



VLSI Synthesis of DSP Kernels

Algorithmic and Architectural Transformations

**Mahesh Mehendale
Sunil D. Sherlekar**

Kluwer Academic Publishers

Vlsi Synthesis Of Dsp Kernels Algorithmic And Architectural Transformations

Phillip A. Laplante



Vlsi Synthesis Of Dsp Kernels Algorithmic And Architectural Transformations:

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 *IEEE Circuits & Devices*, 2003 High-Level VLSI Synthesis Raul Camposano, Wayne Wolf, 2012-12-06 The time has come for high level synthesis When research into synthesizing hardware from abstract program like descriptions started in the early 1970s there was no automated path from the register transfer design produced by high level synthesis to a complete hardware implementation As a result it was very difficult to measure the effectiveness of high level synthesis methods it was also hard to justify to users the need to automate architecture design when low level design had to be completed manually Today's more mature CAD techniques help close the gap between an automatically synthesized design and a manufacturable design Market pressures encourage designers to make use of any and all automated tools Layout synthesis logic synthesis and specialized datapath generators make it feasible to quickly implement a register transfer design in silicon leaving designers more time to consider architectural improvements As IC design becomes more automated customers are increasing their demands today's leading edge designers using logic synthesis systems are training themselves to be tomorrow's consumers of high level synthesis systems The need for very fast turnaround a competitive fabrication

market which makes small quantity ASIC manufacturing possible and the ever growing complexity of the systems being designed all make higher level design automation inevitable

Computer Arithmetic Behrooz Parhami, 2010 Ideal for graduate and senior undergraduate courses in computer arithmetic and advanced digital design Computer Arithmetic Algorithms and Hardware Designs Second Edition provides a balanced comprehensive treatment of computer arithmetic It covers topics in arithmetic unit design and circuit implementation that complement the architectural and algorithmic speedup techniques used in high performance computer architecture and parallel processing Using a unified and consistent framework the text begins with number representation and proceeds through basic arithmetic operations floating point arithmetic and function evaluation methods Later chapters cover broad design and implementation topics including techniques for high throughput low power fault tolerant and reconfigurable arithmetic An appendix provides a historical view of the field and speculates on its future An indispensable resource for instruction professional development and research Computer Arithmetic Algorithms and Hardware Designs Second Edition combines broad coverage of the underlying theories of computer arithmetic with numerous examples of practical designs worked out examples and a large collection of meaningful problems This second edition includes a new chapter on reconfigurable arithmetic in order to address the fact that arithmetic functions are increasingly being implemented on field programmable gate arrays FPGAs and FPGA like configurable devices Updated and thoroughly revised the book offers new and expanded coverage of saturating adders and multipliers truncated multipliers fused multiply add units overlapped quotient digit selection bipartite and multipartite tables reversible logic dot notation modular arithmetic Montgomery modular reduction division by constants IEEE floating point standard formats and interval arithmetic

IEEE International Symposium on Circuits and Systems IEEE Circuits and Systems Society, 2003 These volumes relate to matters discussed during the 2003 IEEE International Symposium on Circuits and Systems such as analogue circuits and signal processing communications multimedia systems and applications general and nonlinear circuits and systems and neural networks and systems

VLSI Logic Synthesis and Design R. W. Dutton, 1991 Very Good No Highlights or Markup all pages are intact

The British National Bibliography Arthur James Wells, 2001 [Index to IEEE Publications](#) Institute of Electrical and Electronics Engineers, 1998 Issues for 1973 cover the entire IEEE technical literature

American Book Publishing Record, 2001 **Readings in Hardware/Software Co-Design** Giovanni De Micheli, Rolf Ernst, Wayne Wolf, 2002 This title serves as an introduction and reference for the field with the papers that have shaped the hardware software co design since its inception in the early 90s [iaetsd international conference on advances in engineering research icaer 2016 chennai conference date 26062016](#), IAETSD

IAETSD-D70-ICAER-2016--26-06-2016-3, iaetsd **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

Books In Print
2004-2005 Ed Bowker Staff, Staff Bowker, Ed, 2004 *Computer & Control Abstracts*, 1996 **Real-time Signal and Image Processing** Phillip A. Laplante, 2000 An introduction to intermediate readings in real time image and signal processing It covers issues and challenges hardware support algorithms software languages and systems and applications and case studies **VLSI Design Methodologies for Digital Signal Processing Architectures** Magdy A. Bayoumi, 2012-12-06 Designing VLSI systems represents a challenging task It is a transfonnation among different specifications corresponding to different levels of design abstraction behavioral stntctural 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 infonnation 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 transfonnation 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 transfonned 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 *Electrical & Electronics Abstracts*, 1997 **Science Abstracts**, 1995 *Synthesis and Optimization of DSP Algorithms* George A. Constantinides, 2004

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