Introduction to the Arduino

Instructor: Lisa Lafleur

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Today we will cover:

- An Overview of Microcontrollers
- Geography of your Arduino
- What makes an Arduino an Arduino
- Basics of what the Arduino can do
- Practice using an Arduino
- Writing code for the Arduino
Drivers and IDE from http://arduino.cc

Secret Installation Tips

- Mac needs X11 to work
- Windows
  - Often need to update USB drivers
  - May need to update Java
  - Try installing with Administrator Privileges
What is a microcontroller?

- Miniature computer
  - Processor
  - Long term memory (program)
  - Short term memory (calculations)
- Input and Output
  - Digital
  - Analog
Microcontroller uses

- Art projects
- Robots and Automation
- Prototyping
- Human interface devices such as remote controls
- Office machines and appliances
- Car engine control systems
- Toys
- and more!
Arduino: microcontroller and more
Your Arduino

- Runs at 16 MHz
- 32 KB Flash memory (30 KB for program)
- 2 KB RAM (calculations)
- 3 counters
- 14 Digital I/O pins
- 6 Analog input pins (10-bit)
A brand new IDE

```c
// read the pushbutton input pin:
buttonState = digitalRead(buttonPin);

// compare the buttonState to its previous state
if (buttonState != lastButtonState) {
    // if the state has changed, increment the counter
    if (buttonState == HIGH) {
        // if the current state is HIGH then the button
        // went from off to on:
        buttonPushCounter++;
        Serial.println("on");
        Serial.println("number of button pushes: ");
        Serial.println(buttonPushCounter, DEC);
    } else {
        // if the current state is LOW then the button
        // went from on to off:
        Serial.println("off");
    }

    // save the current state as the last state,
    // for next time through the loop
    lastButtonState = buttonState;
}

// turns on the LED every four button pushes by
// checking the modulo of the button push counter.
```
GO TO Arduino.cc
Talking to the Arduino

```cpp
void setup() {
    Serial.begin(9600);
}

void loop() {
    Serial.println("success!");
}
```
Digital Output
Digital Output

```c
void setup() {
  pinMode(3, OUTPUT);
}

void loop() {
  digitalWrite(3, HIGH);
  delay(500);
  digitalWrite(3, LOW);
  delay(500);
}
```
Digital Input

ADDING ON to the circuit you already have
void setup() {
    pinMode(3, OUTPUT);
    pinMode(2, INPUT);
}

void loop() {
    if (digitalRead(2) == HIGH)
    {
        digitalWrite(3, HIGH);
    } else
    {
        digitalWrite(3, LOW);
    }
}
Reading analog values with Serial
Reading analog values with Serial

```java
void setup() {
    // no setup required for analog inputs
    // need to set up Serial
    Serial.begin(9600);
}

void loop() {
    Serial.println(analogRead(0));
    delay(30);
}
```
Higher level stuff to touch on

- Options for powering
  - USB vs. DC adapter
  - Vin pin vs. 5V pin
- Pulse Width Modulation (the way to control intensity on the digital pins)
  - Controls LED brightness or color of RGB LEDs
Other workshops to consider

- Arduino Programming
  - programming basics like functions, loops, and conditionals
- Arduino Shields
  - mount peripheral electronics onto permanent daughterboards