

## Project 2, Part A: Controlling a Mouse with EMG

### Breadboard Set Up:

- To begin setup of the electrical components, place the Arduino on the breadboard with the three headers placed as shown in Figure 1.
- NOTE: The three breadboard components of focus are 5V (power), GND (Ground), and A0,A1,A2 (channel of sensor)
- Using three wires and an EMG sensor, place each of the wires in their respective positions as seen in Figure 2
- NOTE: The three sensor components of focus are similar to the breadboard: 5V (Power), GND (Ground) and RAW (EMG sensor output)
- Once attached to the EMG sensor, place wires to their corresponding positions on the breadboard as noted in Table 1 and Figure 3. Repeat this setup for the other two sensors.

**Table 1: Wire placement for breadboard and sensor**

Breadboard	Corresponding EMG Sensor Placement
5V	5V
GND	GND
A0, A1, A2	RAW

- After all parts are connected, connect the blue arduino cable to a USB port on your computer. Check that a light is visible on each of the sensors.
- Open the Arduino app on your computer. Navigate to and click “Tools” located at the top left of the screen.
  - Under “Processor”, select “Port” and ensure “ATMega328P (Old Bootloader)” is selected
  - Under “Board”, select “Arduino Nano”
  - Under “Port”, select the port name that appears, and copy the port name for later
- Download the [BME227-S21](https://github.com/djangraw/BME227-S21) (<https://github.com/djangraw/BME227-S21>) class folder and upload BME227-S21/ArduinoCode/AnalogInToSerial\_Time3Chan\_v2 to the arduino nano.

### Sensor Placement:

- Place the sensors as depicted by Figure 4. It's important that the EMG sensor is correctly placed given the respective channel on the breadboard as described in Table 2.

**Table 2: Sensor placement given channel**

Channel on Breadboard	Corresponding Placement on Body
A0	Forearm
A1	Left Gastrocnemius
A2	Right Gastrocnemius

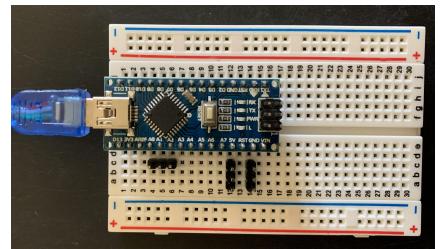


Figure 1: Breadboard setup with Arduino and headers

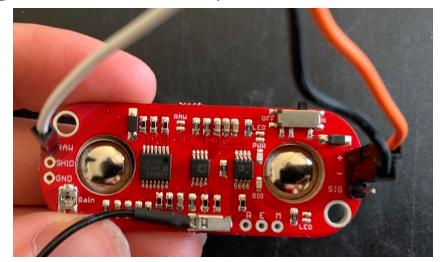


Figure 2: EMG Sensor set up with wires

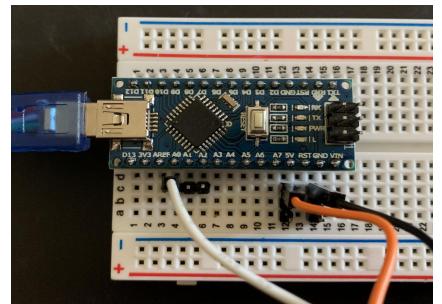


Figure 3: Breadboard setup with EMG connected wires



Figure 4: Sensor placement on each limb

## Running the GUI program via command:

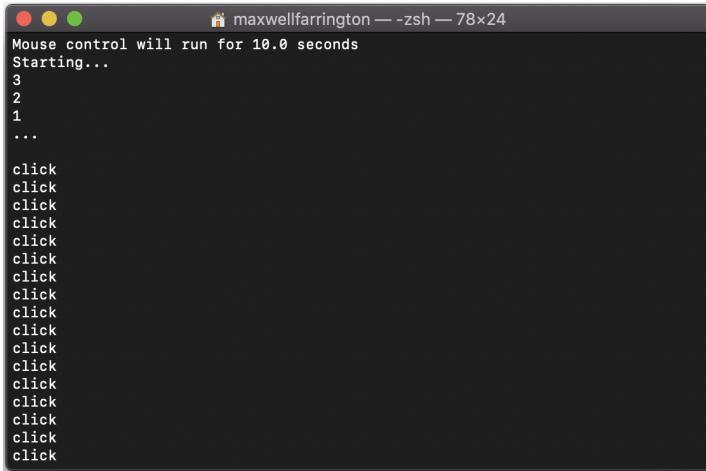
- Open terminal/command prompt and type in the following in the form:  
`python <Filepath>/Project2_PartD.py <speed in x> <speed in y>  
<run duration> <arduino port>`
- Fill in the <items> with the appropriate value or string
  - Start by calling ‘python’
  - Find and copy the entire path to the ‘Project2\_PartD.py’ into the command
  - Next, specify the X and Y speed multipliers to tune the mouse control to fit your screen.  
(It is recommended to set both as ‘1’ to start.)
  - Next, set the duration over which the GUI program will control the mouse in seconds
  - Finally, paste in the arduino port we copied down from earlier
- Run the command

### Example:

The following command will run the GUI program at 1x movement speed in both X and Y for 10 seconds through the port /dev/cu.usbserial-1430:

```
python /Users//...//BME227/Project2_D.py 1 1 10 /dev/cu.usbserial-1430
```

- Once the command has been run, the command window will display a countdown until the mouse control begins.
- While the program is running, it will print the current action as shown in Figure 5.



```
maxwellfarrington — zsh — 78x24
Mouse control will run for 10.0 seconds
Starting...
3
2
1
...
click
```

Figure 5: Terminal window running the GUI program