# **TECH WORKSHOP 1 ARDUINO**

Intro to Electricity
 What is a microcontroller?
 Analog vs. digital signal
 Examples
 LAB

# **TECH WORKSHOP 1 ARDUINO**

#### ARDUINO LAB: 1. LED blink 2. Set up your breadboard



CIRCUITS: 3. Output: Turn a servo motor 4. Digital input: make a push button lights up LED's 5. Analog input: Make an photo cell 6. Bigger load Analog Input & output: make a potentiometer move a motor

# WHAT IS PHYSICAL INTERACTION?

#### What are examples of physical interfaces?



### WHAT IS A MICROCONTROLLER?



### WHAT IS A MICROCONTROLLER?



### **TYPES OF SIGNALS**

#### Analog vs. Digital



Digital inputs have two states: off and on. If voltage is flowing, the circuit is on. If it's not flowing, the circuit is off.



When we want to measure variably changing conditions like this, we need analog inputs.

Examples: thermistors, photocells, force sensing resistors, flex sensors, ...



















ELECTRICITY The flow of electrons through a conductive material

ANALOGY: Water flowing through a hose

Current (amps) = how many electrons are flowing Voltage (volts) = electrical energy (ie pressure) Resistance (ohms) = a material's ability to RESIST current

ELECTRICITY The flow of electrons through a conductive material

ANALOGY: Water flowing through a hose

Current (amps) = how much water Voltage (volts) = water pressure Resistance (ohms) = hose size

electrons (electricity) travelling along a wire





CIRCUIT = A closed loop containing: 1. a source of electrical energy 2. a "load" (motor, light bulb)



### PARTS LIST

Arduino USB Cable Breadboard Potentiometer Pushbutton LED's servo motor DC motor Transistor diode resistors

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Turn on the LED and make it blink

What you need:

Arduino

LED

USB cable







#### Step 1. Download Arduino software

#### A. http://www.arduino.cc/en/Main/Software B. click OK!





Step 1. Download Arduino software

C. Follow the prompts to put the Arduino application in the application folder

#### You've installed Arduino!



Step 1. Download Arduino software

D. Open up Arduino program

E. You should see this





Arduino Uno on /dev/cu.usbmodemfa131

Step 2. Set up the Arduino board

A. Insert the longer leg of the LED into pin 13 of the Arduino.

B. Insert the shorter leg of the LED into the pin labelled GND on the Arduino.



Step 3. Program the Arduino board

A. Plug the Arduino into the computer using the USB cable



#### Step 3. Program the Arduino board

B. Select chip

In Arduino, select: TOOLS ---> Board ---> Arduino UNO

#### C. Select Port

Select Tools ---> Serial Port ---> and click the TOP OPTION :

something like "dev.tty.usbmodemfd131"





Now you are ready to program!

D. Open Blink sketch

Click on File ---> Examples---> Basics ---> Blink

🕷 Arduino	File Edit Sketch	Tools	Help	_	
	New Open Sketchbook Examples Close Save Save Save As Upload to I/O Board	NN     1.Basics       2.Digital       2.Digital       3.Analog       alog       alog       x       XW       S.Control       XS       6.Sensors       As       QXS       At to I/O Board		AnalogReadSerial BareMinimum Blink DigitalReadSerial Fade 7 pics_photopo	
	Page Setup Print	O MP MP	ArduinolSP AP_ADC		ia   Arduino 0022
			AP_Common	*	





#### Step 4. Change the blink speed

00	Blink   Arduino 0022
DO <b>D110</b>	
Blink §	
/* Blink Turns on an LED on for or	ne second, then off for one second, repeatedly.
This example code is in 1	the public domain.
<pre>roid setup() {     // initialize the digital     // Pin 13 has an LED core     pinHode(13, OUTPUT); }</pre>	l pin as an output. nected on most Arduino boards:
<pre>digitalWrite(13, HIGH);   delay(1000);   digitalWrite(13, LOW);   delay(1000); </pre>	// set the LED on // wait for a second // set the LED off // wait for a second

See that I changed the number after "delay(...)"

Before it said delay(1000)

now it says delay(500)

```
void loop() {
    digitalWrite(13, HIGH); // set the LED on
    delay(500); // wait for a second
    digitalWrite(13, LOW); // set the LED off
    delay(500); // wait for a second
}
```

This means that instead of delaying 1 second it will delay for half a second (it blinks twice as fast!)

(NOTE: 1000 in Arduino language means 1000 milliseconds. 1 second = 1000 milliseconds!)

# Step 5. Now that you have MODIFIED the BLINK sketch, go ahead and save it



#### CHALLENGE:

NOW... Try to SLOW DOWN the blink!



### **RECAP: what did we just learn?**

- 1. how to download and install Arduino software
- 2. about the Arduino software language
- 3. how to modify a sketch
- 4. how to upload a sketch to Arduino
- 5. how to blink LED's at different speeds

# **2. USING A BREADBOARD**

Follow this link to make the same circuit using a breadboard. Then get a bit more advanced and use multiple LED's, then an RGB LED.

<u>http://levinegabriella.com/exploringbiomimicry/</u> <u>Arduino\_tutorials/2\_CIID\_tutorial\_breadboard.pdf</u>



## **3. PUSHBUTTON**

Follow this link to make a simple pushbutton ircuit.

<u>http://www.levinegabriella.com/exploringbiomimicry/</u> Arduino\_tutorials/CIID\_Beginner\_makepushbutton.pdf



# **4. USING A SERVO MOTOR**

Follow this link to get some practice using Arduino example code to output rotational motion through a servo motor.

<u>http://levinegabriella.com/exploringbiomimicry/</u> <u>Arduino\_tutorials/3\_CIID\_Servo.pdf</u>

# 5 - 6. ANALOG / DIGITAL

The following excersizes are here:

<u>http://www.levinegabriella.com/exploringbiomimicry/</u> Arduino\_tutorials/4\_CIID\_Arduino\_Analog\_Digital.pdf

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