
Advanced Fpga Design

Advanced HDL Synthesis and SOC Prototyping
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Advanced HDL Synthesis and SOC Prototyping Elsevier

FPGAs (Field-Programmable Gate Arrays) can be found in applications such as smart phones, mp3 players, medical imaging devices, and for aerospace and defense technology. FPGAs consist of logic blocks and programmable interconnects. This allows an engineer to start with a blank slate and program the FPGA for a specific task, for instance, digital signal processing, or a specific device, for example, a software-defined radio. Due to the short time to market and ability to reprogram to fix bugs without having to respin FPGAs are in increasingly high demand. This book is for the engineer that has not yet had any experience with this electrifying and growing field. The complex issue of FPGA design is broken down into four distinct phases - Design / Synthesis / Simulation / Place & Route. Numerous step-by-step examples along with source code accompany the discussion. A brief primer of one of the popular FPGA and hardware languages, VHDL, is incorporated for a simple yet comprehensive learning tool. While a general technology background is assumed, no direct hardware development understanding is needed. Also, included are details on tool-set up, verification techniques, and test benches. Reference material consists of a quick reference guide, reserved words, and common VHDL/FPGA terms. Learn how to design and develop FPGAs -- no prior experience necessary! Breaks down the complex design and development of FPGAs into easy-to-learn building blocks Contains examples, helpful tips, and step-by-step tutorials for synthesis, implementation, simulation, and programming phases

The Design Warrior's Guide to FPGAs John Wiley & Sons

An important working resource for engineers and researchers involved in the design, development, and implementation of signal processing systems The last decade has seen a rapid expansion of the use of field programmable gate arrays (FPGAs) for a wide range of applications beyond traditional digital signal processing (DSP) systems. Written by a team of experts working at the leading edge of FPGA research and development, this second edition of FPGA-based Implementation of Signal Processing Systems has been extensively updated and revised to reflect the latest iterations of FPGA theory, applications, and technology. Written from a system-level perspective, it features expert discussions of contemporary methods and tools used in the design, optimization and implementation of DSP systems using programmable FPGA hardware. And it provides a wealth of practical insights—along with illustrative case studies and timely real-world examples—of critical concern to engineers working in the design and development of DSP systems for radio, telecommunications, audio-visual, and security applications, as well as bioinformatics, Big Data applications, and more. Inside you will find up-to-date coverage of: FPGA solutions for Big Data Applications, especially as they apply to huge data sets The use of ARM processors in FPGAs and the transfer of FPGAs towards heterogeneous computing platforms The evolution of High Level Synthesis tools—including new sections on Xilinx's HLS Vivado tool flow and Altera's OpenCL approach Developments in Graphical Processing Units (GPUs), which are rapidly replacing more traditional DSP systems FPGA-based

Implementation of Signal Processing Systems, 2nd Edition is an indispensable guide for engineers and researchers involved in the design and development of both traditional and cutting-edge data and signal processing systems. Senior-level electrical and computer engineering graduates studying signal processing or digital signal processing also will find this volume of great interest.

FPGA-based Implementation of Signal Processing Systems Springer

Start by walking a typical Verilog design all the way through to silicon; then, review basic Verilog syntax, design, simulation and testing, advanced simulation, and more."--BOOK JACKET.

Synthesis and Optimization of FPGA-Based Systems Elsevier

Digital Systems Design with FPGAs and CPLDs explains how to design and develop digital electronic systems using programmable logic devices (PLDs). Totally practical in nature, the book features numerous (quantify when known) case study designs using a variety of Field Programmable Gate Array (FPGA) and Complex Programmable Logic Devices (CPLD), for a range of applications from control and instrumentation to semiconductor automatic test equipment. Key features include: * Case studies that provide a walk through of the design process, highlighting the trade-offs involved. * Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design. With this book engineers will be able to: * Use PLD technology to develop digital and mixed signal electronic systems * Develop PLD based designs using both schematic capture and VHDL synthesis techniques * Interface a PLD to digital and mixed-signal systems * Undertake complete design exercises from design concept through to the build and test of PLD based electronic hardware This book will be ideal for electronic and computer engineering students taking a practical or Lab based course on digital systems development using PLDs and for engineers in industry looking for concrete advice on developing a digital system using a FPGA or CPLD as its core. Case studies that provide a walk through of the design process, highlighting the trade-offs involved. Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design.

Advanced VLSI Design and Testability Issues Elsevier

FPGA Simulation: A Complete Step-by-Step Guide shows FPGA design engineers how to avoid long lab debug sessions by simulating with SystemVerilog. The book helps engineers to have never simulated their designs before by bringing them through seven steps that can be added incrementally to a design flow. Engineers start with code coverage as the first step. Succeeding steps introduce test planning, assertions, and SystemVerilog simulation techniques. By the end of the process engineers who have never simulated before will know how to create complete self-checking test benches that generate their own stimulus, and demonstrate complete functional coverage. This book is a must for engineers who are facing DO-254 certification requirements on their next FPGA project.

100 Power Tips for FPGA Designers Springer Science & Business Media

Field Programmable Gate Arrays (FPGAs) are devices that provide a fast, low-cost way for embedded system designers to customize products and deliver new versions with upgraded features, because

they can handle very complicated functions, and be reconfigured an infinite number of times. In addition to introducing the various architectural features available in the latest generation of FPGAs, *The Design Warrior's Guide to FPGAs* also covers different design tools and flows. This book covers information ranging from schematic-driven entry, through traditional HDL/RTL-based simulation and logic synthesis, all the way up to the current state-of-the-art in pure C/C++ design capture and synthesis technology. Also discussed are specialist areas such as mixed hardware/software and DSP-based design flows, along with innovative new devices such as field programmable node arrays (FPNAs). Clive "Max" Maxfield is a bestselling author and engineer with a large following in the electronic design automation (EDA) and embedded systems industry. In this comprehensive book, he covers all the issues of interest to designers working with, or contemplating a move to, FPGAs in their product designs. While other books cover fragments of FPGA technology or applications this is the first to focus exclusively and comprehensively on FPGA use for embedded systems. First book to focus exclusively and comprehensively on FPGA use in embedded designs World-renowned best-selling author Will help engineers get familiar and succeed with this new technology by providing much-needed advice on choosing the right FPGA for any design project

Verilog by Example "O'Reilly Media, Inc."

This book uses a "learn by doing" approach to introduce the concepts and techniques of VHDL and FPGA to designers through a series of hands-on experiments. *FPGA Prototyping by VHDL Examples* provides a collection of clear, easy-to-follow templates for quick code development; a large number of practical examples to illustrate and reinforce the concepts and design techniques; realistic projects that can be implemented and tested on a Xilinx prototyping board; and a thorough exploration of the Xilinx PicoBlaze soft-core microcontroller.

Introduction to Digital Design Using Digilent FPGA Boards John Wiley & Sons

Dr Donald Bailey starts with introductory material considering the problem of embedded image processing, and how some of the issues may be solved using parallel hardware solutions. Field programmable gate arrays (FPGAs) are introduced as a technology that provides flexible, fine-grained hardware that can readily exploit parallelism within many image processing algorithms. A brief review of FPGA programming languages provides the link between a software mindset normally associated with image processing algorithms, and the hardware mindset required for efficient utilization of a parallel hardware design. The design process for implementing an image processing algorithm on an FPGA is compared with that for a conventional software implementation, with the key differences highlighted. Particular attention is given to the techniques for mapping an algorithm onto an FPGA implementation, considering timing, memory bandwidth and resource constraints, and efficient hardware computational techniques. Extensive coverage is given of a range of low and intermediate level image processing operations, discussing efficient implementations and how these may vary according to the application. The techniques are illustrated with several example applications or case studies from projects or applications he has been involved with. Issues such as interfacing between the FPGA and peripheral devices are covered briefly, as is designing the system in such a way that it can be more readily debugged and tuned. Provides a bridge between algorithms and hardware Demonstrates how to avoid many of the potential pitfalls Offers practical recommendations and solutions Illustrates several real-world applications and case studies Allows

those with software backgrounds to understand efficient hardware implementation *Design for Embedded Image Processing on FPGAs* is ideal for researchers and engineers in the vision or image processing industry, who are looking at smart sensors, machine vision, and robotic vision, as well as FPGA developers and application engineers. The book can also be used by graduate students studying imaging systems, computer engineering, digital design, circuit design, or computer science. It can also be used as supplementary text for courses in advanced digital design, algorithm and hardware implementation, and digital signal processing and applications. Companion website for the book: www.wiley.com/go/bailey/fpga

Digital System Design with FPGA: Implementation Using Verilog and VHDL Advanced FPGA Design Design Recipes for FPGAs: Using Verilog and VHDL provides a rich toolbox of design techniques and templates to solve practical, every-day problems using FPGAs. Using a modular structure, the book gives 'easy-to-find' design techniques and templates at all levels, together with functional code. Written in an informal and 'easy-to-grasp' style, it goes beyond the principles of FPGAs and hardware description languages to actually demonstrate how specific designs can be synthesized, simulated and downloaded onto an FPGA. This book's 'easy-to-find' structure begins with a design application to demonstrate the key building blocks of FPGA design and how to connect them, enabling the experienced FPGA designer to quickly select the right design for their application, while providing the less experienced a 'road map' to solving their specific design problem. The book also provides advanced techniques to create 'real world' designs that fit the device required and which are fast and reliable to implement. This text will appeal to FPGA designers of all levels of experience. It is also an ideal resource for embedded system development engineers, hardware and software engineers, and undergraduates and postgraduates studying an embedded system which focuses on FPGA design. A rich toolbox of practical FPGA design techniques at an engineer's finger tips Easy-to-find structure that allows the engineer to quickly locate the information to solve their FPGA design problem, and obtain the level of detail and understanding needed

Design Recipes for FPGAs: Using Verilog and VHDL Now Publishers Inc

This title builds on the student's background from a first course in logic design and focuses on developing, verifying, and synthesizing designs of digital circuits. The Verilog language is introduced in an integrated, but selective manner, only as needed to support design examples.

Modern Digital Designs with EDA, VHDL and FPGA John Wiley & Sons

Starts with an overview of today's FPGA technology, devices, and tools for designing state-of-the-art DSP systems. A case study in the first chapter is the basis for more than 30 design examples throughout. The following chapters deal with computer arithmetic concepts, theory and the implementation of FIR and IIR filters, multirate digital signal processing systems, DFT and FFT algorithms, and advanced algorithms with high future potential. Each chapter contains exercises. The VERILOG source code and a glossary are given in the appendices, while the accompanying CD-ROM contains the examples in VHDL and Verilog code as well as the newest Altera "Baseline" software. This edition has a new chapter on adaptive filters, new sections on division and floating point arithmetics, an up-date to the current Altera software, and some new exercises.

Advanced Digital Design with the Verilog HDL Wiley-IEEE Press

This book describes best practices for successful FPGA design. It is the result of the author's

meetings with hundreds of customers on the challenges facing each of their FPGA design teams. By gaining an understanding into their design environments, processes, what works and what does not work, key areas of concern in implementing system designs have been identified and a recommended design methodology to overcome these challenges has been developed. This book's content has a strong focus on design teams that are spread across sites. The goal being to increase the productivity of FPGA design teams by establishing a common methodology across design teams; enabling the exchange of design blocks across teams. Coverage includes the complete FPGA design flow, from the basics to advanced techniques. This new edition has been enhanced to include new sections on System modeling, embedded design and high level design. The original sections on Design Environment, RTL design and timing closure have all been expanded to include more up to date techniques as well as providing more extensive scripts and RTL code that can be reused by readers. Presents complete, field-tested methodology for FPGA design, focused on reuse across design teams; Offers best practices for FPGA timing closure, in-system debug, and board design; Details techniques to resolve common pitfalls in designing with FPGAs.

Learning FPGAs Elsevier

A practical primer for the student and practicing engineer already familiar with the basics of digital design, the reference develops a working grasp of the verilog hardware description language step-by-step using easy-to-understand examples. Starting with a simple but workable design sample, increasingly more complex fundamentals of the language are introduced until all major features of verilog are brought to light. Included in the coverage are state machines, modular design, FPGA-based memories, clock management, specialized I/O, and an introduction to techniques of simulation. The goal is to prepare the reader to design real-world FPGA solutions. All the sample code used in the book is available online. What Strunk and White did for the English language with "The Elements of Style," VERILOG BY EXAMPLE does for FPGA design.

Rapid System Prototyping with FPGAs Springer

The push to move products to market as quickly and cheaply as possible is fiercer than ever, and accordingly, engineers are always looking for new ways to provide their companies with the edge over the competition. Field-Programmable Gate Arrays (FPGAs), which are faster, denser, and more cost-effective than traditional programmable logic devices (PLDs), are quickly becoming one of the most widespread tools that embedded engineers can utilize in order to gain that needed edge. FPGAs are especially popular for prototyping designs, due to their superior speed and efficiency. This book hones in on that rapid prototyping aspect of FPGA use, showing designers exactly how they can cut time off production cycles and save their companies money drained by costly mistakes, via prototyping designs with FPGAs first. Reading it will take a designer with a basic knowledge of implementing FPGAs to the "next-level of FPGA use because unlike broad beginner books on FPGAs, this book presents the required design skills in a focused, practical, example-oriented manner. In-the-trenches expert authors assure the most applicable advice to practicing engineers Dual focus on successfully making critical decisions and avoiding common pitfalls appeals to engineers pressured for speed and perfection Hardware and software are both covered, in order to address the growing trend toward "cross-pollination" of engineering expertise
Real World FPGA Design with Verilog John Wiley & Sons

This book helps readers to implement their designs on Xilinx® FPGAs. The authors demonstrate how to get the greatest impact from using the Vivado® Design Suite, which delivers a SoC-strength, IP-centric and system-centric, next generation development environment that has been built from the ground up to address the productivity bottlenecks in system-level integration and implementation. This book is a hands-on guide for both users who are new to FPGA designs, as well as those currently using the legacy Xilinx tool set (ISE) but are now moving to Vivado. Throughout the presentation, the authors focus on key concepts, major mechanisms for design entry, and methods to realize the most efficient implementation of the target design, with the least number of iterations.

FPGA-Based System Design CRC Press

This consistently written book provides a comprehensive presentation of a multitude of results stemming from the author's as well as various researchers' work in the field. It also covers functional decomposition for incompletely specified functions, decomposition for multi-output functions and non-disjoint decomposition.

Embedded Systems Design with FPGAs CRC Press

Field Programmable Gate Arrays (FPGAs) are currently recognized as the most suitable platform for the implementation of complex digital systems targeting an increasing number of industrial electronics applications. They cover a huge variety of application areas, such as: aerospace, food industry, art, industrial automation, automotive, biomedicine, process control, military, logistics, power electronics, chemistry, sensor networks, robotics, ultrasound, security, and artificial vision. This book first presents the basic architectures of the devices to familiarize the reader with the fundamentals of FPGAs before identifying and discussing new resources that extend the ability of the devices to solve problems in new application domains. Design methodologies are discussed and application examples are included for some of these domains, e.g., mechatronics, robotics, and power systems.

Introduction to Embedded System Design Using Field Programmable Gate Arrays Prentice Hall

Everything FPGA designers need to know about FPGAs and VLSI Digital designs once built in custom silicon are increasingly implemented in field programmable gate arrays (FPGAs). Effective FPGA system design requires a strong understanding of VLSI issues and constraints, and an understanding of the latest FPGA-specific techniques. In this book, Princeton University's Wayne Wolf covers everything FPGA designers need to know about all these topics: both the "how" and the "why." Wolf begins by introducing the essentials of VLSI: fabrication, circuits, interconnects, combinational and sequential logic design, system architectures, and more. Next, he demonstrates how to reflect this VLSI knowledge in a state-of-the-art design methodology that leverages FPGA's most valuable characteristics while mitigating its limitations. Coverage includes: How VLSI characteristics affect FPGAs and FPGA-based logic design How classical logic design techniques relate to FPGA-based logic design Understanding FPGA fabrics: the basic programmable structures of FPGAs Specifying and optimizing logic to address size, speed, and power consumption Verilog, VHDL, and software tools for optimizing logic and designs The structure of large digital systems, including register-transfer design methodology Building large-scale platform and multi-FPGA systems A start-to-finish DSP case study addressing a wide range of design problems PRENTICE HALL Professional Technical Reference Upper Saddle River, NJ 07458 www.phptr.com ISBN: 0-13-142461-0

Advanced Mathematics for FPGA and DSP Programmers Evgeni Stavinov

This book facilitates the VLSI-interested individuals with not only in-depth knowledge, but also the broad aspects of it by explaining its applications in different fields, including image processing and biomedical. The deep understanding of basic concepts gives you the power to develop a new application aspect, which is very well taken care of in this book by using simple language in explaining the concepts. In the VLSI world, the importance of hardware description languages cannot be ignored, as the designing of such dense and complex circuits is not possible without them. Both Verilog and VHDL languages are used here for designing. The current needs of high-performance integrated circuits (ICs) including low power devices and new emerging materials, which can play a very important role in achieving new functionalities, are the most interesting part of the book. The testing of VLSI circuits becomes more crucial than the designing of the circuits in this nanometer technology era. The role of fault simulation algorithms is very well explained, and its implementation using Verilog is the key aspect of this book. This book is well organized into 20 chapters. Chapter 1 emphasizes on uses of FPGA on various image processing and biomedical applications. Then, the descriptions enlighten the basic understanding of digital design from the perspective of HDL in

Chapters 2-5. The performance enhancement with alternate material or geometry for silicon-based FET designs is focused in Chapters 6 and 7. Chapters 8 and 9 describe the study of bimolecular interactions with biosensing FETs. Chapters 10-13 deal with advanced FET structures available in various shapes, materials such as nanowire, HFET, and their comparison in terms of device performance metrics calculation. Chapters 14-18 describe different application-specific VLSI design techniques and challenges for analog and digital circuit designs. Chapter 19 explains the VLSI testability issues with the description of simulation and its categorization into logic and fault simulation for test pattern generation using Verilog HDL. Chapter 20 deals with a secured VLSI design with hardware obfuscation by hiding the IC's structure and function, which makes it much more difficult to reverse engineer.

Principles and Structures of FPGAs Pearson Education

Reviews the historical development of programmable logic devices, the fundamental programming technologies that the programmability is built on, and then describes the basic understandings gleaned from research on architectures. It is an invaluable reference for engineers and computer scientists.

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