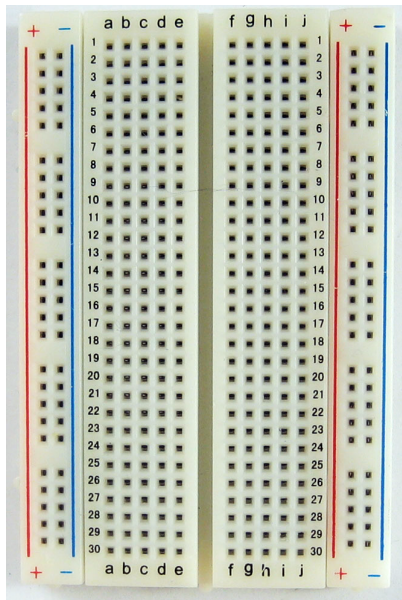


Exploring Biomimetic Interfaces
CIID Summer Course 2013

Setting up a breadboard

1. Understanding a breadboard
2. Make one LED blink on the breadboard
3. Make multiple LED's blink
4. Try it with an RGB LED

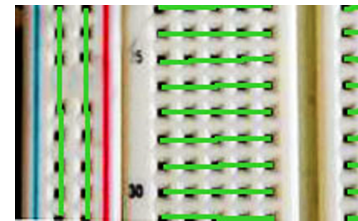


The breadboard is basically a chunk of plastic with a bunch of holes in it. But there is something special going on:

There is electrical conductivity. Basically this means that even though you can't see it, if you poked inside, there are metal strips that connect the ROWS and the COLUMNS together. LIKE THIS:



here's a CLOSE UP



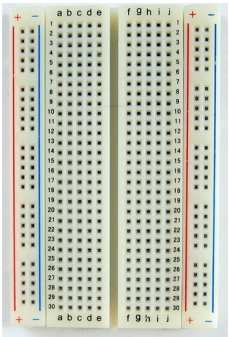
columns

rows

NOW, let's try to get the LED to BLINK, but this time, on the breadboard...

What we will need to set up the breadboard for a blinking LED

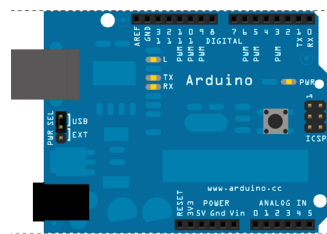
1. Breadboard



2. LED



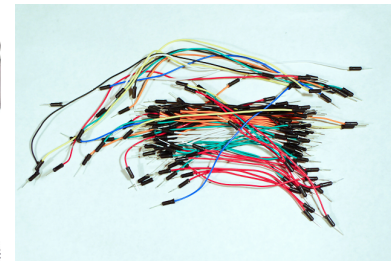
3. Arduino



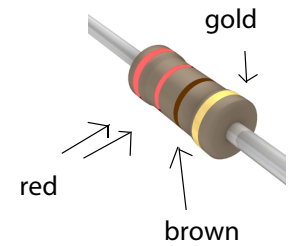
4. USB

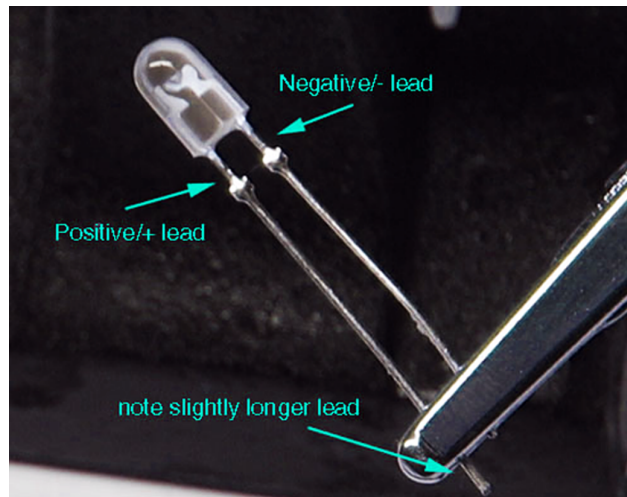


5. wires



6. 1 220 ohm resistor





LED = Light Emitting Diode

LED's WILL NOT work if placed backwards, so if your LED doesn't light up when you think it will, try reversing it!

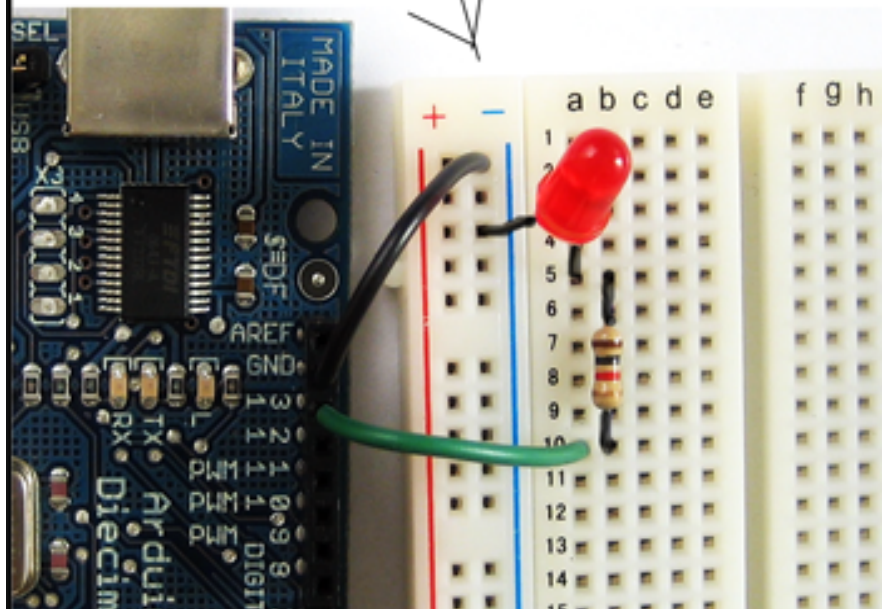
Step 2. Setup the Breadboard

Connect a BLACK wire from a ground ("GND") pin on Arduino to the ground column on the breadboard (the one marked in BLUE, with the minus "-" sign)

Connect a BLUE or GREEN wire from pin 13 to any row on the breadboard

Connect a resistor from one row to the LONG leg of the LED


Connect the LED from the RESISTOR to GROUND (the blue striped column on the breadboard)



NOTE: RESISTORS can be connected EITHER way (unlike LED's)

The color of the wires DOES NOT matter. It just helps to be neat.

Step 3. VERIFY and UPLOAD! (remember this!)



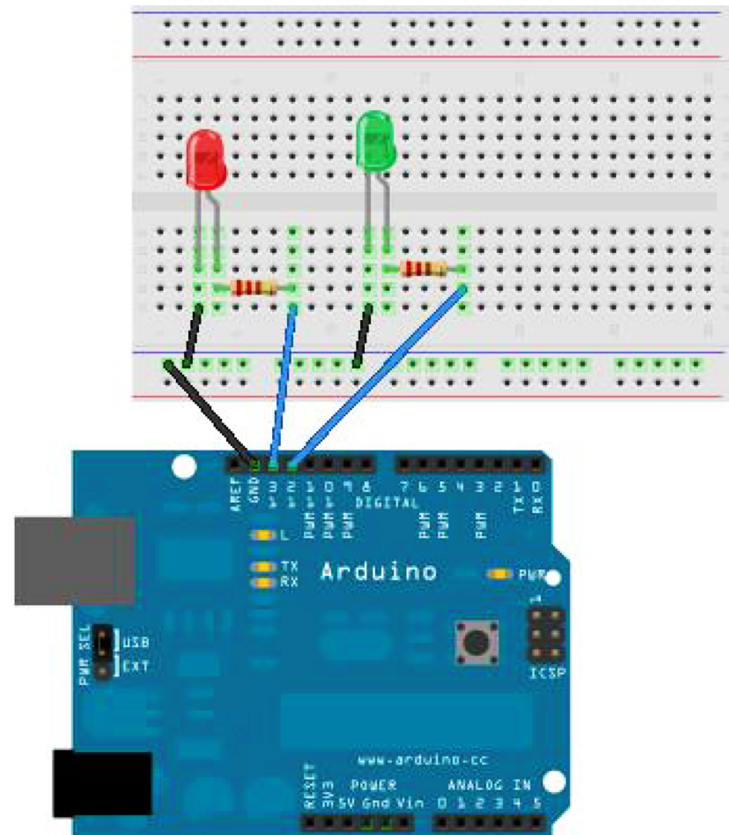
```
Blink | Arduino 0022
Blink 5
//
// Turns on an LED on for one second, then off for one second, repeatedly.
// This example code is in the public domain.
//
void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // set the LED on
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // set the LED off
  delay(1000); // wait for a second
}

Done uploading.
Binary sketch size: 1818 bytes (of a 32256 byte maximum)
```

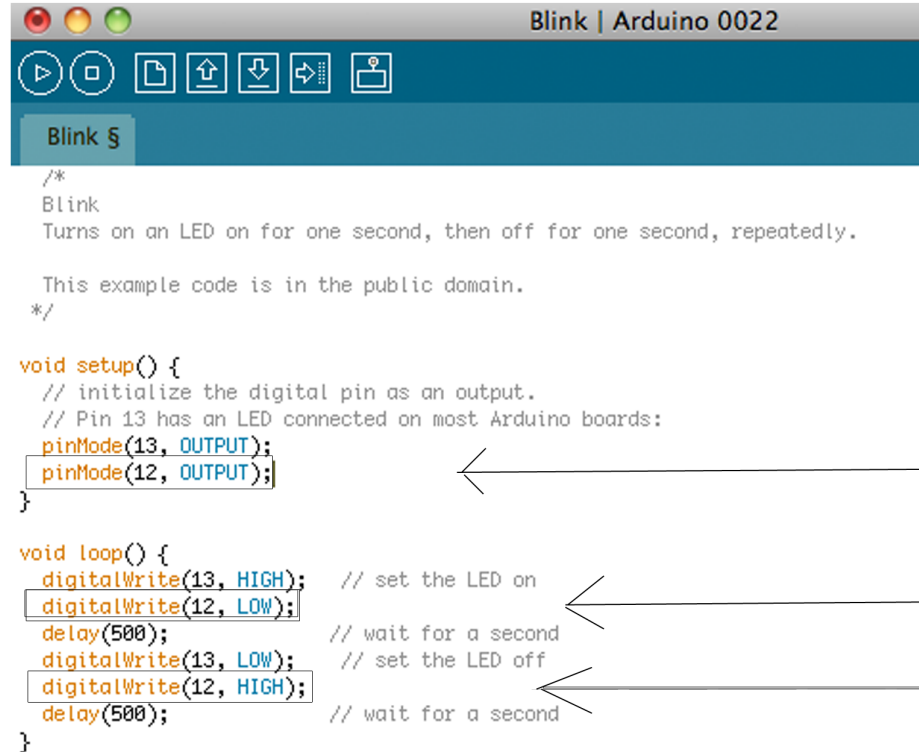
Step 4. Let's mix colors! Lighting up MULTIPLE LEDs

A. Set up the breadboard:



B. MODIFY our BLINK SKETCH

6



```
Blink | Arduino 0022

/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeatedly.
 *
 * This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
  pinMode(12, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  digitalWrite(12, LOW);
  delay(500); // wait for a second
  digitalWrite(13, LOW); // set the LED off
  digitalWrite(12, HIGH);
  delay(500); // wait for a second
}
```

Add these three lines:

pinMode(12, OUTPUT);

digitalWrite(12, LOW);

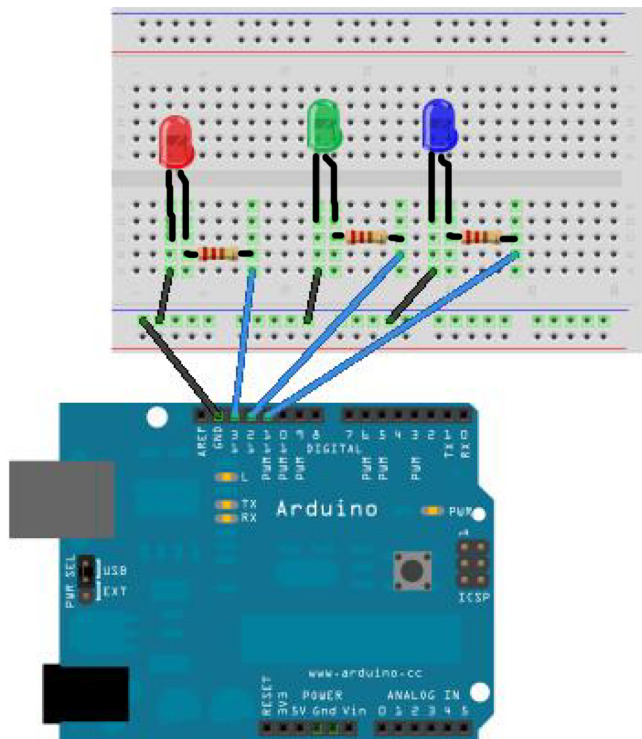
digitalWrite(12, HIGH);

NOTE: all text that looks like:
//this is just a note
is just notes, it isn't part of the code

VERIFY and UPLOAD!

STEP 5 . OPTIONAL: Add another LED of a different color

Prepare the breadboard:



Add a third LED to pin 11

Make the following modifications to our Blink sketch

```
Arduino IDE Window: Blink | Arduino 0022
Blink 5
/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeatedly.
 *
 * This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
  pinMode(12, OUTPUT);
  pinMode(11, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  digitalWrite(12, LOW); // set the LED on
  digitalWrite(11, LOW); // set the LED on
  delay(500); // wait for a second
  digitalWrite(13, LOW); // set the LED off
  digitalWrite(12, HIGH); // set the LED on
  digitalWrite(11, HIGH); // set the LED on
  delay(500); // wait for a second
}
```

VERIFY and UPLOAD.

GET CREATIVE

Try to do this using an RGB LED. Wire it the same way as you did but the RGB LED shares a common ground.

GET CREATIVE:

Think of a way an RGB LED might be used to signal something : for example, it can be used as a warning to mean three different warning statuses. Consider an remote control car running out of batteries, or a sensing vehicle that senses hazardous materials.

