



BeagleBone Black Interfacing: hardware and software

Yury Magda

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The BeagleBone Black development board can be an excellent choice for building various measurement and control systems by developers and hobbyists.

This book is thought as a highly practical guide that can help readers to design measurement and control systems driven by the BeagleBone Black. These systems can comprise external electronic circuits controlled by programs written in Python. Since many measurement systems process analog signals, the guide contains practical applications using popular high-resolution analog-to-digital converters. The guide also covers processing small signals with instrumentation amplifiers and a frequency measurement of digital signals using high-precision PWM-To-Voltage converters.

The guide also contains the material dedicated to digital signal synthesis with digital potentiometers and digital-to-analog converters. The readers will find practical designs of digitally programmable wide-band oscillators, signal amplifiers and PWM circuits. The guide describes practical aspects of interfacing and programming high-precision wide-band sinusoidal and rectangular waveform generators using a popular high-resolution Direct Digital Synthesizer AD9850.

A few projects from the book cover designing network and distributed systems with the BeagleBone Black. The guide also includes projects dedicated to interfacing the BeagleBone Black with popular Arduino Uno and Arduino Due boards. Each project is accompanied by a brief description which helps to make things clear.

Many embedded systems should operate in real-time environment, so the guide contains the projects of real-time systems with the BeagleBone Black. The demo projects of real-time systems use the BeagleBone Black and a very low-cost MSP-EXP432P401R LaunchPad by Texas Instruments.

The BeagleBone Black can be easily fit into wireless systems. The part of material is dedicated to designing the measurement and control systems using Wixel Programmable USB Wireless modules from Pololu Corp. A few projects illustrate the use of a Bluetooth protocol in simple wireless systems built around the BeagleBone Black, desktop PC and Arduino Due.

Most projects described in the book can be improved or modified if necessary. Each project includes a circuit diagram accompanied by the Python source code. The projects with Arduino Uno and Arduino Due also include the source code written in the Processing language. All projects were designed and tested on the BeagleBone Black Rev.C running Debian Linux.

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