Arduino

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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

```
#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

```
// 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

```arduino
// 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