier Cells Ron Hogervorst,Johan Huijsing,2013-03-09 Design of Low Voltage Low Power CMOS Operational Amplifier Cells describes the theory and design of the circuit elements that are required to realize a low voltage low power operational amplifier These elements include constant gm rail to rail input stages class AB rail to rail output stages and frequency compensation methods Several examples of each of these circuit elements are investigated Furthermore the book illustrates several silicon realizations giving their measurement results The text focuses on compact low voltage low power operational amplifiers with good performance Six simple high performance class AB amplifiers are realized using a very compact topology making them particularly suitable for use as VLSI library cells All of the designs can use a supply voltage as low as 3V One of the amplifier designs dissipates only 50 W with a unity gain frequency of 1.5 MHz A second set of amplifiers run on a supply voltage slightly above 1V The amplifiers combine a low power consumption with a gain of 120 dB In addition the design of three fully differential operational amplifiers is addressed Design of Low Voltage Low Power CMOS Operational Amplifier Cells is intended for professional designers of analog circuits It is also suitable for use as a text book for an advanced course in CMOS operational amplifier design Switched-Current Design and Implementation of Oversampling A/D Converters Nianxiong Tan,2012-12-06 Switched Current Design and Implementation of Oversampling A D Converters discusses the switched current SI technique and its application in oversampling A D converters design The SI technique is an analog sampled data technique that fully exploits the digital

CMOS process Compared with the traditional switched capacitor SC technique the SI technique has both pros and cons that are highlighted in the book With the consideration of similarity and difference of SI and SC techniques oversampling A D converter architectures are tailored and optimized for SI design and implementation in the book Switched Current Design and Implementation of Oversampling A D Converters emphasizes the practical aspects of SI circuits without tedious mathematical derivations and is full of circuit design and implementation examples There are more than 10 different chips included in the book demonstrating the high speed over 100 MHz and ultra low voltage 1.2 V operation of SI circuits and systems in standard digital CMOS processes Therefore the book is of special value as a practical guide for designing SI circuits and SI oversampling A D converters Switched Current Design and Implementation of Oversampling A D Converters serves as an excellent reference for analog designers especially A D converter designers and is of interest to digital designers for real time signal processing who need A D interfaces The book may also be used as a text for advanced courses on the subject

Modeling and Simulation of Mixed Analog-Digital Systems B. Antao, 2012-12-06 Modeling and Simulation of Mixed Analog Digital Systems brings together in one place important contributions and state of the art research results in this rapidly advancing area Modeling and Simulation of Mixed Analog Digital Systems serves as an excellent reference providing insight into some of the most important issues in the field

Characterization Methods for Submicron MOSFETs Hisham Haddara, 2012-12-06 It is true that the Metal Oxide Semiconductor Field Effect Transistor MOSFET is a key component in modern microelectronics It is also true that there is a lack of comprehensive books on MOSFET characterization in general However there is more than that as to the motivation and reasons behind writing this book During the last decade device physicists researchers and engineers have been continuously faced with new elements which made the task of MOSFET characterization more and more crucial as well as difficult The progressive miniaturization of devices has caused several phenomena to emerge and modify the performance of scaled down MOSFETs Localized degradation induced by hot carrier injection and Random Telegraph Signal RTS noise generated by individual traps are examples of these phenomena Therefore it was inevitable to develop new models and new characterization methods or at least adapt the existing ones to cope with the special nature of these new phenomena The need for more deep and extensive characterization of MOSFET parameters has further increased as the applications of this device have gained ground in many new fields in which its performance has become more and more sensitive to the properties of its Si/SiO₂ interface MOS transistors have crossed the borders of high speed electronics where they operate at GHz frequencies Moreover MOSFETs are now widely employed in the subthreshold regime in neural circuits and biomedical applications

VLSI — Compatible Implementations for Artificial Neural Networks Sied Mehdi Fakhraie, Kenneth C. Smith, 2012-12-06 This book introduces several state of the art VLSI implementations of artificial neural networks ANNs It reviews various hardware approaches to ANN implementations analog digital and pulse coded The analog approach is emphasized as the main one taken in the later

chapters of the book The area of VLSI implementation of ANNs has been progressing for the last 15 years but not at the fast pace originally predicted Several reasons have contributed to the slow progress with the main one being that VLSI implementation of ANNs is an interdisciplinary area where only a few researchers academics and graduate students are willing to venture The work of Professors Fakhraie and Smith presented in this book is a welcome addition to the state of the art and will greatly benefit researchers and students working in this area Of particular value is the use of experimental results to backup extensive simulations and in depth modeling The introduction of a synapse MOS device is novel The book applies the concept to a number of applications and guides the reader through more possible applications for future work I am confident that the book will benefit a potentially wide readership M I Elmasry University of Waterloo Waterloo Ontario Canada

Preface Neural Networks NNs generally defined as parallel networks that employ a large number of simple processing elements to perform computation in a distributed fashion have attracted a lot of attention in the past fifty years As the result many new discoveries have been made

CMOS Analog Integrated Circuits Tertulien Ndjountche, 2017-12-19

High speed power efficient analog integrated circuits can be used as standalone devices or to interface modern digital signal processors and micro controllers in various applications including multimedia communication instrumentation and control systems New architectures and low device geometry of complementary metaloxidesemiconductor CMOS technologies have accelerated the movement toward system on a chip design which merges analog circuits with digital and radio frequency components CMOS Analog Integrated Circuits High Speed and Power Efficient Design describes the important trends in designing these analog circuits and provides a complete in depth examination of design techniques and circuit architectures emphasizing practical aspects of integrated circuit implementation Focusing on designing and verifying analog integrated circuits the author reviews design techniques for more complex components such as amplifiers comparators and multipliers The book details all aspects from specification to the final chip of the development and implementation process of filters analog to digital converters ADCs digital to analog converters DACs phase locked loops PLLs and delay locked loops DLLs It also describes different equivalent transistor models design and fabrication considerations for high density integrated circuits in deep submicrometer process circuit structures for the design of current mirrors and voltage references topologies of suitable amplifiers continuous time and switched capacitor circuits modulator architectures and approaches to improve linearity of Nyquist converters The text addresses the architectures and performance limitation issues affecting circuit operation and provides conceptual and practical solutions to problems that can arise in the design process This reference provides balanced coverage of theoretical and practical issues that will allow the reader to design CMOS analog integrated circuits with improved electrical performance The chapters contain easy to follow mathematical derivations of all equations and formulas graphical plots and open ended design problems to help determine most suitable architecture for a given set of performance specifications This comprehensive and illustrative text for the design and analysis of CMOS analog integrated

circuits serves as a valuable resource for analog circuit designers and graduate students in electrical engineering CMOS Current Amplifiers Giuseppe Palmisano, Gaetano Palumbo, Salvatore Pennisi, 2012-12-06 CMOS Current Amplifiers presents design strategies for high performance current amplifiers based on CMOS technology After an introduction to various architectures of operational amplifiers the operating principles of the current amplifier are outlined This book provides the reader with simple and compact design equations for use in a pencil and paper design and the following simulation step Chapter 1 introduces the general aspects of current amplifiers After a preliminary classification of operational amplifiers ideal blocks and models are discussed for different architectures and a first high level comparison is made between traditional amplifiers and current amplifiers Analysis and examples of basic circuits as well as signal processing applications involving current amplifiers are also given Non idealities and second order effects causing limitations in performance are then discussed and evaluated Chapter 2 focuses on low drive current amplifiers Several design examples for current conveyors and class A current amplifiers are discussed in detail and design equations are presented for the main performance parameters which allows a good trade off between requirements High performance solutions for high bandwidth and low voltage capability are also considered and finally current comparators with progressively enhanced performance are reported and analyzed critically Chapter 3 deals with current amplifiers for off chip loads Several class AB current mode output stages are discussed and design strategies which improve performance are presented A detailed analysis of non ideal effect is carried out with particular emphasis on linearity Design examples are given and circuit arrangements for further developments are included CMOS Current Amplifiers serves as an excellent reference for researchers and professionals of analog IC design and may also be used as an advanced text on current amplifiers

Design of Very High-Frequency Multirate Switched-Capacitor Circuits Seng-Pan U, Rui Paulo Martins, José Epifânio da Franca, 2006 Design of Very High Frequency Multirate Switched Capacitor Circuits presents the theory and the corresponding CMOS implementation of the novel multirate sampled data analog interpolation technique which has its great potential on very high frequency analog front end filtering due to its inherent dual advantage of reducing the speed of data converters and DSP core together with the specification relaxation of the post continuous time filtering This technique completely eliminates the traditional phenomenon of sampled and hold frequency shaping at the lower input sampling rate Also in order to tackle physical IC imperfections at very high frequency the state of the art circuit design and layout techniques for high speed Switched Capacitor SC circuits are comprehensively discussed Optimum circuit architecture tradeoff analysis Simple speed and power trade off analysis of active elements High order filtering response accuracy with respect to capacitor ratio mismatches Time interleaved effect with respect to gain and offset mismatch Time interleaved effect with respect to timing skew and random jitter with non uniformly holding Stage noise analysis and allocation scheme Substrate and supply noise reduction Gain and offset compensation techniques High bandwidth low power amplifier design

and layout Very low timing skew multiphase generation Two tailor made optimum design examples in CMOS are presented The first one achieves a 3 stage 8 fold SC interpolating filter with 5 5MHz bandwidth and 108MHz output sampling rate for a NTSC PAL CCIR 601 digital video at 3 V Another is a 15 tap 57MHz SC FIR bandpass interpolating filter with 4 fold sampling rate increase to 320MHz and the first time embedded frequency band up translation for DDFS system at 2 5V The corresponding chip prototype achieves so far the highest operating frequency highest filter order and highest center frequency with highest dynamic range under the lowest supply voltage when compared to the previously reported high frequency SC filters in CMOS

Continuous-Time Active Filter Design T. Deliyannis, Yichuang Sun, J.K.

Fidler, 2019-05-08 This book presents the design of active RC filters in continuous time Topics include filter fundamentals active elements realization of functions using opamps LC ladder filters operational transconductance amplifier circuits OTACs MOSFET C filters Continuous Time Active Filter Design uses wave variables to enable the reader to better understand the introduction of more complex variables created through linear transformations of voltages and currents Intended for undergraduate students in electrical engineering Continuous Time Active Filter Design provides chapters as self contained units including introductory material leading to active RC filters

Analog Integrated Circuit Design Tony Chan

Carusone, David Johns, Kenneth Martin, 2011-12-13 When first published in 1996 this text by David Johns and Kenneth Martin quickly became a leading textbook for the advanced course on Analog IC Design This new edition has been thoroughly revised and updated by Tony Chan Carusone a University of Toronto colleague of Drs Johns and Martin Dr Chan Carusone is a specialist in analog and digital IC design in communications and signal processing This edition features extensive new material on CMOS IC device modeling processing and layout Coverage has been added on several types of circuits that have increased in importance in the past decade such as generalized integer N phase locked loops and their phase noise analysis voltage regulators and 1 5b per stage pipelined A D converters Two new chapters have been added to make the book more accessible to beginners in the field frequency response of analog ICs and basic theory of feedback amplifiers

Design of

High Frequency Integrated Analogue Filters Yichuang Sun, 2002-04-15 Sun communication electronics U of Hertfordshire UK this volume s editor also contributed a chapter on the architectures and design of OTA gm C filters The other papers describe on chip automatic tuning of filters analog adaptive filters low voltage techniques for switched current filters log domain filters the MOSFET C technique and active filters using integrated inductors The contributors teach electrical engineering in the US the UK Thailand and Canada Annotation copyrighted by Book News Inc Portland OR

High-Performance CMOS

Continuous-Time Filters José Silva-Martínez, Michiel Steyaert, Willy M.C. Sansen, 2013-03-09 High Performance CMOS Continuous Time Filters is devoted to the design of CMOS continuous time filters CMOS is employed because the most complex integrated circuits have been realized with this technology for two decades The most important advantages and drawbacks of continuous time filters are clearly shown The transfer function is one of the most important filter parameters

but several others like intermodulation distortion power supply rejection ratio noise level and dynamic range are fundamental in the design of high performance systems Special attention is paid to the practical aspects of the design which shows the difference between an academic design and an industrial design A clear understanding of the behavior of the circuits and techniques is preferred over complex equations or interpretation of simulated results Step by step design procedures are very often used to clarify the use of the techniques and topologies The organization of this text is hierarchical starting with the design consideration of the basic building blocks and ending with the design of several high performance continuous time filters Most of the circuits have been fabricated theoretically analyzed and simulated and silicon measurement results are compared with each other High Performance CMOS Continuous Time Filters can be used as a text book for senior or graduate courses on this topic and can also be useful for industrial engineers as a reference book

Vision Chips Alireza Moini, 2012-12-06 This chapter presents a set of introductory material which in addition to providing a general view on the topic highlights the importance of research in this area It also presents a short history of the design of smart vision sensors and points out some of the fundamental issues in the design of such sensors 1 1 A General Overview Machine vision is one of the main branches of artificial intelligence The richness of information present in images makes them the first choice as an input to an artificial system which tries to interact with its environment A large proportion of the brain of many advanced species is dedicated to visual information processing which illustrates the importance of visual information in biological systems Biological visual systems have evolved over millions of years and each specie has developed a specialized visual system tailored for the essential tasks of survival such as catching a prey or escaping a predator Implementing electronic hardware for image processing therefore may benefit from the underlying fundamental aspects of biological vision though in no respect should this be regarded as a solid framework for electronic vision systems Traditionally computer vision algorithms are performed on images captured by conventional cameras and processing is accomplished by means of general purpose digital computers More advanced systems utilize dedicated hardware to speed up the processing stage

Learning on Silicon G. Cauwenberghs, Magdy Bayoumi, 1999-06-30 Learning on Silicon combines models of adaptive information processing in the brain with advances in microelectronics technology and circuit design The premise is to construct integrated systems not only loaded with sufficient computational power to handle demanding signal processing tasks in sensory perception and pattern recognition but also capable of operating autonomously and robustly in unpredictable environments through mechanisms of adaptation and learning This edited volume covers the spectrum of Learning on Silicon in five parts adaptive sensory systems neuromorphic learning learning architectures learning dynamics and learning systems The 18 chapters are documented with examples of fabricated systems experimental results from silicon and integrated applications ranging from adaptive optics to biomedical instrumentation As the first comprehensive treatment on the subject Learning on Silicon serves as a reference for beginners and experienced researchers alike It provides

excellent material for an advanced course and a source of inspiration for continued research towards building intelligent adaptive machines

Analog Circuit Design Rudy J. van de Plassche, Willy M.C. Sansen, Johan Huijsing, 2013-06-29 The realization of signal sampling and quantization at high sample rates with low power dissipation is an important goal in many applications including portable video devices such as camcorders personal communication devices such as wireless LAN transceivers in the read channels of magnetic storage devices using digital data detection and many others This paper describes architecture and circuit approaches for the design of high speed low power pipeline analog to digital converters in CMOS Here the term high speed is taken to imply sampling rates above 1 Mhz In the first section the different conversion techniques applicable in this range of sample rates is discussed Following that the particular problems associated with power minimization in video rate pipeline ADCs is discussed These include optimization of capacitor sizes design of low voltage transmission gates and optimization of switched capacitor gain blocks and operational amplifiers for minimum power dissipation As an example of the application of these techniques the design of a power optimized 10 bit pipeline AID converter ADC that achieves 1.67 mW per MS/s of sampling rate from 1 MS/s to 20 MS/s is described

2 Techniques for CMOS Video Rate AID Conversion Analog to digital conversion techniques can be categorized in many ways One convenient means of comparing techniques is to examine the number of analog clock cycles required to produce one effective output sample of the signal being quantized

Feedback Amplifiers Gaetano Palumbo, Salvatore Pennisi, 2007-05-08 This comprehensive book deals with feedback and feedback amplifiers presenting original material on the topic of feedback circuits After describing the fundamental properties of feedback the book illustrates techniques of analysis for greater insight into feedback amplifiers and design strategies to optimise their performance

Continuous-Time Delta-Sigma Modulators for High-Speed A/D Conversion James A. Cherry, W. Martin Snelgrove, 2006-04-18 Among analog to digital converters the delta sigma modulator has cornered the market on high to very high resolution converters at moderate speeds with typical applications such as digital audio and instrumentation Interest has recently increased in delta sigma circuits built with a continuous time loop filter rather than the more common switched capacitor approach Continuous time delta sigma modulators offer less noisy virtual ground nodes at the input inherent protection against signal aliasing and the potential to use a physical rather than an electrical integrator in the first stage for novel applications like accelerometers and magnetic flux sensors More significantly they relax settling time restrictions so that modulator clock rates can be raised This opens the possibility of wideband 1 MHz or more converters possibly for use in radio applications at an intermediate frequency so that one or more stages of mixing might be done in the digital domain

Continuous Time Delta Sigma Modulators for High Speed A/D Conversion Theory Practice and Fundamental Performance Limits covers all aspects of continuous time delta sigma modulator design with particular emphasis on design for high clock speeds The authors explain the ideal design of such modulators in terms of the well understood discrete time modulator design problem and provide design examples in Matlab They also cover commonly

encountered non idealities in continuous time modulators and how they degrade performance plus a wealth of material on the main problems feedback path delays clock jitter and quantizer metastability in very high speed designs and how to avoid them They also give a concrete design procedure for a real high speed circuit which illustrates the tradeoffs in the selection of key parameters Detailed circuit diagrams simulation results and test results for an integrated continuous time 4 GHz band pass modulator for A D conversion of 1 GHz analog signals are also presented Continuous Time Delta Sigma Modulators for High Speed A D Conversion Theory Practice and Fundamental Performance Limits concludes with some promising modulator architectures and a list of the challenges that remain in this exciting field

Delve into the emotional tapestry woven by Emotional Journey with in **Integrated Video Frequency Continuous Time Filters** . This ebook, available for download in a PDF format (Download in PDF: *), is more than just words on a page; itis a journey of connection and profound emotion. Immerse yourself in narratives that tug at your heartstrings. Download now to experience the pulse of each page and let your emotions run wild.

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