

Arduino And Kinect Projects

Discover best practices and troubleshooting solutions when working on ROS Key Features Develop complex robotic applications using ROS to interface robot manipulators and mobile robots Gain insight into autonomous navigation in mobile robots and motion planning in robot manipulators Discover best practices and troubleshooting solutions Book Description In this day and age, robotics has been gaining a lot of traction in various industries where consistency and perfection matter. Automation is achieved via robotic applications and various platforms that support robotics. The Robot Operating System (ROS) is a modular software platform to develop generic robotic applications. This book focuses on the most stable release of ROS (Kinetic Kame), discusses advanced concepts, and effectively teaches you programming using ROS. We begin with an informative overview of the ROS framework, which will give you a clear idea of how ROS works. During the course of this book, you'll learn to build models of complex robots, and simulate and interface the robot using the ROS MoveIt! motion planning library and ROS navigation stacks. Learn to leverage several ROS packages to embrace your robot models. After covering robot manipulation and navigation, you'll get to grips with the interfacing I/O boards, sensors, and actuators of ROS. Vision sensors are a key component of robots, and an entire chapter is dedicated to the vision sensor and image elaboration, its interface in ROS and programming. You'll also understand the hardware interface and simulation of complex robots to ROS and ROS Industrial. At the end of this book, you'll discover the best practices to follow when programming using ROS. What you will learn Create a robot model with a seven-DOF robotic arm and a differential wheeled mobile robot Work with Gazebo and V-REP robotic simulator Implement autonomous navigation in differential drive robots using SLAM and AMCL packages Explore the ROS Pluginlib, ROS nodelets, and Gazebo plugins Interface I/O boards such as Arduino, robot sensors, and high-end actuators Simulate and motion plan an ABB and universal arm using ROS Industrial Explore the latest version of the ROS framework Work with the motion planning of a seven-DOF arm using MoveIt! Who this book is for If you are a robotics enthusiast or researcher who want to learn more about building robot applications using ROS, this book is for you. In order to learn from this book, you should have a basic knowledge of ROS, GNU/Linux, and C++ programming concepts. The book is also excellent for programmers who want to explore the advanced features of ROS.

Winning Design! LEGO Mindstorms NXT Design Patterns for Fun and Competition is about design that works. It's about building with LEGO MINDSTORMS NXT for fun, for education, but especially for competition. Author James Trobaugh is an experienced coach and leader in the FIRST LEGO League. In this book, he shares his hard-won knowledge about design principles and techniques that contribute to success in robotics competitions. Winning Design! unlocks the secrets of reliable design using LEGO MINDSTORMS NXT. You'll learn proven design patterns that you can employ for common tasks such as turning, pushing, and pulling. You'll reduce and compensate for variation in performance from battery charge levels and motor calibration differences. You'll produce designs that won't frustrate you by not working, but that will delight you with their reliable performance in the heat of competition. Good design is about more than just the hardware. Software counts for a lot, and Winning Design! has you covered. You'll find chapters on program design and organization with tips on effective coding and documentation practices. You'll learn about master programs and the needed flexibility they provide. There's even a section on presenting your robot and software designs to the judges. Winning Design! is the book you need if your involved in competitions such as FIRST LEGO League events. Whether coach, parent, or student, you'll find much in this book to make your design and competition experience fun and memorable, and educational. Please note: the print version of this title is black & white; the eBook is full color.

Find out everything you need to know to build powerful robots with the most up-to-date ROS About This Book This comprehensive, yet easy-to-follow guide will help you find your way through the ROS framework Successfully design and simulate your 3D robot model and use powerful robotics algorithms and tools to program and set up your robots with an unparalleled experience by using the exciting new features from Robot Kinetic Use the latest version of gazebo simulator, OpenCV 3.0, and C++11 standard for your own algorithms Who This Book Is For This book is suitable for an ROS beginner as well as an experienced ROS roboticist or ROS user or developer who is curious to learn ROS Kinetic and its features to make an autonomous Robot. The book is also suitable for those who want to integrate sensors and embedded systems with other software and tools using ROS as a framework. What You Will Learn Understand the concepts of ROS, the command-line tools, visualization GUIs, and how to debug ROS Connect robot sensors and actuators to ROS Obtain and analyze data from cameras and 3D sensors Use Gazebo for robot/sensor and environment simulation Design a robot and see how to make it map the environment, navigate autonomously, and manipulate objects in the environment using MoveIt! Add vision capabilities to the robot using OpenCV 3.0 Add 3D perception capabilities to the robot using the latest version of PCL In Detail Building and programming a robot can be cumbersome and time-consuming, but not when you have the right collection of tools, libraries, and more importantly expert collaboration. ROS enables collaborative software development and offers an unmatched simulated environment that simplifies the entire robot building process. This book is packed with hands-on examples that will help you program your robot and give you complete solutions using open source ROS libraries and tools. It also shows you how to use virtual machines and Docker containers to simplify the installation of Ubuntu and the ROS framework, so you can start working in an isolated and control environment without changing your regular computer setup. It starts with the installation and basic concepts, then continues with more complex modules available in ROS such as sensors and actuators integration (drivers), navigation and mapping (so you can create an autonomous mobile robot), manipulation, Computer Vision, perception in 3D with PCL, and more. By the end of the book, you'll be able to leverage all the ROS Kinetic features to build a fully fledged robot for all your needs. Style and approach This book is packed with hands-on examples that will help you program your robot and give you complete solutions using ROS open source libraries and tools. All the robotics concepts and modules are explained and multiple examples are provided so that you can understand them easily.

Design and develop real-world computer vision applications with the powerful combination of OpenCV and Arduino About This Book- Load and run the applications in Arduino to develop intelligent systems- Design and implement detection, classification, and recognition algorithms for computer vision applications- Explore the best practices of computer vision development including state of the art algorithms and hands-on example projects Who This Book Is For If you are a consumer and hobbyist who has familiarity with the basics of Arduino and wish to learn computer vision programming with Arduino to create intelligent systems, then this book is for you. No knowledge of computer vision programming is required. What You Will Learn- Understand

the design blocks and the generic architecture of computer vision systems by learning an efficient approach to modelling- Build up your skill set of computer vision system design using OpenCV by learning fundamentals, camera selection, data acquisition, filtering, processing, feature extraction and recognition for any specific problem- Learn the wired and wireless communication capabilities of Arduino and comprehensive best practices to connect it to the OpenCV environment in a platform-independent way- Discover how to use Arduino to elegantly interact with real life via physical actions- Solidify everything you've learnt by designing and building a computer vision-enabled practical robot from scratchIn detailsMost technologies are developed with an inspiration of human capabilities. Most of the time, the hardest to implement capability is vision. Development of highly capable computer vision applications in an easy way requires a generic approach. In this approach, Arduino is a perfect tool for interaction with the real world. Moreover, the combination of OpenCV and Arduino boosts the level and quality of practical computer vision applications.Computer vision is the next level of sensing the environment. The purpose of this book is to teach you how to develop Arduino-supported computer vision systems that can interact with real life by seeing it.This book will combine the powers of Arduino and computer vision in a generalized, well-defined, and applicable way. The practices and approaches in the book can be used for any related problems and on any platforms. At the end of the book, you should be able to solve any types of real life vision problems with all its components by using the presented approach. Each component will extend your vision with the best practices on the topic.In each chapter, you will find interesting real life practical application examples about the topics in the chapter. To make it grounded, we will build a vision-enabled robot step by step towards the end of the book. You will observe that, even though the contexts of the problems are very different, the approaches to solve them are the same and very easy!Style and approachThis book is a step-by-step guide that explains each topic sequentially by using best practices and useful tips to build computer-vision applications with OpenCV and Arduino. All the information in the book is combined in a real life all-in-one example application.

"I wrote this book because I love building robots. I want you to love building robots, too. It took me a while to learn about many of the tools and parts in amateur robotics. Perhaps by writing about my experiences, I can give you a head start."--David Cook Robot Building for Beginners, Third Edition provides basic, practical knowledge on getting started in amateur robotics. There is a mix of content: from serious reference tables and descriptions to personal stories and humorous bits. The robot described and built in this book is battery powered and about the size of a lunch box. It is autonomous; that is, it isn't remote controlled. The book is broken up into small chapters, suitable for bedtime (or bathroom) reading. The characteristics and purposes of each major component (resistor, transistor, wire, and motor) are described, followed by a hands-on experiment to demonstrate. Not only does this help the reader to understand a particular piece, but it also prepares them with processes to learn new parts on their own. An appendix offers an introduction to 3D printing and parts of the robot can, as an alternative, be "printed" using a 3D printer. The master project of the book is a simple, entertaining, line-following robot.

Summary Arduino in Action is a hands-on guide to prototyping and building electronics using the Arduino platform. Suitable for both beginners and advanced users, this easy-to-follow book begins with the basics and then systematically guides you through projects ranging from your first blinking LED through connecting Arduino to devices like game controllers or your iPhone. About the Technology Arduino is an open source do-it-yourself electronics platform that supports a mind-boggling collection of sensors and actuators you can use to build anything you can imagine. Even if you've never attempted a hardware project, this easy-to-follow book will guide you from your first blinking LED through connecting Arduino to your iPhone. About this Book Arduino in Action is a hands-on guide to prototyping and building DIY electronics. You'll start with the basics—unpacking your board and using a simple program to make something happen. Then, you'll attempt progressively more complex projects as you connect Arduino to motors, LCD displays, Wi-Fi, GPS, and Bluetooth. You'll explore input/output sensors, including ultrasound, infrared, and light, and then use them for tasks like robotic obstacle avoidance. Arduino programs look a lot like C or C++, so some programming skill is helpful. What's Inside Getting started with Arduino—no experience required! Writing programs for Arduino Sensing and responding to events Robots, flying vehicles, Twitter machines, LCD displays, and more! Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Authors Martin Evans is a professional developer, a lifelong electronics enthusiast, and the creator of an Arduino-based underwater ROV. Joshua Noble is an author and creative technologist who works with smart spaces. Jordan Hochenbaum uses Arduino to explore musical expression and creative interaction. Table of Contents Part 1 Getting started Chapter 1 Hello Arduino Chapter 2 Digital input and output Chapter 3 Simple projects: input and output Part 2 Putting Arduino to work Chapter 4 Extending Arduino Chapter 5 Arduino in motion Chapter 6 Object detection Chapter 7 LCD displays Chapter 8 Communications Chapter 9 Game on Chapter 10 Integrating the Arduino with iOS Chapter 11 Making wearables Chapter 12 Adding shields Chapter 13 Software integration

Develop applications in Microsoft Kinect 2 using gesture and speech recognition, scanning of objects in 3D, and body tracking. Create motion-sensing applications for entertainment and practical uses, including for commercial products and industrial applications. Beginning Microsoft Kinect for Windows SDK 2.0 is dense with code and examples to ensure that you understand how to build Kinect applications that can be used in the real world. Techniques and ideas are presented to facilitate incorporation of the Kinect with other technologies. What You Will Learn Set up Kinect 2 and a workspace for Kinect application development Access audio, color, infrared, and skeletal data streams from Kinect Use gesture and speech recognition Perform computer vision manipulations on image data streams Develop Windows Store apps and Unity3D applications with Kinect 2 Take advantage of Kinect Fusion (3D object mapping technology) and Kinect Ripple (Kinect projector infotainment system) Who This Book Is For Developers who want to include the simple but powerful Kinect technology into their projects, including amateurs and hobbyists, and professional developers

Design, build and simulate complex robots using Robot Operating System and master its out-of-the-box functionalities About This Book Develop complex robotic applications using ROS for interfacing robot manipulators and mobile robots with the help of high end robotic sensors Gain insights into autonomous navigation in mobile robot and motion planning in robot manipulators Discover the best practices and troubleshooting solutions everyone needs when working on ROS Who This Book Is For If you are a robotics enthusiast or researcher who wants to learn more about building robot applications using ROS, this book is for you. In order to learn from this book, you should have a basic knowledge of ROS, GNU/Linux, and C++ programming concepts. The book will also be good for programmers who want to explore the advanced features of ROS. What You Will Learn Create a robot model of a Seven-DOF robotic arm and a differential wheeled mobile robot Work with motion planning of a Seven-DOF arm using MoveIt! Implement autonomous navigation in differential drive robots using SLAM and AMCL packages in ROS

Dig deep into the ROS Pluginlib, ROS nodelets, and Gazebo plugins Interface I/O boards such as Arduino, Robot sensors, and High end actuators with ROS Simulation and motion planning of ABB and Universal arm using ROS Industrial Explore the ROS framework using its latest version In Detail The area of robotics is gaining huge momentum among corporate people, researchers, hobbyists, and students. The major challenge in robotics is its controlling software. The Robot Operating System (ROS) is a modular software platform to develop generic robotic applications. This book discusses the advanced concepts in robotics and how to program using ROS. It starts with deep overview of the ROS framework, which will give you a clear idea of how ROS really works. During the course of the book, you will learn how to build models of complex robots, and simulate and interface the robot using the ROS MoveIt motion planning library and ROS navigation stacks. After discussing robot manipulation and navigation in robots, you will get to grips with the interfacing I/O boards, sensors, and actuators of ROS. One of the essential ingredients of robots are vision sensors, and an entire chapter is dedicated to the vision sensor, its interfacing in ROS, and its programming. You will discuss the hardware interfacing and simulation of complex robot to ROS and ROS Industrial (Package used for interfacing industrial robots). Finally, you will get to know the best practices to follow when programming using ROS. Style and approach This is a simplified guide to help you learn and master advanced topics in ROS using hands-on examples.

Whether you're new to Arduino and Android development, or you've tinkered a bit with either one, this is the book for you. Android has always been a natural fit with Arduino projects, but now that Google has released the Android Open Accessory Development Kit (the Android ADK), combining Android with Arduino to create custom gadgets has become even easier. Beginning Android ADK with Arduino shows how the ADK works and how it can be used with a variety of Arduino boards to create a variety of fun projects that showcase the abilities of the ADK. Mario Böhmer will walk you through several projects, including making sounds, driving motors, and creating alarm systems, all while explaining how to use the ADK and how standard Arduino boards may differ from Google-branded Arduinos. You aren't tied to specific hardware with this book; use what you have, and this book will show you how.

Extend the range of your Arduino skills, incorporate the new developments in both hardware and software, and understand how the electronic applications function in everyday life. This project-based book extends the Arduino Uno starter kits and increases knowledge of microcontrollers in electronic applications. Learn how to build complex Arduino projects, break them down into smaller ones, and then enhance them, thereby broadening your understanding of each topic. You'll use the Arduino Uno in a range of applications such as a blinking LED, route mapping with a mobile GPS system, and uploading information to the internet. You'll also apply the Arduino Uno to sensors, collecting and displaying information, Bluetooth and wireless communications, digital image captures, route tracking with GPS, controlling motors, color and sound, building robots, and internet access. With Arduino Applied, prior knowledge of electronics is not required, as each topic is described and illustrated with examples using the Arduino Uno. What You'll Learn Set up the Arduino Uno and its programming environment Understand the application of electronics in every day systems Build projects with a microcontroller and readily available electronic components Who This Book Is For Readers with an Arduino starter-kit and little-to-no programming experience and those interested in "how electronic appliances work."

Provides step-by-step instructions for building a variety of LEGO Mindstorms NXT and Arduino devices.

This book will show you how to use your Arduino to control a variety of different robots, while providing step-by-step instructions on the entire robot building process. You'll learn Arduino basics as well as the characteristics of different types of motors used in robotics. You also discover controller methods and failsafe methods, and learn how to apply them to your project. The book starts with basic robots and moves into more complex projects, including a GPS-enabled robot, a robotic lawn mower, a fighting bot, and even a DIY Segway-clone. Introduction to the Arduino and other components needed for robotics Learn how to build motor controllers Build bots from simple line-following and bump-sensor bots to more complex robots that can mow your lawn, do battle, or even take you for a ride Please note: the print version of this title is black & white; the eBook is full color.

If you are a programmer, visual artist, or designer with experience in creative coding, and want to use openFrameworks to create fun, stunning, and interactive applications, this is the book for you. Basic knowledge of programming languages, such as C++, Java, Python, or JavaScript, will be enough to proceed with the book.

Design, simulate, and program interactive robots Key Features Design, simulate, build, and program an interactive autonomous mobile robot Leverage the power of ROS, Gazebo, and Python to enhance your robotic skills A hands-on guide to creating an autonomous mobile robot with the help of ROS and Python Book Description Robot Operating System (ROS) is one of the most popular robotics software frameworks in research and industry. It has various features for implementing different capabilities in a robot without implementing them from scratch. This book starts by showing you the fundamentals of ROS so you understand the basics of differential robots. Then, you'll learn about robot modeling and how to design and simulate it using ROS. Moving on, we'll design robot hardware and interfacing actuators. Then, you'll learn to configure and program depth sensors and LIDARs using ROS. Finally, you'll create a GUI for your robot using the Qt framework. By the end of this tutorial, you'll have a clear idea of how to integrate and assemble everything into a robot and how to bundle the software package. What you will learn Design a differential robot from scratch Model a differential robot using ROS and URDF Simulate a differential robot using ROS and Gazebo Design robot hardware electronics Interface robot actuators with embedded boards Explore the interfacing of different 3D depth cameras in ROS Implement autonomous navigation in ChefBot Create a GUI for robot control Who this book is for This book is for those who are conducting research in mobile robotics and autonomous navigation. As well as the robotics research domain, this book is also for the robot hobbyist community. You're expected to have a basic understanding of Linux commands and Python.

Get the most out of your Arduino to develop exciting and creative LED-based projects About This Book Learn to control TV backlighting using an IR remote Get introduced to sound visualization so you are able to use sound-controlled LEDs Build an exciting persistence of vision wand Who This Book Is For Anyone with a basic computer knowledge should be able to get the most out of this book. Although familiarity with some of the electronics would be helpful, it is not a must. What You Will Learn Set up Arduino boards to run a basic 'Hello World' program Develop a mood lamp and expand it to become an LED night lamp Control TV backlight color and intensity using an IR remote Develop an IR-controlled 4*4 LED cube Use sound visualization to develop a sound-controlled LED Christmas tree See a fun way to create interesting long exposure photographs and light displays using persistence of vision (POV) wands In Detail Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino has been used in thousands of different projects and applications by a wide range of programmers and artists, and their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Want to build exciting LED projects with Arduino? This book will be your companion to bring out the creative genius in you. To begin with, you will get introduced to the maker movement and the open source hardware development Arduino boards. You will then move on to develop a mood lamp and a remote-controlled TV backlight. As you progress through the book, you will develop an LED cube and will learn to use sound visualization to develop a sound-controlled LED Christmas tree. You will then move on to build a persistence of vision wand. At the end of each chapter, you'll see some common problems, their solutions, and some workarounds. Style and approach This book takes a project based approach to building LED-based projects with Arduino. Beginning Arduino Programming allows you to quickly and intuitively develop your programming skills through sketching in code. This clear introduction provides you with an understanding of the basic

framework for developing Arduino code, including the structure, syntax, functions, and libraries needed to create future projects. You will also learn how to program your Arduino interface board to sense the physical world, to control light, movement, and sound, and to create objects with interesting behavior. With *Beginning Arduino Programming*, you'll get the knowledge you need to master the fundamental aspects of writing code on the Arduino platform, even if you have never before written code. It will have you ready to take the next step: to explore new project ideas, new kinds of hardware, contribute back to the open source community, and even take on more programming languages.

This is a book for parents and other educators—both formal and informal, who are curious about the intersections of learning and making. Through stories, research, and data, it builds the case for why it is crucial to encourage today's youth to be makers—to see the world as something they are actively helping to create. For those who are new to the Maker Movement, some history and introduction is given as well as practical advice for getting kids started in making. For those who are already familiar with the Maker Movement, this book provides biographical information about many of the “big names” and unsung heroes of the Maker Movement while also highlighting many of the attributes that make this a movement that so many people are passionate about.

If you've done some Arduino tinkering and wondered how you could incorporate the Kinect—or the other way around—then this book is for you. The authors of *Arduino and Kinect Projects* will show you how to create 10 amazing, creative projects, from simple to complex. You'll also find out how to incorporate Processing in your project design—a language very similar to the Arduino language. The ten projects are carefully designed to build on your skills at every step. Starting with the Arduino and Kinect equivalent of "Hello, World," the authors will take you through a diverse range of projects that showcase the huge range of possibilities that open up when Kinect and Arduino are combined. Gesture-based Remote Control. Control devices and home appliances with hand gestures. Kinect-networked Puppet. Play with a physical puppet remotely using your whole body. Mood Lamps. Build your own set of responsive, gesture controllable LED lamps. Drawing Robot. Control a drawing robot using a Kinect-based tangible table. Remote-controlled Vehicle. Use your body gestures to control a smart vehicle. Biometric Station. Use the Kinect for biometric recognition and checking Body Mass Indexes. 3D Modeling Interface. Learn how to use the Arduino LilyPad to build a wearable 3D modelling interface. 360o Scanner. Build a turntable scanner and scan any object 360o using only one Kinect. Delta Robot. Build and control your own fast and accurate parallel robot.

Bring life to your robot using ROS robotic applications About This Book This book will help you boost your knowledge of ROS and give you advanced practical experience you can apply to your ROS robot platforms This is the only book that offers you step-by-step instructions to solidify your ROS understanding and gain experience using ROS tools From eminent authors, this book offers you a plethora of fun-filled examples to make your own quadcopter, turtlebot, and two-armed robots Who This Book Is For If you are a robotics developer, whether a hobbyist, researchers or professional, and are interested in learning about ROS through a hands-on approach, then this book is for you. You are encouraged to have a working knowledge of GNU/Linux systems and Python. What You Will Learn Get to know the fundamentals of ROS and apply its concepts to real robot examples Control a mobile robot to navigate autonomously in an environment Model your robot designs using URDF and Xacro, and operate them in a ROS Gazebo simulation Control a 7 degree-of-freedom robot arm for visual servoing Fly a quadcopter to autonomous waypoints Gain working knowledge of ROS tools such as Gazebo, rviz, rqt, and Move-It Control robots with mobile devices and controller boards In Detail The visionaries who created ROS developed a framework for robotics centered on the commonality of robotic systems and exploited this commonality in ROS to expedite the development of future robotic systems. From the fundamental concepts to advanced practical experience, this book will provide you with an incremental knowledge of the ROS framework, the backbone of the robotics evolution. ROS standardizes many layers of robotics functionality from low-level device drivers to process control to message passing to software package management. This book provides step-by-step examples of mobile, armed, and flying robots, describing the ROS implementation as the basic model for other robots of these types. By controlling these robots, whether in simulation or in reality, you will use ROS to drive, move, and fly robots using ROS control. Style and approach This is an easy-to-follow guide with hands-on examples of ROS robots, both real and in simulation.

It has been said that good things come in small packages. Such is the case with Arduino. Using the Arduino programming language, users operate microcontrollers, which are essentially mini-computers that trigger physical systems such as lights and motors. This book introduces readers to one of the most popular programming platforms, taking computing beyond the computer. The text covers the particulars of Arduino's hardware and software, its capabilities, pros and cons of the platform, and examples of the creativity its use engenders.

Learn robotics through magic, or enhance your magic with robotics! This book is a beginner's guide to creating robotics-infused magic. You'll be introduced to simple DIY electronics, Arduino programming, 3D design and printing, and you will learn how to use those tools to create a treasure trove of magic bots and effects, with readily-sourced materials and everyday objects. It's magic through the lens of the Maker Movement, with a dedication to accessibility -- cardboard meets Arduino meets magic! All ages, backgrounds, and abilities will find clever, fun projects within these pages that challenge their creativity and explode their imagination.

Arduino boards have impressed both hackers and professional engineers. Whether you're a hobbyist or a professional, it isn't just a breadboard and a hazy idea that keeps you going. It's essential to institute a proper design, device instrumentation and, indeed, test your project thoroughly before committing to a particular prototype. *Practical Arduino Engineering* begins by outlining the engineering process, from the basic requirements and preliminary design to prototyping and testing. Each and every chapter exemplifies this process and demonstrates how you can profit from the implementation solid engineering principles—regardless of whether you just play in your basement or you want to publicize and sell your devices. Arduino is a brilliant prototyping platform that allows users to test and iterate design ideas. Imitation by other Arduino makers, hackers and engineers often proves your design's popularity. *Practical Arduino Engineering* will teach you to follow the engineering process carefully; over time, you will be able to review and improve this process, and even extend its scope. *Practical Arduino Engineering* is not purely theoretical. In addition, you'll learn the process of hardware engineering as applicable to Arduino projects, and the importance of the process in each and every project presented in this book. To set the stage, *Practical Arduino Engineering* begins by reviewing the Arduino software landscape, then shows how to set up an Arduino project for testing. Even if you already know your compiler toolchain and the basics of Arduino programming, this refresher course can help fill in the gaps and explain why your compiler may spit out certain error messages. *Practical Arduino Engineering* then gradually builds up the engineering process, from single devices like LCDs, potentiometers and GPS modules, to the integration of several modules into larger projects, such as a wireless temperature measurement system, and ultimately an entire robot. The engineering projects become progressively more challenging throughout the first 4 engineering chapters. Next, you'll proceed with simple steps towards the first intelligent part of a robot: the object detector. You'll find yourself teaching your robot how to avoid very hot objects or insurmountable obstacles. The basic design requirements for a complete robot and, indeed, the detailed design and prototyping for robots can be extremely tricky, which is why engineering discipline is invaluable. *Practical Arduino Engineering* then enters the world of domestic engineering by introducing home alarm systems—not quite as simple as they seem. A solid, robust system can only be built by following the engineering process detailed in previous chapters, and this section reinforces that process. You'll then take a step further in your Arduino engineering process: instrumentation and control, and some error messaging using GSM. Control is introduced via the Xbox controller, a very powerful piece of technology able to play a considerable role in robotics projects. Having already learned to

control motion and to sense and avoid objects, you'll learn how to debug your Arduino projects of varying complexities via the hardware instrumentation software LabVIEW. To complete the journey into Practical Arduino Engineering, you'll discover how to use a special Arduino board to rely on Bluetooth Mate Silver for control of domestic and mobile Arduino projects. Using Bluetooth Mate Silver, you'll learn to implement basic engineering design with almost any Arduino project, and be able to justify, build, debug, and extend Arduino-based designs using a solid engineering approach. Please note: the print version of this title is black & white; the eBook is full color.

Dive hands-on into the tools, techniques, and information for making your own analog synthesizer. If you're a musician or a hobbyist with experience in building electronic projects from kits or schematics, this do-it-yourself guide will walk you through the parts and schematics you need, and how to tailor them for your needs. Author Ray Wilson shares his decades of experience in synth-DIY, including the popular Music From Outer Space (MFOS) website and analog synth community. At the end of the book, you'll apply everything you've learned by building an analog synthesizer, using the MFOS Noise Toaster kit. You'll also learn what it takes to create synth-DIY electronic music studio. Get started in the fun and engaging hobby of synth-DIY without delay. With this book, you'll learn: The differences between analog and digital synthesizers Analog synthesizer building blocks, including VCOs, VCFs, VCAs, and LFOs How to tool up for synth-DIY, including electronic instruments and suggestions for home-made equipment Foundational circuits for amplification, biasing, and signal mixing How to work with the MFOS Noise Toaster kit Setting up a synth-DIY electronic music studio on a budget

This book thoroughly explains how computers work. It starts by fully examining a NAND gate, then goes on to build every piece and part of a small, fully operational computer. The necessity and use of codes is presented in parallel with the appropriate pieces of hardware. The book can be easily understood by anyone whether they have a technical background or not. It could be used as a textbook.

This book teaches the reader to build rockets--powered by compressed air, water, and solid propellant--with the maximum possible fun, safety, and educational experience. Make: Rockets is for all the science geeks who look at the moon and try to figure out where Neil Armstrong walked, watch in awe as rockets lift off, and want to fly their own model rockets. Starting with the basics of rocket propulsion, readers will start out making rockets made from stuff lying around the house, and then move on up to air-, water-, and solid propellant-powered rockets. Most of the rockets in the book can be built from parts in the Estes Designer Special kit.

With more than 60 practical and creative hacks, this book helps you turn Raspberry Pi into the centerpiece of some cool electronics projects. Want to create a controller for a camera or a robot? Set up Linux distributions for media centers or PBX phone systems? That's just the beginning of what you'll find inside Raspberry Pi Hacks. If you're looking to build either a software or hardware project with more computing power than Arduino alone can provide, Raspberry Pi is just the ticket. And the hacks in this book will give you lots of great ideas. Use configuration hacks to get more out of your Pi Build your own web server or remote print server Take the Pi outdoors to monitor your garden or control holiday lights Connect with SETI or construct an awesome Halloween costume Hack the Pi's Linux OS to support more complex projects Decode audio/video formats or make your own music player Achieve a low-weight payload for aerial photography Build a Pi computer cluster or a solar-powered lab

Build a variety of awesome robots that can see, sense, move, and do a lot more using the powerful Robot Operating System About This Book Create and program cool robotic projects using powerful ROS libraries Work through concrete examples that will help you build your own robotic systems of varying complexity levels This book provides relevant and fun-filled examples so you can make your own robots that can run and work Who This Book Is For This book is for robotic enthusiasts and researchers who would like to build robot applications using ROS. If you are looking to explore advanced ROS features in your projects, then this book is for you. Basic knowledge of ROS, GNU/Linux, and programming concepts is assumed. What You Will Learn Create your own self-driving car using ROS Build an intelligent robotic application using deep learning and ROS Master 3D object recognition Control a robot using virtual reality and ROS Build your own AI chatter-bot using ROS Get to know all about the autonomous navigation of robots using ROS Understand face detection and tracking using ROS Get to grips with teleoperating robots using hand gestures Build ROS-based applications using Matlab and Android Build interactive applications using TurtleBot In Detail Robot Operating System is one of the most widely used software frameworks for robotic research and for companies to model, simulate, and prototype robots. Applying your knowledge of ROS to actual robotics is much more difficult than people realize, but this title will give you what you need to create your own robotics in no time! This book is packed with over 14 ROS robotics projects that can be prototyped without requiring a lot of hardware. The book starts with an introduction of ROS and its installation procedure. After discussing the basics, you'll be taken through great projects, such as building a self-driving car, an autonomous mobile robot, and image recognition using deep learning and ROS. You can find ROS robotics applications for beginner, intermediate, and expert levels inside! This book will be the perfect companion for a robotics enthusiast who really wants to do something big in the field. Style and approach This book is packed with fun-filled, end-to-end projects on mobile, armed, and flying robots, and describes the ROS implementation and execution of these models.

Work through a mix of amazing robotic projects using the Raspberry Pi Zero or the Raspberry Pi 3 About This Book Easy to follow instructions, yet the ones that help you build powerful robots, and exclusive coverage of mobile robots with the Pi Zero Build robots that can run, swim and fly and the cutting-edge dimension of robotics that is possible with the Raspberry Pi Zero and Pi 3 Interact with your projects wirelessly and make sci-fi possible, right in your home Who This Book Is For This book is for hobbyists and programmers who are excited about using the Raspberry Pi 3 and Raspberry Pi Zero. It is for those who are taking their first steps towards using these devices to control hardware and software and write simple programs that enable amazing projects. No programming experience is required, Just a little computer and mechanical aptitude and the desire to build some interesting projects. What You Will Learn Control a variety of different DC motors Add a USB webcam to see what your robot can see Attach a projector to project information Insert USB control hardware to control a complex robot with two legs Include speech recognition so that your projects can receive commands Add speech output to that the robot can communicate with the world around it Include wireless communication so that you can see what the robot is seeing and control the robot from a distance In Detail This book will allow you to take full advantage of Raspberry Pi Zero and Raspberry Pi 3 by building both simple and complex robotic projects. The book takes a mission-critical approach to show you how to build amazing robots and helps you decide which board to use for which type of robot. The book puts a special emphasis on designing mobile (or movable) robots using the Raspberry Pi Zero. The projects will show inexpensive, yet powerful, ways to take full advantage. It will teach you how to program Raspberry Pi, control the movement of your robot, and add features to your robots. Style and approach This fun and practical tutorial contain step-by-step instructions to get you hands-on building inexpensive projects. It contains mission-critical chapters and everything you need to know to get started.

Hacking the Kinect is the technogeek's guide to developing software and creating projects involving the groundbreaking volumetric sensor known as the Microsoft Kinect. Microsoft's release of the Kinect in the fall of 2010 startled the technology world by providing a low-cost sensor that can detect and track body movement in three-dimensional space. The Kinect set new records for the fastest-selling gadget of all time. It has been adopted worldwide by hobbyists, robotics enthusiasts, artists, and even some entrepreneurs hoping to build business around the technology. Hacking the Kinect introduces you to programming for the Kinect. You'll learn to set up a software environment, stream data from the Kinect, and write code to interpret that data. The progression of hands-on projects in the book leads you even deeper into an understanding of how the device functions and how you can apply it to create fun and educational projects. Who knows? You might even come up with a business idea. Provides an excellent source of fun and educational projects for a tech-savvy parent to pursue with a son or daughter Leads you progressively from making your very first connection to the Kinect through mastery of its full feature set Shows how to interpret the Kinect data stream in order to drive your own software and hardware applications, including robotics applications

Build a robot that responds to electrical activity in your brain—it's easy and fun. If you're familiar with Arduino and have basic mechanical building skills, this book will show you how to construct a robot that plays sounds, blinks lights, and reacts to signals from an affordable electroencephalography (EEG) headband. Concentrate and the robot will move. Focus more and it will go faster. Let your mind wander and the robot will slow down. You'll find complete instructions for building a simple robot chassis with servos, wheels, sensors, LEDs, and a speaker. You also get the code to program the Arduino microcontroller to receive wireless signals from the EEG. Your robot will astound anyone who wears the EEG headband. This book will help you: Connect an inexpensive EEG device to Arduino Build a robot platform on wheels Calculate a percentage value from a potentiometer reading Mix colors with an RGB LED Play tones with a piezo speaker Write a program that makes the robot avoid boundaries Create simple movement routines

Arduino programming for the absolute beginner, with project-based learning Adventures in Arduino is the beginner's guide to Arduino programming, designed specifically for 11-to 15-year olds who want to learn about Arduino, but don't know where to begin. Starting with the most basic concepts, this book coaches you through nine great projects that gradually build your skills as you experiment with electronics. The easy-to-follow design and clear, plain-English instructions make this book the ideal guide for the absolute beginner, geared toward those with no computing experience. Each chapter includes a video illuminating the material, giving you plenty of support on your journey to electronics programming. Arduino is a cheap, readily available hardware development platform based around an open source, programmable circuit board. Combining these chips with sensors and servos allows you to gain experience with prototyping as you build interactive electronic crafts to bring together data and even eTextiles. Adventures in Arduino gets you started on the path of scientists, programmers, and engineers, showing you the fun way to learn electronic programming and interaction design. Discover how and where to begin Arduino programming Develop the skills and confidence to tackle other projects Make the most of Arduino with basic programming concepts Work with hardware and software to create interactive electronic devices There's nothing like watching your design come to life and interact with the real world, and Arduino gives you the capability to do that time and again. The right knowledge combined with the right tools can create an unstoppable force of innovation, and your curiosity is the spark that ignites the flame. Adventures in Arduino gets you started on the right foot, but the path is totally up to you.

Looks at the techniques of interactive design, covering such topics as 2D and 3D graphics, sound, computer vision, and geolocation.

Program Kinect to do awesome things using a unique selection of open source software! The Kinect motion-sensing device for the Xbox 360 and Windows became the world's fastest-selling consumer electronics device when it was released (8 million sold in its first 60 days) and won prestigious awards, such as "Gaming Gadget of the Year." Now Kinect Open Source Programming Secrets lets YOU harness the Kinect's powerful sensing capabilities for gaming, science, multimedia projects, and a mind-boggling array of other applications on platforms running Windows, Mac OS, and Linux. Dr. Andrew Davison, a user interface programming expert, delivers exclusive coverage of how to program the Kinect sensor with the Java wrappers for OpenNI and NITE, which are APIs created by PrimeSense, the primary developers of the Kinect's technology. Beginning with the basics--depth imaging, 3D point clouds, skeletal tracking, and hand gestures--the book examines many other topics, including Kinect gaming, FFAST-style gestures that aren't part of standard NITE, motion detection using OpenCV, how to create gesture-driven GUIs, accessing the Kinect's motor and accelerometer, and other tips and techniques. Inside: Free open source APIs to let you develop amazing Kinect hacks for commercial or private use Full coverage of depth detection, camera, and infrared imaging point clouds; Kinect gaming; 3D programming; gesture-based GUIs, and more Online access to detailed code examples on the author's web site, plus bonus chapters on speech recognition, beamforming, and other exotica

"I wrote this book because I love building robots. I want you to love building robots, too. It took me a while to learn about many of the tools and parts in amateur robotics. Perhaps by writing about my experiences, I can give you a head start." —David Cook Robot Building for Beginners, Second Edition is an update of David Cook's best-selling Robot Building for Beginners. This book continues its aim at teenagers and adults who have an avid interest in science and dream of building household explorers. No formal engineering education is assumed. The robot described and built in this book is battery powered and about the size of a lunchbox. It is autonomous. That is, it isn't remote controlled. You'll begin with some tools of the trade, and then work your way through prototyping, robot bodybuilding, and eventually soldering your own circuit boards. By the book's end, you will have a solid amateur base of understanding so that you can begin creating your own robots to vacuum your house or maybe even rule the world!

Time-of-Flight Cameras and Microsoft Kinect™ closely examines the technology and general characteristics of time-of-flight range cameras, and outlines the best methods for maximizing the data captured by these devices. This book also analyzes the calibration issues that some end-users may face when using these type of cameras for research, and suggests methods for improving the real-time 3D reconstruction of dynamic and static scenes. Time-of-Flight Cameras and Microsoft Kinect™ is intended for researchers and advanced-level students as a reference guide for time-of-flight cameras.

Practitioners working in a related field will also find the book valuable.

Beginning C for Arduino is written for those who have no prior experience with microcontrollers or programming but would like to experiment and learn both. This book introduces you to the C programming language, reinforcing each programming structure with a simple demonstration of how you can use C to control the Arduino family of microcontrollers. Author Jack Purdum uses an engaging style to teach good programming techniques using examples that have been honed during his 25 years of university teaching. Beginning C for Arduino will teach you: The C programming language How to use C to control a microcontroller and related hardware How to extend C by creating your own library routines During the course of the book, you will learn the basics of programming, such as working with data types, making decisions, and writing control loops. You'll then progress onto some of the trickier aspects of C programming, such as using pointers effectively, working with the C preprocessor, and tackling file I/O. Each

chapter ends with a series of exercises and review questions to test your knowledge and reinforce what you have learned.

A guide to creating computer applications using Microsoft Kinect features instructions on using the device with different operating systems, using 3D scanning technology, and building robot arms, all using open source programming language.

Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experimentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

Arduino and Kinect Projects Design, Build, Blow Their Minds Apress

Learn how to control your home or car from your Android smartphone - air conditioning, lights, entertainment systems, and more! Android Open Accessory is a new, simple, and secure protocol for connecting any microcontroller-empowered device to an Android smartphone or tablet. This Wrox guide shows Android programmers how to use AOA with Arduino, the microcontroller platform, to control such systems as lighting, air conditioning, and entertainment systems from Android devices. Furthermore, it teaches the circuit-building skills needed to create games and practical products that also take advantage of Android technology. Introduces Android Open Accessory and shows how to set up the hardware and development environment Explains how to code both Android and Arduino elements of an accessory Features four complete projects developers can build using various sensors and indicators/actuators, including source code Gives Android developers the tools to create powerful, sophisticated projects Professional Android Open Accessory with Android ADK and Arduino opens exciting new opportunities for Android developers.

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