Overview

- Arduino is an open-source single-board microcontroller
- It's a descendant of the open-source wiring platform
- Has a processing-based integrated development environment
The History

- Arduino means "Brave Friend" in Italian
- Created in 2005 in Ivrea, Italy
- Arduino team: Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino and David Mellis
The Problem

- The "Arduino" project was created to teach non-technologists microcontrollers.
- Arduino uses a method called physical computing.
- The assumption was that the students were coming from a background other than CS or EE.
The evolution

- In early 2000's there were a few schools teaching microcontrollers to non-majors.
- Schools needed simpler engineering tools than were available at the time (BX-24 and Basic Stamp).
- The current board's functioned well enough but didn't teach programming.
- In 2002 in Ivrea, a team developed programa2003, Wiring, then Arduino.
Example 1 - turning on a light

```c
#define LED_PIN 13

void setup () { 
    pinMode (LED_PIN, OUTPUT); // enable pin 13 for digital output
}

void loop () { 
    digitalWrite (LED_PIN, HIGH); // turn on the LED
    delay (1000); // wait one second (1000 milliseconds)
    digitalWrite (LED_PIN, LOW); // turn off the LED
    delay (1000); // wait one second
}```
Example 2 - creating tones

```cpp
// notes in the melody:
int melody[] = {
    NOTE_C4, NOTE_G3, NOTE_G3, NOTE_A3, NOTE_G3, 0, NOTE_B3, NOTE_C4};

// note durations: 4 = quarter note, 8 = eighth note, etc.:
int noteDurations[] = {
    4, 8, 8, 4, 4, 4, 4, 4
};

void setup() {
    // iterate over the notes of the melody:
    for (int thisNote = 0; thisNote < 8; thisNote++) {
        // to calculate the note duration, take one second
        // divided by the note type.
        // e.g. quarter note = 1000 / 4, eighth note = 1000/8, etc.
        int noteDuration = 1000 / noteDurations[thisNote];
        tone(8, melody[thisNote], noteDuration);

        // to distinguish the notes, set a minimum time between them.
        // the note's duration + 30% seems to work well:
        int pauseBetweenNotes = noteDuration * 1.30;
        delay(pauseBetweenNotes);
        // stop the tone playing:
        noTone(8);
    }
}

void loop() {
    // no need to repeat the melody.
}
```
Example 3 - Push Button Response

```cpp
// constants won't change. They're used here to
// set pin numbers:
const int buttonPin = 2;  // the number of the pushbutton pin
const int ledPin = 13;    // the number of the LED pin

// variables will change:
int buttonState = 0;       // variable for reading the pushbutton status

void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed.  
  // if it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```
The Arduino Comparison

- Compared to other microcontrollers, Arduino is essentially the same hardware.
- The difference is the ease of use.
- Most CS/EE departments teach in the order of Ohms law, assembly language, and command prompts.
- Arduino can be applied and programed simply through its IDE.