

Introduction to Physical Computing: Week 4 (2/12/2019)

Today's agenda

- Lecture
 - Physical computing as a subversive medium
- Lab
 - Servo motors
 - Serial communication

Physical Computing as a Subversive Medium

- Computational devices and networked systems are embedded all around us
 - Often times used for surveillance and control
- Physical computing gives us agency and allows us to subvert these systems
 - How can we appropriate these (at times) oppressive tools and use them to benefit us?
 - How can we turn them into something playful?

Elena Nikonole

Deus x mchn

<https://vimeo.com/261811531>

! MEDIENGRUPPE BITNIK

Surveillance Chess (2012)

<https://www.bitnik.org/s/>

James Tregaskis

Who is at the door?

[http://doc.gold.ac.uk/compartsblog/index.php/
work/who-is-at-the-door/](http://doc.gold.ac.uk/compartsblog/index.php/work/who-is-at-the-door/)

Urban Armour

Miss-My-Face: <https://urbanarmor.org/portfolio/miss-my-face/>

The Social Escape Dress:

<https://urbanarmor.org/portfolio/the-social-escape-dress/>

The Power Suit:

<https://urbanarmor.org/portfolio/the-power-suit/>

S.W.A.M.P.

Improvised Empathetic Device:

<http://www.swamp.nu/projects/ied/>

Brain-Controlled Interface for the Motile Control of Spermatozoa by Ani Lu

[https://www.media.mit.edu/projects/woman-of-S
TEAM-grabs-back/overview/](https://www.media.mit.edu/projects/woman-of-S
TEAM-grabs-back/overview/)

MIT Media Lab

DuoSkin temporary tattoos:

<https://vimeo.com/178334883>

Machine Learning and Arduino

<https://blog.tensorflow.org/2019/11/fruit-identification-using-arduino-and-tensorflow.html>

==Lab==

Servo Motors

- Have three pins
 - Power
 - Ground
 - Digital pin
- Rotation of the motor is controlled through pulse width modulation (pwm)
- Used for precise tasks where you need to know the angle of the motor

Pulse Width Modulation (pwm)

- A type of digital signal that is used to create analog-like effects
- Servo Motor is controlled through digital input, pwm allows us to smoothly control motor
- Is either HIGH or LOW
- PWM allows us to determine the length of time it is HIGH or LOW
- This determines the angle at which the servo rotates

Read more here: <https://learn.sparkfun.com/tutorials/pulse-width-modulation/all>

Pulse Width Modulation (PWM)

50% duty cycle



75% duty cycle



25% duty cycle

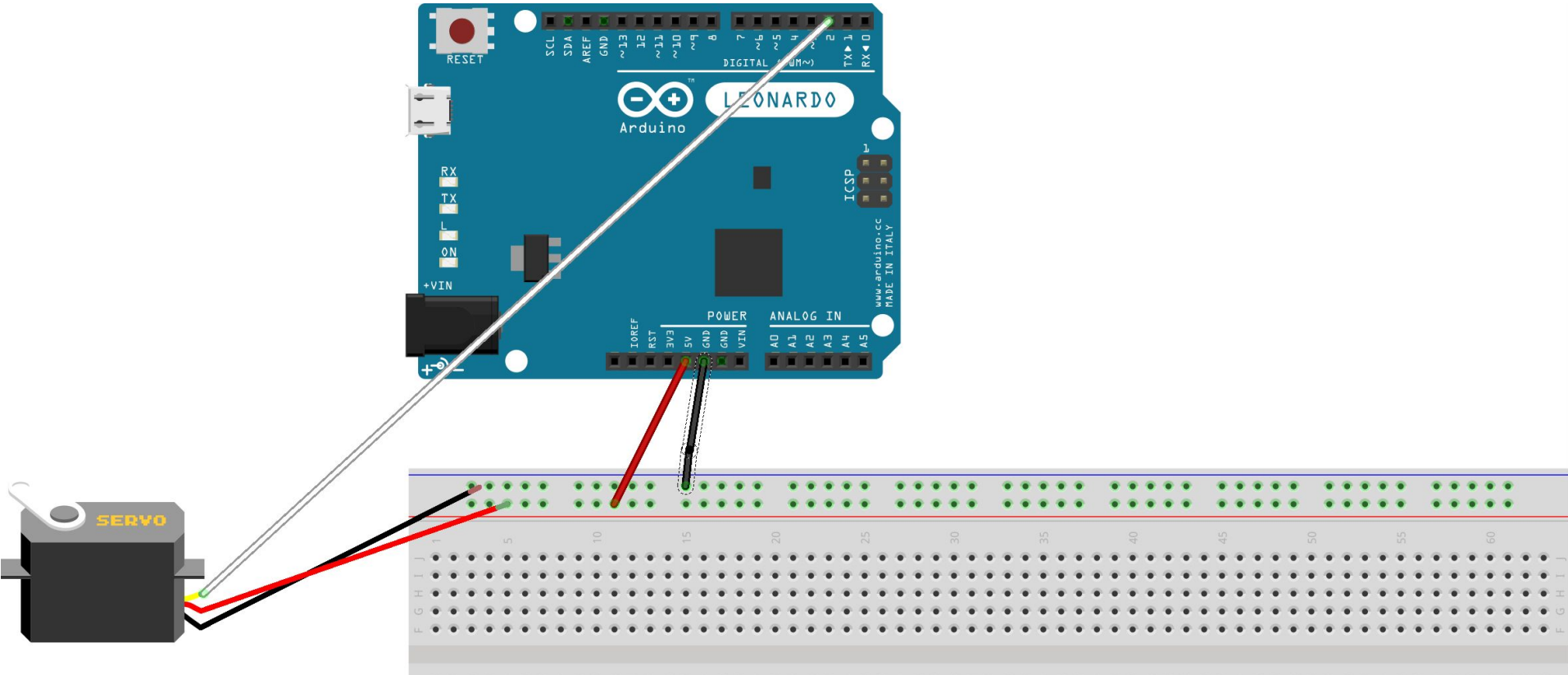


Simple Servo Tutorials

<https://www.intorobotics.com/tutorial-how-to-control-the-tower-pro-sg90-servo-with-arduino-uno/>

<https://www.instructables.com/id/Arduino-Servo-Motors/>

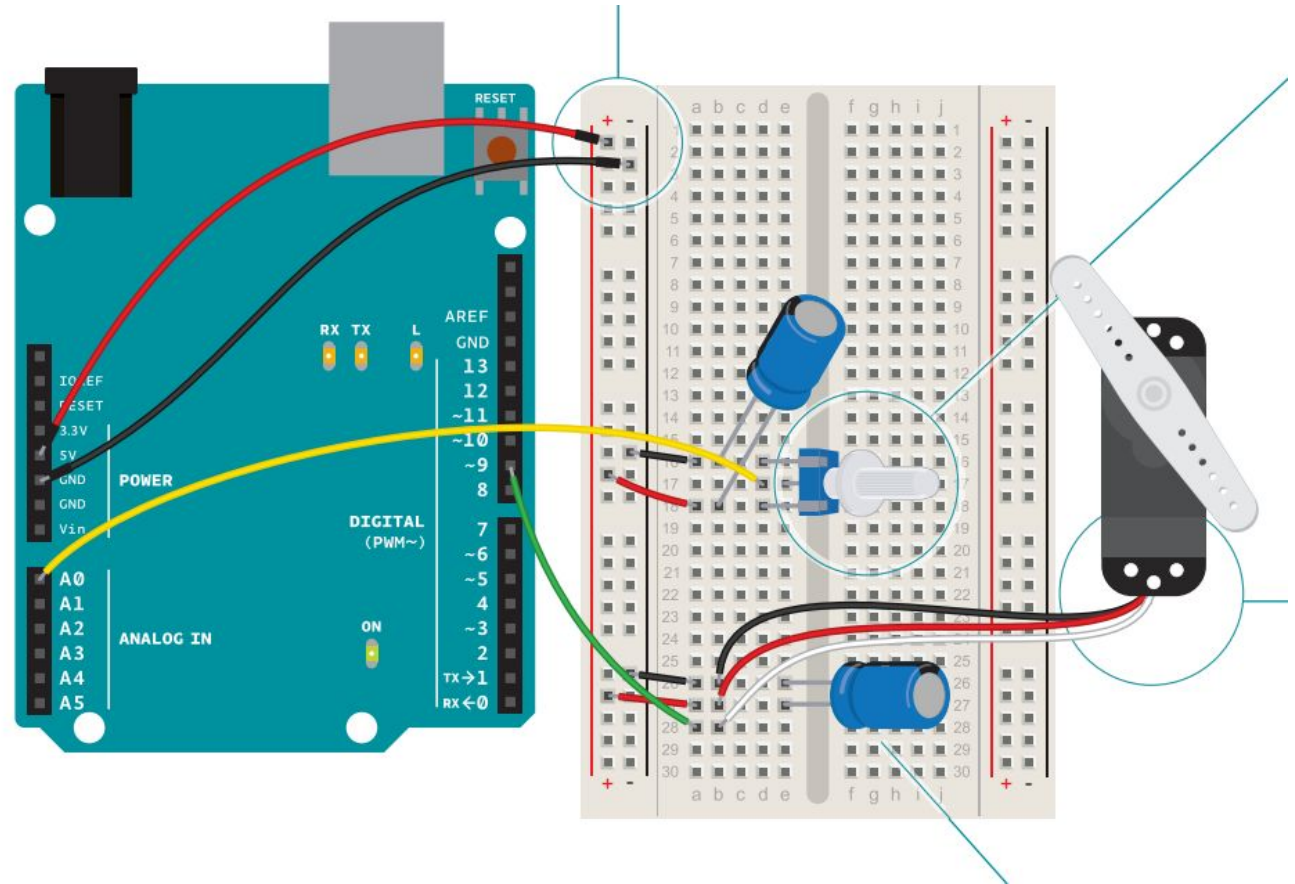
Get started with the servo!



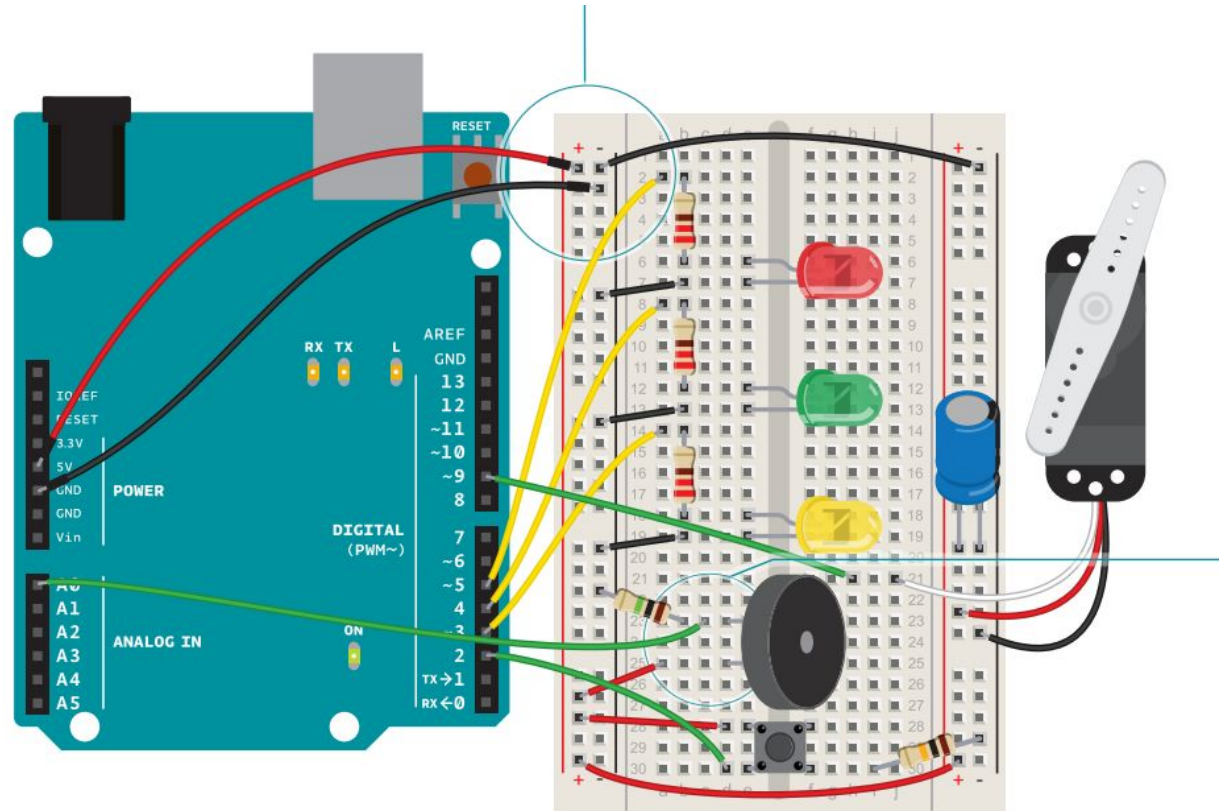
Code :

https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/servo_motor_test.ino

Mood Cue



Knock Lock



Break!

Let's relax and clear our minds before delving into serial communication!

Serial Communication

- Send data between Arduino and p5 through serial communication
- Will use a light sensor to send data from Arduino to p5
- Will use p5 to control a servo motor connected to an Arduino
- We will make Arduino and p5 speak to each other simultaneously

Tutorials for Arduino and Serial Communication with p5

- <https://itp.nyu.edu/physcomp/labs/labs-serial-communication/lab-serial-input-to-the-p5-js-ide/>
- <https://medium.com/@yyyyyyyuan/tutorial-serial-communication-with-arduino-and-p5-js-cd39b3ac10ce>

How does serial communication between Arduino and p5 Work?

- Arduino sends data through the serial port
- P5.serialport creates a websocket that sends the data to p5 running in the browser
 - Websocket: provides a low-latency connection between the client and the server
 - Transaction can be initiated by either client or server
 - Allows for the simultaneous transfer of data
- Serial data from Arduino sent to p5 via the websocket
- The websocket sends data from p5 to Arduino via the Arduino's serial input

Read more here: <https://blog.teamtreehouse.com/an-introduction-to-websockets>

Download p5 Serial Control App

<https://github.com/p5-serial/p5.serialcontrol/releases/tag/0.1.2>

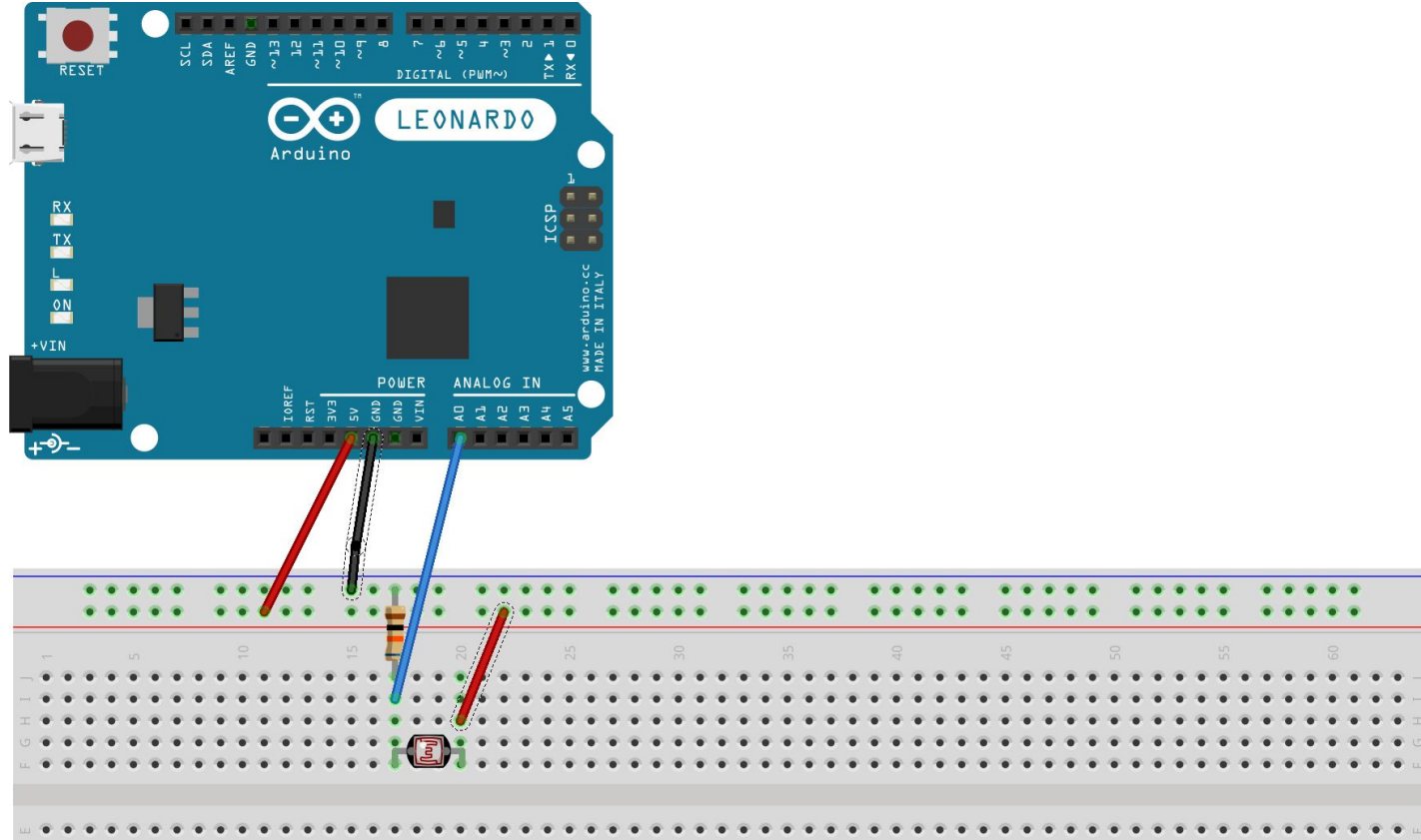
Find the name of your serial port:

<https://www.mathworks.com/help/supportpkg/arduinoio/ug/find-arduino-port-on-windows-mac-and-linux.html>

Sending Data from Arduino to p5

- We will be sending data from the light sensor to p5
- We will display the Arduino data as a graph using p5

Arduino Circuit and Breadboard



Code

Arduino code:

<https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/lightserial.ino>

- P5.js code:

- Part 1:

- <https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/serialcontrol.js>

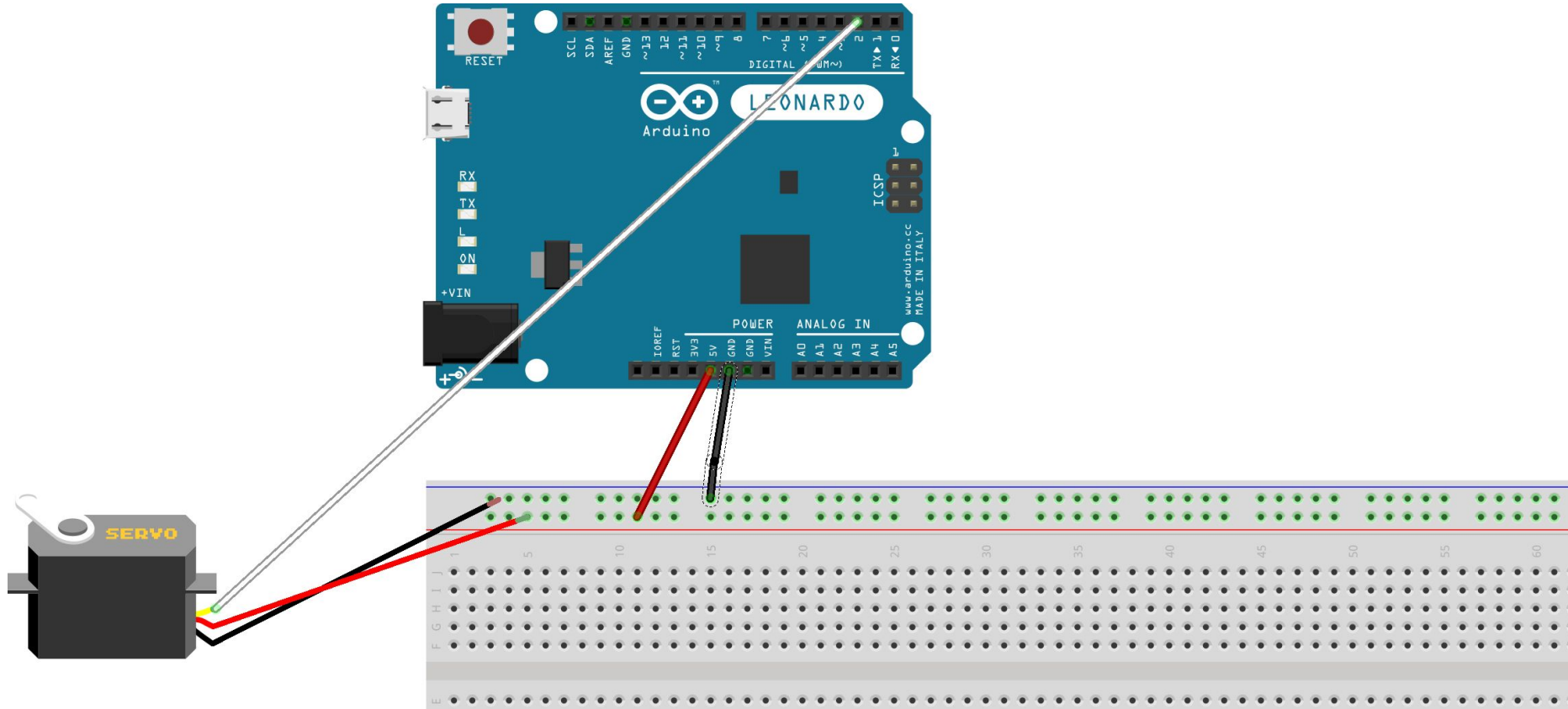
- Part

- 2: https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/serialcontrol_graph.js

Sending Data from p5 to Arduino

- We will create a slider with values from 0-180 in p5
- We will use these values to change the color of the background in the p5 sketch and we will use them to control the rotation of the servo motor on the Arduino

Arduino Circuit and Breadboard



Code

Arduino code:

https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/servo_motor_serial.ino

P5.js code: https://github.com/jmakivic/cci-pcomp-fall2019/blob/master/serialcontrol_send.js

Make them speak to each other!

- What should we change in the Arduino and p5 code to make them send data simultaneously?

Freestyle!

Part 1: Choose a different sensor to send information to the p5 sketch

Part 2: Make a p5 sketch control a piezo or another component on the Arduino

Part 3: Connect Part 1 and 2. How can the sensor from Part 1 affect the p5 sketch, which affects the piezo (or other component) in Part 2?