

Microprocessor Systems

Scope

This document describes microprocessor systems under consideration for the drone project(s). System includes a range of sizes of related boards together with a software environment. All are open source hardware and software.

Systems described:

- Raspberry Pi
- Arduino
- BeagleBone (incomplete)

Raspberry Pi

Systems range in size from:



Raspberry Pi Model B+

To:



Raspberry Pi Zero W

Common Features

Primary programming environment is a variant of Debian Linux. Programming can be in any language supported by Linux. Python is emphasized, but C, C++ , and Perl are available.

Operating System and programs are on a Micro SD card.

A terminal screen is via HDMI with Micro connector on the small board.

Keyboard and mouse is connected via USB. Also, possibly Bluetooth, although I have not tested it.

A dedicated camera connection (ribbon cable) is present. These connect to dedicated camera models with several choices: 5MP and 8MP. I plan on the 8MP for video and still pictures. The 5MP will be used for positioning.

ADC 8 channels

PWM output

SPI and I2C

The larger device has

Dedicated support for a dedicated terminal screen

Four USB ports rather than one.

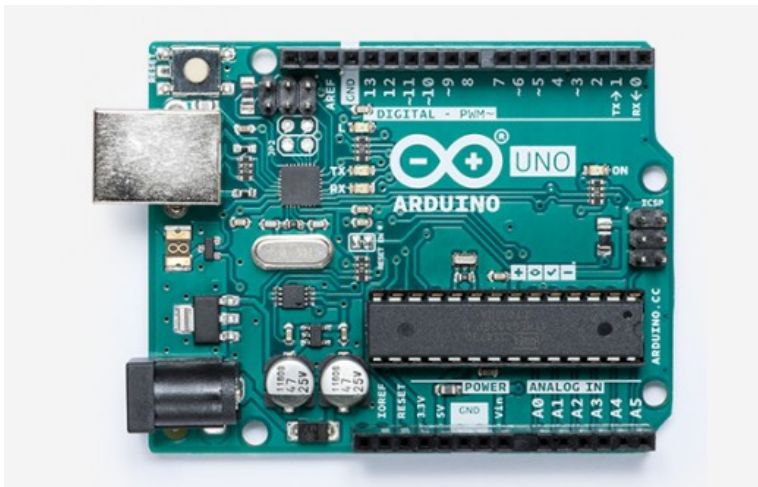
1.4 GHz 4 core processor rather than 0.9GHz single core processor.

1GB Ram rather than 500MB.

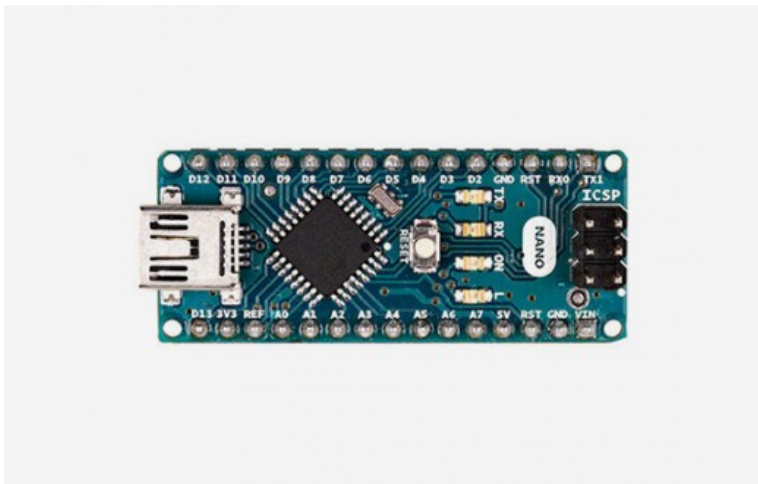
Arduino

This includes original Arduino systems and systems using the Arduino development environment. Initially we will consider the original Arduino systems. The small board is ~ \$3 from China.

Systems include:



Arduino UNO



Arduino Nano

Features

The two boards have similar functions.

ATmega328 processor at 16MHZ.

32 KB Flash memory

2KB RAM

6 PWM pins

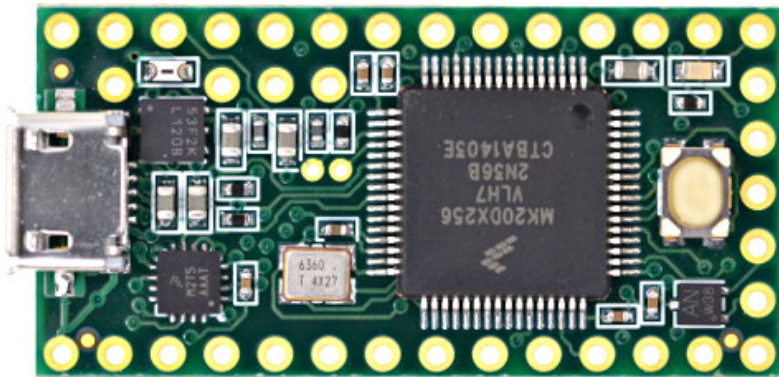
22 Digital IO pins (shared with PWM)

8 DAC pins

Programming environment

The Arduino is typically programmed using an extended version of C using its own IDE which can be PC or Cloud Based. I have only used the PC based.

Beyond the "official" products I have selected a few of interest



Teensy 3.3

ARM Cortex M4

72MHz

256 KB Flash

64 KB Ram

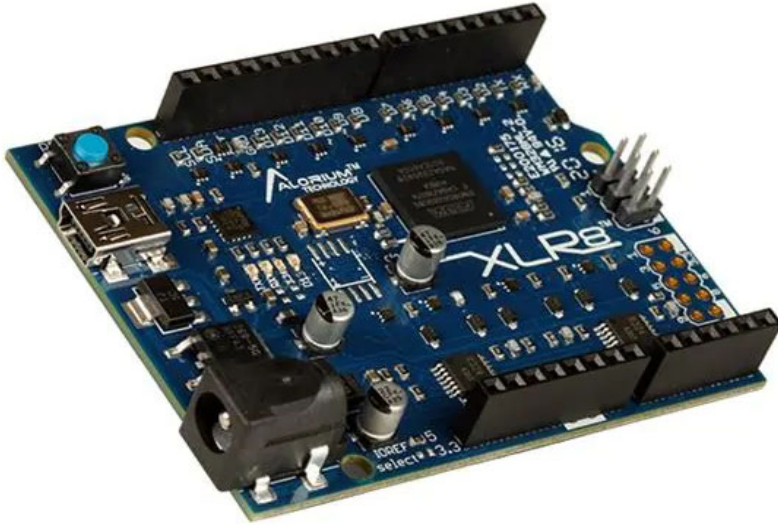
24 Digital IO

21 Analog inputs sharing 2 ADC (12-bit)

3 UART

SPI

2 I2C



XLR8

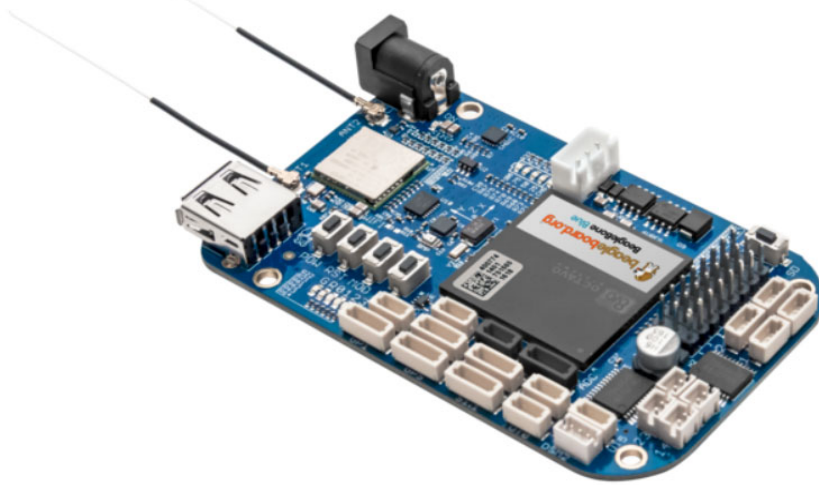
ATmega328 implemented is part of an Altera MAX 10



ESP32

A fast, cheap combined ARM processor and radio. I will investigate later.

BeagleBone



BeagleBone Blue

This is specifically targeted towards robotic applications.

1GHz ARM Cortex A8 Processor

512 MB RAM

USB Client, USB host

Debian Linux

Ardupilot

WiFi

Misc. IO pins