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""3.1 Combinational Circuits""""3.1.1 Encoders""; ""3.1.2 Decoders""; ""3.1.3 Multiplexers""; ""3.1.4 Comparators""; ""3.1.5 Arithmetical Circuits""; ""3.1.6 Barrel Shifters""; ""3.2 Sequential Circuits""; ""3.2.1 Registers""; ""3.2.2 Shift Registers""; ""3.2.3 Counters""; ""3.2.4 Arithmetical Circuits with Accumulators""; ""3.3 Finite State Machines""; ""3.4 Optimization of FPGA-Based Circuits and Systems""; ""3.4.1 Highly Parallel Network-Based Solutions""; ""3.4.2 Hardware Accelerators""; ""3.4.3 Parallel Modular Algorithms Running in Hierarchical FSMs"" ""3.5 Design Examples for Parallel Sort""""3.6 Design Examples for Parallel Search""; ""3.7 Design Examples for Parallel Counters""; ""3.8 Design Examples for Counting Networks""; ""3.9 Design Examples for LUT-Based Hamming Weight CountersComparators""; ""3.10 Design Examples for Operations Over Vectors""; ""References""; ""4 Embedded Blocks and System-Level Design""; ""Abstract ""; ""4.1 Using IP Cores""; ""4.2 Design with Embedded DSP Slices""; ""4.3 Interaction with FPGA""; ""4.3.1 Digilent Parallel Port Interface""; ""4.3.1.1 Digilent EPP Communication Module"" ""4.3.1.2 Application Software""""4.3.2 UART Interface""; ""4.3.2.1 UART Communication Module""; ""4.3.2.2 Application Software""; ""4.4 Software-Hardware Co-design and Co-simulation""; ""4.4.1 Software-Hardware Co-design with Digilent Parallel Port Interface""; ""4.4.2 Software-Hardware Co-design with UART Interface""; ""4.5 Programmable Systems-on-Chip""; ""References""; ""5 Design Technique Based on Hierarchical and Parallel Specifications""; ""Abstract ""; ""5.1 Modular Hierarchical Specifications""; ""5.2 Hierarchical Finite State Machines"" ""5.2.1 HDL Template for HFSM with Explicit Modules""

Sommario/riassunto

The book is composed of two parts. The first part introduces the concepts of the design of digital systems using contemporary field-programmable gate arrays (FPGAs). Various design techniques are discussed and illustrated by examples. The operation and effectiveness of these techniques is demonstrated through experiments that use relatively cheap prototyping boards that are widely available. The book begins with easily understandable introductory sections, continues with commonly used digital circuits, and then gradually extends to more advanced topics. The advanced topics include novel techniques where parallelism is applied extensively. These techniques involve not only core reconfigurable logical elements, but also use embedded blocks such as memories and digital signal processing slices and interactions with general-purpose and application-specific computing systems. Fully synthesizable specifications are provided in a hardware-description language (VHDL) and are ready to be tested and incorporated in engineering designs. A number of practical applications are discussed from areas such as data processing and vector-based computations (e.g. Hamming weight counters/comparators). The second part of the book covers the more theoretical aspects of finite state machine synthesis with the main objective of reducing basic FPGA resources, minimizing delays and achieving greater optimization of circuits and systems.
