BEAGLEBONE BLACK PROGRAMMING BY EXAMPLE

Beaglebone Black Programming by Example: A Hands-On Guide for Beginners and Enthusiasts

beaglebone black programming by example opens up an exciting world for both hobbyists and professionals interested in embedded systems, robotics, and IoT projects. This single-board computer offers a powerful platform to learn low-level programming, hardware interaction, and software development in a practical, hands-on manner. Whether you are just starting or looking to deepen your understanding, exploring beaglebone black programming through real examples can make the learning process intuitive and rewarding.

In this article, we'll dive into the essentials of beaglebone black programming by example, covering everything from setting up the environment to writing code that interacts with sensors and actuators. Along the way, you'll gain insights on Linux-based development, GPIO manipulation, and peripheral interfacing, all critical skills for mastering the BeagleBone Black.

Getting Started with BeagleBone Black Programming by Example

Before jumping into coding, it's crucial to prepare your BeagleBone Black and development setup. The board runs a Debian-based Linux operating system, making it versatile and accessible. Here's how to get started:

Setting Up Your Development Environment

The BeagleBone Black comes with a pre-installed Linux distribution, but you may want to flash a fresh image or update it to the latest version. You can download the official Debian image from the BeagleBoard website and flash it onto a microSD card if you prefer booting from external storage.

To program the board:

- Connect the BeagleBone Black to your PC via USB.
- Access it via SSH using the default IP address (usually 192.168.7.2) or USB serial connection.
- Install necessary development tools such as Python, Node.js, or C compilers depending on your preferred programming language.

This setup creates an ideal base for running your example programs and experimenting with real hardware.

Choosing the Right Programming Language

One of the advantages of BeagleBone Black is the flexibility in programming languages. Common choices include:

- **Python**: Great for beginners and rapid prototyping with libraries like Adafruit_BBIO for GPIO control.
- **C/C++**: Offers low-level hardware access and better performance, suitable for demanding applications.
- **JavaScript (Node.js)**: Ideal for web-connected projects and asynchronous event handling.
- **Shell scripting**: Useful for quick automation and system-level tasks.

For beaglebone black programming by example, Python often strikes the perfect balance between simplicity and control, especially when interacting with the board's GPIO pins.

Interfacing with GPIO: Practical Programming Examples

General Purpose Input/Output (GPIO) pins are the fundamental interface between the BeagleBone Black and the external world. Learning to control and read these pins is a cornerstone of beaglebone black programming by example.

Blinking an LED

Let's start with the classic "blink" example, which involves toggling an LED on and off to confirm your setup is working correctly.

Example using Python:

```python
import Adafruit_BBIO.GPIO as GPIO
import time

LED_PIN = "P9_14"

GPIO.setup(LED_PIN, GPIO.OUT)

try:
while True:
GPIO.output(LED_PIN, GPIO.HIGH)
time.sleep(1)
GPIO.output(LED_PIN, GPIO.LOW)
time.sleep(1)
except KeyboardInterrupt:
GPIO.cleanup()
```

This code initializes the LED pin as an output and toggles its state every second, demonstrating basic GPIO manipulation. It's a simple yet effective introduction to beaglebone black programming by example.

Reading a Push Button Input

Interfacing with input devices like buttons is another essential skill. Here's an example of reading a push button press:

```python
BUTTON_PIN = "P9_12"

GPIO.setup(BUTTON_PIN, GPIO.IN)

try:
while True:
if GPIO.input(BUTTON_PIN):
print("Button Pressed!")
time.sleep(0.1)
except KeyboardInterrupt:
GPIO.cleanup()
```

This snippet constantly checks the button state and prints a message when pressed. Combining input and output programming allows you to build interactive projects such as alarms, counters, or control panels.

Using Analog Inputs and PWM Outputs

BeagleBone Black's analog-to-digital converters (ADC) and Pulse Width Modulation (PWM) capabilities extend its usability beyond digital signals, enabling you to work with sensors and control motors or LEDs with variable brightness.

Reading Analog Sensors

Unlike many microcontrollers, BeagleBone Black supports multiple analog inputs, which is perfect for reading sensors like potentiometers, temperature sensors, or light sensors.

Example: Reading an analog input in Python

```python
import Adafruit_BBIO.ADC as ADC
import time

ADC.setup()
sensor_pin = “P9_40”

try:
while True:
value = ADC.read(sensor_pin)
voltage = value * 1.8 # ADC reference voltage is 1.8V
print(f“Sensor Voltage: {voltage:.2f} V”)
time.sleep(1)
except KeyboardInterrupt:
pass
```

This example demonstrates how to convert raw ADC readings into voltage values, providing real-time sensor data for your projects.

Controlling Motors with PWM

Pulse Width Modulation is essential when you want to control motor speed or LED brightness. BeagleBone Black has dedicated PWM pins accessible from the OS.

Example: Dimming an LED using PWM

```python
import Adafruit_BBIO.PWM as PWM
import time

PWM_PIN = “P9_14”

PWM.start(PWM_PIN, 0) # Start with 0% duty cycle

try:
while True:
for dc in range(0, 101, 5):
```

```
PWM.set_duty_cycle(PWM_PIN, dc)
time.sleep(0.1)
for dc in range(100, -1, -5):
PWM.set_duty_cycle(PWM_PIN, dc)
time.sleep(0.1)
except KeyboardInterrupt:
PWM.stop(PWM_PIN)
PWM.cleanup()
```

This code smoothly increases and decreases the brightness of an LED by adjusting the PWM duty cycle, showcasing a practical application of beaglebone black programming by example.

Advanced BeagleBone Black Programming by Example

Once you're comfortable with basic input/output, you can explore more complex concepts such as device tree overlays, real-time programming, and interfacing with communication protocols.

Using I2C and SPI for Sensor Communication

Many sensors and modules communicate via I2C or SPI buses. BeagleBone Black supports these protocols, allowing you to connect a wide range of devices like accelerometers, displays, and memory chips.

Example: Reading temperature from an I2C sensor

Using the SMBus library in Python, you can read data from an I2C device:

```python
import smbus
import time

bus = smbus.SMBus(2) # I2C bus number on BeagleBone Black
sensor_address = 0x48 # Example sensor address

def read_temperature():
temp_reg = 0x00
raw = bus.read_word_data(sensor_address, temp_reg)
# Convert raw data to temperature depending on sensor datasheet
temp = ((raw & 0xff) <> 8) # Swap bytes
temp_c = temp * 0.0625
return temp_c

try:
while True:
temperature = read_temperature()
print(f"Temperature: {temperature:.2f} C")
time.sleep(1)
except KeyboardInterrupt:
pass
```

This example highlights how beaglebone black programming by example can extend to real-world sensor integration.

Real-Time Control and PRU Programming

For applications requiring precise timing or high-speed data processing, the BeagleBone Black's Programmable Real-time Units (PRUs) provide a dedicated microcontroller subsystem. Programming the PRUs involves using assembly or C and requires deeper knowledge but opens doors to advanced robotics, signal processing, and industrial control.

While this topic is more advanced, starting with simple PRU examples such as toggling pins at precise intervals can be a rewarding next step after mastering the basics.

Tips for Effective BeagleBone Black Programming by Example

Learning beaglebone black programming through examples is most effective when combined with good practices:

- **Experiment incrementally**: Start with simple scripts and gradually add complexity.
- **Use community resources**: Websites, forums, and GitHub repositories offer countless example projects.
- **Document your code**: Clear comments and structure help you and others understand your projects.
- **Leverage libraries**: Using well-maintained libraries like Adafruit_BBIO or PyBBIO can save time and reduce errors.
- **Understand hardware schematics**: Knowing the pinout and electrical limits helps avoid damaging your board or peripherals.
- **Backup your work**: Keep copies of your code and configurations to recover quickly from mistakes.

Embracing a project-based approach, where you build something tangible—like a weather station, robotic arm, or home automation device—can solidify your skills while keeping the process engaging.

BeagleBone Black programming by example is not just about writing code; it's about bringing ideas to life with hardware and software working seamlessly. With patience and curiosity, you'll find this platform a robust and exciting gateway into the world of embedded systems development.

Frequently Asked Questions

What is BeagleBone Black and why is it popular for programming by example?

BeagleBone Black is a low-cost, community-supported development platform for developers and hobbyists. It is popular for programming by example because it offers extensive GPIO pins, supports multiple programming languages, and has a large online community with numerous tutorials and example projects.

Which programming languages are commonly used for BeagleBone Black programming by example?

Common programming languages for BeagleBone Black include Python, C/C++, JavaScript (with Node.js), and Shell scripting. Python is especially popular due to its simplicity and the availability of libraries like Adafruit_BBIO for hardware interaction.

How can I start programming GPIO pins on the BeagleBone Black by example?

To start programming GPIO pins, you can use Python with the Adafruit_BBIO library. An example includes importing the library, setting a pin as output, and toggling its state. Many tutorials provide step-by-step examples to make it easier for beginners.

Are there any example projects for BeagleBone Black that demonstrate sensor interfacing?

Yes, there are numerous example projects such as interfacing temperature sensors (like the TMP36), ultrasonic distance sensors, and light sensors. These projects typically include code examples in Python or C demonstrating how to read sensor data through ADC or GPIO pins.

How do I program the BeagleBone Black to control motors by example?

Programming motor control involves using PWM signals to control speed and direction. Example code is available in Python using the Adafruit_BBIO.PWM module, where you initialize PWM on specific pins and adjust duty cycles to control motor speed.

Can I use Node.js for BeagleBone Black programming by example?

Yes, Node.js is supported on BeagleBone Black, and libraries like 'bonescript' allow easy hardware interaction. There are many example scripts available that demonstrate reading sensors, controlling LEDs, and handling I/O operations using JavaScript.

What are some good resources for finding BeagleBone Black programming examples?

Good resources include the official BeagleBone Black website, GitHub repositories, online forums like the BeagleBoard Google Group, and tutorial websites such as Adafruit and Hackster.io, which offer numerous example projects and code snippets.

How do I program the BeagleBone Black to connect to the internet by example?

You can program the BeagleBone Black to connect to the internet using built-in Ethernet or Wi-Fi dongles. Example projects often use Python libraries like 'requests' to perform HTTP operations or MQTT clients for IoT communication, with sample code available in many tutorials.

Is it possible to run real-time applications on BeagleBone Black by example?

Yes, BeagleBone Black supports real-time programming using the PRU (Programmable Real-time Unit) processors. Example projects demonstrate how to write PRU assembly or C code to handle time-sensitive tasks, allowing precise control over hardware timing.

Additional Resources

Beaglebone Black Programming by Example: An In-Depth Exploration

beaglebone black programming by example serves as a practical gateway into the world of embedded systems development, offering engineers, hobbyists, and educators an accessible platform for hands-on learning. The BeagleBone Black (BBB) is a low-cost, community-supported development board renowned for its versatility and robust capabilities. This article delves into the nuances of programming the BeagleBone Black through concrete examples, highlighting its architecture, programming environments, and real-world applications.

Understanding the BeagleBone Black Architecture

Before embarking on beaglebone black programming by example, it is essential to grasp the hardware foundation that makes the BBB a preferred choice for embedded projects. At its core, the BeagleBone Black features a 1 GHz ARM Cortex-A8 processor, 512 MB of DDR3 RAM, and 4 GB of onboard eMMC flash storage. This configuration offers a balance between processing power and energy efficiency, making it suitable for a diverse set of applications, from robotics to IoT devices.

Additionally, the BBB boasts a rich set of input/output options including 2x 46-pin headers, multiple serial communication interfaces (UART, SPI, I2C), analog inputs, and programmable real-time units (PRUs). These features enable developers to interface with sensors, actuators, and other peripherals seamlessly.

Why Choose BeagleBone Black for Programming?

The BeagleBone Black stands out when compared to other development boards such as Raspberry Pi or Arduino due to its real-time capabilities and extensive I/O flexibility. While Raspberry Pi excels in multimedia and general-purpose computing, the BBB's PRUs offer deterministic timing control, which is invaluable in industrial automation or motor control applications.

Furthermore, beaglebone black programming by example leverages a Linux-based operating system (typically Debian), providing access to a mature software ecosystem and numerous programming languages including Python, C/C++, and JavaScript. This blend of hardware and software flexibility makes the BBB a compelling platform for both beginners and seasoned programmers.

Getting Started: Setting Up Your BeagleBone Black Environment

Programming the BeagleBone Black effectively requires an initial setup phase that includes flashing the operating system, establishing connectivity, and installing necessary development tools.

Flashing the Operating System

The official Debian image is the most widely used operating system for the BBB. Flashing this image onto the eMMC memory can be done via a microSD card or USB connection using tools like Etcher. This process prepares the board for development by ensuring a stable and up-to-date Linux environment.

Establishing Connectivity

The BeagleBone Black supports both USB and Ethernet connections, which can be used for SSH access. This remote login capability allows developers to write, compile, and test code without needing a dedicated display or keyboard connected to the board.

Installing Development Tools

A variety of programming languages and tools are compatible with the BBB. For instance, Python is popular due to its readability and extensive libraries for hardware interaction. Installing packages such as Adafruit_BBIO enables easy control of GPIO pins. Similarly, C/C++ developers can utilize GCC toolchains and libraries tailored for embedded development.

Beaglebone Black Programming by Example: Practical Applications

To demonstrate the power and flexibility of the BeagleBone Black, it is instructive to explore some concrete programming examples that cover a range of functionalities.

Example 1: Blinking an LED Using Python

One of the simplest yet most illustrative examples in beaglebone black programming by example is toggling an onboard LED. This exercise introduces GPIO control and basic script execution.

```python
import Adafruit_BBIO.GPIO as GPIO
import time

LED_PIN = ”P8_14”
GPIO.setup(LED_PIN, GPIO.OUT)

try:
while True:
GPIO.output(LED_PIN, GPIO.HIGH)
time.sleep(1)
GPIO.output(LED_PIN, GPIO.LOW)
time.sleep(1)
except KeyboardInterrupt:
GPIO.cleanup()
```

This script configures a GPIO pin as output and alternates it between HIGH and LOW states, causing the LED to blink every second. It encapsulates the essence of hardware control through software, a foundational skill in embedded development.

Example 2: Reading Analog Sensor Data

The BeagleBone Black includes a set of 7 analog inputs, accessible via the built-in ADC. Reading sensor data can be achieved by accessing system files or via dedicated libraries.

Here is an example snippet in Python to read the voltage from analog pin AIN0:

```python
def read_adc():
with open(”/sys/bus/iio/devices/iio:device0/in_voltage0_raw”, ’r’) as f:
raw_value = int(f.read())
voltage = (raw_value * 1.8) / 4095 # Convert raw ADC value to voltage (0-1.8V)
return voltage

print(”Analog input voltage: {:.2f} V”.format(read_adc()))
```

This example demonstrates how to interface with hardware sensors, a critical step in applications such as environmental monitoring or data acquisition.

Example 3: Controlling a Servo Motor with PWM

Pulse Width Modulation (PWM) is often used to control motor speed or position. The BeagleBone Black supports multiple PWM outputs, which can be harnessed to drive servo motors.

Below is a simplified example of generating a PWM signal using the Adafruit_BBIO library:

```python
import Adafruit_BBIO.PWM as PWM
import time

PWM_PIN = “P9_14”
PWM.start(PWM_PIN, 7.5) # 7.5% duty cycle corresponds to a neutral servo position

try:
while True:
PWM.set_duty_cycle(PWM_PIN, 5) # Move to 0 degrees
time.sleep(1)
PWM.set_duty_cycle(PWM_PIN, 10) # Move to 180 degrees
time.sleep(1)
except KeyboardInterrupt:
PWM.stop(PWM_PIN)
PWM.cleanup()
```

This example not only illustrates PWM usage but also highlights the importance of precise timing in hardware control.

Advanced Programming Techniques and Tools

As developers progress beyond basic examples, the BeagleBone Black supports advanced programming paradigms and tools that facilitate complex project development.

Using PRUs for Real-Time Processing

The PRUs (Programmable Real-Time Units) embedded within the BBB’s Sitara processor are unique features that enable deterministic, low-latency processing separate from the main CPU. Programming PRUs requires specialized toolchains and knowledge of assembly or C tailored for these microcontrollers.

Applications benefiting from PRU programming include motor control, signal processing, and time-critical data acquisition where Linux’s non-real-time kernel would be insufficient.

Cross-Compiling and Remote Debugging

Developers often prefer to write and compile code on a more powerful host PC before deploying it to the BeagleBone Black. Cross-compilation toolchains streamline this workflow, enabling efficient iteration cycles.

Moreover, remote debugging tools such as GDBserver allow debugging on the target hardware while interfacing through an IDE on the host machine, enhancing productivity and reducing development time.

Integrating with IoT and Cloud Services

BeagleBone Black programming by example increasingly involves connectivity to cloud platforms and IoT frameworks. By leveraging Python libraries such as MQTT clients or HTTP APIs, the BBB can transmit sensor data to cloud dashboards or receive commands from remote applications.

This integration expands the BBB's role from a standalone embedded board to a node within larger distributed systems, aligning with modern trends in connected device ecosystems.

Comparative Perspective: BeagleBone Black vs. Other Development Boards

While beaglebone black programming by example emphasizes the board's unique features, understanding its position relative to alternatives informs appropriate project selection.

- **Raspberry Pi:** Offers higher CPU performance and multimedia capabilities but lacks real-time processing units, which limits deterministic control.
- **Arduino:** Simpler microcontroller boards with easier programming for beginners but less processing power and memory.
- **NVIDIA Jetson Nano:** Geared towards AI and GPU-intensive tasks but at a higher cost and power consumption.

The BeagleBone Black thus occupies a middle ground, providing sufficient processing power, real-time control, and I/O flexibility at an affordable price point.

Community and Support Resources

One of the strengths underpinning beaglebone black programming by example is the active and supportive community. Resources such as the official BeagleBoard forums, GitHub repositories, and dedicated tutorials provide invaluable assistance to developers navigating challenges.

Moreover, comprehensive documentation and example projects facilitate learning and inspire innovation, making the BBB a platform conducive to experimentation and professional development alike.

The BeagleBone Black continues to maintain relevance in the embedded systems landscape by balancing hardware capabilities with accessible programming environments. Through practical examples and evolving toolsets, developers are empowered to create solutions that span simple educational demonstrations to complex industrial applications.

Beaglebone Black Programming By Example

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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

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beaglebone black programming by example: BeagleBone By Example Jayakarthigeyan 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.

beaglebone black programming by example: 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 DescriptionEmbedded 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 inter-connected 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 perk, 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.

beaglebone black programming by example: *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, Anlaog 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.

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Cortex A8 processor capable of running numerous mobile and desktop-capable operating systems, typically variants of Linux including Debian, Android, and Ubuntu. Yet, BeagleBone is small enough to fit in a small mint tin box. The Bone may be used in a wide variety of projects from middle school science fair projects to senior design projects to first prototypes of very complex systems. Novice users may access the power of the Bone throughthe user-friendly BoneScript software, experienced through a Web browser in most major operating systems, including Microsoft Windows, Apple Mac OS X, or the Linux operating systems. Seasoned users may take full advantage of the Bone's power using the underlying Linux-based operating system, a host of feature extension boards (Capes) and a wide variety of Linux community open source libraries. This book provides an introduction to this powerful computer and has been designed for a wide variety of users including the first time novice through the seasoned embedded system design professional. The book contains background theory on system operation coupled with many well-documented, illustrative examples. Examples for novice users are centered on motivational, fun robot projects while advanced projects follow the theme of assistive technology and image-processing applications.

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