Pyboard Microcontroller Using MicroPython

Introduction

This is a review of the Pyboard Microcontroller and MicroPython. Microcontrollers are used for many applications requiring data collection, real-world sensing, and control of real world interfaces. Traditionally, microcontrollers run programs from a compiled C or C++ program. The Pyboard Microcontroller allows for rapid prototyping using the high level language MicroPython as its underlying operating system (OS). This microcontroller has similar specifications and capabilities as other microcontrollers on the market, however, no microcontroller has used a high level language such as Python to run its underlying OS.

Common Microcontrollers on the Market

Mbed Microcontroller

The Mbed LPC1768 is powered by a Cortex-M3 at 96Mhz and has 512KB flash memory as well as 32KB RAM [1]. This microcontroller is mid-range in terms of hardware specifications. The cost is approximately 49 USD. It operates using C++ and an online integrated development environment (IDE). The microcontroller has no extra features built-in, but does have 30 IO pins as well as Ethernet functionality. The Mbed has a large developer community and thus many libraries, which are plug and play, allowing for rapid deployment of code.

Arduino Microcontroller

The Arduino Uno is powered by an ATmega328P at 16MHz and has 32KB flash memory as well as 2KB RAM [2]. This microcontroller is on the lower end of the spectrum in terms of hardware specifications. The cost is approximately 25 USD. It operates on a modified version of C++ and has its own online and offline IDE. The microcontroller has no extra features built-in, but does have 18 IO pins. Arduino has the largest developer community and the lowest initial learning curve due to its many premade code templates.

Pyboard Microcontroller

The Pyboard is powered by a Cortex-M4 at 168Mhz and has 1024KB flash memory as well as 192KB RAM [3]. The board contains an onboard accelerometer and a micro SD card slot. This microcontroller contains the higher end hardware specifications than most mainstream microcontrollers. The cost is approximately 45 USD. It operates on a modified version of Python called MicroPython. This is one of the newest microcontrollers on the market and has a growing developer community. However, it has no IDE and requires a higher level of aptitude to deploy code. Once a method of code deployment is established, this will be the easiest microcontroller to use due to its use of a high level language.

Technology Behind MicroPython

MicroPython OS

MicroPython is a subset of the Python 3 language that is designed to run on microcontrollers in a memory constrained environment [4]. The language has a 98.4% coverage of the core functionality of Python 3 [5]. This gives the user the capability to deploy a high-level programming language onto a low level microcontroller without having to learn a, more complex, low level programming language. MicroPython functions as both a Python compiler and a runtime environment, which allows the user to execute Python commands straight on the board [5]. It also includes a new Python library called "machine" which assists with accessing low level hardware [5].

Code Deployment

Python scripts can be directly executed by typing them into the command after establishing a serial connection with the Pyboard. However, this method of code deployment is limiting as scripts cannot be run on boot using this method [6]. The Pyboard contains an internal filesystem which allows for the user to store code that will be run after the boot sequence [6]. Using the Adafruit MicroPython Tool (ampy) the user can access the filesystem and copy scripts to run on the Pyboard after the boot sequence.

Bluetooth Module

The Pyboard has 16 IO pins which allows for a wide range of accessories which can be utilized alongside the microcontroller. The Bluetooth module offers great capability in serial data transfer. One of the most useful features is the capability for the user to use a wireless command prompt via Bluetooth [6]. Thus, code can be deployed and data can be transferred using this module.

Future of Pyboard

The Pyboard has a growing developer community and will continue to get more features as more developers begin using this technology. The MicroPython project has raised over 120,000 USD towards developing the OS and campaign continues expanding [7]. This technology is the first of its kind and offers great future outlook.

References

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