

Synthesis and Optimization of DSP Algorithms

George A. Constantinides,
Peter Y.K. Cheung and
Wayne Luk

Kluwer Academic Publishers



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Luiz Cláudio Villar dos Santos



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Synthesis and Optimization of DSP Algorithms George Constantinides, Peter Y.K. Cheung, Wayne Luk, 2007-05-08

Synthesis and Optimization of DSP Algorithms describes approaches taken to synthesising structural hardware descriptions of digital circuits from high level descriptions of Digital Signal Processing DSP algorithms The book contains A tutorial on the subjects of digital design and architectural synthesis intended for DSP engineers A tutorial on the subject of DSP intended for digital designers A discussion of techniques for estimating the peak values likely to occur in a DSP system thus enabling an appropriate signal scaling Analytic techniques simulation techniques and hybrids are discussed The applicability of different analytic approaches to different types of DSP design is covered The development of techniques to optimise the precision requirements of a DSP algorithm aiming for efficient implementation in a custom parallel processor The idea is to trade off numerical accuracy for area or power consumption advantages Again both analytic and simulation techniques for estimating numerical accuracy are described and contrasted Optimum and heuristic approaches to precision optimisation are discussed A discussion of the importance of the scheduling allocation and binding problems and development of techniques to automate these processes with reference to a precision optimized algorithm Future perspectives for synthesis and optimization of DSP algorithms

Synthesis and Optimization of DSP Algorithms George A. Constantinides, 2004

Optimization of DSP Algorithms George Constantinides, Peter Y. K. Cheung, Wayne Luk, 2014-09-01

Optimization of DSP Algorithms George Constantinides, Peter Y.K. Cheung, Wayne Luk, 2013-04-24 *Synthesis and Optimization of DSP Algorithms* describes approaches taken to synthesising structural hardware descriptions of digital circuits from high level descriptions of Digital Signal Processing DSP algorithms The book contains A tutorial on the subjects of digital design and architectural synthesis intended for DSP engineers A tutorial on the subject of DSP intended for digital designers A discussion of techniques for estimating the peak values likely to occur in a DSP system thus enabling an appropriate signal scaling Analytic techniques simulation techniques and hybrids are discussed The applicability of different analytic approaches to different types of DSP design is covered The development of techniques to optimise the precision requirements of a DSP algorithm aiming for efficient implementation in a custom parallel processor The idea is to trade off numerical accuracy for area or power consumption advantages Again both analytic and simulation techniques for estimating numerical accuracy are described and contrasted Optimum and heuristic approaches to precision optimisation are discussed A discussion of the importance of the scheduling allocation and binding problems and development of techniques to automate these processes with reference to a precision optimized algorithm Future perspectives for synthesis and optimization of DSP algorithms

VLSI Synthesis of DSP Kernels Mahesh Mehendale, Sunil D. Sherlekar, 2013-04-17 A critical step in the design of a DSP system is to identify for each of its components DSP kernels an implementation architecture that provides the desired degree of flexibility programmability and optimises the area delay power parameters The book covers the entire

solution space comprising both hardware multiplier based and multiplex less architectures that offer varying degrees of programmability For each of the implementation styles several algorithmic and architectural transformations are proposed so as to optimally implement weighted sum based DSP kernels over the area display power space VLSI Synthesis of DSP Kernels presents the following Six different target implementation styles Programmable DSP based implementation Programmable processors with no dedicated hardware multiplier Implementation using hardware multipliers and adders Distributed Arithmetic DA based implementation Residue Number System RNS based implementation and Multiplier less implementation using adders and shifters for fixed coefficient DSP kernels For each of the implementation styles description and analysis of several algorithmic and architectural transformations aimed at one or more of reduced area higher performance and low power Automated and semi automated techniques for applying each of these transformations and Classification of the transformations based on the properties that they exploit and their encapsulation in a design framework A methodology that uses the framework to systematically explore the application of these transformations depending on the characteristics of the algorithm and the target implementation style VLSI Synthesis of DSP Kernels is essential reading for designers of both hardware and software based DSP systems developers of IP modules for DSP applications EDA tools developers researchers and managers interested in getting a comprehensive overview of current trends and future challenges in optimal implementations of DSP kernels It will also be suitable for graduate students specialising in the area of VLSI Digital Signal Processing

VLSI and Chip Design Dr. M. Maheswaran, Mandadupu Anusha, Bandam Narendar, Modugu Rambabu, 2024-05-23 VLSI and Chip Design exploration of Very Large Scale Integration VLSI technology and the intricacies of modern chip design It fundamental principles advanced methodologies and the latest innovations in circuit design fabrication and testing With a focus on digital and analog systems this integrates theoretical concepts with practical applications catering to both beginners and professionals It emphasizes design optimization power efficiency and scalability making it an essential resource for engineers researchers and students aspiring to excel in semiconductor technology and integrated circuit design

Reconfigurable Computing Scott Hauck, André DeHon, 2010-07-26 Reconfigurable Computing marks a revolutionary and hot topic that bridges the gap between the separate worlds of hardware and software design the key feature of reconfigurable computing is its groundbreaking ability to perform computations in hardware to increase performance while retaining the flexibility of a software solution Reconfigurable computers serve as affordable fast and accurate tools for developing designs ranging from single chip architectures to multi chip and embedded systems Scott Hauck and Andre DeHon have assembled a group of the key experts in the fields of both hardware and software computing to provide an introduction to the entire range of issues relating to reconfigurable computing FPGAs field programmable gate arrays act as the computing vehicles to implement this powerful technology Readers will be guided into adopting a completely new way of handling existing design concerns and be able to make use of the vast opportunities possible with

reconfigurable logic in this rapidly evolving field Designed for both hardware and software programmers Views of reconfigurable programming beyond standard programming languages Broad set of case studies demonstrating how to use FPGAs in novel and efficient ways

Algorithms for VLSI Design Automation Sabih H. Gerez,1999-01-05 Modern microprocessors such as Intel s Pentium chip typically contain many millions of transistors They are known generically as Very Large Scale Integrated VLSI systems and their sheer scale and complexity has necessitated the development of CAD tools to automate their design This book focuses on the algorithms which are the building blocks of the design automation software which generates the layout of VLSI circuits Courses on this area are typically elective courses taken at senior undergrad or graduate level by students of Electrical and Electronic Engineering and sometimes in Computer Science or Computer Engineering

Digital Signal Processing Applications ,1996 *Architecture and Design of Distributed Embedded Systems* Bernd Kleinjohann,2013-04-18 Due to the decreasing production costs of IT systems applications that had to be realised as expensive PCBs formerly can now be realised as a system on chip Furthermore low cost broadband communication media for wide area communication as well as for the realisation of local distributed systems are available Typically the market requires IT systems that realise a set of specific features for the end user in a given environment so called embedded systems Some examples for such embedded systems are control systems in cars airplanes houses or plants information and communication devices like digital TV mobile phones or autonomous systems like service or edutainment robots For the design of embedded systems the designer has to tackle three major aspects The application itself including the man machine interface The target architecture of the system including all functional and non functional constraints and the design methodology including modelling specification synthesis test and validation The last two points are a major focus of this book This book documents the high quality approaches and results that were presented at the International Workshop on Distributed and Parallel Embedded Systems DIPES 2000 which was sponsored by the International Federation for Information Processing IFIP and organised by IFIP working groups WG10 3 WG10 4 and WG10 5 The workshop took place on October 18 19 2000 in Schlo Eringerfeld near Paderborn Germany *Architecture and Design of Distributed Embedded Systems* is organised similar to the workshop Chapters 1 and 4 Methodology I and II deal with different modelling and specification paradigms and the corresponding design methodologies Generic system architectures for different classes of embedded systems are presented in Chapter 2 In Chapter 3 several design environments for the support of specific design methodologies are presented Problems concerning test and validation are discussed in Chapter 5 The last two chapters include distribution and communication aspects Chapter 6 and synthesis techniques for embedded systems Chapter 7 This book is essential reading for computer science researchers and application developers

High Level Synthesis and Word Length Optimization of Digital Signal Processing Systems George Anthony Constaninides,University of London (GB),2002

Memory Management for Synthesis of DSP Software Praveen K. Murthy,Shuvra S. Bhattacharyya,2018-12-14

Although programming in memory restricted environments is never easy this holds especially true for digital signal processing DSP The data rich computation intensive nature of DSP makes memory management a chief and challenging concern for designers Memory Management for Synthesis of DSP Software focuses on minimizing memory requirements during the synthesis of DSP software from dataflow representations Dataflow representations are used in many popular DSP design tools and the methods of this book can be applied in that context as well as other contexts where dataflow is used This book systematically reviews research conducted by the authors on memory minimization techniques for compiling synchronous dataflow SDF specifications Beginning with an overview of the foundations of software synthesis techniques from SDF descriptions it examines aggressive buffer sharing techniques that take advantage of specific and quantifiable tradeoffs between code size and buffer size to achieve high levels of buffer memory optimization The authors outline coarse level strategies using lifetime analysis and dynamic storage allocation DSA for efficient buffer sharing as one approach and demonstrate the role of the CBP consumed before produced parameter at a finer level using a merging framework for buffer sharing They present two powerful algorithms for combining these sharing techniques and then introduce techniques that are not restricted to the single appearance scheduling space of the other techniques Extensively illustrated to clarify the mathematical concepts Memory Management for Synthesis of DSP Software presents a comprehensive survey of state of the art research in DSP software synthesis

VLSI Digital Signal Processors Vijay Madisetti,1995 This is the only book that offers a thorough treatment of the following design and application of programmable digital signal processors formal specification and optimization of signal processing architectures and circuits high level synthesis of DSP architectures and datapaths detailed treatment of application specific integrated circuits ASICs scheduling allocation and assignment algorithms for multiple processor DSP systems and hardware software co design issues in DSP

VLSI Digital Signal Processors An Introduction to Rapid Prototyping and Design Synthesis provides a cohesive quantitative and clear exposition of the implementation and prototyping of digital signal processing algorithms on programmable signal processors parallel processing systems and application specific ICs Included are both programmable and dedicated digital signal processors and discussions of the latest optimization methods and the use of computer aided design techniques

Semantic

Hyper/Multimedia Adaptation Ioannis E. Anagnostopoulos,Mária Bieliková,Phivos Mylonas,Nicolas Tsapatsoulis,2012-07-28 Nowadays more and more users are witnessing the impact of Hypermedia Multimedia as well as the penetration of social applications in their life Parallel to the evolution of the Internet and Web several Hypermedia Multimedia schemes and technologies bring semantic based intelligent personalized and adaptive services to the end users More and more techniques are applied in media systems in order to be user group centric adapting to different content and context features of a single or a community user In respect to all the above researchers need to explore and study the plethora of challenges that emergent personalisation and adaptation technologies bring to the new era This edited volume

aims to increase the awareness of researchers in this area All contributions provide an in depth investigation on research and deployment issues regarding already introduced schemes and applications in Semantic Hyper Multimedia and Social Media Adaptation Moreover the authors provide survey based articles so as potential readers can use it for catching up the recent trends and applications in respect to the relevant literature Finally the authors discuss and present their approach in the respective field or problem addressed

FPGA-based Implementation of Signal Processing Systems Roger Woods, John McAllister, Gaye Lightbody, Ying Yi, 2008-10-13 Field programmable gate arrays FPGAs are an increasingly popular technology for implementing digital signal processing DSP systems By allowing designers to create circuit architectures developed for the specific applications high levels of performance can be achieved for many DSP applications providing considerable improvements over conventional microprocessor and dedicated DSP processor solutions The book addresses the key issue in this process specifically the methods and tools needed for the design optimization and implementation of DSP systems in programmable FPGA hardware It presents a review of the leading edge techniques in this field analyzing advanced DSP based design flows for both signal flow graph SFG based and dataflow based implementation system on chip SoC aspects and future trends and challenges for FPGAs The automation of the techniques for component architectural synthesis computational models and the reduction of energy consumption to help improve FPGA performance are given in detail Written from a system level design perspective and with a DSP focus the authors present many practical application examples of complex DSP implementation involving high performance computing e g matrix operations such as matrix multiplication high speed filtering including finite impulse response FIR filters and wave digital filters WDFs adaptive filtering e g recursive least squares RLS filtering transforms such as the fast Fourier transform FFT FPGA based Implementation of Signal Processing Systems is an important reference for practising engineers and researchers working on the design and development of DSP systems for radio telecommunication information audio visual and security applications Senior level electrical and computer engineering graduates taking courses in signal processing or digital signal processing shall also find this volume of interest

IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences ,1992

Exploiting Instruction-level Parallelism Luiz Cláudio Villar dos Santos, 1998

Proceedings of the ... Midwest Symposium on Circuits and Systems ,1996

Proceedings ,2000

1986 IEEE International Symposium on Circuits and Systems, Le Baron Hotel, San Jose, California, May 5-7, 1986 ,1986

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