A Controller Implementation Using Fpga In Labview Environment

Power electronics and variable frequency drives are continuously developing multidisciplinary fields in electrical engineering and it is practically not possible to write a book covering the entire area by one individual specialist. Especially by taking account the recent fast development in the neighboring fields like control theory, computational intelligence and signal processing, which all strongly influence new solutions in control of power electronics and drives. Therefore, this book is written by individual key specialist working on the area of modern advanced control methods which penetrates current implementation of power converters and drives. Although some of the presented methods are still not adopted by industry, they create new solutions with high further research and application potential. The material of the book is presented in the following three parts: Part I: Advanced Power Electronic Control in Renewable Energy Sources (Chapters 1-4), Part II: Predictive Control of Power Converters and Drives (5-7), Part III: Neurocontrol and Nonlinear Control of Power Converters and Drives (8-11). The book is intended for engineers, researchers and students in the field of power electronics and drives who are interested in the use of advanced control methods and also for specialists from the control theory area who like to explore new area of applications.
Master FPGA digital system design and implementation with Verilog and VHDL This practical guide explores the development and deployment of FPGA-based digital systems using the two

most popular hardware description languages, Verilog and VHDL. Written by a pair of digital circuit design experts, the book offers a solid grounding in FPGA principles, practices, and applications and provides an overview of more complex topics. Important concepts are demonstrated through real-world examples, ready-to-run code, and inexpensive start-to-finish projects for both the Basys and Arty boards. Digital System Design with FPGA: Implementation Using Verilog and VHDL covers: • Field programmable gate array fundamentals • Basys and Arty FPGA boards • The Vivado design suite • Verilog and VHDL • Data types and operators • Combinational circuits and circuit blocks • Data storage elements and sequential circuits • Soft-core microcontroller and digital interfacing • Advanced FPGA applications • The future of FPGA

In the research area of computer science, practitioners are constantly searching for faster platforms with pertinent results. With analytics that span environmental development to computer hardware emulation, problem-solving algorithms are in high demand. Field-Programmable Gate Array (FPGA) is a promising computing platform that can be significantly faster for some applications and can be applied to a variety of fields. FPGA Algorithms and Applications for the Internet of Things provides emerging research exploring the theoretical and practical aspects of computable algorithms and applications within robotics and electronics development. Featuring coverage on a broad range of topics such as neuroscience, bioinformatics, and artificial intelligence, this book is ideally designed for computer science specialists, researchers, professors, and students seeking current research on cognitive analytics and advanced computing.

This book focuses on prototyping aspects of concurrent control systems and their further

implementation and partial reconfiguration in programmable devices. Further, it lays out a full
prototyping flow for concurrent control systems. Based on a given primary specification, a
system is described with an interpreted Petri net, which naturally reflects the concurrent and
sequential relationships of the design. The book shows that, apart from the traditional option of
static configuration of the entire system, the latest programmable devices (especially FPGAs)
offer far more sophistication. Partial reconfiguration allows selected parts of the system to be
replaced without having to reprogram the entire structure of the device. Approaches to
dynamic and static partial reconfiguration of concurrent control systems are presented and
described in detail."/p> The theoretical work is illustrated by examples drawn from various
applications, with a milling machine and a traffic-light controller highlighted as representative
interpreted Petri nets. Given the ubiquity of concurrent control systems in a huge variety of
technological areas including transportation, medicine, artificial intelligence, manufacturing,
security and safety and planetary exploration, the innovative software and hardware design
methods described here will be of considerable interest to control engineers and systems and
circuits researchers in many areas of industry and academia.
This book presents the proceedings of the 20th Polish Control Conference. A triennial event
that was first held in 1958, the conference successfully combines its long tradition with a
modern approach to shed light on problems in control engineering, automation, robotics and a
wide range of applications in these disciplines. The book presents new theoretical results
concerning the steering of dynamical systems, as well as industrial case studies and worked
solutions to real-world problems in contemporary engineering. It particularly focuses on the
modelling, identification, analysis and design of automation systems; however, it also

addresses the evaluation of their performance, efficiency and reliability. Other topics include fault-tolerant control in robotics, automated manufacturing, mechatronics and industrial systems. Moreover, it discusses data processing and transfer issues, covering a variety of methodologies, including model predictive, robust and adaptive techniques, as well as algebraic and geometric methods, and fractional order calculus approaches. The book also examines essential application areas, such as transportation and autonomous intelligent vehicle systems, robotic arms, mobile manipulators, cyber-physical systems, electric drives and both surface and underwater marine vessels. Lastly, it explores biological and medical applications of the control-theory-inspired methods.

Logic design of digital devices is a very important part of the Computer Science. It deals with design and testing of logic circuits for both data-path and control unit of a digital system. Design methods depend strongly on logic elements using for implementation of logic circuits. Different programmable logic devices are wide used for implementation of logic circuits. Nowadays, we witness the rapid growth of new and new chips, but there is a strong lack of new design methods. This book includes a variety of design and test methods targeted on different digital devices. It covers methods of digital system design, the development of theoretical base for construction and designing of the PLD–based devices, application of UML for digital design. A considerable part of the book is devoted to design methods oriented on implementing control units using FPGA and CPLD chips. Such important issues as design of reliable FSMs, automatic design of concurrent logic controllers, the models and methods for creating infrastructure IP services for the SoCs are also presented. The editors of the book hope that it will be interesting and useful for experts in Computer Science and Electronics, as

well as for students, who are viewed as designers of future digital devices and systems. This book presents real-world problems and pioneering research that reflect novel approaches to cybernetics, algorithms and software engineering in the context of intelligent systems. It gathers the peer-reviewed proceedings of the 2nd Computational Methods in Systems and Software 2018 (CoMeSySo 2018), a conference that broke down traditional barriers by being held online. The goal of the event was to provide an international forum for discussing the latest high-quality research results.

The two-volume set LNAI 9692 and LNAI 9693 constitutes the refereed proceedings of the 15th International Conference on Artificial Intelligence and Soft Computing, ICAISC 2016, held in Zakopane, Poland in June 2016. The 134 revised full papers presented were carefully reviewed and selected from 343 submissions. The papers included in the first volume are organized in the following topical sections: neural networks and their applications; fuzzy systems and their applications; evolutionary algorithms and their applications; agent systems, robotics and control; and pattern classification. The second volume is divided in the following parts: bioinformatics, biometrics and medical applications; data mining; artificial intelligence in modeling and simulation; visual information coding meets machine learning; and various problems of artificial intelligence.

The automobile industry is tremendously peculiar due to several strict requirements regarding functional reliability, safety standards, comfort level, high-volume production, and environmental limits. In addition, the industry is experiencing a disruptive evolution of modern vehicle research and design:

electrification, connectivity, and autonomous driving. This book provides a robust overview of automotive engineering, including new proposals and the latest trends in road vehicle systems and sub-systems. Each chapter presents a rigorous analysis or a new solution in a clear and concise manner, such that professional and academic readers will appreciate both the theory dissertation and the industrial application.

This book features papers focusing on the implementation of new and future technologies, which were presented at the International Conference on New Technologies, Development and Application, held at the Academy of Science and Arts of Bosnia and Herzegovina in Sarajevo on 27th–29th June 2019. It covers a wide range of future technologies and technical disciplines, including complex systems such as Industry 4.0; robotics; mechatronics systems; automation; manufacturing; cyber-physical and autonomous systems; sensors; networks; control, energy, automotive and biological systems; vehicular networking and connected vehicles; effectiveness and logistics systems, smart grids, as well as nonlinear, power, social and economic systems. We are currently experiencing the Fourth Industrial Revolution "Industry 4.0", and its implementation will improve many aspects of human life in all segments, and lead to changes in business paradigms and production models. Further, new

business methods are emerging, transforming production systems, transport, delivery, and consumption, which need to be monitored and implemented by every company involved in the global market.

Author's abstract: This research compares the behavior of three robot navigation controllers namely: PID, Artificial Neural Networks (ANN), and Fuzzy Logic (FL), that are used to control the same autonomous mobile robot platform navigating a real unknown indoor environment that contains simple geometric-shaped static objects to reach a goal in an unspecified location. In particular, the study presents and compares the design, simulation, hardware implementation, and testing of these controllers. The first controller is a traditional linear PID controller, and the other two are intelligent non-linear controllers, one using Artificial Neural Networks and the other using Fuzzy Logic Techniques. Each controller is simulated first in MATLAB® using the Simulink Toolbox. Later the controllers are implemented using Quartus ll® software and finally the hardware design of each controller is implemented and downloaded to a Field-Programmable Gate Array (FPGA) card which is mounted onto the mobile robot platform. The response of each controller was tested in the same physical testing environment using a maze that the robot should navigate avoiding obstacles and reaching the desired goal. To evaluate the controllers' behavior each trial run is graded with a

standardized rubric based on the controllers' ability to react to situations presented within the trial run. The results of both the MATLAB® simulation and FPGA implementation show the two intelligent controllers, ANN and FL, outperformed the PID controller. The ANN controller was marginally superior to the FL controller in overall navigation and intelligence.

Author's abstract: This work documents a study of intelligent neural network control system design and implementation for engineering applications. In this study, the effectiveness of single multiplicative neuron (SMN) in place of traditional multi-layer perceptron (MLP) is investigated. The objectives were to (i) verify the feasibility of SMN based control systems, (ii) quantitatively compare the performance of SMN and MLP based systems, (iii) determine the amount of computation that could be saved by using SMN instead of MLP in a control system, and (iv) determine the performance of a SMN in an adaptive critic design (ACD) using action dependent heuristic dynamic programming (ADHDP). It was hypothesized that the replacement of a MLP network with a SMN would result in a controller that would achieve the same control quality in a less processor intensive manner, possibly allowing controller implementation on a less costly computer or microcontroller system. Controllers featuring the MLP and the SMN were implemented in LabVIEW for two physical systems and compared based on

their ability to accurately control the system response when given complex reference inputs. The SMN based control systems were implemented with both off-line and on-line training using conventional and field programmable gate array (FPGA) based data acquisition hardware. The controllers were also compared based on the number of calculations required to complete the artificial neural network (ANN) related sections of the control loop. The SMN based control systems were found to perform as well as, if not better than their MLP based counterparts, in all cases studied, while significantly reducing required computations. The SMN was finally implemented in an intelligent controller based on ADHDP and found to perform better than conventional controllers like PID with a periodic disturbance.

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

The book focuses on the integration of intelligent communication systems, control systems, and devices related to all aspects of engineering and sciences. It contains high-quality research papers presented at the 2nd international conference, ICICCD 2017, organized by the Department of Electronics, Instrumentation and Control Engineering of University of Petroleum and Energy

Studies, Dehradun on 15 and 16 April, 2017. The volume broadly covers recent advances of intelligent communication, intelligent control and intelligent devices. The work presented in this book is original research work, findings and practical development experiences of researchers, academicians, scientists and industrial practitioners.

The present book includes a set of selected papers from the third "International Conference on Informatics in Control Automation and Robotics" (ICINCO 2006), held in Setúbal, Portugal, from 1 to 5 August 2006, sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC). The conference was organized in three simultaneous tracks: "Intelligent Control Systems and Optimization", "Robotics and Automation" and "Systems Modeling, Signal Processing and Control". The book is based on the same structure. Although ICINCO 2006 received 309 paper submissions, from more than 50 different countries in all continents, only 31 where accepted as full papers. From those, only 23 were selected for inclusion in this book, based on the classifications provided by the Program Committee. The selected papers also reflect the interdisciplinary nature of the conference. The diversity of topics is an important feature of this conference, enabling an overall perception of several important scientific and technological trends. These high quality standards will be

maintained and reinforced at ICINCO 2007, to be held in Angers, France, and in future editions of this conference.

The PID Controller is the most common controller used in industries and provides a number of arrangements. The parallel arrangement, in which all the three parameters of the PID controller are added, is implemented in this project. The PID controls the speed on motor on the basis of the difference (known as error signal) between the desired speed and the actual speed. This Project aims to implement a digital PID controller on FPGA for DC Motor Speed control. The system mainly consists of PID controller, PWM and DC Motor with feedback circuit. The DC motor has high degree of non-linearity. The PID controller will help us to control this non-linearity.

"Introduction to Embedded System Design Using Field Programmable Gate Arrays" provides a starting point for the use of field programmable gate arrays in the design of embedded systems. The text considers a hypothetical robot controller as an embedded application and weaves around it related concepts of FPGA-based digital design. The book details: use of FPGA vis-à-vis general purpose processor and microcontroller; design using Verilog hardware description language; digital design synthesis using Verilog and Xilinx® SpartanTM 3 FPGA; FPGA-based embedded processors and peripherals; overview of serial data communications and signal conditioning using FPGA; FPGA-based motor drive controllers; and prototyping digital systems using FPGA. The book is a good introductory text for FPGA-based design for

both students and digital systems designers. Its end-of-chapter exercises and frequent use of example can be used for teaching or for self-study.

This book presents the original concepts and modern techniques for specification, synthesis, optimisation and implementation of parallel logical control devices. It deals with essential problems of reconfigurable control systems like dependability, modularity and portability. Reconfigurable systems require a wider variety of design and verification options than the application-specific integrated circuits. The book presents a comprehensive selection of possible design techniques. The diversity of the modelling approaches covers Petri nets, state machines and activity diagrams. The preferences of the presented optimization and synthesis methods are not limited to increasing of the efficiency of resource use. One of the biggest advantages of the presented methods is the platform independence, the FPGA devices and single board computers are some of the examples of possible platforms. These issues and problems are illustrated with practical cases of complete control systems. If you expect a new look at the reconfigurable systems designing process or need ideas for improving the quality of the project, this book is a good choice.g process or need ideas for improving the quality of the project, this book is a good choice.

This book discusses data communication and computer networking, communication technologies and the applications of IoT (Internet of Things), big data, cloud computing and healthcare informatics. It explores, examines and critiques intelligent data communications and presents inventive methodologies in communication technologies and IoT. Aimed at researchers and academicians who need to understand the importance of data communication and advanced technologies in IoT, it offers different perspectives to help readers increase their

knowledge and motivates them to conduct research in the area, highlighting various innovative ideas for future research.

Artificial intelligence (AI) is a branch of computer science that models the human ability of reasoning, usage of human language and organization of knowledge, solving problems and practically all other human intellectual abilities. Usually it is characterized by the application of heuristic methods because in the majority of cases there is no exact solution to this kind of problem. Soft computing can be viewed as a branch of AI that deals with the problems that explicitly contain incomplete or complex information, or are known to be impossible for direct computation, i.e., these are the same problems as in AI but viewed from the perspective of their computation. The Mexican International Conference on Artificial Intelligence (MICAI), a yearly international conference series organized by the Mexican Society for Artificial Intelligence (SMIA), is a major international AI forum and the main event in the academic life of the country's growing AI community. In 2010, SMIA celebrated 10 years of activity related to the organization of MICAI as is represented in its slogan "Ten years on the road with AI". MICAI conferences traditionally publish high-quality papers in all areas of artificial intelligence and its applications. The proceedings of the previous MICAI events were also published by Springer in its Lecture Notes in Artificial Intelligence (LNAI) series, vols. 1793, 2313, 2972, 3789, 4293, 4827, 5317, and 5845. Since its foundation in 2000, the conference has been growing in popularity and improving in quality.

Implementation of a PID Controller on FPGA for DC Motor SpeedLAP Lambert Academic Publishing

This book highlights recent research on Intelligent Systems and Nature Inspired Computing. It

presents 212 selected papers from the 18th International Conference on Intelligent Systems Design and Applications (ISDA 2018) and the 10th World Congress on Nature and Biologically Inspired Computing (NaBIC), which was held at VIT University, India. ISDA-NaBIC 2018 was a premier conference in the field of Computational Intelligence and brought together researchers, engineers and practitioners whose work involved intelligent systems and their applications in industry and the "real world." Including contributions by authors from over 40 countries, the book offers a valuable reference guide for all researchers, students and practitioners in the fields of Computer Science and Engineering.

Artificial Intelligence and Object-Oriented Technologies to Searching: An Algorithmic Tour Industrial electronics systems govern so many different functions that vary in complexity-from the operation of relatively simple applications, such as electric motors, to that of more complicated machines and systems, including robots and entire fabrication processes. The Industrial Electronics Handbook, Second Edition combines traditional and new

The use of the system-level tool DSP Builder for high-level development of FPGA-based controllers was studied. The capabilities of the DSP Builder tool were further extended by developing the Custom Control Library. The custom library is comprised of widely used components such as discretized integrators, PID controller, PWM generator, and A/D controller. DSP Builder and the Custom Control Library together can be used to rapidly develop controllers in the familiar and standard Simulink design environment for FPGA implementation. An

implementation case study demonstrated usage of DSP Builder and the Custom Control Library to develop a FPGA-based controller for an air levitation system in the Matlab/Simulink environment.

An instructive reference that will help control researchers and engineers, interested in a variety of industrial processes, to take advantage of a powerful tuning method for the ever-popular PID control paradigm. This monograph presents explicit PID tuning rules for linear control loops regardless of process complexity. It shows the reader how such loops achieve zero steady-position, velocity, and acceleration errors and are thus able to track fast reference signals. The theoretical development takes place in the frequency domain by introducing a general-transfer-function-known process model and by exploiting the principle of the magnitude optimum criterion. It is paralleled by the presentation of real industrial control loops used in electric motor drives. The application of the proposed tuning rules to a large class of processes shows that irrespective of the complexity of the controlled process the shape of the step and frequency response of the control loop exhibits a specific performance. This specific performance, along with the PID explicit solution, formulates the basis for developing an automatic tuning method for the PID controller parameters which is a problem often met in many industry applications—temperature, pH, and

humidity control, ratio control in product blending, and boiler-drum level control, for example. The process of the model is considered unknown and controller parameters are tuned automatically such that the aforementioned performance is achieved. The potential both for the explicit tuning rules and the automatic tuning method is demonstrated using several examples for benchmark process models recurring frequently in many industry applications.

This book constitutes the refereed proceedings of the 12th International Conference on Field-Programmable Logic and Applications, FPL 2002, held in Montpellier, France, in September 2002. The 104 revised regular papers and 27 poster papers presented together with three invited contributions were carefully reviewed and selected from 214 submissions. The papers are organized in topical sections on rapid prototyping, FPGA synthesis, custom computing engines, DSP applications, reconfigurable fabrics, dynamic reconfiguration, routing and placement, power estimation, synthesis issues, communication applications, new technologies, reconfigurable architectures, multimedia applications, FPGA-based arithmetic, reconfigurable processors, testing and fault-tolerance, crypto applications, multitasking, compilation techniques, etc.

This book is intended to provide a systematic overview of so-called smart techniques, such as nature-inspired algorithms, machine learning and

metaheuristics. Despite their ubiquitous presence and widespread application to different scientific problems, such as searching, optimization and /or classification, a systematic study is missing in the current literature. Here, the editors collected a set of chapters on key topics, paying attention to provide an equal balance of theory and practice, and to outline similarities between the different techniques and applications. All in all, the book provides an unified view on the field on intelligent methods, with their current perspective and future challenges.

This book provides step-by-step guidance on how to design VLSI systems using Verilog. It shows the way to design systems that are device, vendor and technology independent. Coverage presents new material and theory as well as synthesis of recent work with complete Project Designs using industry standard CAD tools and FPGA boards. The reader is taken step by step through different designs, from implementing a single digital gate to a massive design consuming well over 100,000 gates. All the design codes developed in this book are Register Transfer Level (RTL) compliant and can be readily used or amended to suit new projects.

This volume contains the proceedings of the KKA 2017 – the 19th Polish Control Conference, organized by the Department of Automatics and Biomedical

Engineering, AGH University of Science and Technology in Kraków, Poland on June 18–21, 2017, under the auspices of the Committee on Automatic Control and Robotics of the Polish Academy of Sciences, and the Commission for Engineering Sciences of the Polish Academy of Arts and Sciences. Part 1 deals with general issues of modeling and control, notably flow modeling and control, sliding mode, predictive, dual, etc. control. In turn, Part 2 focuses on optimization, estimation and prediction for control. Part 3 is concerned with autonomous vehicles, while Part 4 addresses applications. Part 5 discusses computer methods in control, and Part 6 examines fractional order calculus in the modeling and control of dynamic systems. Part 7 focuses on modern robotics. Part 8 deals with modeling and identification, while Part 9 deals with problems related to security, fault detection and diagnostics. Part 10 explores intelligent systems in automatic control, and Part 11 discusses the use of control tools and techniques in biomedical engineering. Lastly, Part 12 considers engineering education and teaching with regard to automatic control and robotics.
Revised edition of: FPGA-based implementation of signal processing systems / Roger Woods ... [et al.]. 2008.
The book is a collection of high quality peer reviewed research papers presented in Seventh International Conference on Bio-Inspired Computing (BIC-TA 2012)

held at ABV-IIITM Gwalior, India. These research papers provide the latest developments in the broad area of "Computational Intelligence". The book discusses wide variety of industrial, engineering and scientific applications of nature/bio-inspired computing and presents invited papers from the inventors/originators of novel computational techniques.

This book provides the advanced issues of FPGA design as the underlying theme of the work. In practice, an engineer typically needs to be mentored for several years before these principles are appropriately utilized. The topics that will be discussed in this book are essential to designing FPGA's beyond moderate complexity. The goal of the book is to present practical design techniques that are otherwise only available through mentorship and real-world experience.

This book presents a selection of papers representing current research on using field programmable gate arrays (FPGAs) for realising image processing algorithms. These papers are reprints of papers selected for a Special Issue of the Journal of Imaging on image processing using FPGAs. A diverse range of topics is covered, including parallel soft processors, memory management, image filters, segmentation, clustering, image analysis, and image compression. Applications include traffic sign recognition for autonomous driving, cell detection for histopathology, and video compression. Collectively, they represent the current state-of-the-art on image processing using FPGAs.

The goal of this effort was to develop a digital motor controller using field programmable gate arrays (FPGAs). This is a more rugged approach than a conventional microprocessor digital

controller. FPGAs typically have higher radiation (rad) tolerance than both the microprocessor and memory required for a conventional digital controller. Furthermore, FPGAs can typically operate at higher speeds. (While speed is usually not an issue for motor controllers, it can be for other system controllers.) Other than motor power, only a 3.3-V digital power supply was used in the controller; no analog bias supplies were used. Since most of the circuit was implemented in the FPGA, no additional parts were needed other than the power transistors to drive the motor. The benefits that FPGAs provide over conventional designs-lower power and fewer parts-allow for smaller packaging and reduced weight and cost. King, K. D. Marshall Space Flight Center NASA/TM-2003-212501, NAS 1.15:212501, M-1076

This book analyses the legal, ethical and social aspects of using deep-learning AI robotic products. The collective effort of distinguished international researchers has been incorporated into one book suitable for the broader audience interested in the emerging scientific field of roboethics. The book has been edited by Prof. George Dekoulis, Aerospace Engineering Institute, Cyprus, expert on state-of-the-art implementations of robotic systems for unmanned spacecraft navigation and other aerospace applications. We hope this book will increase the sensitivity of all the community members involved with roboethics. The significance of incorporating all aspects of roboethics right at the beginning of the creation of a new deep-learning AI robot is emphasised and analysed throughout the book. AI robotic systems offer an unprecedented set of virtues to the society. However, the principles of roboethical design and operation of deep-learning AI robots must be strictly legislated, the manufacturers should apply the laws and the knowledge development of the AI robots should be closely monitored after sales. This will minimise the drawbacks of implementing such intelligent technological

solutions. These devices are a representation of ourselves and form communities like us. Learning from them is also a way to improve ourselves.

With the rapid advances in technology, the conventional academic and research departments of Electronics engineering, Electrical Engineering, Computer Science, Instrumentation Engineering over the globe are forced to come together and update their curriculum with few common interdisciplinary courses in order to come out with the engineers and researchers with muli-dimensional capabilities. The gr- ing perception of the 'Hardware becoming Soft' and 'Software becoming Hard' with the emergence of the FPGAs has made its impact on both the hardware and software professionals to change their mindset of working in narrow domains. An interdisciplinary field where 'Hardware meets the Software' for undertaking se- ingly unfeasible tasks is System on Chip (SoC) which has become the basic pl- form of modern electronic appliances. If it wasn't for SoCs, we wouldn't be driving our car with foresight of the traffic congestion before hand using GPS. Without the omnipresence of the SoCs in our every walks of life, the society is wouldn't have evidenced the rich benefits of the convergence of the technologies such as audio, video, mobile, IPTV just to name a few. The growing expectations of the consumers have placed the field of SoC design at the heart of at variance trends. On one hand there are challenges owing to design complexities with the emergence of the new processors, RTOS, software protocol stacks, buses, while the brutal forces of deep submicron effects such as crosstalk, electromigration, timing closures are challe- ing the design metrics. Many different kinds of FPGAs exist, with different programming technologies, different architectures and different software. Field-Programmable Gate Array Technology describes the major FPGA architectures available today, covering the three programming technologies that

are in use and the major architectures built on those programming technologies. The reader is introduced to concepts relevant to the entire field of FPGAs using popular devices as examples. Field-Programmable Gate Array Technology includes discussions of FPGA integrated circuit manufacturing, circuit design and logic design. It describes the way logic and interconnect are implemented in various kinds of FPGAs. It covers particular problems with design for FPGAs and future possibilities for new architectures and software. This book compares CAD for FPGAs with CAD for traditional gate arrays. It describes algorithms for placement, routing and optimization of FPGAs. Field-Programmable Gate Array Technology describes all aspects of FPGA design and development. For this reason, it covers a significant amount of material. Each section is clearly explained to readers who are assumed to have general technical expertise in digital design and design tools. Potential developers of FPGAs will benefit primarily from the FPGA architecture and software discussion. Electronics systems designers and ASIC users will find a background to different types of FPGAs and applications of their use.

This book focuses on control units, which are a vital part of modern digital systems, and responsible for the efficiency of controlled systems. The model of a finite state machine (FSM) is often used to represent the behavior of a control unit. As a rule, control units have irregular structures that make it impossible to design their logic circuits using the standard library cells. Design methods depend strongly on such factors as the FSM used, specific features of the logic elements implemented in the FSM logic circuit, and the characteristics of the control algorithm to be interpreted. This book discusses Moore and Mealy FSMs implemented with FPGA chips, including look-up table elements (LUT) and embedded memory blocks (EMB). It

is crucial to minimize the number of LUTs and EMBs in an FSM logic circuit, as well as to make the interconnections between the logic elements more regular, and various methods of structural decompositions can be used to solve this problem. These methods are reduced to the presentation of an FSM circuit as a composition of different logic blocks, the majority of which implement systems of intermediate logic functions different (and much simpler) than input memory functions and FSM output functions. The structural decomposition results in multilevel FSM circuits having fewer logic elements than equivalent single-level circuits. The book describes well-known methods of structural decomposition and proposes new ones, examining their impact on the final amount of hardware in an FSM circuit. It is of interest to students and postgraduates in the area of Computer Science, as well as experts involved in designing digital systems with complex control units. The proposed models and design methods open new possibilities for creating logic circuits of control units with an optimal amount of hardware and regular interconnections.

Copyright: 208b485422cca02f70b5ead512f92a13