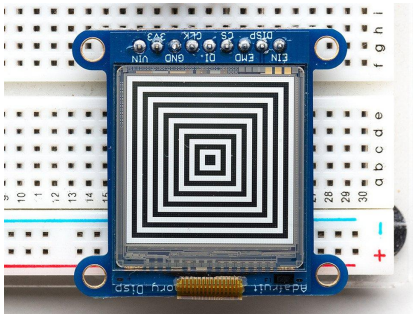# ARDUINO WEEK 3 – OUTPUTS & FIRMATA

CCLab 2016
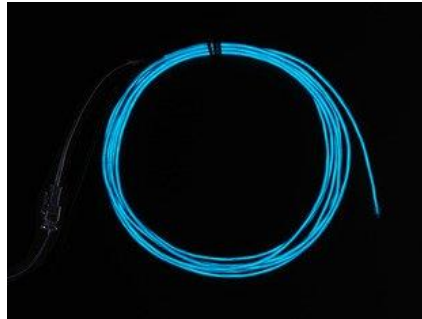
GO TO SPARKFUN.COM/SIKCODE

copy the "SIK Guide Code"folder into Arduino's folder named "examples"
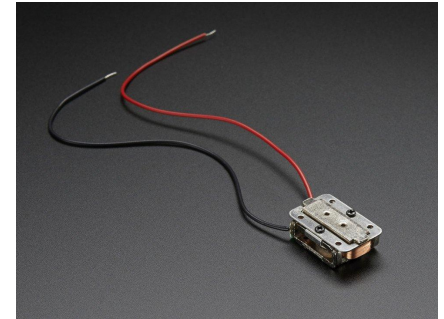
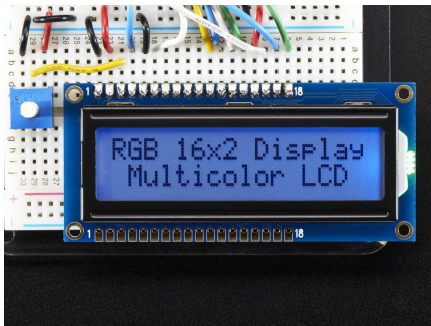# There are many other outputs besides LEDs for use with Arduino ☺
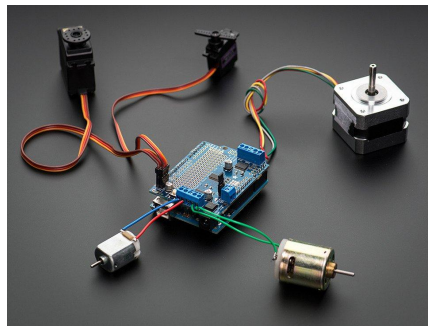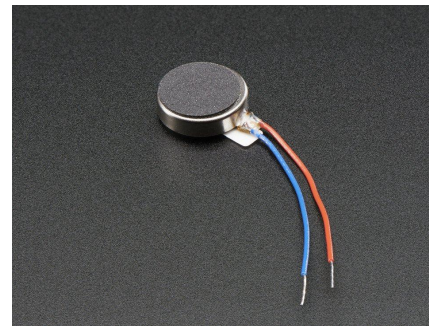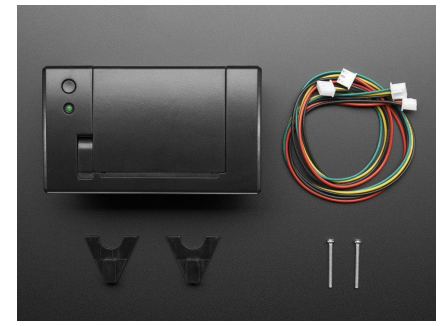
eInk Display

EL Wire

Speakers

Bone Conduction Transducer

LCD Display

Motors

Vibrating Motor Disc

Receipt Printer

Creating Outputs

Servo
FROM
Digital Pin 5

Piezo Buzzer
or
8 ohm Speaker
FROM
Digital Pin 3

SPECTRUM
RGB LED
FROM
R Dp 9
G Dp 10
B Dp 11
W +3V

FLASH
BlueWhite
LED
TO
Analog
Pin 2

FADE
Red
LED
TO
Digital
Pin 6

Voltage Divider

0-20K
ohm
LDR

10K ohm
Resistor

PIR
Infra RedSensor
TO
Analog Pin 0

Cell Phone
Vibrator
FROM
Digital Pin 7

LDR
TO
Analog
Pin 1

MASTER COMPONENTS WIRING DIAGRAM 1
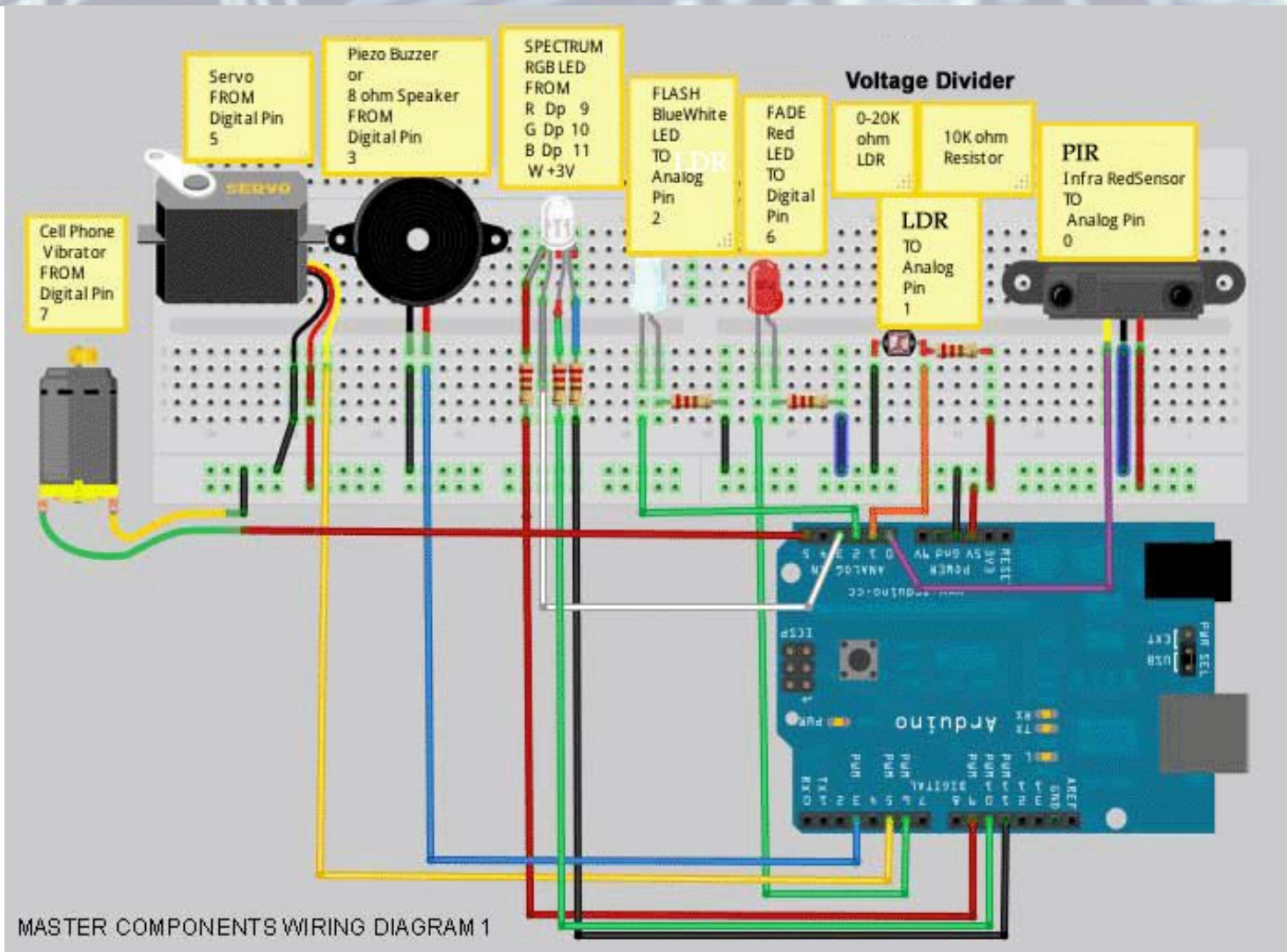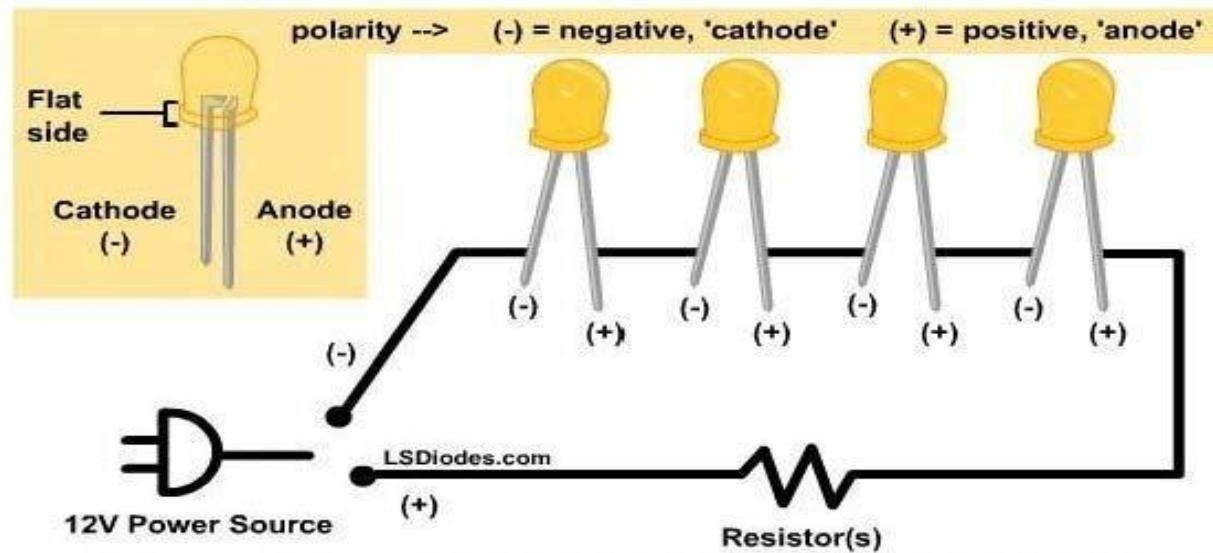
MULTIPLE LEDs

Series Circuit

LEDS++

Two components are in series if they share a common node and if the **same current** flows through them.
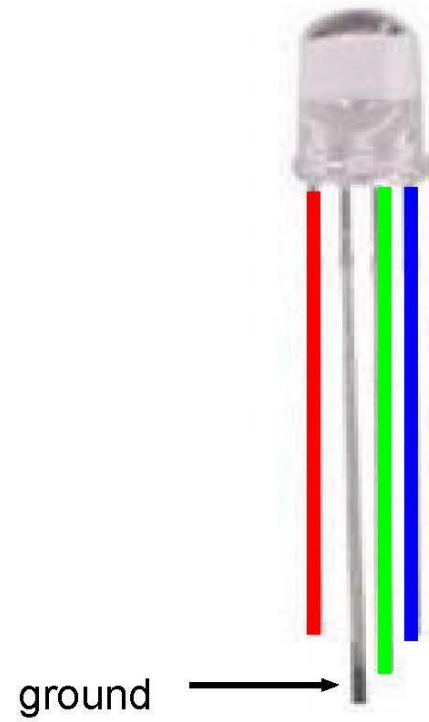
Parallel Circuit

If components share *two* common nodes, they are in parallel.
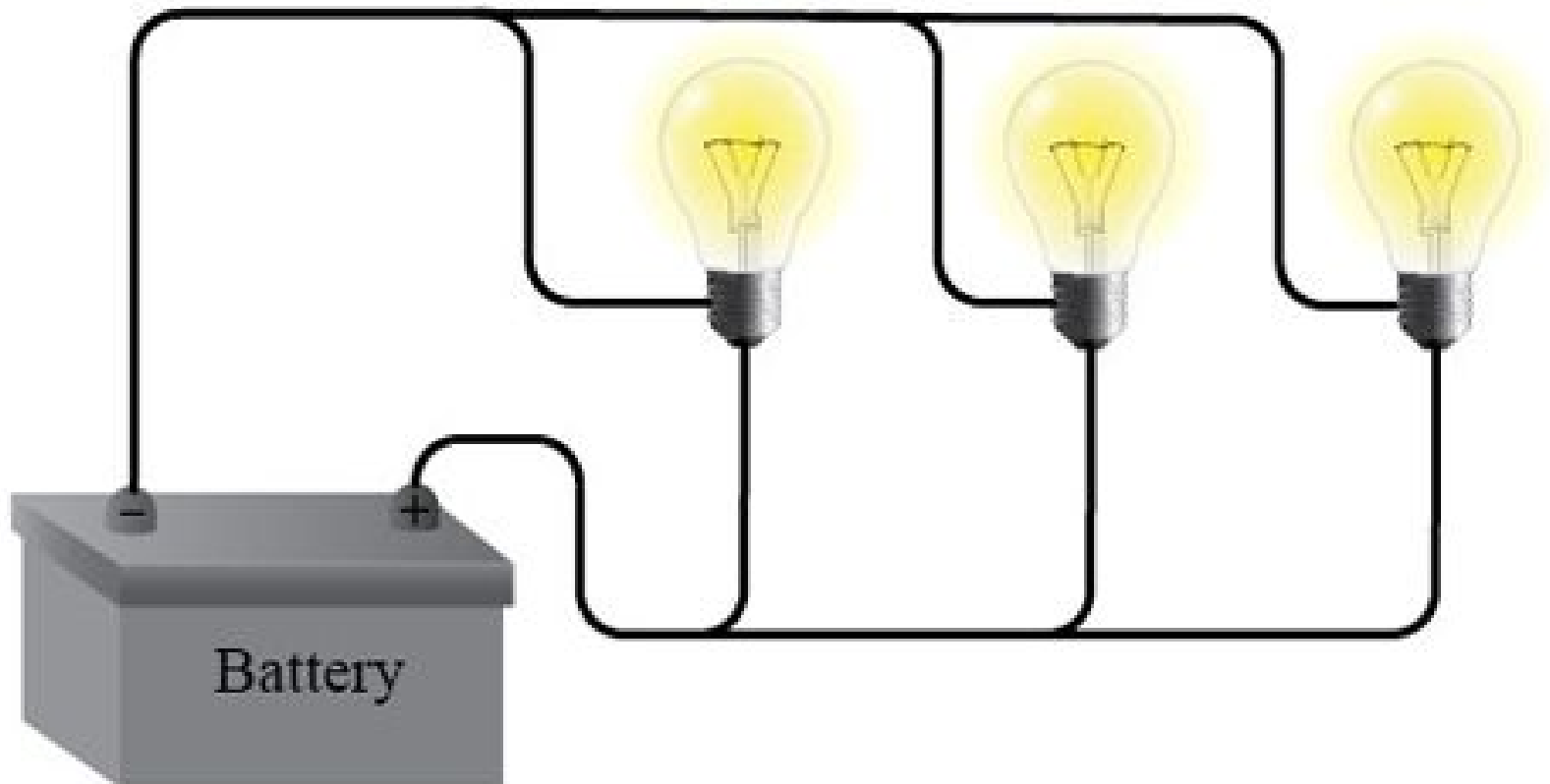
RGB LED

ground →

RGB LEDS

file->example->SIK Guide Code->Circuit_03

330 Ohm resistors

orange/orange/brown/gold

protip: color code your wires!
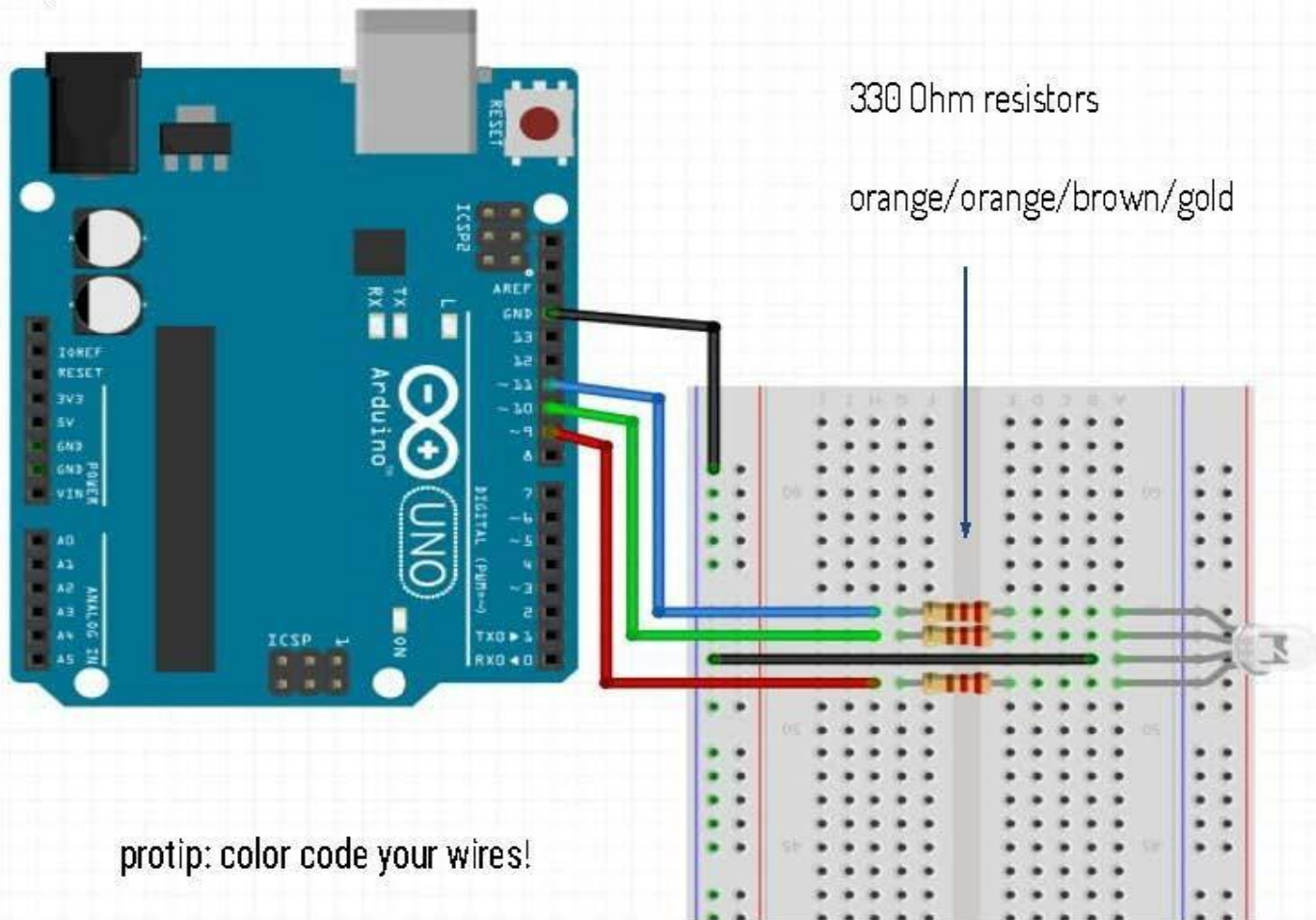
Multiple LEDs

Arduino>Examples>Control>Arrays

Arduino>Examples>Control>ForLoopIteration
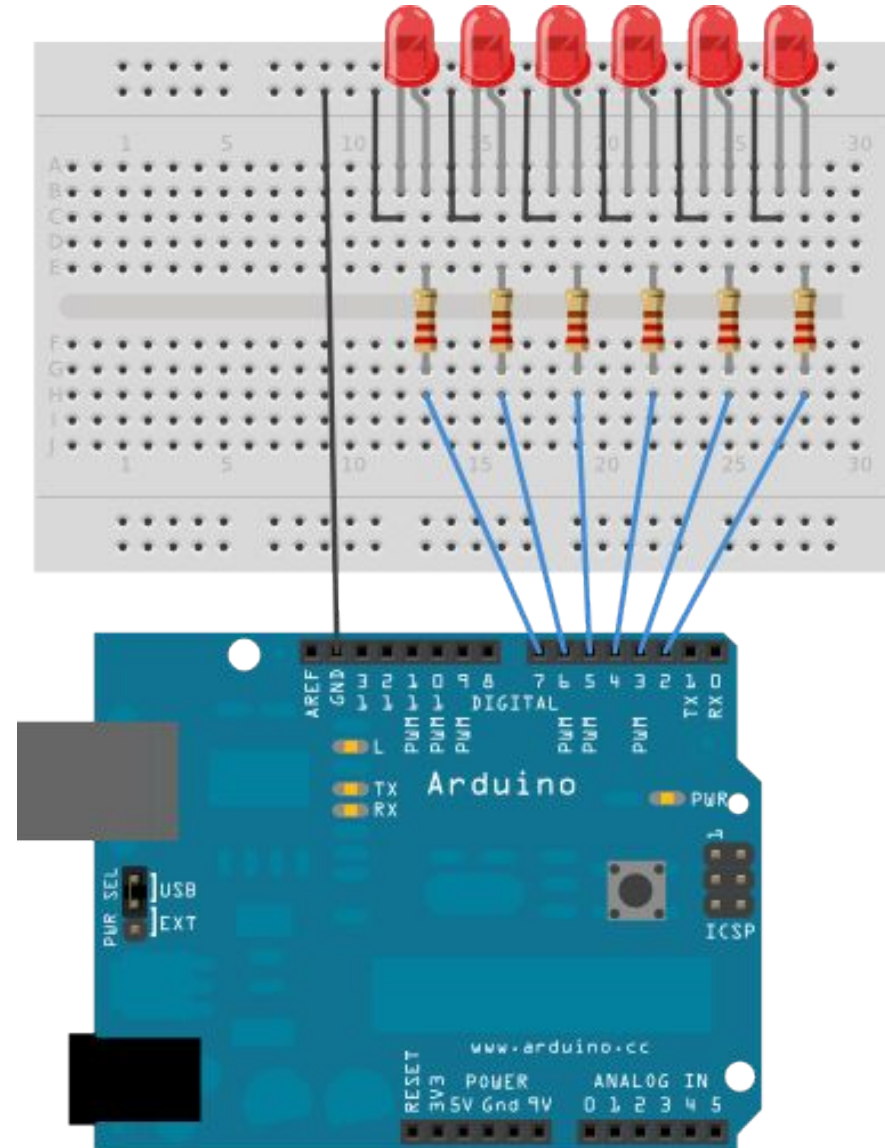
Motors

Servo Motor

- Can be precisely controlled
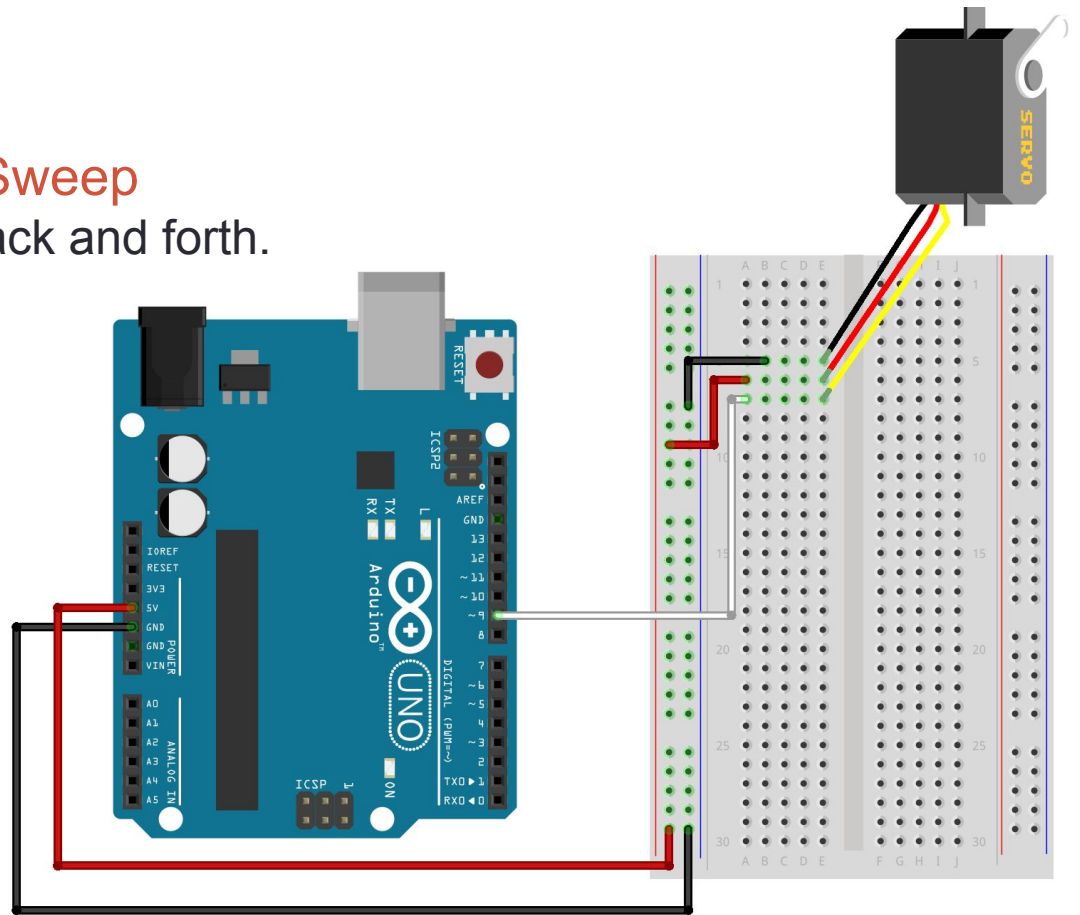 - On standard servos, the shaft can be positioned at various angles between 0 and 180 degrees
  - Continuous rotation servos allow the rotation to be set to various speeds

Servo Sweep

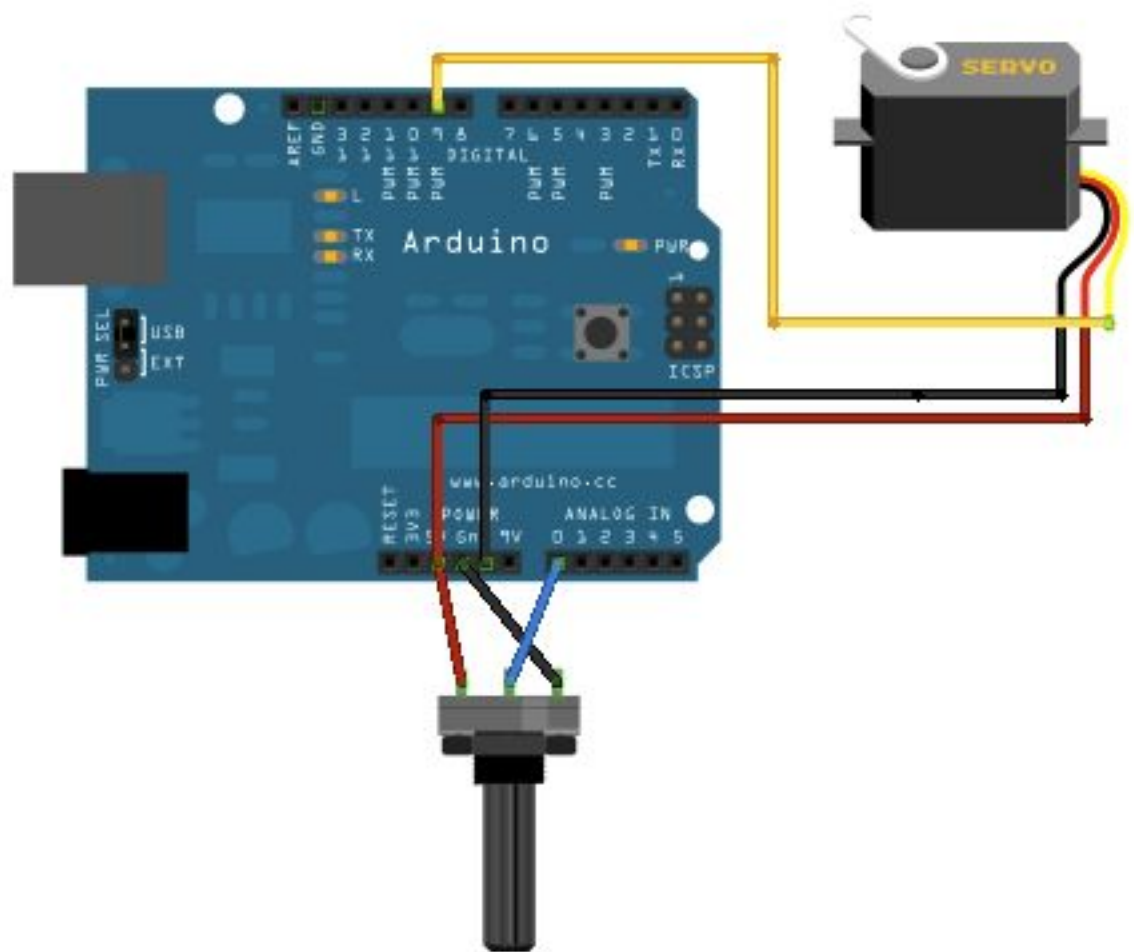Arduino > Examples > Servo > Sweep
Sweep the shaft of a servo motor back and forth.

fritzing

Servo Knob

Arduino > Examples > Servo >Knob
Control the position of a servo with a potentiometer.

DC Motor

- The most common type of motor
- Normally they have just two leads, one positive and one negative
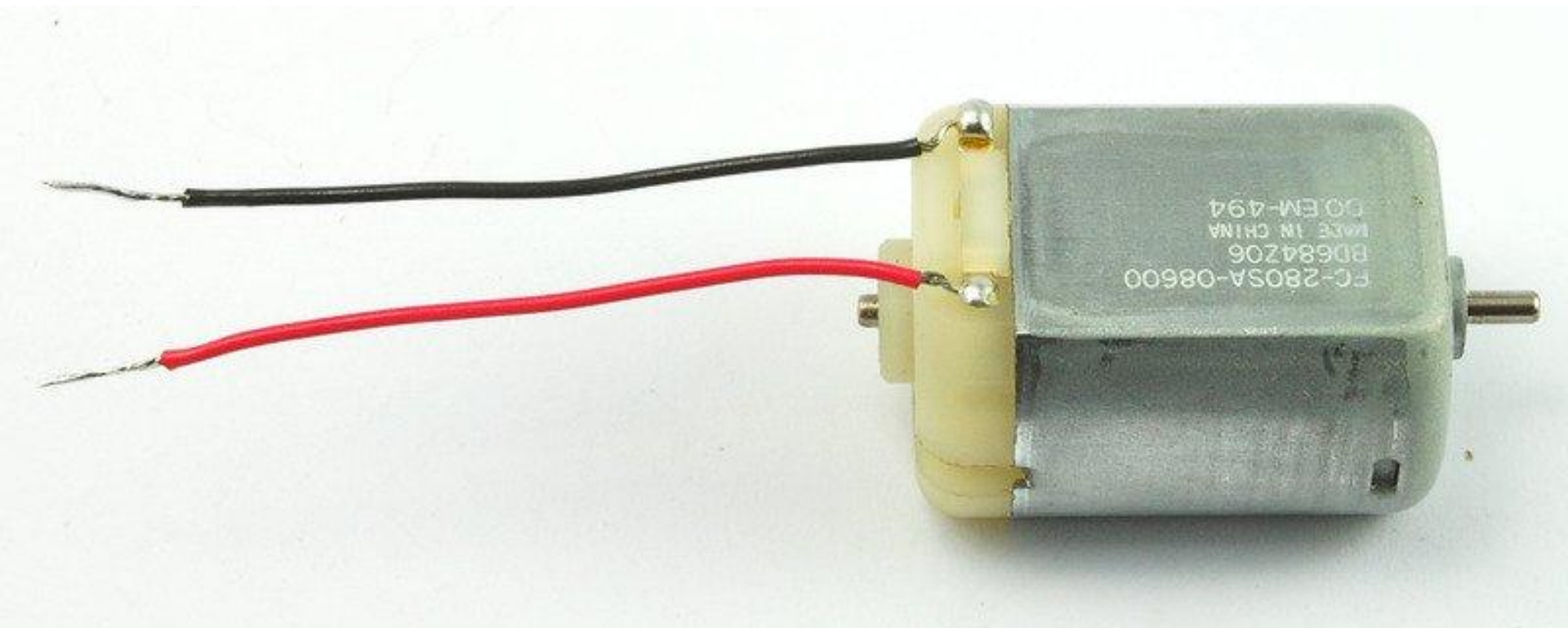
Transistor

A semiconductor device used to amplify and switch electronic signals and electrical power
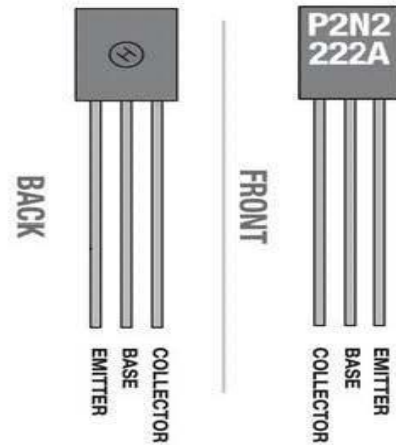
A transistor is a solid-state switch. When we give it a small amount of current, it can switch a much larger current.

Diode

Diode
(1N4148)

x2

* ACTUAL SIZE
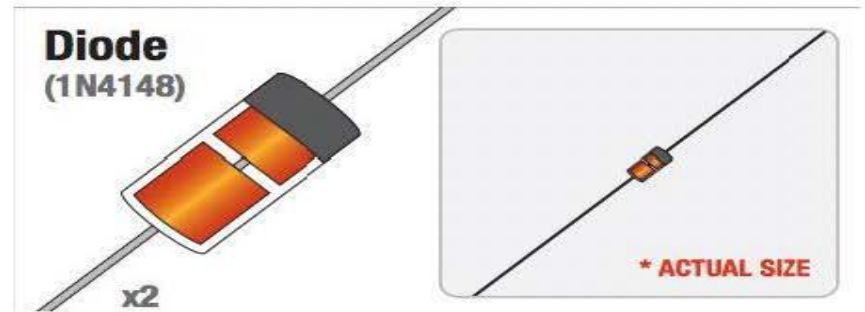
Allows an electric current to pass in one direction, while blocking current in the opposite direction.

DC Motor

Arduino>file>example>SIK Guide Code>Circuit_12

Communication Protocols

Quick Question!

What are protocols?
Why are they important?
Give an example.

FIRMATA

What is Firmata?

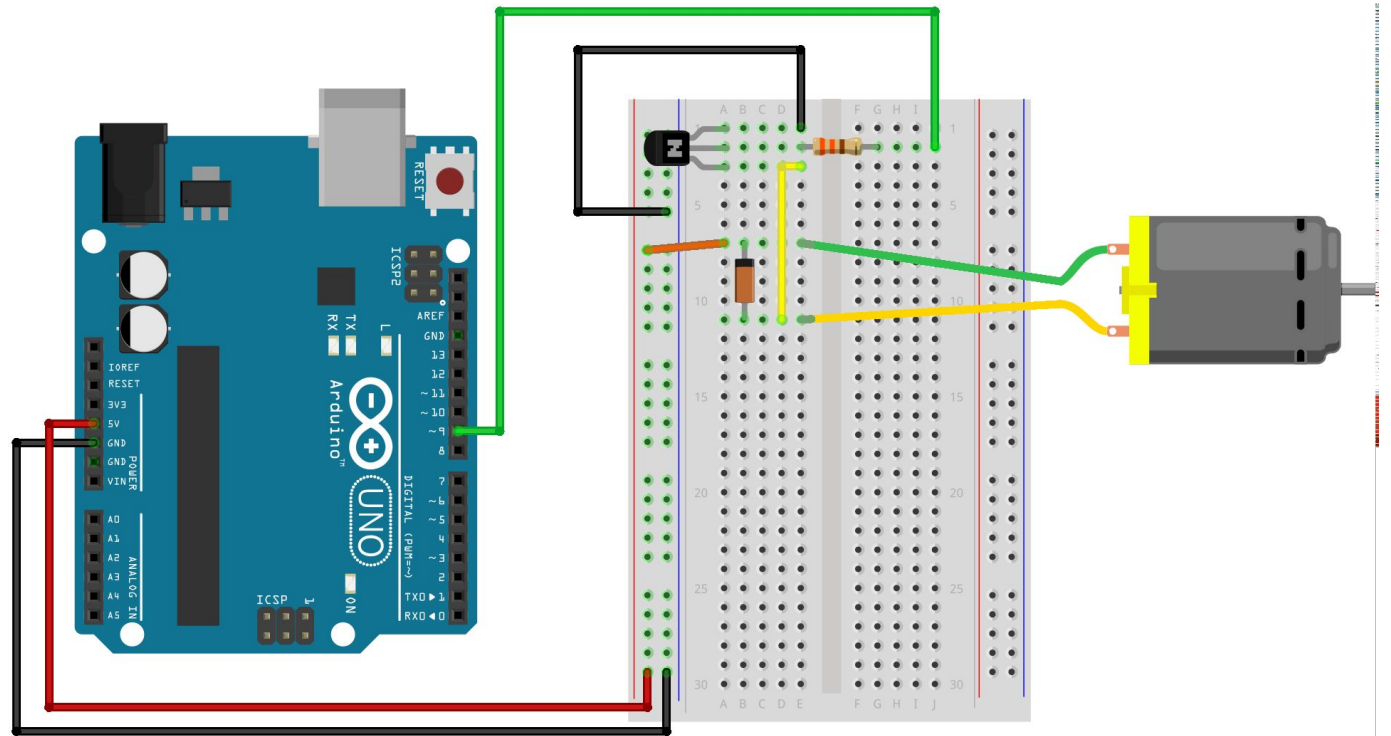Firmata is a generic protocol for communicating with microcontrollers from software on a host computer.

Why use Firmata?

 ATmega328P microcontroller running at 16MHz, the 32Kb of memory space on an Arduino is not enough for larger projects. It would be great if we can harness the power of our PC to do the complex processing while the Arduino can be the platform for the sensors and motor controls.

Processing = Master
Arduino = Slave

Load Firmata on Arduino
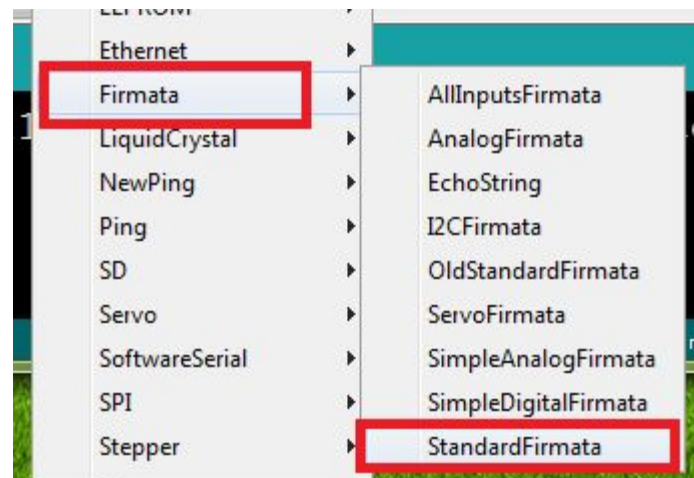
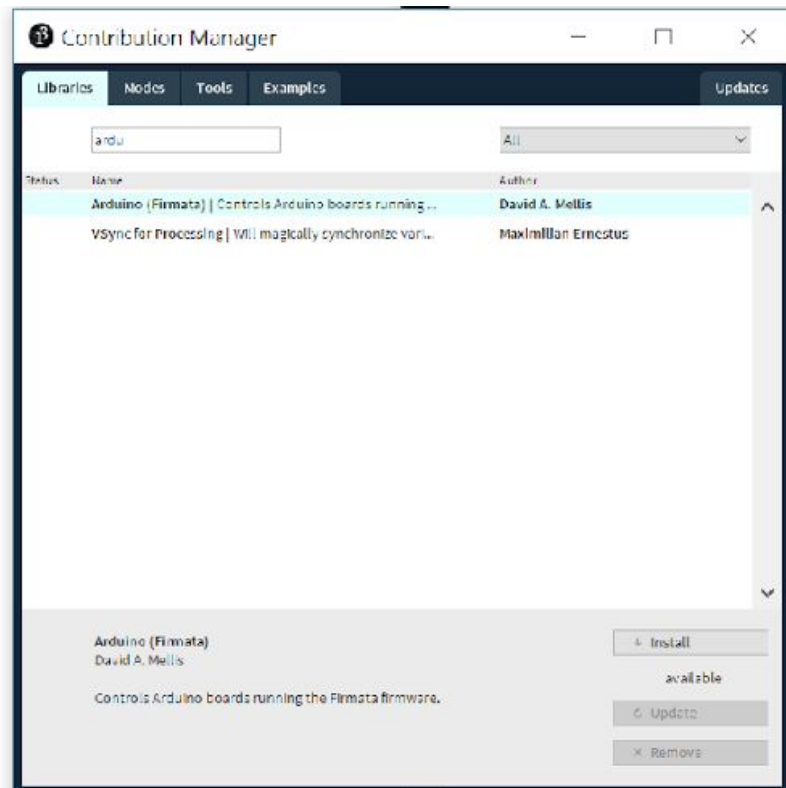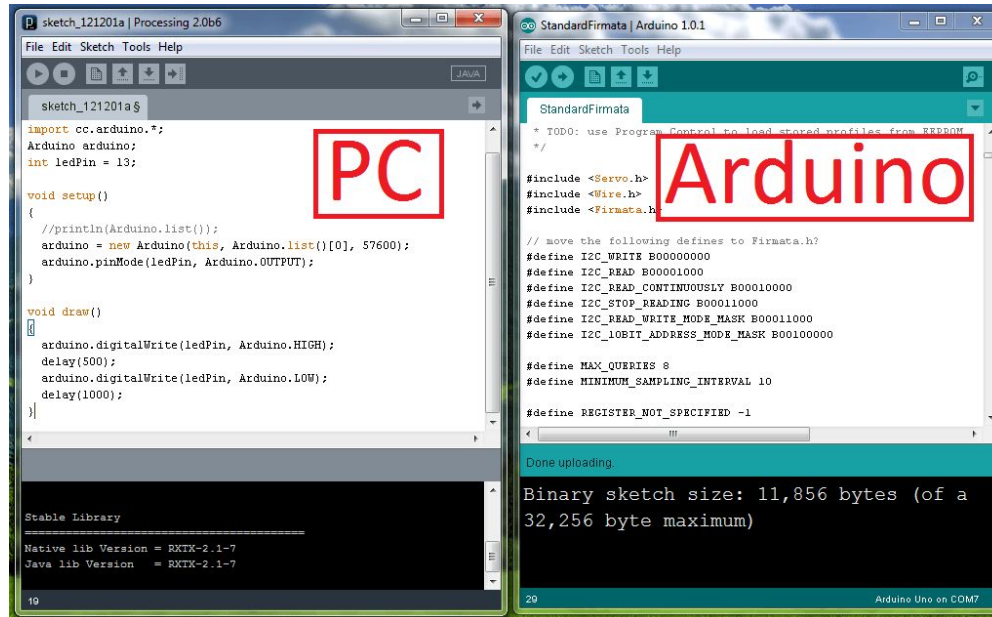# Install Firmata library in Processing

Processing code

Now use "Open..." to open the example in the Arduino library (in Processing).
Processing Folder -> libraries -> arduino -> examples -> arduino_input -> arduino_input.pde

Now that we have both systems connected, there is no need to compile and upload to the Arduino anymore.

this is an old screenshot
(disregard the code)

Processing code

The sketch will :-
- draw a filled box for each **digital pin** that's HIGH (5 volts).
- draw a circle whose size corresponds to the value of an **analog input**.

Pro Tip

Read up on OSC libraries

You can use OSC library in processing to 'talk' to other applications on same network over WiFi. Now you can clearly make much larger interconnected systems!

Processing Lib: http://www.sojamo.de/libraries/oscP5/
OpenFrameworks Lib: https://github.com/palida/ofxOsc
Full Spec: http://opensoundcontrol.org/spec-1_0

Homework

1. **Use Firmata Serial library to control hardware connected to your Arduino from an interactive processing sketch.**

You know the drill:
- Submit code on github
- Video link in readme.md

2. **Create and solder a circuit using at least six LEDs.**

Oh yes, midterms…
It's time to shine!