

Pulse Oximetry & Microcontrollers

D-Lab: Health

5 March 2010

Pulse Oximetry Purpose

- Detect oxygen saturation of a patient's blood.
- While you're at it, detect pulse rate.

Image of pulse oximeter with handheld digital device removed due to copyright restrictions.

How It's Done

- Red Blood Cells carry oxygen using hemoglobin
- Hemoglobin changes shape when it picks up oxygen
- This shape changes how the protein absorbs light

Images of oxyhemoglobin and deoxyhemoglobin removed due to copyright restrictions.

How It's Done

- A PulseOx transmits two different wavelengths of light through a thin part of the body and measures the difference in intensity.
- Calibrated curves translate this to O2Sat.
- Detect pulse by seeing periodic changes in intensity

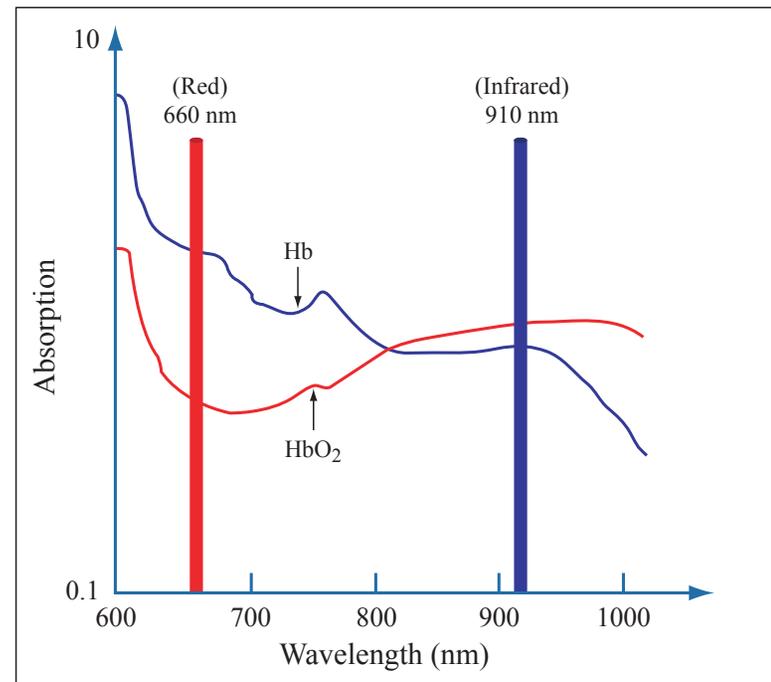


Image by MIT OpenCourseWare.

Microcontrollers

- Small computers built on integrated circuits.
- Take inputs, do processing, create outputs.

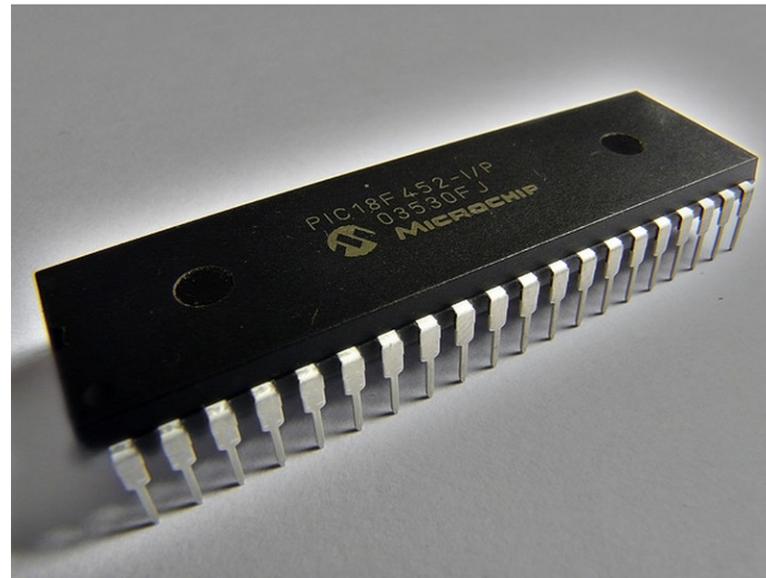


Image by marzzelo from Flickr.

Arduino

- A single-board microprocessor system.

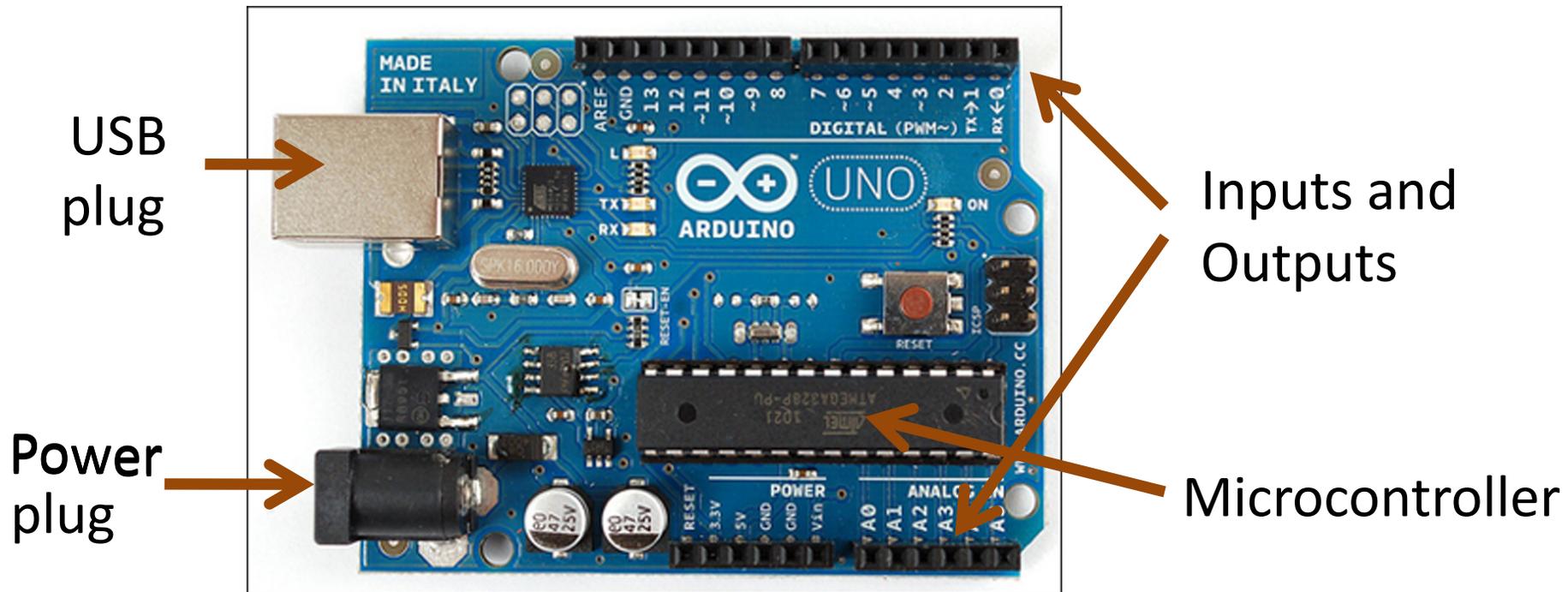
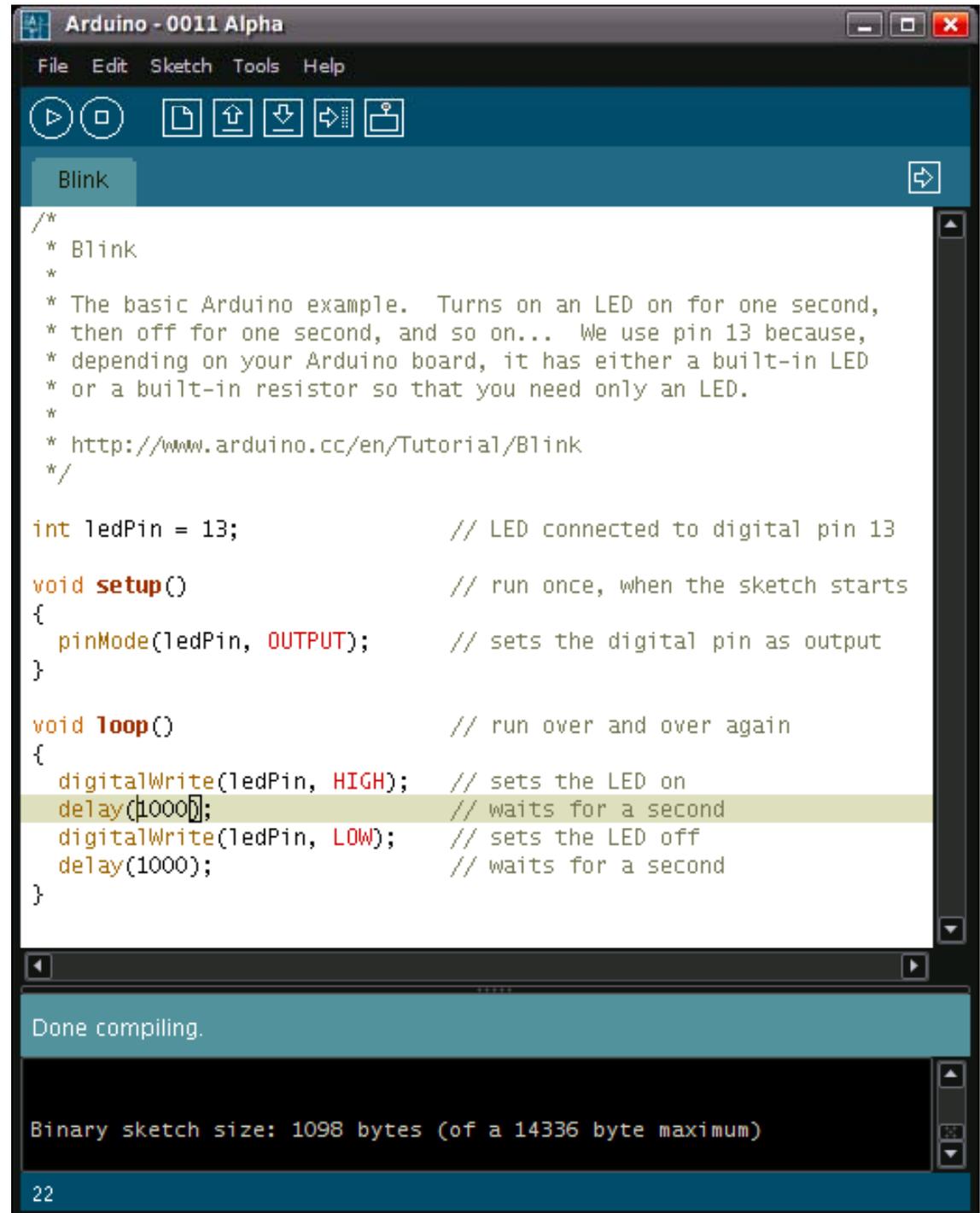


Image by adafruit on Flickr.

Programming Arduino

- A lot like C++
- Program on your computer, then load software onto microcontroller, which runs in a loop



```
Arduino - 0011 Alpha
File Edit Sketch Tools Help
Blink
/*
 * Blink
 *
 * The basic Arduino example. Turns on an LED on for one second,
 * then off for one second, and so on... We use pin 13 because,
 * depending on your Arduino board, it has either a built-in LED
 * or a built-in resistor so that you need only an LED.
 *
 * http://www.arduino.cc/en/Tutorial/Blink
 */

int ledPin = 13;           // LED connected to digital pin 13

void setup()              // run once, when the sketch starts
{
  pinMode(ledPin, OUTPUT); // sets the digital pin as output
}

void loop()               // run over and over again
{
  digitalWrite(ledPin, HIGH); // sets the LED on
  delay(1000);                // waits for a second
  digitalWrite(ledPin, LOW);  // sets the LED off
  delay(1000);                // waits for a second
}

Done compiling.

Binary sketch size: 1098 bytes (of a 14336 byte maximum)

22
```

More on Arduinos

- Arduino plug-in expansion “shields”:
<http://www.sparkfun.com/commerce/categories.php?c=103>
- Arduino Project Examples

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