



BeagleBone Black

Programming by Example



Agus Kurniawan

Beaglebone Black Programming By Example

Matthew Scarpino



Beaglebone Black Programming By Example:

BeagleBone Black Programming by Example Agus Kurniawan, BeagleBone Black is a low cost community supported development platform for developers and hobbyists This book helps you to get started with BeagleBone Black development using Python and Node js with Debian Linux platform Several demo samples are be provided to accelerate your learning The following is highlight topics in this book Preparing Development Environment Basic Configuration Serial Debugging BeagleBone Black Programming Language BeagleBone Black I O Programming GPIO Analog I O PWM UART SPI I2C TWI Arduino Development Working with XBee IEEE 802 15 4 OpenCV Development *BeagleBone Black Programming using Matlab* Agus Kurniawan,2015-10-15 MATLAB provides APIs to access BeagleBone Black board This book helps you to get started with BeagleBone Black Programming using Matlab The following the highlight Preparing Development Environment Setting up BeagleBone Black Development for MATLAB Working with GPIO Working with PWM and ADC Working with I2C Working with SPI Working with Serial Port Working with Web Camera Working with BeagleBone Black Linux Command Measuring and Plotting Sensor Data in Real Time Programming the BeagleBone Black: Getting Started with JavaScript and BoneScript Simon Monk,2014-05-06 Program your own BeagleBone Black projects Build creative BeagleBone Black devices no prior programming or electronics experience required In Programming the BeagleBone Black electronics guru Simon Monk explains essential application development methods through straightforward directions and cool downloadable examples Discover how to navigate the board write and debug code use expansion capes and control external hardware Easy to follow plans show you how to wire up and program a Web controlled roving robot and an e mail notifier that lights an incandescent lamp Set up the BeagleBone Black and explore its features Connect to your computer via USB or Ethernet Use the BeagleBone Black as a stand alone PC Write and execute BoneScript code Use JavaScript functions and timers Perform analog and digital I O Work with expansion capes and modules Design Web interfaces that control electronics Assemble and program a robot and an e mail notifier Handbook of Research on Educational Technology Integration and Active Learning Keengwe, Jared,2015-05-31 As today s teachers prepare to instruct a new generation of students the question is no longer whether technology should be integrated into the classroom but only how Forced to combat shorter attention spans and an excess of stimuli teachers sometimes see technology as a threat rather than a potential enhancement to traditional teaching methods The Handbook of Research on Educational Technology Integration and Active Learning explores the need for new professional development opportunities for teachers and educators as they utilize emerging technologies to enhance the learning experience Highlighting the advancements of ubiquitous computing authentic learning and student centered instruction this book is an essential reference source for educators academics students researchers and librarians

Programming the BeagleBone Yogesh Chavan,2016-01-28 Master BeagleBone programming by doing simple electronics and Internet of Things projects About This Book Quickly develop electronics projects that interact with Internet

applications using JavaScript and Python Learn about electronics components such as sensors and motors and how to communicate with them by writing programs A step by step guide to explore the exciting world of BeagleBone from connecting BeagleBone to doing electronics projects and creating IoT applications Who This Book Is For If you want to learn programming on embedded systems with BeagleBone by doing simple electronics projects this book is for you This book is also helpful to BeagleBone owners who want to quickly implement small scale home automation solutions It is assumed that you have familiarity with C and Python programming Some familiarity with electronics is helpful but not essential What You Will Learn Connect your BeagleBone to a computer in different ways and get the Cloud9 IDE running to quick start programming on the BeagleBone Get to know about BeagleBone extension pins such as GPIO and how to connect various electronics components with BeagleBone Read and write to various electronics components such as LED Push button sensors and motors Grasp in depth theory on Analog PWM and BUS programming and the electronics components used in programs Handle data to and from various BUS supporting modules such as UART I2C and SPI using the Adafruit BBIO Python library Write real life IoT applications in JavaScript and Python such as shooting an e mail on overheat and controlling a servo motor remotely Make use of online free cloud services to store and analyze sensor data collected on the BeagleBone Discover what else can be done using the BeagleBone Get to grips with embedded system BUS communication In Detail The whole world is moving from desktop computers to smartphones and embedded systems We are moving towards utilizing Internet of Things IoT An exponential rise in the demand for embedded systems and programming in the last few years is driving programmers to use embedded development boards such as Beaglebone BeagleBone is an ultra small cost effective computer that comes with a powerful hardware It runs a full fledged Debian Linux OS and provides numerous electronics solutions BeagleBone is open source and comes with an Ethernet port which allows you to deploy IoT projects without any additions to the board It provides plenty of GPIO Analog pins and UART I2C SPI pins which makes it the right choice to perform electronics projects This gives you all the benefits of Linux kernel such as multitasking multiusers and extensive device driver support This allows you to do programming in many languages including high level languages such as JavaScript and Python This book aims to exploit the hardware and software capabilities of BeagleBone to create real life electronics and IoT applications quickly It is divided into two parts The first part covers JavaScript programs The second part provides electronics projects and IoT applications in Python First you will learn to use BeagleBone as tool to write useful applications on embedded systems Starting with the basics needed to set up BeagleBone and the Cloud9 IDE this book covers interfacing with various electronics components via simple programs The electronics theory related to these components is then explained in depth before you use them in a program Finally the book helps you create some real life IoT applications Style and approach An easy to follow guide full of real world electronics programs and quick troubleshooting tips using BeagleBone All the required electronics concepts are explained in detail before using them in a program and all programs are explained in depth Most of

the theory is covered in the first part while the second part gives you some quick programs

Mastering Embedded Linux Programming Chris Simmonds, 2017-06-30 Learn to confidently develop debug and deploy robust embedded Linux systems with hands on examples using BeagleBone and QEMU Key Features Step by step guide from toolchain setup to real time programming with hands on implementation Practical insights on kernel configuration device drivers and memory management Covers hardware integration using BeagleBone Black and virtual environments via QEMU Book Description Embedded Linux runs many of the devices we use every day from smart TVs to WiFi routers test equipment to industrial controllers all of them have Linux at their heart Linux is a core technology in the implementation of the interconnected world of the Internet of Things You will begin by learning about the fundamental elements that underpin all embedded Linux projects the toolchain the bootloader the kernel and the root filesystem You ll see how to create each of these elements from scratch and how to automate the process using Buildroot and the Yocto Project Moving on you ll find out how to implement an effective storage strategy for flash memory chips and how to install updates to the device remotely once it is deployed You ll also get to know the key aspects of writing code for embedded Linux such as how to access hardware from applications the implications of writing multi threaded code and techniques to manage memory in an efficient way The final chapters show you how to debug your code both in applications and in the Linux kernel and how to profile the system so that you can look out for performance bottlenecks By the end of the book you will have a complete overview of the steps required to create a successful embedded Linux system What you will learn Evaluate the Board Support Packages offered by most manufacturers of a system on chip or embedded module Use Buildroot and the Yocto Project to create embedded Linux systems quickly and efficiently Update IoT devices in the field without compromising security Reduce the power budget of devices to make batteries last longer Interact with the hardware without having to write kernel device drivers Debug devices remotely using GDB and see how to measure the performance of the systems using powerful tools such as perf ftrace and valgrind Who this book is for This book is for embedded engineers Linux developers and computer science students looking to build real world embedded systems It suits readers who are familiar with basic Linux use and want to deepen their skills in kernel configuration debugging and device integration

GNU/Linux Rapid Embedded Programming Rodolfo Giometti, 2017-03-29 An annotated guide to program and develop GNU Linux Embedded systems quickly Key Features Rapidly design and build powerful prototypes for GNU Linux Embedded systems Become familiar with the workings of GNU Linux Embedded systems and how to manage its peripherals Write monitor and configure applications quickly and effectively manage an external micro controller and use it as co processor for real time tasks Book Description Embedded computers have become very complex in the last few years and developers need to easily manage them by focusing on how to solve a problem without wasting time in finding supported peripherals or learning how to manage them The main challenge with experienced embedded programmers and engineers is really how long it takes to turn an idea into reality and we show you

exactly how to do it This book shows how to interact with external environments through specific peripherals used in the industry We will use the latest Linux kernel release 4.4.x and Debian Ubuntu distributions with embedded distributions like OpenWrt and Yocto The book will present popular boards in the industry that are user friendly to base the rest of the projects on BeagleBone Black SAMA5D3 Xplained Wandboard and system on chip manufacturers Readers will be able to take their first steps in programming the embedded platforms using C Bash and Python PHP languages in order to get access to the external peripherals More about using and programming device driver and accessing the peripherals will be covered to lay a strong foundation The readers will learn how to read write data from to the external environment by using both C programs or a scripting language Bash PHP Python and how to configure a device driver for a specific hardware After finishing this book the readers will be able to gain a good knowledge level and understanding of writing configuring and managing drivers controlling and monitoring applications with the help of efficient quick programming and will be able to apply these skills into real world projects What you will learn Use embedded systems to implement your projects Access and manage peripherals for embedded systems Program embedded systems using languages such as C Python Bash and PHP Use a complete distribution such as Debian or Ubuntu or an embedded one such as OpenWrt or Yocto Harness device driver capabilities to optimize device communications Access data through several kinds of devices such as GPIO s serial ports PWM ADC Ethernet WiFi audio video I2C SPI One Wire USB and CAN Who this book is for This book targets Embedded System developers and GNU Linux programmers who would like to program Embedded Systems and perform Embedded development The book focuses on quick and efficient prototype building Some experience with hardware and Embedded Systems is assumed as is having done some previous work on GNU Linux systems Knowledge of scripting on GNU Linux is expected as well

Mastering Embedded Linux Programming Frank Vasquez,Chris Simmonds,2021-05-14 Build customize and deploy Linux based embedded systems with confidence using Yocto bootloaders and build tools Key Features Master build systems toolchains and kernel integration for embedded Linux Set up custom Linux distros with Yocto and manage board specific configurations Learn real world debugging memory handling and system performance tuning Book DescriptionIf you re looking for a book that will demystify embedded Linux then you ve come to the right place Mastering Embedded Linux Programming is a fully comprehensive guide that can serve both as means to learn new things or as a handy reference The first few chapters of this book will break down the fundamental elements that underpin all embedded Linux projects the toolchain the bootloader the kernel and the root filesystem After that you will learn how to create each of these elements from scratch and automate the process using Buildroot and the Yocto Project As you progress the book will show you how to implement an effective storage strategy for flash memory chips and install updates to a device remotely once it s deployed You ll also learn about the key aspects of writing code for embedded Linux such as how to access hardware from apps the implications of writing multi threaded code and techniques to manage memory in an efficient way The final chapters

demonstrate how to debug your code whether it resides in apps or in the Linux kernel itself You ll also cover the different tracers and profilers that are available for Linux so that you can quickly pinpoint any performance bottlenecks in your system By the end of this Linux book you ll be able to create efficient and secure embedded devices using Linux What you will learn Use Buildroot and the Yocto Project to create embedded Linux systems Troubleshoot BitBake build failures and streamline your Yocto development workflow Update IoT devices securely in the field using Mender or balena Prototype peripheral additions by reading schematics modifying device trees soldering breakout boards and probing pins with a logic analyzer Interact with hardware without having to write kernel device drivers Divide your system up into services supervised by BusyBox runit Debug devices remotely using GDB and measure the performance of systems using tools such as perf ftrace eBPF and Callgrind Who this book is for If you re a systems software engineer or system administrator who wants to learn how to implement Linux on embedded devices then this book is for you It s also aimed at embedded systems engineers accustomed to programming for low power microcontrollers who can use this book to help make the leap to high speed systems on chips that can run Linux Anyone who develops hardware that needs to run Linux will find something useful in this book but before you get started you ll need a solid grasp on POSIX standard C programming and shell scripting

BeagleBone Cookbook Mark A. Yoder, Jason Kridner, 2015-04-03 BeagleBone is an inexpensive web server Linux desktop and electronics hub that includes all the tools you need to create your own projects whether it s robotics gaming drones or software defined radio If you re new to BeagleBone Black or want to explore more of its capabilities this cookbook provides scores of recipes for connecting and talking to the physical world with this credit card sized computer All you need is minimal familiarity with computer programming and electronics Each recipe includes clear and simple wiring diagrams and example code to get you started If you don t know what BeagleBone Black is you might decide to get one after scanning these recipes Learn how to use BeagleBone to interact with the physical world Connect force light and distance sensors Spin servo motors stepper motors and DC motors Flash single LEDs strings of LEDs and matrices of LEDs Manage real time input output I O Work at the Linux I O level with shell commands Python and C Compile and install Linux kernels Work at a high level with JavaScript and the BoneScript library Expand BeagleBone s functionality by adding capes Explore the Internet of Things

[30 BeagleBone Black Projects for the Evil Genius](#) Christopher Rush, 2014-09-26 Fiendishly Fun Ways to Use the BeagleBone Black This wickedly inventive guide shows you how to program and build fun and fascinating projects with the BeagleBone Black You ll learn how to connect the BeagleBone Black to your computer and program it quickly mastering BoneScript and other programming tools so you can get started right away 30 BeagleBone Black Projects for the Evil Genius is filled with a wide variety of do it yourself LED sensor robotics display audio and spy gadgets You ll also get tips and techniques that will help you design your own ingenious devices Features step by step instructions and helpful illustrations Provides full schematic and breadboard layout diagrams for the projects Includes detailed programming code Removes the

frustration factor all required parts are listed along with sources Build these and other clever creations High powered LED Morse code sender RGB LED fader GPS tracker Temperature sensor Light level indicator Web controlled rover Plant hydration system Sentinel turret 7 segment clock Display for sensor information Internet radio Imperial march indicator Intruder alert using Twitter API Lie detector Auto dog barker

Data Science: New Issues, Challenges and Applications Gintautas Dzemyda, Jolita Bernatavičienė, Janusz Kacprzyk, 2020-02-13 This book contains 16 chapters by researchers working in various fields of data science They focus on theory and applications in language technologies optimization computational thinking intelligent decision support systems decomposition of signals model driven development methodologies interoperability of enterprise applications anomaly detection in financial markets 3D virtual reality monitoring of environmental data convolutional neural networks knowledge storage data stream classification and security in social networking The respective papers highlight a wealth of issues in and applications of data science Modern technologies allow us to store and transfer large amounts of data quickly They can be very diverse images numbers streaming related to human behavior and physiological parameters etc Whether the data is just raw numbers crude images or will help solve current problems and predict future developments depends on whether we can effectively process and analyze it Data science is evolving rapidly However it is still a very young field In particular data science is concerned with visualizations statistics pattern recognition neurocomputing image analysis machine learning artificial intelligence databases and data processing data mining big data analytics and knowledge discovery in databases It also has many interfaces with optimization block chaining cyber social and cyber physical systems Internet of Things IoT social computing high performance computing in memory key value stores cloud computing social computing data feeds overlay networks cognitive computing crowdsourcing analysis log analysis container based virtualization and lifetime value modeling Again all of these areas are highly interrelated In addition data science is now expanding to new fields of application chemical engineering biotechnology building energy management materials microscopy geographic research learning analytics radiology metal design ecosystem homeostasis investigation and many others

BeagleBone Cookbook Mark A. Yoder, Jason Kridner, 2015-04-03 BeagleBone is an inexpensive web server Linux desktop and electronics hub that includes all the tools you need to create your own projects whether it's robotics gaming drones or software defined radio If you're new to BeagleBone Black or want to explore more of its capabilities this cookbook provides scores of recipes for connecting and talking to the physical world with this credit card sized computer All you need is minimal familiarity with computer programming and electronics Each recipe includes clear and simple wiring diagrams and example code to get you started If you don't know what BeagleBone Black is you might decide to get one after scanning these recipes Learn how to use BeagleBone to interact with the physical world Connect force light and distance sensors Spin servo motors stepper motors and DC motors Flash single LEDs strings of LEDs and matrices of LEDs Manage real time input output I/O Work at the Linux I/O level with shell commands Python and C

Compile and install Linux kernels Work at a high level with JavaScript and the BoneScript library Expand BeagleBone s functionality by adding capes Explore the Internet of Things **BeagleBone For Dummies** Rui Santos,Luís Miguel Costa Perestrelo,2015-02-23 The definitive easy to use guide to the popular BeagleBone board BeagleBone For Dummies is the definitive beginner s guide to using the popular BeagleBone board to learn electronics and programming Unlike other books that require previous knowledge of electronics Linux and Python this one assumes you know nothing at all and guides you step by step throughout the process of getting acquainted with your BeagleBone Original or BeagleBone Black You ll learn how to get set up use the software build the hardware and code your projects with plenty of examples to walk you through the process You ll move carefully through your first BeagleBone project then get ideas for branching out from there to create even better more advanced programs The BeagleBone is a tiny computer board about the size of a credit card that has all the capability of a desktop Its affordability and ease of use has made it popular among hobbyists hardware enthusiasts and programmers alike and it s time for you to join their ranks as you officially dive into the world of microcomputers This book removes the guesswork from using the popular BeagleBone board and shows you how to get up and running in no time Download the operating system and connect your BeagleBone Learn to navigate the desktop environment Start programming with Python and Bonescript Build your first project and find plans for many more To learn BeagleBone you could spend hours on the Internet and still never find the information you need or you can get everything you need here This book appeals to all new and inexperienced hobbyists tinkerers electronics gurus hackers budding programmers engineers and hardware geeks who want to learn how to get the most out of their powerful BeagleBone **BeagleBone Essentials** Rodolfo Giometti,2015-05-28 If you are a developer with some hardware or electrical engineering experience who wants to learn how to use embedded machine learning capabilities and get access to a GNU Linux device driver to collect data from a peripheral or to control a device this is the book for you **Digital Health** Alan Godfrey,Sam Stuart,2021-07-06 Digital Health Exploring Use and Integration of Wearables is the first book to show how and why engineering theory is used to solve real world clinical applications considering the knowledge and lessons gathered during many international projects This book provides a pragmatic A to Z guide on the design deployment and use of wearable technologies for laboratory and remote patient assessment aligning the shared interests of diverse professions to meet with a common goal of translating engineering theory to modern clinical practice It offers multidisciplinary experiences to guide engineers where no clinically advice and expertise may be available Entering the domain of wearables in healthcare is notoriously difficult as projects and ideas often fail to deliver due to the lack of clinical understanding i e what do healthcare professionals and patients really need This book provides engineers and computer scientists with the clinical guidance to ensure their novel work successfully translates to inform real world clinical diagnosis treatment and management Presents the first guide for wearable technologies in a multidisciplinary and translational manner Helps engineers design real world applications to help them

better understand theory and drive pragmatic clinical solutions Combines the expertise of engineers and clinicians in one go to guide accessible to all *BeagleBone By Example* Jayakarthygeyan Prabakar,2016-08-31 Learn how to build physical computing systems using BeagleBone Black and Python About This Book Get to grips with the fundamentals of BeagleBone Leverage Python scripts to program BeagleBone for your requirements Build four exciting projects from home automation to a tele controlled robot Who This Book Is For This book is intended for hobbyists and consumers who wish to create impressive projects using BeagleBone You must be familiar with Python programming What You Will Learn Program on BeagleBone Black using Python Interface sensors and actuators to BeagleBone Black Build your own real time physical computing systems Connect physical computing systems to cloud servers Build your own home automation and home security system Build your own tele controlled robot with real time video streaming In Detail BeagleBone is a low cost community supported development platform to develop a variety of electronic projects This book will introduce you to BeagleBone and get you building fun cool and innovative projects with it Start with the specifications of BeagleBone Black and its operating systems then get to grips with the GPIOs available in BeagleBone Black Work through four types of exciting projects building real time physical computing systems home automation image processing for a security system and building your own tele controlled robot and learn the fundamentals of a variety of projects in a single book By the end of this book you will be able to write code for BeagleBone in order to operate hardware and impart decision making capabilities with the help of efficient coding in Python Style and approach This book is a step by step guide that will walk you through the fundamentals of building different projects using BeagleBone Black **Designing Circuit Boards with EAGLE** Matthew Scarpino,2014-03-27 Matt Scarpino has provided a great tool for the hobbyist starting out in the circuit board design world demonstrating all the features you ll need to create your own circuit board projects However the experienced engineer will also benefit from the book as it serves as a complete reference guide to all EAGLE software configuration settings and features His insightful guidance helps simplify difficult tasks and his handy tips will help save you hours of trial and error experimentation Rich Blum author Sams Teach Yourself Arduino Programming in 24 Hours and Sams Teach Yourself Python Programming for Raspberry Pi in 24 Hours Powerful flexible and inexpensive EAGLE is the ideal PCB design solution for every Maker DIYer startup hobbyist or student Today all open source Arduino designs are released in EAGLE format If you want to design cost effective new PCBs this is the tool to learn Matthew Scarpino helps you take full advantage of EAGLE s remarkable capabilities You won t find any differential equations here only basic circuit theory and hands on techniques for designing effective PCBs and getting innovative new gadgets to market Scarpino starts with an accessible introduction to the fundamentals of PCB design Next he walks through the design of basic intermediate and complex circuit boards starting with a simple inverting amplifier and culminating in a six layer single board computer with hundreds of components and thousands of routed connections As the circuits grow more complex you ll master advanced EAGLE features and discover

how to automate crucial design related tasks Whatever your previous experience Scarpino's start to finish examples and practical insight can help you create designs of stunning power and efficiency Understand single sided double sided and multilayer boards Design practical circuits with the schematic editor Transform schematics into physical board designs Convert board designs into Gerber output files for fabrication Expand EAGLE's capabilities with new libraries and components Exchange designs with LTspice and simulate their responses to input Automate simple repetitive operations with editor commands Streamline circuit design and library generation with User Language programs ULPs Design for the advanced BeagleBone Black with high speed BGA devices and a 32 bit system on a chip SoC Use buses to draw complex connections between components Configure stackups create route BGA components and route high speed signals eagle book com provides an archive containing the design files for the book's circuits It also includes EAGLE libraries scripts and User Language programs ULPs

Exploring BeagleBone Derek Molloy,2014-12-31 In depth instruction and practical techniques for building with the BeagleBone embedded Linux platform Exploring BeagleBone is a hands on guide to bringing gadgets gizmos and robots to life using the popular BeagleBone embedded 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 the 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 [Android for the BeagleBone Black](#)

Andrew Henderson,Aravind Prakash,2015-02-19 If you are an Android app developer who wants to experiment with the hardware capabilities of the BeagleBone Black platform then this book is ideal for you You are expected to have basic knowledge of developing Android apps but no prior hardware experience is required *Learning BeagleBone Python*

Programming Alexander Hiam, 2015-07-14 BeagleBone is a barebone computer that can be configured and customized for different applications and is almost half the price of a standard computer This book will cover the basics of how BeagleBone Black s hardware interface subsystems work and can be controlled using two popular Python libraries for BeagleBone Black You will be introduced to BeagleBone Black s GPIO PWM ADC UART SPI I2C and eQEP subsystems We will then dive deep into more complex built in peripherals demonstrating different ways to receive input from a user including buttons potentiometers and rotary encoders with the eQEP module We will also learn about interfacing with external devices this will be demonstrated using the serial modules to interface with external devices such as temperature sensors and accelerometers Towards the end of the book we will present a couple of real world problems and demonstrate how to solve them with the skills you ve acquired

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