Arduino

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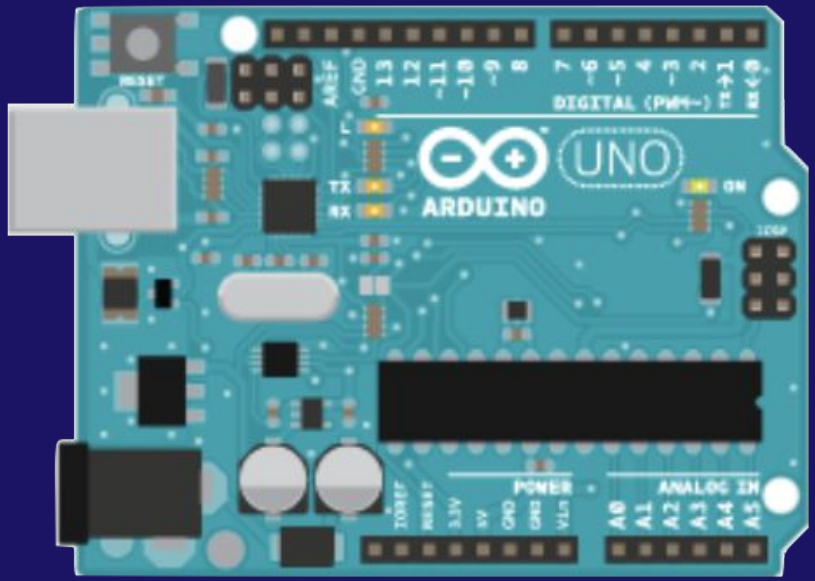
What is an Arduino?

- Open source electronic software
- Easy to use hardware
- Reads input
- Produce outputs



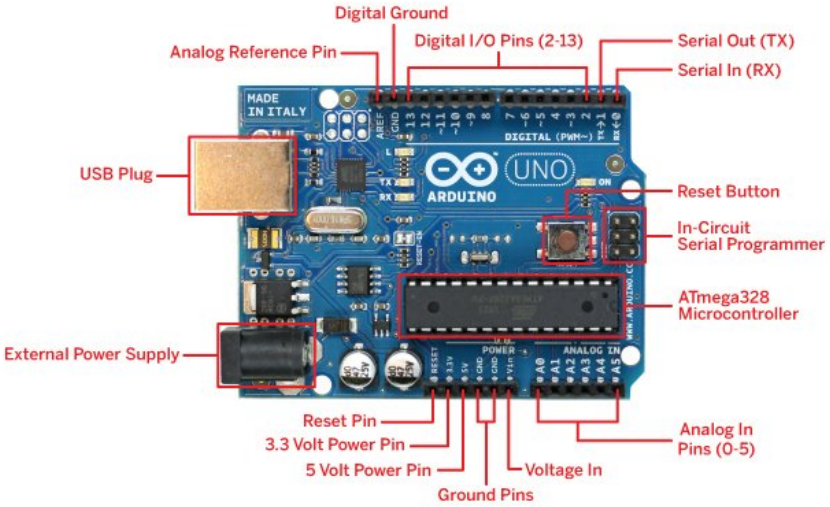
Components

Software

- Arduino IDE
- Arduino coding language

Hardware

- Arduino board
- Microcontroller


Digital Ground
Analog Reference Pin
Digital I/O Pins (2-13)
Serial Out (TX)
Serial In (RX)
USB Plug
Reset Button
In-Circuit
Serial Programmer
ATmega328
Microcontroller
External Power Supply
Reset Pin
3.3 Volt Power Pin
5 Volt Power Pin
Ground Pins
Voltage In
Analog In
Pins (0-5)
MADE
IN ITALY
UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN

Arduino IDE

- Free software
- Language is derived from C
- Targeted for use in microcontrollers
- Must have setup() and loop() functions
  - setup() sets initial conditions
    - Run only when running code or turning on
  - loop() is where code that makes functionality lives

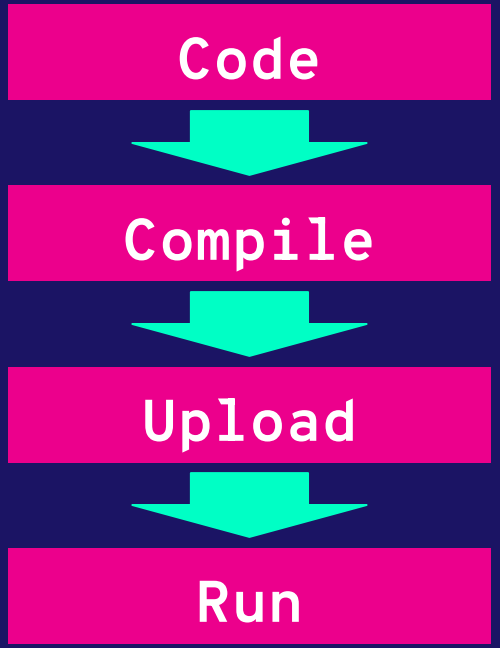
```
5  void setup() {
6
7  }
8
9  void loop() {
10
11 }
```

Microcontroller

- Simplest form of a computer
  - Take input from world and produce output
- Simple processor - typically only does one task, such as listening to a sensor
- Pins for input and output
  - Other controllers attached to these pins
  - Require power and communications connection

Running Programs

- Only run one
- No operating system
- To change, must change hardware
- Bootloader used to replace operating system

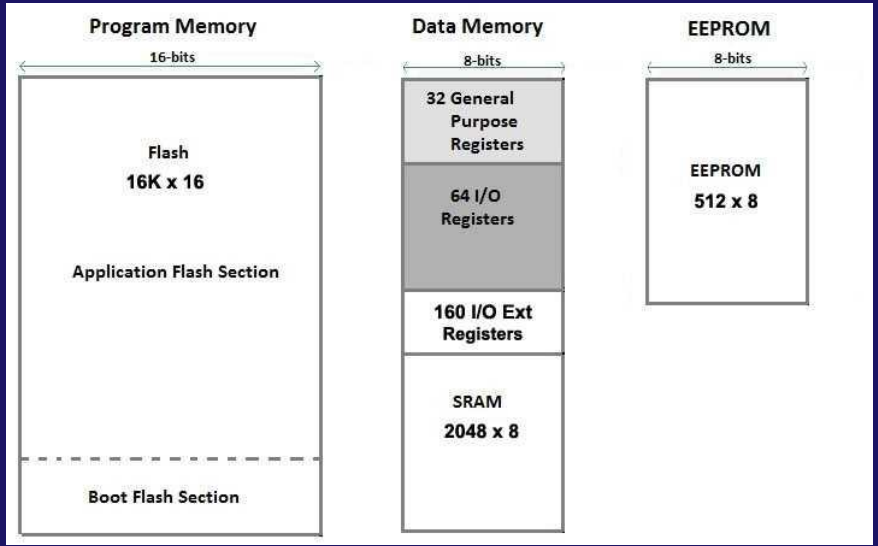


Bootloader

- Firmware
- In controllers memory
- Can reprogram rest of memory
- Used to program directly from computer to microcontroller
- Allow processors to get new programs outside of dedicated ports

Arduino “Burn Bootloader”

1. Unlock bootloader section
2. Set fuses on the chip
3. Upload bootloader code
4. Lock bootloader section



Summary

- Arduino is cheap and great for beginners
- Bootloader replaces operating system
- Idea of operating system still present
  - A layer of abstraction between software and hardware!

Citations

https://www.arduino.cc/
https://itp.nyu.edu/physcomp/lessons/microcontrollers-the-basics/
http://www.cs.binghamton.edu/~tbarten1/CS120_Summer_2015/Labs/Lab_03.html