

Building Wireless Sensor Networks With Zigbee Xbee Arduino And Processing

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Chemical Engineering Morton Denn 2011-09-30 'Chemical engineering is the field of applied science that employs physical, chemical, and biological rate processes for the betterment of humanity.' This opening sentence of Chapter 1 has been the underlying paradigm of chemical engineering. Chemical Engineering: An Introduction is designed to enable the student to explore the activities in which a modern chemical engineer is involved by focusing on mass and energy balances in liquid-phase processes. Problems explored include the design of a feedback level controller, membrane separation, hemodialysis, optimal design of a process with chemical reaction and separation, washout in a bioreactor, kinetic and mass transfer limits in a two-phase reactor, and the use of the membrane reactor to overcome equilibrium limits on conversion. Mathematics is employed as a language at the most elementary level. Professor Morton M. Denn incorporates design meaningfully; the design and analysis problems are realistic in format and scope.

Interconnecting Smart Objects with IP Jean-Philippe Vasseur 2010-07-06 Interconnecting Smart Objects with IP: The Next Internet Explains why the Internet Protocol (IP) has become the protocol of choice for smart object networks. IP has successfully demonstrated the ability to interconnect billions of digital systems on the global Internet and in private IP networks. Once smart objects can be easily interconnected, a whole new class of smart object systems can begin to evolve. The book discusses how IP-based smart object networks are being designed and deployed. The book is organized into three parts. Part 1 demonstrates why the IP architecture is well suited to smart object networks, in contrast to non-IP based sensor network or other proprietary systems that interconnect to IP networks (e.g., the public Internet of private IP networks) via hard-to-manage and expensive multi-protocol translation gateways that scale poorly. Part 2 examines protocols and algorithms, including smart objects and the low power link layers technologies used in these networks. Part 3 describes the following smart object network applications: smart grid, industrial automation, smart cities and urban networks, home automation, building automation, structural health monitoring, and container tracking. Shows in detail how connecting smart objects impacts our lives with practical implementation examples and case studies Provides an in depth understanding of the technological and architectural aspects underlying smart objects technology Offers an in-depth examination of relevant IP protocols to build large scale smart object networks in support of a myriad of new services

Handbook of Smart Homes, Health Care and Well-Being Joost van Hoof 2016-03-14 Smart homes, home automation and ambient-assisted living are terms used to describe technological systems that enrich our living environment and provide means to support care, facilitate well-being and improve comfort. This handbook provides an overview of the domain from the perspective of health care and technology. In Part 1, we set out to describe the demographic changes in society, including ageing and diseases and impairments which lead to the needs for technological solutions. In Part 2, we describe the technological solutions, ranging from sensor-based networks, components, to communication protocols that are used in the design of smart homes. We also deal with biomedical features which can be measured and services that can be delivered to end-users as well as the use of social robots. In Part 3, we present best practices in the field. These best practices mainly focus on existing projects in Europe, the USA and Asia, in which people receive help through dedicated technological solutions being part of the continuum of the home environment and care.

Building Wireless Sensor Networks Using Arduino Matthias Kooijman 2015-10-19 Leverage the powerful Arduino and XBee platforms to monitor and control your surroundings! This book build your own low-power, wireless network using ready-made Arduino and XBee hardware Create a complex project using the Arduino prototyping platform A guide that explains the concepts and builds upon them with the help of examples to form projects Who This Book Is For This book is targeted at embedded system developers and hobbyists who have some working knowledge of Arduino and who wish to extend their projects using wireless connectivity. What You Will Learn Interact with XBee boards using the XCTU program on Windows, OS X, or Linux Make your Arduino boards communicate wirelessly, using XBee modules in the advanced API mode Centrally collect and store measured sensor data, in the cloud or your own database Connect the coordinator Arduino to the Internet and send data to web services Control your environment automatically, based on sensor input from your network Interact with off-the-shelf ZigBee Home Automation devices Make your devices battery-powered and let them sleep to get months or even years of battery life In Detail Arduino has been established as the de facto standard microcontroller programming platform, being used for one-off do-it-yourself projects as well as prototypes for actual products. By providing a myriad of libraries, the Arduino community has made it very easy to interact with pretty much any piece of hardware out there. XBee offers a great range of low-power wireless solutions that are easy to work with, by taking all of the complexity of wireless (mesh) networking out of your hands and letting you focus on what to send without worrying about the how. Building wireless sensor networks is cost-effective as well as efficient as it will be done with Arduino support. The book starts with a brief introduction to various wireless protocols, concepts, and the XBee hardware that enables their use. Then the book expands to explain the Arduino boards to you, letting them read and send sensor data, collect that data centrally, and then even control your home from the Internet. Moving further more advanced topics such as interacting through the standard ZigBee Home Automation protocol, or making your application power-efficient are covered. By the end of the book, you will have all the tools needed to build complete, real-world solutions. Style and approach A hands-on guide, featuring a single home automation project that can be built as described or with endless variations. Every step is illustrated with complete examples and screenshots, allowing you to build the examples swiftly.

Exploring BeagleBone Derek Moley 2014-12-05 In-depth instruction and practical techniques for building with the BeagleBone embedded Linux platform Exploring BeagleBone is a hands-on guide to bringingsensors, gizmos, and robots—to life using the popular BeagleBoneembedded Linux platform. Comprehensive content and deep detail provide more than just a BeagleBone instruction manual— you'll also learn the underlying engineering techniques that will allow you to create your own projects. The book begins with a foundational primer on essential skills, and then gradually moves into communication, control, and advanced applications using C/C++, allowing you to learn at your own pace. In addition, the book's companion website features instructional videos, source code, discussion forums, and more, to ensure that you have everything you need. The BeagleBone's small size, high performance, low cost, and extreme adaptability have made it a favorite development platform, and the Linux software base allows for complex yet flexible functionality. The BeagleBone has applications in smart buildings, robot control, environmental sensing, to name a few, and expansion boards and peripherals dramatically increase these possibilities. Exploring BeagleBone provides a reader-friendly guide to the device, including a crash course in computer engineering. While following step by step, you can get up to speed on embedded Linux, electronics, and programming Master interfacing electronic circuits, buses and modules, with practical examples Explore the Internet-connected BeagleBone and the BeagleBone with a display Apply the BeagleBone to sensing applications, including video and sound Explore the BeagleBone's programmable real-time controllers Hands-on learning helps ensure that your new skills stay with you, allowing you to design with electronics, modules, or peripherals even beyond the BeagleBone. Insightful guidance and online peer support help you transition from beginner to expert as you master the techniques presented in Exploring BeagleBone, the practical handbook for the popular computing platform.

Internet Science Samira EL Yacoubi 2019-11-25 This book constitutes the proceedings of the 6th International Conference on Internet Science held in Perpignan, France, in December 2019. The 30 revised full papers presented were carefully reviewed and selected from 45 submissions. The papers detail a multidisciplinary understanding of the development of the Internet as a societal and technological artefact which increasingly evolves with human societies.

Wireless Sensor Networks for Developing Countries Faisal Karim Shaikh 2013-08-30 This book constitutes the refereed proceedings of the First International Conference on Wireless Sensor Networks for Developing Countries, WSN4DC 2013, held in Jamshoro, Pakistan, in April 2013. The 10 revised full papers presented were carefully reviewed and selected from 30 submissions. The papers are organized in topical sections on WSN applications/services for developing countries; mobile WSN; underwater WSN; VANETS; body area networks; energy harvesting in WSN; WSN and cloud integration; WSN and IoT; QoS and QoT; WSN MAC, network and transport protocols; cross layer approaches; security aspects in WSN; WSN applications in smart grid and energy management; WSN in structural health monitoring.

Building Wireless Sensor Networks Robert Faludi 2010-12-14 Get ready to create distributed sensor systems and intelligent interactive devices using the ZigBee wireless networking protocol and Series 2 XBee radios. By the time you're halfway through this fast-paced, hands-on guide, you'll have built a series of useful projects, including a complete ZigBee wireless network that delivers remotely sensed data. Radio networking is creating revolutions in volcano monitoring, performance art, clean energy, and consumer electronics. As you follow the examples in each chapter, you'll learn how to tackle inspiring projects of your own. This practical guide is ideal for inventors, hackers, crafters, students, hobbyists, and scientists. Investigate an assortment of practical and intriguing project ideas Prep your ZigBee toolbox with an extensive shopping list of parts and programs Create a simple, working ZigBee network with XBee radios in less than two hours -- for under \$100 Use the Arduino open source electronics prototyping platform to build a series of increasingly complex projects Get familiar with XBee's API mode for creating sensor networks Build fully scalable sensing and actuation systems with inexpensive components Learn about power management, source routing, and other XBee technical nuances Make gateways that connect with neighboring networks, including the Internet

Wireless Sensor and Actuator Networks Amiya Nayak 2010-01-26 This timely book offers a mixture of theory, experiments, and simulations that provides qualitative and quantitative insights in the field of sensor and actuator networking. The chapters are selected in a way that makes the book comprehensive and self-contained. It covers a wide range of recognized problems in sensor networks, striking a balance between theoretical and practical coverage. The book is appropriate for graduate students and practitioners working as engineers, programmers, and technologists.

Handbook of Research on Demand-Driven Web Services: Theory, Technologies, and Applications Sun, Zhaohao 2014-03-31 In the current technological world, Web services play an integral role in service computing and social networking services. This is also the case in the traditional FREG (foods, resources, energy, and goods) services because almost all traditional services are replaced fully or partially by Web services. Handbook of Research on Demand-Driven Web Services: Theory, Technologies, and Applications presents comprehensive and in-depth studies that reveal the cutting-edge theories, technologies, methodologies, and applications of demand-driven Web, mobile, and e-business services. This book provides critical perspectives for researchers and practitioners, lecturers and undergraduate/graduate students, and professionals in the fields of computing, business, service, management, and government, as well as a variety of readers from all the social strata.

Building Arduino PLCs Pradeeka Seneviratne 2017-02-07 Learn the fundamentals of PLCs and how to control them using Arduino software to create your first Arduino PLC. You will learn how to draw Ladder Logic diagrams to represent PLC designs for a wide variety of automated applications and to convert the diagrams to Arduino sketches. A comprehensive shopping guide includes the hardware and software components you need in your tool box. You will learn to use Arduino UNO, Arduino Ethernet shield, and Arduino WiFi shield. Building Arduino PLCs shows you how to build and test a simple Arduino UNO-based 5V DC logic level PLC with Grove base shield by connecting simple sensors and actuators. You will also learn how to build industry-grade PLCs with the help of ArduinoX. What You'll Learn Build ModBus-enabled PLCs Map Arduino PLCs into the cloud using NearBus cloud connector to control the PLC through the Internet Use do-it-yourself light platforms such as IFTTT Enhance your PLC by adding Relay shields for connecting heavy loads Who This Book Is For Engineers, designers, crafters, and makers. Basic knowledge in electronics and Arduino programming or any other programming language is recommended.

Hacking Wireless Networks For Dummies Kevin Beaver 2011-05-09 Become a cyber-hero - know the common wireless weaknesses "Reading a book like this one is a worthy endeavor toward becoming an experienced wireless security professional." - Devin Akin - CTO, The Certified Wireless Network Professional (CWNP) Program Wireless networks are so convenient - not only for you, but also for those nefarious types who'd like to invade them. The only way to know if your system can be penetrated is to simulate an attack. This book shows you how, along with how to strengthen any weakspots you find in your network's armor. Discover how to: Perform ethical hacks without compromising a system Combat denial of service and WEP attacks Understand how invaders think Recognize the effects of different hacks Protect against war drivers and rogue devices

Z-Wave Essentials Christian Paritz 2017-06-10 Z-Wave is the leading international standard for wireless communication in smart homes. Different products from different vendors work together and interoperate in one single network to provide intelligent lighting, safety, security and energy efficiency. This book describes all you need to know about Z-Wave: The radio layer standardized by the international ITU organization, the networking between the device to realize a stable communication and finally the device specific application functions that ensure the interoperability between the different devices. Practical guidance for the installation and trouble shooting of wireless networks is provided as well.

Open Source Technology: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources 2014-11-30 The pervasiveness of and universal access to modern information and communication technologies has enabled a popular new paradigm in the dissemination of information, art, and ideas. Now, instead of relying on a finite number of content providers to control the flow of information, users can generate and disseminate their own content for a wider audience. Open Source Technology: Concepts, Methodologies, Tools, and Applications investigates examples and methodologies in user-generated and freely-accessible content available through electronic and online media. With applications in education, government, entertainment, and more, the technologies explored in these volumes will provide a comprehensive reference for web designers, software developers, and practitioners in a wide variety of fields and disciplines.

Beginning Sensor Networks with XBee, Raspberry Pi, and Arduino Charles Bell 2020-06-25 Build sensor networks with Python and MicroPython using XBee radio modules, Raspberry Pi, and Arduino boards. This revised and updated edition will put all of these together to form a sensor network, and show you how to turn your Raspberry Pi into a MySQL database server to store your sensor data! You'll review the different types of sensors and sensor networks, along with new technology, including how to build a simple XBee network. You'll then walk through building an sensor nodes on the XBee, Raspberry Pi, and Arduino, and also learn how to collect data from multiple sensor nodes. The book also explores different ways to store sensor data, including writing to an SD card, sending data to the cloud, and setting up a Raspberry Pi MySQL server to host your data. You'll even learn how to connect to and interact with a MySQL database server directly from an Arduino! Finally you'll see how to put it all together by connecting your sensor nodes to your new Raspberry Pi database server. If you want to see how well XBee, Raspberry Pi, and Arduino can get along, especially to create a sensor network, then Beginning Sensor Networks with XBee, Raspberry Pi, and Arduino is just the book you need. What You'll Learn Code your sensor nodes with Python and MicroPython Work with new XBee 3 modules Host your data on Raspberry Pi Get started with MySQL Create sophisticated sensor networks Who This Book Is For Those interested in building or experimenting with sensor networks and IoT solutions, including those with little or no programming experience. A secondary target includes readers interested in using XBee modules with Raspberry Pi and Arduino, those interested in controlling XBee modules with MicroPython.

Energy-Efficient Wireless Sensor Networks Vidushi Sharma 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.

IoT Fundamentals David Hanes 2017-05-30 Today, billions of devices are Internet-connected, IoT standards and protocols are stabilizing, and technical professionals must increasingly solve real problems with IoT technologies. Now, five leading Cisco IoT experts present the first comprehensive, practical reference for making IoT work. IoT Fundamentals brings together knowledge previously available only in white papers, standards documents, and other hard-to-find sources—or nowhere at all. The authors begin with a high-level overview of IoT and introduce key concepts needed to successfully design IoT solutions. Next, they walk through each key technology, protocol, and technical building block that combine into complete IoT solutions. Building on these essentials, they present several detailed use cases, including manufacturing, energy, utilities, smart-connected cities, transportation, mining, and public safety. Whatever your role or existing infrastructure, you'll gain deep insight what IoT applications can do, and what it takes to deliver them. Fully covers the principles and components of next-generation wireless networks built with Cisco IoT solutions such as IEEE 802.11 (Wi-Fi), IEEE 802.15.4-2015 (Mesh), and LoRaWAN Brings together real-world tips, insights, and best practices for designing and implementing next-generation wireless networks Presents start-to-finish configuration examples for common deployment scenarios Reflects the extensive first-hand experience of Cisco experts

Arduino Home Automation Projects Marco Schwartz 2014-07-23 This book is divided into projects that are explained in a first-by-step format, with practical instructions that are easy to follow. If you want to build your own home automation systems wirelessly using the Arduino platform, this is the book for you. You will need to have some basic experience in Arduino and general programming languages, such as C and C++ to understand the projects in this book.

Visualizing Data Ben Fry 2008 Provides information on the methods of visualizing data on the Web, along with example projects and code.

Advances in Computing Jairo E. Serrano C. 2018-08-19 This book constitutes the refereed proceedings of the 13th Colombian Conference on Computing, CCC 2018, held in Cartagena, Colombia, in September 2018. The 46 revised full papers presented were carefully reviewed and selected from 194 submissions. The papers deal with the following topics: information and knowledge management, software engineering and IT architectures, educational informatics, intelligent systems and robotics, human-computer interaction, distributed systems and large-scale architectures, image processing, computer vision and multimedia, security of the information, formal methods, computational logic, and theory of computation.

Distributed Network Data Alasdair Allan 2013-02-26 Build your own distributed sensor network to collect, analyze, and visualize real-time data about our human environment—including noise level, temperature, and people flow. With this hands-on book, you'll learn how to turn your project idea into working hardware, using the easy-to-learn Arduino microcontroller and off-the-shelf sensors. Authors Alasdair Allan and Kipp Bradford walk you through the entire process, from prototyping a

simple sensor node to performing real-time analysis on data captured by a deployed multi-sensor network. Demonstrated at recent O'Reilly Strata Conferences, the future of distributed data is already here. If you have programming experience, you can get started immediately. Wire up a circuit on a breadboard, and use the Arduino to read values from a sensor Add a microphone and infrared motion detector to your circuit Move from breadboard to prototype with Fritzing, a program that converts your circuit design into a graphical representation Simplify your design: learn use cases and limitations for using Arduino pins for power and grounding Build wireless networks with XBee radios and request data from multiple sensor platforms Visualize data from your sensor network with Processing or LabVIEW

Wireless Sensor Networks Damodar Reddy Edla 2020-11-24 Wireless Sensor Networks: Evolutionary Algorithms for Optimizing Performance provides an integrative overview of bio-inspired algorithms and their applications in the area of Wireless Sensor Networks (WSN). Along with the usage of the WSN, the number of risks and challenges occurs while deploying any WSN. Therefore, to defeat these challenges some of the bio-inspired algorithms are applied and discussed in this book. Discussion includes a broad, integrated perspective on various challenges and issues in WSN and also impact of bio-inspired algorithms on the lifetime of the WSN. It creates interdisciplinary theory, concepts, definitions, models and findings involved in WSN and bio-inspired algorithms making it an essential guide and reference. It includes various WSN examples making the book accessible to a broader interdisciplinary readership. The book offers comprehensive coverage of the most essential topics, including: Evolutionary algorithms Swarm intelligence Hybrid algorithms Energy efficiency in WSN Load balancing of gateways Localization Clustering and routing Designing fitness functions according to the issues in WSN. The book explains about practices of shuffled complex evolution algorithm, shuffled frog leaping algorithm, particle swarm optimization and dolphin swarm optimization to defeat various challenges in WSN. The author elucidates how we must transform our thinking, illuminating the benefits and opportunities offered by bio-inspired approaches to innovation and learning in the area of WSN. This book serves as a reference book for scientific investigators who shows an interest in evolutionary computation and swarm intelligence as well as issues and challenges in WSN.

Beginning Sensor Networks with Arduino and Raspberry Pi Charles Bell 2014-01-23 Beginning Sensor Networks with Arduino and Raspberry Pi teaches you how to build wireless sensor networks with Arduino and XBee radio modules, and even shows you how to turn your Raspberry Pi into a MySQL database server to store your sensor data! First you'll learn about the different types of sensors and sensor networks, including how to build a simple XBee network. Then you'll walk through building an Arduino-based temperature sensor and data collector, followed by building a Raspberry Pi-based sensor node. Next you'll learn different ways to store sensor data, including writing to an SD card, sending data to the cloud, and setting up a Raspberry Pi MySQL server to host your data. You even learn how to connect to and interact with a MySQL database server directly from an Arduino! Finally you'll learn how to put it all together by connecting your Arduino sensor node to your new Raspberry Pi database server. If you want to see how well Arduino and Raspberry Pi can get along, especially to create a sensor network, then Beginning Sensor Networks with Arduino and Raspberry Pi is just the book you need.

Hands-On ZigBee Fred Eady 2010-07-27 Since its recent introduction, the ZigBee protocol has created an enormous amount of buzz in venues from magazine covers to trade show floors to water coolers. Its promise of providing a simpler, cheaper, more power-efficient WPAN (Wireless Personal Area Network) alternative to WiFi and Bluetooth has opened up new data collection possibilities in application areas from industrial controls to medical devices to intruder alarms. Yet, despite this widespread interest, there is still little information available that goes beyond detailing the spec itself. Missing from the current ZigBee lexicon is practical, application-oriented guidance from an expert, specifically geared to aid engineers in implementing this new technology. Enter respected designer and popular columnist Fred Eady! With his new book, Hands-On ZigBee, he provides the only comprehensive how-to ZigBee guide available. The only one-stop ZigBee resource available—from basics to sniffers to specs 7 easy-to-assemble ZigBee projects allow the reader to follow along—hands-on! Working hardware and software examples included in every chapter

Roberto Verdone 2010-07-27 When choosing the technology options to develop a wireless sensor network (WSN), it is vital that their performance levels can be assessed for the type of application intended. This book describes the different technology options - MAC protocols, routing protocols, localisation and data fusion techniques - and provides the means to numerically measure their performance, whether by simulation, mathematical models or experimental test beds. Case studies, based on the authors' direct experience of implementing wireless sensor networks, describe the design methodology and the type of measurements used, together with samples of the performance measurements attained. The book will enable you to answer vital questions such as: * How long will my network remain alive given the amount of sensing required of it? * For how long should I set the sleeping state of my motes? * How many sensors should I distribute to meet the expected requirements of the application? * What type of throughput should I expect as a function of the number of nodes deployed and the radio interface chosen (whether it be Bluetooth or ZigBee)? * How is the Packet Error Rate of my ZigBee motes affected by the selection of adjacent frequency sub bands in the ISM 2.4GHz band? * How is the localisation precision dependant on the number of nodes deployed in a corridor? Communications and signal processing engineers, researchers and graduate students working in wireless sensor networks will find this book an invaluable practical guide to this important technology. "This book gives a proper balance between theory and application; it is a book for those RF engineers that want to appreciate both why, how and in which domains Wireless Sensor Networks can be best applied." - Fabio Babilonia, CREBERE, PALIA "This book is a thorough and accessible exposition on wireless sensor networks with a good balance between theory and practice; it is valuable for both students and practicing engineers, and is an essential addition for engineering libraries." - Professor Moe Win, Associate Professor at the Laboratory for Information and Decision Systems (LIDS), Massachusetts Institute of Technology * Only book to explore wireless sensor network technologies and assess their performance capabilities against possible applications * Enables the engineer to choose the technology that will give the best performance for the intended application * Case studies, based on the authors' direct experience of implementing wireless sensor networks, describe the design methodology and the type of measurements used, together with samples of the performance measurements attained

Beginning LoRa Radio Networks with Arduino Pradeeka Seneviratne 2019-02-18 Create your own LoRa wireless projects for non-industrial use and gain a strong basic understanding of the LoRa technology, LoRa WAN, and LPWAN. You'll start by building your first LoRa wireless channel and then move on to various interesting projects such as setting up networks with a LoRa gateway, communicating with IoT servers using RESTful API and MQTT protocol, and real-time GPS tracking. With LoRa wireless and LoRaWAN, you can build a wide array of applications in the area of smart agriculture, smart cities, smart environment, smart healthcare, smart homes and buildings, smart industrial control, smart metering, smart supply chain and logistics. Beginning LoRa Radio Networks with Arduino provides a practical introduction and uses affordable and easy to obtain hardware to build projects with the Arduino development environment. What You'll Learn Understand the hardware need to build LoRaWAN Use the Arduino development environment to write code Connect to Arduino hardware and upload programs and communicate with them Setup networks with LoRa gateway Show real time track with TAIL, and path history Who This Book Is For Inventors, hackers, crafters, students, hobbyists, and scientists

Deek Moley 2016-06-13 Expert Raspberry Pi capabilities with fundamental engineering principles Exploring Raspberry Pi is the innovators guide to bringing Raspberry Pi to life. This book favors engineering principles over a 'recipe' approach to give you the skills you need to design and build your own projects. You'll understand the fundamental principles in a way that transfers to any type of electronics, electronic modules, or external peripherals, using a "learning by doing" approach that caters to both beginners and experts. The book begins with basic Linux and programming skills, and helps you stock your inventory with common parts and supplies. Next, you'll learn how to make parts work together to achieve the goals of your project, no matter what type of components you use. The companion website provides a full repository that structures all of the code and scripts, along with links to video tutorials and supplementary content that takes you deeper into your project. The Raspberry Pi's most famous feature is its adaptability. It can be used for thousands of electronic applications, and using the Linux OS expands the functionality even more. This book helps you get the most from your Raspberry Pi, but it also gives you the fundamental engineering skills you need to incorporate any electronics into any project. Develop the Linux and programming skills you need to build basic applications Build your inventory of parts so you can always "make it work" Understand interfacing, controlling, and communicating with almost any component Explore advanced applications with video, audio, real-world interactions, and more Be free to adapt and create with Exploring Raspberry Pi

ZigBee Wireless Sensor and Control Network Ata Elahi 2009-10-29 The First Practical Guide to Advanced Wireless Development with ZigBee Technologies Supported by more than a hundred companies, the new ZigBee standard enables powerful new wireless applications for safety, security, and control, ranging from smart energy to home automation and medical care to advanced remote control. ZigBee Wireless Sensor and Control Network brings together all the knowledge professionals need to start building effective ZigBee solutions. The only simple, concise guide to ZigBee architecture, concepts, networking, and applications, this book thoroughly explains the entire ZigBee protocol stack and covers issues ranging from routing to security. It also presents detailed, practical coverage of ZigBee features for home automation, smart energy networking, and consumer electronics. Topics include * Fundamental wireless concepts: OSI Model, error detection, the ISM Band, modulation, WLAN, FHSS, DSSS, Wireless MANs, Bluetooth, and more * ZigBee essentials: applications, characteristics, device types, topologies, protocol architecture, and expanded ZigBee PRO features * Physical layer: includes frequency bands, data rate, channels, data/management services, transmitter power, and receiver sensitivity * MAC layer: data/management services, MAC layer information base, access methods, and frames * Network layer: data entities, NIB, device configuration, starting network, addressing, discovery, channel scanning, and more * Application support sublayer and application layer: includes profiles, cluster format, attributes, device discovery, and binding * ZigBee network security: includes encryption, trust center, security modes, and security management primitives * Address assignment and routing techniques * Alternative technologies: 6LoWPAN, WirelessHART, and Z-Wave

Sensor Technologies Michael J. McGrath 2014-01-23 Sensor Technologies: Healthcare, Wellness and Environmental Applications explores the key aspects of sensor technologies, covering wired, wireless, and discrete sensors for the specific application domains of healthcare, wellness and environmental sensing. It discusses the social, regulatory, and design considerations specific to these domains. The book provides an application-based approach using real-world examples to illustrate the application of sensor technologies in a practical and experiential manner. The book guides the reader from the formulation of the research question, through the design and validation phases to the implementation and management phase of sensor applications. The processes and examples used in the book are primarily based on research carried out by Intel or joint academic research programs. "Sensor Technologies: Healthcare, Wellness and Environmental Applications provides an extensive overview of sensing technologies and their applications in healthcare, wellness, and environmental monitoring. From sensor hardware to system applications and case studies, this book gives readers an in-depth understanding of the technologies and how they can be applied. I would highly recommend it to students or researchers who are interested in wireless sensing technologies and the associated applications." Dr. Benny Lo Lecturer, The Hamlyn Centre, Imperial College of London "This timely addition to the literature on sensors covers the broad complexity of sensing, sensor types, and the vast range of existing and emerging applications in a very clearly written and accessible manner. It is particularly good at capturing the exciting possibilities that will occur as sensor networks merge with cloud-based 'big data' analytics to provide a host of new applications that will impact directly on the individual. In ways we cannot fully predict at present, it really brings this home through the use of carefully chosen case studies that bring the overwhelming concept of 'big data' down to the personal level of individual life and health." Dermot Diamond Director, National Centre for Sensor Research, Principal Investigator, CLARITY Centre for Sensor Technologies, Dublin City University "Sensor Technologies: Healthcare, Wellness and Environmental Applications takes the reader on an end-to-end journey of sensor technologies, covering the fundamentals from an engineering perspective, introducing how the data gleaned can be both processed and visualized, in addition to offering exemplar case studies in a number of application domains. It is a must-read for those studying any undergraduate course that involves sensor technologies. It also provides a thorough foundation for those involved in the research and development of applied sensor systems. I highly recommend it to any engineer who wishes to broaden their knowledge in this area!" Chris Nugent Professor of Biomedical Engineering, University of Ulster

Anna Hac 2003-12-17 Tremendous technological advances have been made in the development of low-cost sensor devices equipped with wireless network interfaces. The area of wireless sensor networks is rapidly growing as new technologies emerge and new applications are developed. This book introduces networked embedded systems, smart sensors, and wireless sensor networks, with a strong focus on architecture, applications, networks and distributed systems support for wireless sensor networks. The issues and challenges for the development of wireless sensor networks not only encompass a broad spectrum of research topics but also give rise to the evolution of a new breed of multi-disciplinary wireless network applications. Such sensor networks may be used for applications spanning several domains including military, medical, industrial, and home networks. Wireless Sensor Network Designs: Covers the newest sensor technology, design issues, problems and solutions Explains a broad range of topics such as networked embedded systems, smart sensor networks, power-aware sensor networks, routing, clustering, security, operating systems, and networks support Includes a comprehensive bibliography Provides a descriptive tutorial suitable for graduate students and newcomers to this exciting field of technology

Digi XBee3 ZigBee 3 Development Workshop Agus Kurniawan 2019-05-01 This book is designed to everyone who want to get started with XBee3 ZigBee 3 development. Demo scenarios are provided to accelerate your learning with step-by-step approach. This book uses Python as programming language. The following is a list of highlight topics in this book: * Preparing Development Environment * Set Up Digi XBee3 ZigBee 3 * XBee3 ZigBee AT Command * XBee3 ZigBee 3 Programming * XBee3 ZigBee Digital I/O and ADC * Working with Sleep Mode * XBee3 ZigBee Networking

Fundamentals of Wireless Sensor Networks Walteneug Dargie 2010-11-05 In this book, the authors describe the fundamental concepts and practical aspects of wireless sensor networks. The book provides a comprehensive view to this rapidly evolving field, including its many novel applications, ranging from protecting civil infrastructure to pervasive health monitoring. Using detailed examples and illustrations, this book provides an inside track on the current state of the technology. The book is divided into three parts. In Part I, several node architectures, applications and operating systems are discussed. In Part II, the basic architectural frameworks, including the key building blocks required for constructing large-scale, energy-efficient sensor networks are presented. In Part III, the challenges and approaches pertaining to local and global management strategies are presented— this includes topics on power management, sensor node localization, the time synchronization, and security. At the end of each chapter, the authors provide practical exercises to help students strengthen their grip on the subject. There are more than 200 exercises altogether. Key Features: Offers a comprehensive introduction to the theoretical and practical concepts pertaining to wireless sensor networks Explains the constraints and challenges of wireless sensor network design; and discusses the most promising solutions Provides an in-depth treatment of the most critical technologies for sensor network communications, power management, security, and programming Reviews the latest research results in sensor network design, and demonstrates how the individual components fit together to build complex sensing systems For a variety of application scenarios Includes an accompanying website containing solutions to exercises (http://www.wiley.com/go/dargie_fundamentals) This book serves as an introductory text to the field of wireless sensor networks at both graduate and advanced undergraduate level, but it will also appeal to researchers and practitioners wishing to learn about sensor network technologies and their application areas, including environmental monitoring, protection of civil infrastructure, health care, precision agriculture, traffic control, and homeland security.

Building Wireless Sensor Networks Shaim Femham 2017-09-26 Building Wireless Sensor Networks: Application to Routing and Data Diffusion discusses challenges involved in securing routing in wireless sensor networks with new hybrid topologies. An analysis of the security of real time data diffusion—a protocol for routing in wireless sensor networks—is provided, along with various possible attacks and possible countermeasures. Different applications are introduced, and new topologies are developed. Topics include audio video bridging (AVB) switched Ethernet, which uses the representation of a network of wireless sensors by a grayscale image to construct routing protocols, thereby minimizing energy consumption and data sharing in vehicular ad-hoc networks. Existing wireless networks aim to provide communication services between vehicles by enabling the vehicular networks to support wide range applications. New topologies are proposed first, based on the graphiton models, then the wireless sensor networks (WSN) based on the IEEE 802.15.4 standard (ZigBee sensors), and finally the Pancake graphs as an alternative to the Hypercube for interconnecting processors in parallel computer networks. Presents an analysis and protocol for routing in wireless sensor networks Presents ways to prevent attacks against this protocol

Introduces different applications Develops new topologies

Building Based Multilevel Parking Vacancy Monitoring System Dr. Narmada Alaparthi 2017-01-20 Looking for empty parking spaces in congested parking spaces can be painstaking and time consuming. The average time spent in parking bays cruising for vacant spaces approximately varies from 3.5–12 minutes. These cruising cars also add to the traffic and also to the pollution inside the bay. The present parking management system in the urban cities of growing economies like India lacks efficiency, often leaving the drivers frustrated. We are engaged in developing an automated parking management system employing Wireless Sensor Network (WSN) technology. The parking management system can detect the presence and/or absence of a vehicle in the respective parking spaces and automatically provide the location of the identified available spaces to prospective users in real-time. This paper describes the ultrasonic based vehicle detection system, ZigBee networks and presents the preliminary results.

ZigBee Wireless Networks and Transceivers Shahin Farahani 2011-04-08 ZigBee is a short-range wireless networking standard backed by such industry leaders as Motorola, Texas Instruments, Philips, Samsung, Siemens, Freescale, etc. It supports mesh networking, each node can transmit and receive data, offers high security and robustness, and is being rapidly adopted in industrial, control/monitoring, and medical applications. This book will explain the ZigBee protocol, discuss the design of ZigBee hardware, and describe how to design and implement ZigBee networks. The book has a dedicated website for the latest technical updates, ZigBee networking calculators, and additional materials. Dr. Farahani is a ZigBee system engineer for Freescale semiconductors Inc. The book comes with a dedicated website that contains additional resources and calculators: http://www.learnzigbee.com Provides a comprehensive overview of ZigBee technology and networking, from RF/physical layer considerations to application layer development Discusses ZigBee security features such as encryption Describes how ZigBee can be used in location detection applications Explores techniques for ZigBee co-existence with other wireless technologies such as 802.11 and Bluetooth The book comes with a dedicated website that contains additional resources and calculators: http://www.learnzigbee.com

Synchronous Data Acquisition with Wireless Sensor Networks Jürgen Helmuth Funck 2018

ZigBee Wireless Networking Drew Gislason 2008-10-09 ZigBee is a standard based on the IEEE 802.15.4 standard for wireless personal networks. This standard allows for the creation of very low cost and low power networks— these applications run for years rather than months. These networks are created from sensors and actuators and can wireless control many electrical products such as remote controls, medical, industrial, and security sensors. Hundreds of companies are creating application including Mitsubishi, Motorola, Freescale, and Siemens. This book is written for engineers who plan to develop ZigBee applications and networks, to understand how they work, and to evaluate this technology to see if it is appropriate to a particular project. This book does not simply state facts but explains why ZigBee can do through detailed code examples. "Details how to plan and develop applications and networks * ZigBee sensors have many applications including industrial automation, medical sensing, remote controls, and security * Hot topic for today's electrical engineer because it is low cost and low power

Wireless Sensor Networks Feng Zhao 2004 Information processing in sensor networks is a rapidly emerging area of computer science and electrical engineering research. This text introduces the fundamental issues and constraints concerning various aspects of sensor networks, using examples from current research and implementation efforts.