HARDWARE-SOFTWARE CO-DESIGN OF EMBEDDED SYSTEMS

The POLIS Approach

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   Hardware-Software Co-Design of Embedded Systems F. Balarin,Paolo Giusto,Attila Jurecska,Claudio Passerone,Ellen Sentovich,Bassam Tabbara,M. Chiodo,Harry Hsieh,Luciano Lavagno,Alberto Sangiovanni-Vincentelli,Kei Suzuki,2012-12-06 Embedded systems are informally defined as a collection of programmable parts surrounded by ASICs and other standard components that interact continuously with an environment through sensors and actuators The programmable parts include micro controllers and Digital Signal Processors DSPs Embedded systems are often used in life critical situations where reliability and safety are more important criteria than performance Today embedded systems are designed with an ad hoc approach that is heavily based on earlier experience with similar products and on manual design Use of higher level languages such as C helps structure the design somewhat but with increasing complexity it is not sufficient Formal verification and automatic synthesis of implementations are the surest ways to guarantee safety Thus the POLIS system which is a co design environment for embedded systems is based on a formal model of computation POLIS was initiated in 1988 as a research project at the University of California at Berkeley and over the years grew into a full design methodology with a software system supporting it Hardware Software Co Design of Embedded Systems The POLIS Approach is intended to give a complete overview of the POLIS system including its formal and algorithmic aspects Hardware Software Co Design of Embedded Systems The POLIS Approach will be of interest to embedded system designers automotive electronics consumer electronics and telecommunications micro controller designers CAD developers and students

   Hardware-Software Co-Design of Embedded Systems F. Balarin,1997-05-31 Embedded systems are informally defined as a collection of programmable parts surrounded by ASICs and other standard components that interact continuously with an environment through sensors and actuators The programmable parts include micro controllers and Digital Signal Processors DSPs Hardware Software Co Design of Embedded Systems The POLIS Approach is intended to give a complete overview of the POLIS system including its formal and algorithmic aspects and will be of interest to embedded system designers automotive electronics consumer electronics and telecommunications micro controller designers CAD developers and students   Readings in Hardware/Software Co-Design Giovanni De Micheli,Rolf Ernst,Wayne Wolf,2002 This title serves as an introduction ans reference for the field with the papers that have shaped the hardware software co design since its inception in the early 90s   **Design of Hardware/Software Embedded Systems** Eugenio Villar Bonet,2001 Este libro presenta los desaf os planteados por las nuevas y sumamente poderosas tecnolog as de integraci n de sistemas electr nicos que est n en la base de los cambios sociales hacia lo que llaman la Sociedad de la Informaci n en la que los dispositivos electr nicos se har n una parte incorporada de la vida diaria encajados en casi cada producto Es necesario un conocimiento cuidadoso de los desaf os para aprovechar la amplia gama de ocasiones ofrecidas por tales capacidades de integraci n y las correspondientes posibilidades de dise o de sistemas electr nicos   **Hardware/Software Co-Design for**

Data Flow Dominated Embedded Systems Ralf Niemann,1998-10-31 Introduces different tasks of hardware software co design including system specification hardware software partitioning co synthesis and co simulation Summarizes and classifies co design tools and methods for these tasks and presents the co design tool COOL useful for solving co design tasks for the class of data flow dominated embedded systems Primary emphasis is on hardware software partitioning and the co synthesis phase and their coupling A mathematical formulation of the hardware software partitioning problem is given and several novel approaches are presented and compared for solving the partitioning problem Annotation copyrighted by Book News Inc Portland OR   **Hardware-software Partitioning in Co-design of Embedded Systems** Habeel Ahmad,1998   **Embedded Systems Design with 8051 Microcontrollers** Zdravko Karakehayov,1999-08-06 A presentation of developments in microcontroller technology providing lucid instructions on its many and varied applications It focuses on the popular eight bit microcontroller the 8051 and the 83C552 The text outlines a systematic methodology for small scale control dominated embedded systems and is accompanied by a disk of all the example problems included in the book

Architecture and Design of Distributed Embedded Systems Bernd Kleinjohann,2013-04-18 Due to the decreasing production costs of IT systems applications that had to be realised as expensive PCBs formerly can now be realised as a system on chip Furthermore low cost broadband communication media for wide area communication as well as for the realisation of local distributed systems are available Typically the market requires IT systems that realise a set of specific features for the end user in a given environment so called embedded systems Some examples for such embedded systems are control systems in cars airplanes houses or plants information and communication devices like digital TV mobile phones or autonomous systems like service or edutainment robots For the design of embedded systems the designer has to tackle three major aspects The application itself including the man machine interface The target architecture of the system including all functional and non functional constraints and the design methodology including modelling specification synthesis test and validation The last two points are a major focus of this book This book documents the high quality approaches and results that were presented at the International Workshop on Distributed and Parallel Embedded Systems DIPES 2000 which was sponsored by the International Federation for Information Processing IFIP and organised by IFIP working groups WG10 3 WG10 4 and WG10 5 The workshop took place on October 18 19 2000 in Schlo Eringerfeld near Paderborn Germany Architecture and Design of Distributed Embedded Systems is organised similar to the workshop Chapters 1 and 4 Methodology I and II deal with different modelling and specification paradigms and the corresponding design methodologies Generic system architectures for different classes of embedded systems are presented in Chapter 2 In Chapter 3 several design environments for the support ofspecific design methodologies are presented Problems concerning test and validation are discussed in Chapter 5 The last two chapters include distribution and communication aspects Chapter 6 and synthesis techniques for embedded systems Chapter 7 This book is essential reading for computer science researchers and application

developers   *Co-Design for System Acceleration* Nadia Nedjah,Luiza Mourelle,2007-05-17 In this book we are concerned with studying the co design methodology in general and how to determine the more suitable interface mechanism in a co design system in particular This will be based on the characteristics of the application and those of the target architecture of the system We provide guidelines to support the designer s choice of the interface mechanism   *Electronic System-Level HW/SW Co-Design of Heterogeneous Multi-Processor Embedded Systems* Luigi Pomante,2022-09-01 Modern electronic systems consist of a fairly heterogeneous set of components Today a single system can be constituted by a hardware platform frequently composed of a mix of analog and digital components and by several software application layers The hardware can include several heterogeneous microprocessors e g GPP DSP GPU etc dedicated ICs ASICs and or FPGAs memories a set of local connections between the system components and some interfaces between the system and the environment sensors actuators etc Therefore on the one hand multi processor embedded systems are capable of meeting the demand of processing power and flexibility of complex applications On the other hand such systems are very complex to design and optimize so that the design methodology plays a major role in determining the success of the products For these reasons to cope with the increasing system complexity the approaches typically used today are oriented towards co design methodologies working at the higher levels of abstraction Unfortunately such methodologies are typically customized for the specific application suffer of a lack of generality and still need a considerable effort when real size project are envisioned Therefore there is still the need for a general methodology able to support the designer during the high level steps of a co design flow enabling an effective design space exploration before tackling the low level steps and thus committing to the final technology This should prevent costly redesign loops In such a context the work described in this book composed of two parts aims at providing models methodologies and tools to support each step of the co design flow of embedded systems implemented by exploiting heterogeneous multi processor architectures mapped on distributed systems as well as fully integrated onto a single chip

   Embedded Systems Handbook 2-Volume Set Richard Zurawski,2018-10-08 During the past few years there has been an dramatic upsurge in research and development implementations of new technologies and deployments of actual solutions and technologies in the diverse application areas of embedded systems These areas include automotive electronics industrial automated systems and building automation and control Comprising 48 chapters and the contributions of 74 leading experts from industry and academia the Embedded Systems Handbook Second Edition presents a comprehensive view of embedded systems their design verification networking and applications The contributors directly involved in the creation and evolution of the ideas and technologies presented offer tutorials research surveys and technology overviews exploring new developments deployments and trends To accommodate the tremendous growth in the field the handbook is now divided into two volumes New in This Edition Processors for embedded systems Processor centric architecture description languages Networked embedded systems in the automotive and industrial automation fields Wireless embedded systems Embedded

Systems Design and Verification Volume I of the handbook is divided into three sections It begins with a brief introduction to embedded systems design and verification The book then provides a comprehensive overview of embedded processors and various aspects of system on chip and FPGA as well as solutions to design challenges The final section explores power aware embedded computing design issues specific to secure embedded systems and web services for embedded devices Networked Embedded Systems Volume II focuses on selected application areas of networked embedded systems It covers automotive field industrial automation building automation and wireless sensor networks This volume highlights implementations in fast evolving areas which have not received proper coverage in other publications Reflecting the unique functional requirements of different application areas the contributors discuss inter node communication aspects in the context of specific applications of networked embedded systems   A Platform-Centric Approach to System-on-Chip (SOC) Design Vijay Madisetti,Chonlameth Arpnikanondt,2006-06-28 Increasing system complexity has created a pressing need for better design tools and associated methodologies and languages for meeting the stringent time to market and cost constraints Platform centric and platfo based system on chip SoC design methodologies based on reuse of software and hardware functionality has also gained increasing exposure and usage within the Electronic System Level ESL design communities The book proposes a new methodology for realizing platform centric design of complex systems and presents a detailed plan for its implementation The proposed plan allows component vendors system integrators and product developers to collaborate effectively and efficiently to create complex products within budget and schedule constraints This book focuses more on the use of platforms in the design of products and not on the design of platforms themselves Platform centric design is not for everyone as some may feel that it does not allow them to differentiate their offering from competitors to a significant degree However its proponents may claim that the time market and cost advantages of platform centric design more than compensate for any drawbacks   Multiprocessor Systems-on-Chips Ahmed Jerraya,Wayne Wolf,2005 Modern system on chip SoC design shows a clear trend toward integration of multiple processor cores on a single chip Designing a multiprocessor system on chip MPSOC requires an understanding of the various design styles and techniques used in the multiprocessor Understanding the application area of the MPSOC is also critical to making proper tradeoffs and design decisions Multiprocessor Systems on Chips covers both design techniques and applications for MPSOCs Design topics include multiprocessor architectures processors operating systems compilers methodologies and synthesis algorithms and application areas covered include telecommunications and multimedia The majority of the chapters were collected from presentations made at the International Workshop on Application Specific Multi Processor SoC held over the past two years The workshop assembled internationally recognized speakers on the range of topics relevant to MPSOCs After having refined their material at the workshop the speakers are now writing chapters and the editors are fashioning them into a unified book by making connections between chapters and developing common terminology Examines several different architectures and

the constraints imposed on them Discusses scheduling real time operating systems and compilers Analyzes design trade off and decisions in telecommunications and multimedia applications **System Specification & Design Languages** Eugenio Villar,Jean Mermet,2007-05-08 In this fourth book in the CHDL Series a selection of the best papers presented in FDL 02 is published System Specification and Design Languages contains outstanding research contributions in the four areas mentioned above So The Analog and Mixed Signal system design contributions cover the new methodological approaches like AMS behavioral specification mixed signal modeling and simulation AMS reuse and MEMs design using the new modeling languages such as VHDL AMS Verilog AMS Modelica and analog mixed signal extensions to SystemC UML is the de facto standard for SW development covering the early development stages of requirement analysis and system specification The UML based system specification and design contributions address latest results on hot topic areas such as system profiling performance analysis and UML application to complex HW SW embedded systems and SoC design C C for HW SW systems design is entering standard industrial design flows Selected papers cover system modeling system verification and SW generation The papers from the Specification Formalisms for Proven design workshop present formal methods for system modeling and design semantic integrity and formal languages such as ALPHA HANDLE and B **Embedded Systems Handbook** Richard Zurawski,2018-09-03 Considered a standard industry resource the Embedded Systems Handbook provided researchers and technicians with the authoritative information needed to launch a wealth of diverse applications including those in automotive electronics industrial automated systems and building automation and control Now a new resource is required to report on current developments and provide a technical reference for those looking to move the field forward yet again Divided into two volumes to accommodate this growth the Embedded Systems Handbook Second Edition presents a comprehensive view on this area of computer engineering with a currently appropriate emphasis on developments in networking and applications Those experts directly involved in the creation and evolution of the ideas and technologies presented offer tutorials research surveys and technology overviews that explore cutting edge developments and deployments and identify potential trends This first self contained volume of the handbook Embedded Systems Design and Verification is divided into three sections It begins with a brief introduction to embedded systems design and verification It then provides a comprehensive overview of embedded processors and various aspects of system on chip and FPGA as well as solutions to design challenges The final section explores power aware embedded computing design issues specific to secure embedded systems and web services for embedded devices Those interested in taking their work with embedded systems to the network level should complete their study with the second volume Network Embedded Systems **Handbook of Computer Architecture** Anupam Chattopadhyay,2024-12-20 This handbook presents the key topics in the area of computer architecture covering from the basic to the most advanced topics including software and hardware design methodologies It will provide readers with the most comprehensive updated reference information covering applications in single core

processors multicore processors application specific processors reconfigurable architectures emerging computing architectures processor design and programming flows test and verification This information benefits the readers as a full and quick technical reference with a high level review of computer architecture technology detailed technical descriptions and the latest practical applications **Systems, Controls, Embedded Systems, Energy, and Machines** Richard C. Dorf,2017-12-19 In two editions spanning more than a decade The Electrical Engineering Handbook stands as the definitive reference to the multidisciplinary field of electrical engineering Our knowledge continues to grow and so does the Handbook For the third edition it has expanded into a set of six books carefully focused on a specialized area or field of study Each book represents a concise yet definitive collection of key concepts models and equations in its respective domain thoughtfully gathered for convenient access Systems Controls Embedded Systems Energy and Machines explores in detail the fields of energy devices machines and systems as well as control systems It provides all of the fundamental concepts needed for thorough in depth understanding of each area and devotes special attention to the emerging area of embedded systems Each article includes defining terms references and sources of further information Encompassing the work of the world s foremost experts in their respective specialties Systems Controls Embedded Systems Energy and Machines features the latest developments the broadest scope of coverage and new material on human computer interaction **Digital Systems Design with FPGAs and CPLDs** Ian Grout,2011-04-08 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 hardwareThis 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 **Ambient Intelligence with Microsystems** Kieran Delaney,2008-10-17 Augmented Materials and Smart Objects investigates the issues required to ensure technology platforms capable of being seamlessly integrated into everyday objects

particularly the requirements for integrated computation and MEMs sensors System in a package solutions multi chip modules the impact of the trend towards embedded microelectronic electronics sub systems novel assembly techniques for autonomous MEMs sensors as well as practical performance issues that are key to the AmI concept Also discussed are current requirements for realizing applications oriented examples of smart objects e g smart textiles gadgets integration of smart systems for utility and environmental monitoring etc these are based upon heterogeneous systems linking networks of sensors attached to or physically embedded in objects with information management systems enabling collections of smart objects to collaborate to provide proactive services to the user Finally Augmented Materials and Smart Objects describes and discusses a number of vision statements strongly relevant to the future development of distributed embedded sensor and actuator platforms for smart objects and ultimately Ambient Intelligence The framework for this is the concept of Augmented Materials these are materials with fully embedded distributed information systems designed to measure all relevant physical properties and provide a full knowledge representation of the material in effect the material would know itself and its current status   *Discrete-Event Modeling and Simulation* Gabriel A. Wainer,Pieter J. Mosterman,2018-09-03 Collecting the work of the foremost scientists in the field Discrete Event Modeling and Simulation Theory and Applications presents the state of the art in modeling discrete event systems using the discrete event system specification DEVS approach It introduces the latest advances recent extensions of formal techniques and real world examples of various applications The book covers many topics that pertain to several layers of the modeling and simulation architecture It discusses DEVS model development support and the interaction of DEVS with other methodologies It describes different forms of simulation supported by DEVS the use of real time DEVS simulation the relationship between DEVS and graph transformation the influence of DEVS variants on simulation performance and interoperability and composability with emphasis on DEVS standardization The text also examines extensions to DEVS new formalisms and abstractions of DEVS models as well as the theory and analysis behind real world system identification and control To support the generation and search of optimal models of a system a framework is developed based on the system entity structure and its transformation to DEVS simulation models In addition the book explores numerous interesting examples that illustrate the use of DEVS to build successful applications including optical network on chip construction building design process control workflow systems and environmental models A one stop resource on advances in DEVS theory applications and methodology this volume offers a sampling of the best research in the area a broad picture of the DEVS landscape and trend setting applications enabled by the DEVS approach It provides the basis for future research discoveries and encourages the development of new applications

Hardware Software Co Design Of Embedded Systems The Polis Approach: Bestsellers in 2023 The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of bestselling books, exploring the fascinating narratives that have captivated audiences this year. Hardware Software Co Design Of Embedded Systems The Polis Approach : Colleen Hoovers "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can succeed. Hardware Software Co Design Of Embedded Systems The Polis Approach : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This spellbinding historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids captivating storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Hardware Software Co Design Of Embedded Systems The Polis Approach : Delia Owens "Where the Crawdads Sing" This mesmerizing coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of engaging stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a exceptional and suspenseful novel that will keep you wondering until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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Hardware Software Co Design Of Embedded Systems The Polis Approach Introduction

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