

Introduction To Embedded Systems Using Microcontrollers And The Msp430

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Series Embedded Microprocessor Systems Design Embedded System Design Embedded Systems Design Introduction to Embedded Systems: Interfacing to the Freescale 9S12 Intelligence for Embedded Systems Intro To Embedded Systems 1E Developing and Managing Embedded Systems and Products Introduction to Embedded Systems The Art of Designing Embedded Systems Introduction to Embedded Systems

Introduction to Embedded Systems

Until the late 1980s, information processing was associated with large mainframe computers and huge tape drives. During the 1990s, this trend shifted toward information processing with personal computers, or PCs. The trend toward miniaturization continues and in the future the majority of information processing systems will be small mobile computers, many of which will be embedded into larger products and interfaced to the physical environment. Hence, these kinds of systems are called embedded systems. Embedded systems together with their physical environment are called cyber-physical systems. Examples include systems such as transportation and fabrication equipment. It is expected that the total market volume of embedded systems will be significantly larger than that of traditional information processing systems such as PCs and mainframes. Embedded systems share a number of common characteristics. For example, they

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must be dependable, efficient, meet real-time constraints and require customized user interfaces (instead of generic keyboard and mouse interfaces). Therefore, it makes sense to consider common principles of embedded system design. Embedded System Design starts with an introduction into the area and a survey of specification models and languages for embedded and cyber-physical systems. It provides a brief overview of hardware devices used for such systems and presents the essentials of system software for embedded systems, like real-time operating systems. The book also discusses evaluation and validation techniques for embedded systems. Furthermore, the book presents an overview of techniques for mapping applications to execution platforms. Due to the importance of resource efficiency, the book also contains a selected set of optimization techniques for embedded systems, including special compilation techniques. The book closes with a brief survey on testing. Embedded System Design can be used as a text book for courses on embedded systems and as a source which provides pointers to relevant material in the area for PhD students and teachers. It assumes a basic knowledge of information processing hardware and software. Courseware related to this book is available at <http://ls12-www.cs.tu-dortmund.de/~marwedel>.

MSP430 Microcontroller Basics

This book employs a bottom-up educational approach with an overall educational objective of allowing students to discover how the computer interacts with its

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environment through learning basic computer architecture, assembly language programming, as well as through an introduction to interfacing. Developed around the Freescale 9S12, this book describes both the general processes and the specific details involved in microcomputer simulation. In particular, detailed case studies are used to illustrate fundamental concepts, and laboratory assignments are provided. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Embedded Computing for High Performance

This book is one of four books that teach the fundamentals of embedded systems as applied to the Texas Instruments MSP432 microcontroller. An embedded system is a system that performs a specific task and has a computer embedded inside. A system is comprised of components and interfaces connected together for a common purpose. This book teaches the fundamentals of microcontroller interfacing and real-time programming in the context of robotics. There is a chapter on assembly language to expose important concepts of the microcontroller architecture. However, most of the software development occurs in C. This book can be used with Texas Instruments Robot Systems Learning Kit (TI-RSLK). This book provides an introduction to robots that could be used at the college level with little or no prerequisites. Specific topics include microcontrollers, fixed-point numbers, the design of software in C, elementary data structures, programming

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input/output including interrupts, analog to digital conversion, digital to analog conversion, power, sensor interfacing, motor interfacing, an introduction to digital signal processing, control systems, and communication systems. The book shows how you deploy both Bluetooth Low Energy, and wifi onto the robot, creating an internet of things. This book employs a bottom-up approach to learning. It will not include an exhaustive recapitulation of the information in data sheets. First, it begins with basic fundamentals, which allows the reader to solve new problems with new technology. Second, the book presents many detailed design examples. These examples illustrate the process of design. There are multiple structural components that assist learning. Checkpoints, with answers in the back, are short easy to answer questions providing immediate feedback while reading. The book includes an index and a glossary so that information can be searched. The most important learning experiences in a class like this are of course the laboratories. Specifically for this volume, look at the lab assignments for TI-RSLK curriculum. There is a web site accompanying this book: <http://users.ece.utexas.edu/valvano/arm/robotics.ht>

Embedded Systems Interfacing for Engineers Using the Freescale HCS08 Microcontroller

The MSP430 microcontroller family offers ultra-low power mixed signal, 16-bit

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architecture that is perfect for wireless low-power industrial and portable medical applications. This book begins with an overview of embedded systems and microcontrollers followed by a comprehensive in-depth look at the MSP430. The coverage included a tour of the microcontroller's architecture and functionality along with a review of the development environment. Start using the MSP430 armed with a complete understanding of the microcontroller and what you need to get the microcontroller up and running! Details C and assembly language for the MSP430 Companion Web site contains a development kit Full coverage is given to the MSP430 instruction set, and sigma-delta analog-digital converters and timers

Embedded Systems

Interested in developing embedded systems? Since they don't tolerate inefficiency, these systems require a disciplined approach to programming. This easy-to-read guide helps you cultivate a host of good development practices, based on classic software design patterns and new patterns unique to embedded programming. Learn how to build system architecture for processors, not operating systems, and discover specific techniques for dealing with hardware difficulties and manufacturing requirements. Written by an expert who's created embedded systems ranging from urban surveillance and DNA scanners to children's toys, this book is ideal for intermediate and experienced programmers, no matter what platform you use. Optimize your system to reduce cost and increase performance

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Develop an architecture that makes your software robust in resource-constrained environments Explore sensors, motors, and other I/O devices Do more with less: reduce RAM consumption, code space, processor cycles, and power consumption Learn how to update embedded code directly in the processor Discover how to implement complex mathematics on small processors Understand what interviewers look for when you apply for an embedded systems job "Making Embedded Systems is the book for a C programmer who wants to enter the fun (and lucrative) world of embedded systems. It's very well written—entertaining, even—and filled with clear illustrations." —Jack Ganssle, author and embedded system expert.

EMBEDDED SYSTEM DESIGN: A UNIFIED HARDWARE/SOFTWARE INTRODUCTION

"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® Spartan™ 3 FPGA; FPGA-based

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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.

Making Embedded Systems

Ubiquitous in today's consumer-driven society, embedded systems use microprocessors that are hidden in our everyday products and designed to perform specific tasks. Effective use of these embedded systems requires engineers to be proficient in all phases of this effort, from planning, design, and analysis to manufacturing and marketing. Taking a systems-level approach, *Real-Time Embedded Systems: Optimization, Synthesis, and Networking* describes the field from three distinct aspects that make up the three major trends in current embedded system design. The first section of the text examines optimization in real-time embedded systems. The authors present scheduling algorithms in multi-core embedded systems, instruct on a robust measurement against the inaccurate information that can exist in embedded systems, and discuss potential problems of heterogeneous optimization. The second section focuses on synthesis-level approaches for embedded systems, including a scheduling algorithm for phase

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change memory and scratch pad memory and a treatment of thermal-aware multiprocessor synthesis technology. The final section looks at networking with a focus on task scheduling in both a wireless sensor network and cloud computing. It examines the merging of networking and embedded systems and the resulting evolution of a new type of system known as the cyber physical system (CPS). Encouraging readers to discover how the computer interacts with its environment, Real-Time Embedded Systems provides a sound introduction to the design, manufacturing, marketing, and future directions of this important tool.

Embedded System Design on a Shoestring

Covers the significant embedded computing technologies—highlighting their applications in wireless communication and computing power An embedded system is a computer system designed for specific control functions within a larger system—often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Presented in three parts, Embedded Systems: Hardware, Design, and Implementation provides readers with an immersive introduction to this rapidly growing segment of the computer industry. Acknowledging the fact that embedded systems control many of today's most common devices such as smart phones, PC tablets, as well as hardware embedded in cars, TVs, and even refrigerators and heating systems, the book starts with a basic introduction to embedded computing systems. It hones in

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on system-on-a-chip (SoC), multiprocessor system-on-chip (MPSoC), and network-on-chip (NoC). It then covers on-chip integration of software and custom hardware accelerators, as well as fabric flexibility, custom architectures, and the multiple I/O standards that facilitate PCB integration. Next, it focuses on the technologies associated with embedded computing systems, going over the basics of field-programmable gate array (FPGA), digital signal processing (DSP) and application-specific integrated circuit (ASIC) technology, architectural support for on-chip integration of custom accelerators with processors, and O/S support for these systems. Finally, it offers full details on architecture, testability, and computer-aided design (CAD) support for embedded systems, soft processors, heterogeneous resources, and on-chip storage before concluding with coverage of software support—in particular, O/S Linux. *Embedded Systems: Hardware, Design, and Implementation* is an ideal book for design engineers looking to optimize and reduce the size and cost of embedded system products and increase their reliability and performance.

Embedded Software Development

Addressing current issues of which any engineer or computer scientist should be aware, this monograph is a response to the need to adopt a new computational paradigm as the methodological basis for designing pervasive embedded systems with sensor capabilities. The requirements of this paradigm are to control

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complexity, to limit cost and energy consumption and to provide adaptation and cognition abilities allowing the embedded system to interact proactively with the real world. The quest for such intelligence requires the formalization of a new generation of intelligent systems able to exploit advances in digital architectures and in sensing technologies. The book sheds light on the theory behind intelligence for embedded systems with specific focus on: · robustness (the robustness of a computational flow and its evaluation); · intelligence (how to mimic the adaptation and cognition abilities of the human brain), · the capacity to learn in non-stationary and evolving environments by detecting changes and reacting accordingly; and · a new paradigm that, by accepting results that are correct in probability, allows the complexity of the embedded application to be kept under control. Theories, concepts and methods are provided to motivate researchers in this exciting and timely interdisciplinary area. Applications such as porting a neural network from a high-precision platform to a digital embedded system and evaluating its robustness level are described. Examples show how the methodology introduced can be adopted in the case of cyber-physical systems to manage the interaction between embedded devices and physical world. Researchers and graduate students in computer science and various engineering-related disciplines will find the methods and approaches propounded in Intelligence for Embedded Systems of great interest. The book will also be an important resource for practitioners working on embedded systems and applications.

Introduction to Embedded Systems - A Cyber Physical Systems Approach - Second Edition

Appropriate for undergraduate and beginning graduate level courses on embedded systems or microprocessor based systems design in computer engineering, electrical engineering, and computer science. The basic structure, operation, and design of embedded systems is presented in a stepwise fashion. A balanced treatment of both hardware and software is provided. The Intel 80C188EB microprocessor is used as the instructional example. Hardware is covered starting from the component level. Software development focuses on assembly language. The only background required is an introductory course in digital systems design.

Debugging Embedded Microprocessor Systems

Embedded Systems with PIC Microcontrollers: Principles and Applications is a hands-on introduction to the principles and practice of embedded system design using the PIC microcontroller. Packed with helpful examples and illustrations, the book provides an in-depth treatment of microcontroller design as well as programming in both assembly language and C, along with advanced topics such as techniques of connectivity and networking and real-time operating systems. In this one book students get all they need to know to be highly proficient at

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embedded systems design. This text combines embedded systems principles with applications, using the 16F84A, 16F873A and the 18F242 PIC microcontrollers. Students learn how to apply the principles using a multitude of sample designs and design ideas, including a robot in the form of an autonomous guide vehicle. Coverage between software and hardware is fully balanced, with full presentation given to microcontroller design and software programming, using both assembler and C. The book is accompanied by a companion website containing copies of all programs and software tools used in the text and a 'student' version of the C compiler. This textbook will be ideal for introductory courses and lab-based courses on embedded systems, microprocessors using the PIC microcontroller, as well as more advanced courses which use the 18F series and teach C programming in an embedded environment. Engineers in industry and informed hobbyists will also find this book a valuable resource when designing and implementing both simple and sophisticated embedded systems using the PIC microcontroller. *Gain the knowledge and skills required for developing today's embedded systems, through use of the PIC microcontroller. *Explore in detail the 16F84A, 16F873A and 18F242 microcontrollers as examples of the wider PIC family. *Learn how to program in Assembler and C. *Work through sample designs and design ideas, including a robot in the form of an autonomous guided vehicle. *Accompanied by a CD-ROM containing copies of all programs and software tools used in the text and a 'student' version of the C compiler.

Embedded Systems Architecture

Many electrical and computer engineering projects involve some kind of embedded system in which a microcontroller sits at the center as the primary source of control. The recently-developed Arduino development platform includes an inexpensive hardware development board hosting an eight-bit ATMEL ATmega-family processor and a Java-based software-development environment. These features allow an embedded systems beginner the ability to focus their attention on learning how to write embedded software instead of wasting time overcoming the engineering CAD tools learning curve. The goal of this text is to introduce fundamental methods for creating embedded software in general, with a focus on ANSI C. The Arduino development platform provides a great means for accomplishing this task. As such, this work presents embedded software development using 100% ANSI C for the Arduino's ATmega328P processor. We deviate from using the Arduino-specific Wiring libraries in an attempt to provide the most general embedded methods. In this way, the reader will acquire essential knowledge necessary for work on future projects involving other processors. Particular attention is paid to the notorious issue of using C pointers in order to gain direct access to microprocessor registers, which ultimately allow control over all peripheral interfacing. Table of Contents: Introduction / ANSI C / Introduction to Arduino / Embedded Debugging / ATmega328P Architecture / General-Purpose Input/Output / Timer Ports / Analog Input Ports / Interrupt Processing / Serial

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Communications / Assembly Language / Non-volatile Memory

Embedded Systems

This book introduces a modern approach to embedded system design, presenting software design and hardware design in a unified manner. It covers trends and challenges, introduces the design and use of single-purpose processors ("hardware") and general-purpose processors ("software"), describes memories and buses, illustrates hardware/software tradeoffs using a digital camera example, and discusses advanced computation models, controls systems, chip technologies, and modern design tools. For courses found in EE, CS and other engineering departments.

Embedded Systems Design with the Texas Instruments MSP432 32-bit Processor

An introduction to the engineering principles of embedded systems, with a focus on modeling, design, and analysis of cyber-physical systems.

Embedded Systems

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Embedded Systems Architecture is a practical and technical guide to understanding the components that make up an embedded system's architecture. This book is perfect for those starting out as technical professionals such as engineers, programmers and designers of embedded systems; and also for students of computer science, computer engineering and electrical engineering. It gives a much-needed 'big picture' for recently graduated engineers grappling with understanding the design of real-world systems for the first time, and provides professionals with a systems-level picture of the key elements that can go into an embedded design, providing a firm foundation on which to build their skills. Real-world approach to the fundamentals, as well as the design and architecture process, makes this book a popular reference for the daunted or the inexperienced: if in doubt, the answer is in here! Fully updated with new coverage of FPGAs, testing, middleware and the latest programming techniques in C, plus complete source code and sample code, reference designs and tools online make this the complete package Visit the companion web site at <http://booksite.elsevier.com/9780123821966/> for source code, design examples, data sheets and more A true introductory book, provides a comprehensive get up and running reference for those new to the field, and updating skills: assumes no prior knowledge beyond undergrad level electrical engineering Addresses the needs of practicing engineers, enabling it to get to the point more directly, and cover more ground. Covers hardware, software and middleware in a single volume Includes a library of design examples and design tools, plus a complete set of

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source code and embedded systems design tutorial materials from companion website

Real-Time Embedded Systems

Debugging Embedded Microprocessor Systems provides techniques for engineers, technicians, and students who need to correct design faults in embedded systems. Using real-world scenarios, designers can learn practical, time-saving ways to avoid and repair potentially costly problems. Prevention is stressed. In this book, the author addresses hardware and software issues, including up-front design techniques to prevent bugs and contain design creep. Practical advice includes descriptions of common tools which can be used to help identify and repair bugs, as well as test routines. RTOS and embedded PC environments are also covered. Each chapter of Debugging Embedded Microprocessor Systems opens with an example design problem which illustrates real-world issues such as design changes, time pressures, equipment or component availability, etc. Case studies of past debugging projects are presented in the final chapter. Addresses real-world issues like design changes, time pressures, equipment or component availability
Practical, time-saving methods for preventing and correcting design problems
Covers debugging tools and programmer test routines

Designing Embedded Systems with PIC Microcontrollers

A hands-on introduction to the field of embedded systems; A focus on fast prototyping of embedded systems; All key embedded system concepts covered through simple and effective experimentation; An understanding of ARM technology, one of the world's leaders; A practical introduction to embedded C; Applies possibly the most accessible set of tools available in the embedded world. This book is an introduction to embedded systems design, using the ARM mbed and C programming language as development tools. The mbed provides a compact, self-contained and low-cost hardware core, and the on-line compiler requires no download or installation, being accessible wherever an internet link exists. The book further combines these with a simple "breadboard" approach, whereby simple circuits are built up around the mbed, with no soldering or pcb assembly required. The book adopts a "learning through doing" approach. Each chapter is based around a major topic in embedded systems. The chapter proceeds as a series of practical experiments; the reader sets up a simple hardware system, develops and downloads a simple program, and immediately observes and tests the outcomes. The book then reflects on the experimental results, evaluating the strengths and weaknesses of the technology or technique introduced, explores how precise the link is between theory and practice, and considers applications and the wider context. The only book that explains how to use ARM's mbed development toolkit to help the speedy and easy development of embedded

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systems. Teaches embedded systems core principles in the context of developing quick applications, making embedded systems development an easy task for the non specialist who does not have a deep knowledge of electronics or software All key concepts are covered through simple and effective experimentation

Introduction to Embedded System Design Using Field Programmable Gate Arrays

Device drivers are developed illustrating the use of general-purpose and special-purpose digital I/O interfaces, analog interfaces, serial interfaces and real-time I/O processing. The hardware side of each interface is described and electrical specifications and related issues are considered. The first part of the book provides the programming skills necessary to implement the software in this part.

Programming Embedded Systems

Linux® is being adopted by an increasing number of embedded systems developers, who have been won over by its sophisticated scheduling and networking, its cost-free license, its open development model, and the support offered by rich and powerful programming tools. While there is a great deal of hype surrounding the use of Linux in embedded systems, there is not a lot of practical

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information. Building Embedded Linux Systems is the first in-depth, hard-core guide to putting together an embedded system based on the Linux kernel. This indispensable book features arcane and previously undocumented procedures for: Building your own GNU development toolchain Using an efficient embedded development framework Selecting, configuring, building, and installing a target-specific kernel Creating a complete target root filesystem Setting up, manipulating, and using solid-state storage devices Installing and configuring a bootloader for the target Cross-compiling a slew of utilities and packages Debugging your embedded system using a plethora of tools and techniques Details are provided for various target architectures and hardware configurations, including a thorough review of Linux's support for embedded hardware. All explanations rely on the use of open source and free software packages. By presenting how to build the operating system components from pristine sources and how to find more documentation or help, this book greatly simplifies the task of keeping complete control over one's embedded operating system, whether it be for technical or sound financial reasons. Author Karim Yaghmour, a well-known designer and speaker who is responsible for the Linux Trace Toolkit, starts by discussing the strengths and weaknesses of Linux as an embedded operating system. Licensing issues are included, followed by a discussion of the basics of building embedded Linux systems. The configuration, setup, and use of over forty different open source and free software packages commonly used in embedded Linux systems are also covered. uClibc, BusyBox, U-Boot, OpenSSH, tftpd, tftp, strace, and gdb are

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among the packages discussed.

Embedded Systems, an Introduction Using the Renesas Rx62N Microcontroller

Embedded Systems and Robotics with Open-Source Tools provides easy-to-understand and easy-to-implement guidance for rapid prototype development. Designed for readers unfamiliar with advanced computing technologies, this highly accessible book: Describes several cutting-edge open-source software and hardware technologies Examines a number of embedded computer systems and their practical applications Includes detailed projects for applying rapid prototype development skills in real time Embedded Systems and Robotics with Open-Source Tools effectively demonstrates that, with the help of high-performance microprocessors, microcontrollers, and highly optimized algorithms, one can develop smarter embedded devices.

Embedded Microprocessor Systems

Front Cover; Dedication; Embedded Systems Security: Practical Methods for Safe and Secure Software and Systems Development; Copyright; Contents; Foreword; Preface; About this Book; Audience; Organization; Approach; Acknowledgements;

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Chapter 1 -- Introduction to Embedded Systems Security; 1.1What is Security?; 1.2What is an Embedded System?; 1.3Embedded Security Trends; 1.4Security Policies; 1.5Security Threats; 1.6Wrap-up; 1.7Key Points; 1.8 Bibliography and Notes; Chapter 2 -- Systems Software Considerations; 2.1The Role of the Operating System; 2.2Multiple Independent Levels of Security.

Modeling and Optimization of Parallel and Distributed Embedded Systems

Nowadays, embedded systems - computer systems that are embedded in various kinds of devices and play an important role of specific control functions, have permeated various scenes of industry. Therefore, we can hardly discuss our life or society from now onwards without referring to embedded systems. For wide-ranging embedded systems to continue their growth, a number of high-quality fundamental and applied researches are indispensable. This book contains 13 excellent chapters and addresses a wide spectrum of research topics of embedded systems, including parallel computing, communication architecture, application-specific systems, and embedded systems projects. Embedded systems can be made only after fusing miscellaneous technologies together. Various technologies condensed in this book as well as in the complementary book "Embedded Systems - Theory and Design Methodology", will be helpful to researchers and engineers

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around the world.

Real-Time Bluetooth Networks

This book provides a thorough introduction to the Texas Instruments MSP432™ microcontroller. The MSP432 is a 32-bit processor with the ARM Cortex M4F architecture and a built-in floating point unit. At the core, the MSP432 features a 32-bit ARM Cortex-M4F CPU, a RISC-architecture processing unit that includes a built-in DSP engine and a floating point unit. As an extension of the ultra-low-power MSP microcontroller family, the MSP432 features ultra-low power consumption and integrated digital and analog hardware peripherals. The MSP432 is a new member to the MSP family. It provides for a seamless transition to applications requiring 32-bit processing at an operating frequency of up to 48 MHz. The processor may be programmed at a variety of levels with different programming languages including the user-friendly Energia rapid prototyping platform, in assembly language, and in C. A number of C programming options are also available to developers, starting with register-level access code where developers can directly configure the device's registers, to Driver Library, which provides a standardized set of application program interfaces (APIs) that enable software developers to quickly manipulate various peripherals available on the device. Even higher abstraction layers are also available, such as the extremely user-friendly Energia platform, that enables even beginners to quickly prototype an application on

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MSP432. The MSP432 LaunchPad is supported by a host of technical data, application notes, training modules, and software examples. All are encapsulated inside one handy package called MSPWare, available as both a stand-alone download package as well as on the TI Cloud development site: dev.ti.com The features of the MSP432 may be extended with a full line of BoosterPack plug-in modules. The MSP432 is also supported by a variety of third party modular sensors and software compiler companies. In the back, a thorough introduction to the MSP432 line of microcontrollers, programming techniques, and interface concepts are provided along with considerable tutorial information with many illustrated examples. Each chapter provides laboratory exercises to apply what has been presented in the chapter. The book is intended for an upper level undergraduate course in microcontrollers or mechatronics but may also be used as a reference for capstone design projects. Practicing engineers already familiar with another microcontroller, who require a quick tutorial on the microcontroller, will also find this book very useful. Finally, middle school and high school students will find the MSP432 highly approachable via the Energia rapid prototyping system.

Fast and Effective Embedded Systems Design

Learn about designing, programming, and developing with the popular new Texas Instruments family of microcontrollers, the MSP430 series with this new book from Chris Nagy. This product line is experiencing explosive growth due to its low-power

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consumption and powerful features, but very little design and application information is available other than what is offered by the manufacturer. The book fills a gap in the technical literature for embedded systems engineers by offering a more complete combination of technical data, example code, and descriptive prose than is available from the manufacturer reference information, and is useful to both professionals and hobbyists. Intended for embedded engineers who are new to the embedded field, or for the thousands of engineers who have experience with other microcontrollers (such as PICs, 8051s, or Motorola HC0x devices) but are new to the MSP430 line, Chris Nagy offers a thorough and practical description of the device features, gives development guidelines, and provides design examples. Code examples are used in virtually every chapter and online. The book is divided into three sections: the first section provides detailed descriptions of the devices themselves; the second describes hardware/firmware development for the devices; the third is designed to incorporate information from the first two, and provide guidelines and examples of designs. Get up-to-speed on the TI MSP430 product family's features and idiosyncrasies A 'hand-holding' reference to help get started on designs

Embedded Systems Security

Hardware/Software Partitioning Cross-Platform Development Firmware Debugging Performance Analysis Testing and Integration Get into embedded systems

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programming with a clear understanding of the development cycle and the specialized aspects of

Programming Embedded Systems

Embedded Computing for High Performance: Design Exploration and Customization Using High-level Compilation and Synthesis Tools provides a set of real-life example implementations that migrate traditional desktop systems to embedded systems. Working with popular hardware, including Xilinx and ARM, the book offers a comprehensive description of techniques for mapping computations expressed in programming languages such as C or MATLAB to high-performance embedded architectures consisting of multiple CPUs, GPUs, and reconfigurable hardware (FPGAs). The authors demonstrate a domain-specific language (LARA) that facilitates retargeting to multiple computing systems using the same source code. In this way, users can decouple original application code from transformed code and enhance productivity and program portability. After reading this book, engineers will understand the processes, methodologies, and best practices needed for the development of applications for high-performance embedded computing systems. Focuses on maximizing performance while managing energy consumption in embedded systems Explains how to retarget code for heterogeneous systems with GPUs and FPGAs Demonstrates a domain-specific language that facilitates migrating and retargeting existing applications to modern

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systems Includes downloadable slides, tools, and tutorials

Embedded System Design

If you have programming experience and a familiarity with C--the dominant language in embedded systems--Programming Embedded Systems, Second Edition is exactly what you need to get started with embedded software. This software is ubiquitous, hidden away inside our watches, DVD players, mobile phones, anti-lock brakes, and even a few toasters. The military uses embedded software to guide missiles, detect enemy aircraft, and pilot UAVs. Communication satellites, deep-space probes, and many medical instruments would have been nearly impossible to create without embedded software. The first edition of Programming Embedded Systems taught the subject to tens of thousands of people around the world and is now considered the bible of embedded programming. This second edition has been updated to cover all the latest hardware designs and development methodologies. The techniques and code examples presented here are directly applicable to real-world embedded software projects of all sorts. Examples use the free GNU software programming tools, the eCos and Linux operating systems, and a low-cost hardware platform specially developed for this book. If you obtain these tools along with Programming Embedded Systems, Second Edition, you'll have a full environment for exploring embedded systems in depth. But even if you work with different hardware and software, the principles covered in this book apply. Whether

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you are new to embedded systems or have done embedded work before, you'll benefit from the topics in this book, which include: How building and loading programs differ from desktop or server computers Basic debugging techniques--a critical skill when working with minimally endowed embedded systems Handling different types of memory Interrupts, and the monitoring and control of on-chip and external peripherals Determining whether you have real-time requirements, and whether your operating system and application can meet those requirements Task synchronization with real-time operating systems and embedded Linux Optimizing embedded software for size, speed, and power consumption Working examples for eCos and embedded Linux So whether you're writing your first embedded program, designing the latest generation of hand-held whatchamacalits, or managing the people who do, this book is for you. Programming Embedded Systems will help you develop the knowledge and skills you need to achieve proficiency with embedded software. Praise for the first edition: "This lively and readable book is the perfect introduction for those venturing into embedded systems software development for the first time. It provides in one place all the important topics necessary to orient programmers to the embedded development process. --Lindsey Vereen, Editor-in-Chief, Embedded Systems Programming

Building Embedded Linux Systems

This textbook serves as an introduction to the subject of embedded systems

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design, using microcontrollers as core components. It develops concepts from the ground up, covering the development of embedded systems technology, architectural and organizational aspects of controllers and systems, processor models, and peripheral devices. Since microprocessor-based embedded systems tightly blend hardware and software components in a single application, the book also introduces the subjects of data representation formats, data operations, and programming styles. The practical component of the book is tailored around the architecture of a widely used Texas Instrument's microcontroller, the MSP430 and a companion web site offers for download an experimenter's kit and lab manual, along with Powerpoint slides and solutions for instructors.

Embedded Systems and Robotics with Open Source Tools

This Expert Guide gives you the knowledge, methods and techniques to develop and manage embedded systems successfully. It shows that teamwork, development procedures, and program management require unique and wide ranging skills to develop a system, skills that most people can attain with persistence and effort. With this book you will: Understand the various business aspects of a project from budgets and schedules through contracts and market studies Understand the place and timing for simulations, bench tests, and prototypes, and understand the differences between various formal methods such as FMECA, FTA, ETA, reliability, hazard analysis, and risk analysis Learn general

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design concerns such as the user interface, interfaces and partitioning, DFM, DFA, DFT, tradeoffs such as hardware versus software, buy versus build, processor choices, and algorithm choices, acquisition concerns, and interactions and comparisons between electronics, functions, software, mechanics, materials, security, maintenance, and support Covers the life cycle for developing an embedded system: program management, procedures for design and development, manufacturing, maintenance, logistics, and legal issues Includes proven and practical techniques and advice on tackling critical issues reflecting the authors' expertise developed from years of experience

Embedded Systems Design Using the TI MSP430 Series

Embedded Microprocessor Systems Design

Welcome to Real-Time Bluetooth Networks - Shape the World. This book, now in its second printing December 2017, offers a format geared towards hands-on self-paced learning. The overarching goal is to give you the student an experience with real-time operating systems that is based on the design and development of a simplified RTOS that exercises all the fundamental concepts. To keep the discourse grounded in practice we have refrained from going too deep into any one topic. We

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believe this will equip the student with the knowledge necessary to explore more advanced topics on their own. In essence, we will teach you the skills of the trade, but mastery is the journey you will have to undertake on your own. An operating system (OS) is layer of software that sits on top of the hardware. It manages the hardware resources so that the applications have the illusion that they own the hardware all to themselves. A real-time system is one that not only gets the correct answer but gets the correct answer at the correct time. Design and development of an OS therefore requires both, understanding the underlying architecture in terms of the interface (instruction set architecture, ISA) it provides to the software, and organizing the software to exploit this interface and present it to user applications. The decisions made in effectively managing the underlying architecture becomes more crucial in real-time systems as the performance (specifically timing) demands go beyond simple logical correctness. The architecture we will focus on is the ARM ISA, which is a very popular architecture in the embedded device ecosystem where real-time systems proliferate. A quick introduction to the ISA will be followed by specifics of TI's offering of this ISA as the Tiva and MSP432 Launchpad microcontroller. To make the development truly compelling we need a target application that has real-time constraints and multi-threading needs. To that end you will incrementally build a personal fitness device with Bluetooth connectivity. The Bluetooth connectivity will expose you to the evolving domain of Internet-of-things (IoT) where our personal fitness device running a custom RTOS will interact with a smartphone.

Embedded System Design

Jack Ganssle has been forming the careers of embedded engineers for 20+ years. He has done this with four books, over 500 articles, a weekly column, and continuous lecturing. Technology moves fast and since the first edition of this best-selling classic much has changed. The new edition will reflect the author's new and ever evolving philosophy in the face of new technology and realities. Now more than ever an overarching philosophy of development is needed before just sitting down to build an application. Practicing embedded engineers will find that Jack provides a high-level strategic plan of attack to the often times chaotic and ad hoc design and development process. He helps frame and solve the issues an engineer confronts with real-time code and applications, hardware and software coexistences, and streamlines detail management. CONTENTS: Chapter 1 - Introduction Chapter 2 - The Project Chapter 3 - The Code Chapter 4 - Real Time Chapter 5 - The Real World Chapter 6 - Disciplined Development Appendix A - A Firmware Standard Appendix B - A Simple Drawing System Appendix C - A Boss's Guide to Process *Authored by Jack Ganssle, Tech Editor of Embedded Systems Programming and weekly column on embedded.com *Keep schedules in check as projects and codes grow by taking time to understand the project beforehand *Understand how cost/benefit coexists with design and development

Embedded Systems Design

This book strives to identify and introduce the durable intellectual ideas of embedded systems as a technology and as a subject of study. The emphasis is on modeling, design, and analysis of cyber-physical systems, which integrate computing, networking, and physical processes.

Introduction to Embedded Systems: Interfacing to the Freescale 9S12

This book introduces the state-of-the-art in research in parallel and distributed embedded systems, which have been enabled by developments in silicon technology, micro-electro-mechanical systems (MEMS), wireless communications, computer networking, and digital electronics. These systems have diverse applications in domains including military and defense, medical, automotive, and unmanned autonomous vehicles. The emphasis of the book is on the modeling and optimization of emerging parallel and distributed embedded systems in relation to the three key design metrics of performance, power and dependability. Key features: Includes an embedded wireless sensor networks case study to help illustrate the modeling and optimization of distributed embedded systems. Provides an analysis of multi-core/many-core based embedded systems to explain

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the modeling and optimization of parallel embedded systems. Features an application metrics estimation model; Markov modeling for fault tolerance and analysis; and queueing theoretic modeling for performance evaluation. Discusses optimization approaches for distributed wireless sensor networks; high-performance and energy-efficient techniques at the architecture, middleware and software levels for parallel multicore-based embedded systems; and dynamic optimization methodologies. Highlights research challenges and future research directions. The book is primarily aimed at researchers in embedded systems; however, it will also serve as an invaluable reference to senior undergraduate and graduate students with an interest in embedded systems research.

Intelligence for Embedded Systems

Intro To Embedded Systems 1E

Billions of microcontrollers are sold each year to create embedded systems for a wide range of products. An embedded system is an application-specific computer system which is built into a larger system or device. Using a computer system offers many benefits such as sophisticated control, precise timing, low unit cost, low development cost, high flexibility, small size, and low weight. These basic

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characteristics can be used to improve the overall system or device in various ways: Improved performance More functions and features Reduced cost Increased dependability This book uses the Renesas RX62N family of processors to demonstrate concepts with hands-on examples complete with source code targeting the YRDKRX62N evaluation board. The 32-bit RX processor core provides remarkable instruction throughput, with high clock rates and hardware support for floating-point and digital-signal processing instructions. The core is also quite agile, responding to fast interrupts in 5 clock cycles. These processors offer a wide range of sophisticated peripherals to simplify interfacing with and controlling external devices.

Developing and Managing Embedded Systems and Products

Embedded Software Development: The Open-Source Approach delivers a practical introduction to embedded software development, with a focus on open-source components. This programmer-centric book is written in a way that enables even novice practitioners to grasp the development process as a whole. Incorporating real code fragments and explicit, real-world open-source operating system references (in particular, FreeRTOS) throughout, the text: Defines the role and purpose of embedded systems, describing their internal structure and interfacing with software development tools Examines the inner workings of the GNU compiler collection (GCC)-based software development system or, in other words, toolchain

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Presents software execution models that can be adopted profitably to model and express concurrency Addresses the basic nomenclature, models, and concepts related to task-based scheduling algorithms Shows how an open-source protocol stack can be integrated in an embedded system and interfaced with other software components Analyzes the main components of the FreeRTOS Application Programming Interface (API), detailing the implementation of key operating system concepts Discusses advanced topics such as formal verification, model checking, runtime checks, memory corruption, security, and dependability Embedded Software Development: The Open-Source Approach capitalizes on the authors' extensive research on real-time operating systems and communications used in embedded applications, often carried out in strict cooperation with industry. Thus, the book serves as a springboard for further research.

Introduction to Embedded Systems

Special Features: · Embedded Systems Design: A Unified Hardware/Software Introduction provides readers a unified view of hardware design and software design. This view enables readers to build modern embedded systems having both hardware and software. Chapter 7's example uses the methods described earlier in the book to build a combined hardware/software system that meets performance constraints while minimizing costs.· Not specific to any one microprocessor. The reader maintains an open view towards all microprocessors. Chapter 3 talks of

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features common to most microprocessors.· Provides a simple, yet powerful, new view of hardware design, showing that hardware can be automatically generated from a high-level programming language. Presents unified view of hardware and software; both are described using a programming language, both get derived from that language, only differing in design metrics. Chapter 2 concisely provides a method for deriving hardware implementations of sequential programs -- something not found in any other book. About The Book: This book introduces a modern approach to embedded system design, presenting software design and hardware design in a unified manner. It covers trends and challenges, introduces the design and use of single-purpose processors (hardware) and general-purpose processors (software), describes memories and buses, illustrates hardware/software tradeoffs using a digital camera example, and discusses advanced computation models, controls systems, chip technologies, and modern design tools. For courses found in EE, CS and other engineering departments.

The Art of Designing Embedded Systems

The less-experienced engineer will be able to apply Ball's advice to everyday projects and challenges immediately with amazing results. In this new edition, the author has expanded the section on debug to include avoiding common hardware, software and interrupt problems. Other new features include an expanded section on system integration and debug to address the capabilities of more recent

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emulators and debuggers, a section about combination microcontroller/PLD devices, and expanded information on industry standard embedded platforms. Covers all 'species' of embedded system chips rather than specific hardware Learn how to cope with 'real world' problems Design embedded systems products that are reliable and work in real applications

Introduction to Embedded Systems

In this practical guide, experienced embedded engineer Lewin Edwards demonstrates faster, lower-cost methods for developing high-end embedded systems. With today's tight schedules and lower budgets, embedded designers are under greater pressure to deliver prototypes and system designs faster and cheaper. Edwards demonstrates how the use of the right tools and operating systems can make seemingly impossible deadlines possible. Designer's Guide to Embedded Systems Development shares many advanced, in-the-trenches design secrets to help engineers achieve better performance on the job. In particular, it covers many of the newer design tools supported by the GPL (GNU Public License) system. Code examples are given to provide concrete illustrations of tasks described in the text. The general procedures are applicable to many possible projects based on any 16/32-bit microcontroller. The book covers choosing the right architecture and development hardware to fit the project; choosing an operating system and developing a toolchain; evaluating software licenses and

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how they affect a project; step-by-step building instructions for gcc, binutils, gdb and newlib for the ARM7 core used in the case study project; prototyping techniques using a custom printed circuit board; debugging tips; and portability considerations. A wealth of practical tips, tricks and techniques Design better, faster and more cost-effectively

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