System-Level Power-Aware Design Techniques in Real-Time Systems

Osman S. Unsal, Israel Koren, System-Level Power-Aware Design Techniques in Real-Time Systems, Proceedings of IEEE, Vol. 91, No. 7, July 2003.

Systemlevel Design Techniques For Energyefficient Embedded Systems

Matthias S. Müller,Bronis R. de Supinski,Barbara Chapman

Systemlevel Design Techniques For Energyefficient Embedded Systems:

System-Level Design Techniques for Energy-Efficient Embedded Systems Marcus T. Schmitz,Bashir M. Al-Hashimi,Petru Eles,2006-01-16 System Level Design Techniques for Energy Efficient Embedded Systems addresses the development and validation of co synthesis techniques that allow an effective design of embedded systems with low energy dissipation The book provides an overview of a system level co design flow illustrating through examples how system performance is influenced at various steps of the flow including allocation mapping and scheduling The book places special emphasis upon system level co synthesis techniques for architectures that contain voltage scalable processors which can dynamically trade off between computational performance and power consumption Throughout the book the introduced co synthesis techniques which target both single mode systems and emerging multi mode applications are applied to numerous benchmarks and real life examples including a realistic smart phone   *System-Level Design Techniques for Energy-Efficient Embedded Systems* Marcus T. Schmitz,Bashir M. Al-Hashimi,Petru Eles,2004 System Level Design Techniques for Energy Efficient Embedded Systems will be of interest to advanced undergraduates graduate students and designers BOOK JACKET   *System-Level Design Techniques for Energy-Efficient Embedded Systems* Marcus T. Schmitz,Bashir M. Al-Hashimi,Petru Eles,2008-11-01 System Level Design Techniques for Energy Efficient Embedded Systems addresses the development and validation of co synthesis techniques that allow an effective design of embedded systems with low energy dissipation The book provides an overview of a system level co design flow illustrating through examples how system performance is influenced at various steps of the flow including allocation mapping and scheduling The book places special emphasis upon system level co synthesis techniques for architectures that contain voltage scalable processors which can dynamically trade off between computational performance and power consumption Throughout the book the introduced co synthesis techniques which target both single mode systems and emerging multi mode applications are applied to numerous benchmarks and real life examples including a realistic smart phone   **System-Level Design of GPU-Based Embedded Systems** Arian Maghazeh,2018-12-07 Modern embedded systems deploy several hardware accelerators in a heterogeneous manner to deliver high performance computing Among such devices graphics processing units GPUs have earned a prominent position by virtue of their immense computing power However a system design that relies on sheer throughput of GPUs is often incapable of satisfying the strict power and time related constraints faced by the embedded systems This thesis presents several system level software techniques to optimize the design of GPU based embedded systems under various graphics and non graphics applications As compared to the conventional application level optimizations the system wide view of our proposed techniques brings about several advantages First it allows for fully incorporating the limitations and requirements of the various system parts in the design process Second it can unveil optimization opportunities through exposing the information flow between the processing components Third the techniques

are generally applicable to a wide range of applications with similar characteristics In addition multiple system level techniques can be combined together or with application level techniques to further improve the performance We begin by studying some of the unique attributes of GPU based embedded systems and discussing several factors that distinguish the design of these systems from that of the conventional high end GPU based systems We then proceed to develop two techniques that address an important challenge in the design of GPU based embedded systems from different perspectives The challenge arises from the fact that GPUs require a large amount of workload to be present at runtime in order to deliver a high throughput However for some embedded applications collecting large batches of input data requires an unacceptable waiting time prompting a trade off between throughput and latency We also develop an optimization technique for GPU based applications to address the memory bottleneck issue by utilizing the GPU L2 cache to shorten data access time Moreover in the area of graphics applications and in particular with a focus on mobile games we propose a power management scheme to reduce the GPU power consumption by dynamically adjusting the display resolution while considering the user s visual perception at various resolutions We also discuss the collective impact of the proposed techniques in tackling the design challenges of emerging complex systems The proposed techniques are assessed by real life experimentations on GPU based hardware platforms which demonstrate the superior performance of our approaches as compared to the state of the art techniques **Evolving OpenMP in an Age of Extreme Parallelism** Matthias S. Müller,Bronis R. de Supinski,Barbara Chapman,2009-05-22 Annotation This book constitutes the refereed proceedings of the 5th International Workshop on OpenMP IWOMP 2009 held in Dresden Germany in June 2009 The papers are organized in topical sections on performance and applications runtime environments tools and benchmarks as well as proposed extensions to OpenMP   Distributed Computing and Networking Luciano Bononi,AJOY DATTA,Stéphane Devismes,Archan Misra,2012-04-10 This book constitutes the refereed proceedings of the 13th International Conference on Distributed Computing and Networking ICDCN 2012 held in Hong Kong China during January 3 6 2012 The 36 revised full papers and 1 short paper presented together with 4 poster papers were carefully reviewed and selected from 100 submissions The papers address all current issues in the field of distributed computing and networking Being a leading forum for researchers and practitioners to exchange ideas and share best practices ICDCN also hosts as a forum for PhD students to discuss their research ideas and get quality feedback from the well renowned experts in the field of distributed computing and computer networking   *Energy-Efficient Fault-Tolerant Systems* Jimson Mathew,Rishad A. Shafik,Dhiraj K. Pradhan,2013-09-07 This book describes the state of the art in energy efficient fault tolerant embedded systems It covers the entire product lifecycle of electronic systems design analysis and testing and includes discussion of both circuit and system level approaches Readers will be enabled to meet the conflicting design objectives of energy efficiency and fault tolerance for reliability given the up to date techniques presented   Design, Automation, and Test in Europe Rudy Lauwereins,Jan Madsen,2008-01-08 In 2007 The

Design Automation and Test in Europe DATE conference celebrated its tenth anniversary As a tribute to the chip and system level design and design technology community this book presents a compilation of the three most influential papers of each year This provides an excellent historical overview of the evolution of a domain that contributed substantially to the growth and competitiveness of the circuit electronics and systems industry   Embedded Systems Handbook Richard Zurawski,2005-08-16 Embedded systems are nearly ubiquitous and books on individual topics or components of embedded systems are equally abundant Unfortunately for those designers who thirst for knowledge of the big picture of embedded systems there is not a drop to drink Until now The Embedded Systems Handbook is an oasis of information offering a mix of basic a   Energy-Efficient Wireless Sensor Networks Vidushi Sharma,Anuradha Pughat,2017-07-28 The advances in low power electronic devices integrated with wireless communication capabilities are one of recent areas of research in the field of Wireless Sensor Networks WSNs One of the major challenges in WSNs is uniform and least energy dissipation while increasing the lifetime of the network This is the first book that introduces the energy efficient wireless sensor network techniques and protocols The text covers the theoretical as well as the practical requirements to conduct and trigger new experiments and project ideas The advanced techniques will help in industrial problem solving for energy hungry wireless sensor network applications   **Design Principles for Embedded Systems** KCS Murti,2021-09-20 The book is designed to serve as a textbook for courses offered to graduate and undergraduate students enrolled in electronics and electrical engineering and computer science This book attempts to bridge the gap between electronics and computer science students providing complementary knowledge that is essential for designing an embedded system The book covers key concepts tailored for embedded system design in one place The topics covered in this book are models and architectures Executable Specific Languages SystemC Unified Modeling Language real time systems real time operating systems networked embedded systems Embedded Processor architectures and platforms that are secured and energy efficient A major segment of embedded systems needs hard real time requirements This textbook includes real time concepts including algorithms and real time operating system standards like POSIX threads Embedded systems are mostly distributed and networked for deterministic responses The book covers how to design networked embedded systems with appropriate protocols for real time requirements Each chapter contains 2 3 solved case studies and 10 real world problems as exercises to provide detailed coverage and essential pedagogical tools that make this an ideal textbook for students enrolled in electrical and electronics engineering and computer science programs   **Energy Efficient Hardware-Software Co-Synthesis Using Reconfigurable Hardware** Jingzhao Ou,Viktor K. Prasanna,2009-10-14 Rapid energy estimation for energy efficient applications using field programmable gate arrays FPGAs remains a challenging research topic Energy dissipation and efficiency have prevented the widespread use of FPGA devices in embedded systems Helping overcome these challenges this book offers solutions for the development of energy efficient applications using FPGAs It provides a framework for high level

hardware software application development describes energy performance modeling for reconfigurable system on chip devices and explores energy efficient designs for various applications The authors present a two step rapid energy estimation technique that enables high level design space exploration and offer a hardware software design for energy efficient implementations of operating systems   Ultra Low-Power Electronics and Design E. Macii,2007-05-08 Power consumption is a key limitation in many high speed and high data rate electronic systems today ranging from mobile telecom to portable and desktop computing systems especially when moving to nanometer technologies Ultra Low Power Electronics and Design offers to the reader the unique opportunity of accessing in an easy and integrated fashion a mix of tutorial material and advanced research results contributed by leading scientists from academia and industry covering the most hot and up to date issues in the field of the design of ultra low power devices systems and applications   Design and Test Technology for Dependable Systems-on-Chip Ubar, Raimund,Raik, Jaan,Vierhaus, Heinrich Theodor,2010-12-31 This book covers aspects of system design and efficient modelling and also introduces various fault models and fault mechanisms associated with digital circuits integrated into System on Chip SoC Multi Processor System on Chip MPSoC or Network on Chip NoC   Power Estimation and Optimization Methodologies for VLIW-based Embedded Systems Vittorio Zaccaria,M.G. Sami,Donatella Sciuto,Cristina Silvano,2007-05-08 LOW power design is playing an important role in today ultra large scale integration ULSI design particularly as we continue to double the number of transistors on a die every two years and increase the frequency of operation at fairly the same rate Certainly an important aspect of low power faces with mobile communications and it has a huge impact on our lives as we are at the start line of the proliferation of mobile PDA s Personal Digital Assistants Wireless LAN and portable multi media computing All of these devices are shaping the way we will be interacting with our family peers and workplace thus requiring also a new and innovative low power design paradigm Furthermore low power design techniques are becoming paramount in high performance desktop base station and server applications such as high speed microprocessors where excess in power dissipation can lead to a number of cooling reliability and signal integrity concerns severely burdening the total industrialcost Hence low power design can be easily anticipated to further come into prominence as we move to next generation System on Chip and Network on Chip designs This book is entirely devoted to disseminate the results of a long term research program between Politecnico di Milano Italy and STMic electronics in the field of architectural exploration and optimization techniques to designing low power embedded systems   **Designing Embedded Processors** Jörg Henkel,Sri Parameswaran,2007-07-27 As we embrace the world of personal portable and perplexingly complex digital systems it has befallen upon the bewildered designer to take advantage of the available transistors to produce a system which is small fast cheap and correct yet possesses increased functionality Increasingly these systems have to consume little energy Designers are increasingly turning towards small processors which are low power and customize these processors both in software and hardware to achieve their objectives of a low power system which is verified

and has short design turnaround times Designing Embedded Processors examines the many ways in which processor based systems are designed to allow low power devices It looks at processor design methods memory optimization dynamic voltage scaling methods compiler methods and multi processor methods Each section has an introductory chapter to give a breadth view and have a few specialist chapters in the area to give a deeper perspective The book provides a good starting point to engineers in the area and to research students embarking upon the exciting area of embedded systems and architectures

Model-Based Design for Embedded Systems Gabriela Nicolescu,Pieter J. Mosterman,2018-09-03 The demands of increasingly complex embedded systems and associated performance computations have resulted in the development of heterogeneous computing architectures that often integrate several types of processors analog and digital electronic components and mechanical and optical components all on a single chip As a result now the most prominent challenge for the design automation community is to efficiently plan for such heterogeneity and to fully exploit its capabilities A compilation of work from internationally renowned authors Model Based Design for Embedded Systems elaborates on related practices and addresses the main facets of heterogeneous model based design for embedded systems including the current state of the art important challenges and the latest trends Focusing on computational models as the core design artifact this book presents the cutting edge results that have helped establish model based design and continue to expand its parameters The book is organized into three sections Real Time and Performance Analysis in Heterogeneous Embedded Systems Design Tools and Methodology for Multiprocessor System on Chip and Design Tools and Methodology for Multidomain Embedded Systems The respective contributors share their considerable expertise on the automation of design refinement and how to relate properties throughout this refinement while enabling analytic and synthetic qualities They focus on multi core methodological issues real time analysis and modeling and validation taking into account how optical electronic and mechanical components often interface Model based design is emerging as a solution to bridge the gap between the availability of computational capabilities and our inability to make full use of them yet This approach enables teams to start the design process using a high level model that is gradually refined through abstraction levels to ultimately yield a prototype When executed well model based design encourages enhanced performance and quicker time to market for a product Illustrating a broad and diverse spectrum of applications such as in the automotive aerospace health care consumer electronics this volume provides designers with practical readily adaptable modeling solutions for their own practice

Sustainable ICTs and Management Systems for Green Computing Hu, Wen-Chen,Kaabouch, Naima,2012-06-30 This book focuses on information technology using sustainable green computing to reduce energy and resources used Provided by publisher *Ambient Intelligence* Werner Weber,Jan Rabaey,Emile H.L. Aarts,2005-12-12 Ambient intelligence is the vision of a technology that will become invisibly embedded in our natural surroundings present whenever we need it enabled by simple and effortless interactions attuned to all our senses adaptive to users and context sensitive and autonomous High

quality information access and personalized content must be available to everybody anywhere and at any time This book addresses ambient intelligence used to support human contacts and accompany an individual s path through the complicated modern world From the technical standpoint distributed electronic intelligence is addressed as hardware vanishing into the background Devices used for ambient intelligence are small low power low weight and very importantly low cost they collaborate or interact with each other and they are redundant and error tolerant This means that the failure of one device will not cause failure of the whole system Since wired connections often do not exist radio methods will play an important role for data transfer This book addresses various aspects of ambient intelligence from applications that are imminent since they use essentially existing technologies to ambitious ideas whose realization is still far away due to major unsolved technical challenges **Integrated Circuit and System Design. Power and Timing Modeling, Optimization and Simulation** Jose L. Ayala,Braulio Garcia-Camara,Manuel Prieto,Martino Ruggiero,Gilles Sicard,2011-09-15 This book constitutes the refereed proceedings of the 21st International Conference on Integrated Circuit and System Design PATMOS 2011 held in Madrid Spain in September 2011 The 34 revised full papers presented were carefully reviewed and selected from numerous submissions The paper feature emerging challenges in methodologies and tools for the design of upcoming generations of integrated circuits and systems and focus especially on timing performance and power consumption as well as architectural aspects with particular emphasis on modeling design characterization analysis and optimization

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