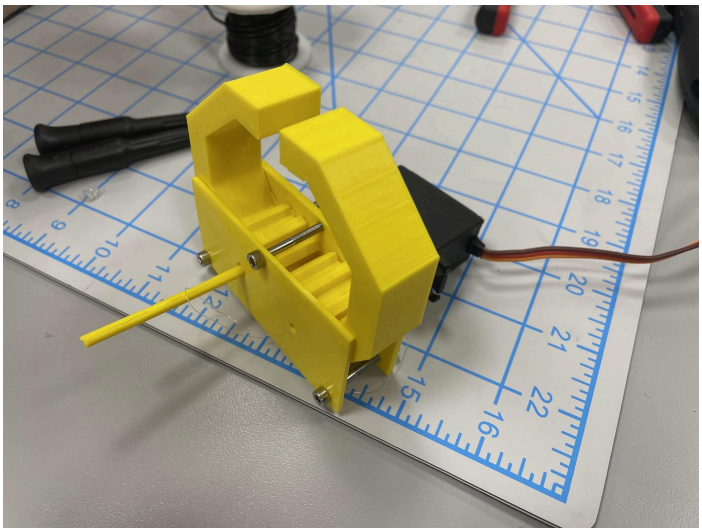
How to make a muscle-activated claw using a Myoware muscle sensor



Introduction:

The task of building a muscle-activated claw using a Myoware muscle sensor involves the use of electronics, code, and lots of perseverance. This task should not be taken lightly, and shouldn't be taken on by someone without experience with electronics. The results of these instructions allow the user to experience the feeling of controlling an external device using only the movement of their muscles. This should take place over several days, or over the process of several hours. Anyone choosing to take this task must understand the danger it presents, not to the user themself, but to the electronics and the belongings of said user. Misuse or poor actions while following these instructions could result in the destruction of the user's laptop, computer, or other devices.

Tools:

- Screwdrivers of various sizes
- Scissors
- Wire stripper
- 3D printer
- Pliers
- Hex wrench of various sizes

Materials:

- Myoware Muscle Sensor (design based on 1.0)
- Arduino Uno
- Arduino IDE software
- Electronics Breadboard
- 9 Volt Battery Snap Connector
- 9-volt battery
- Tower Pro MG996R servo
- Externally powered USB hub
- USB to USB-b cable
- Linksprite power base shield (**optional**)
- Snap electrodes
- Stranded Aluminum wire (Red, Black, White)
- **5x** M3x0.5mm 30mm screws
- **3x** Hex nut M3x0.5mm thread

Note:

- It may be useful to get backups of the following in case of an incident:
    - 9 Volt Battery Snap Connector
    - Tower Pro MG996R servo
    - Snap electrodes

Warning

- **Misuse of electronics can result in damage to your computer, laptop, or other electronics; this can include damage to the motherboard, drives, and other components**

Instructions

1. Making the Claw

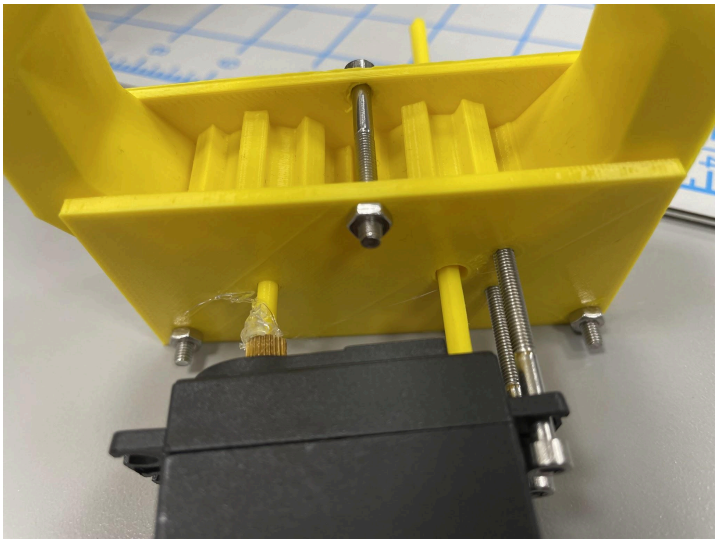
For this portion, you're going to want:

- 3D printer
- **5x** M3x0.5mm 30mm screws
- Tower Pro MG996R servo

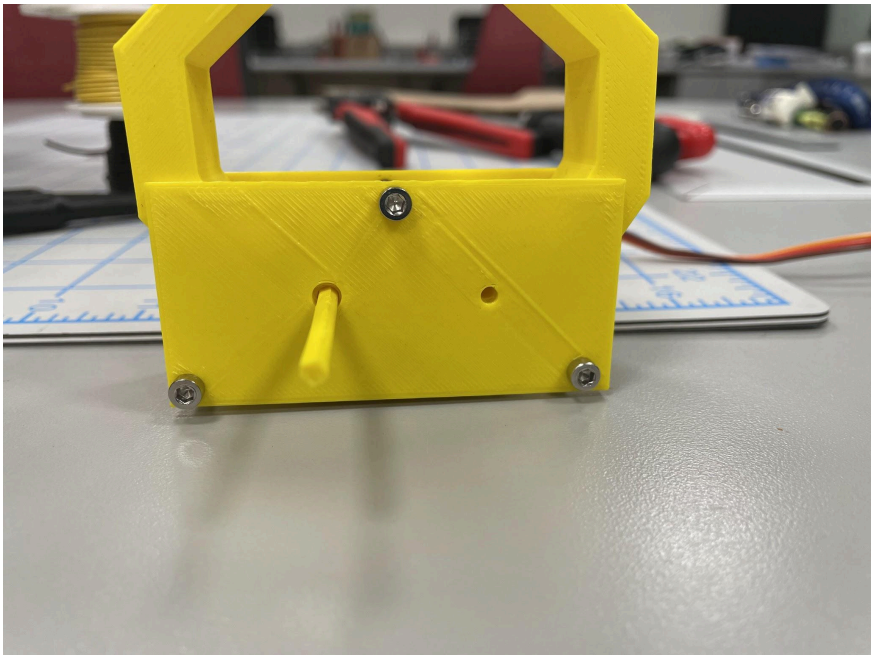
a. In order to print the claw for this project, you can either download the files using this link or you can use the specifications I've described below and design/test it yourself.
    i. ~3 inches tall
    ii. Screw holes are .118 inches

iii. Design the screw for the motor within the file
iv. Two walls to hold the claw together
v. Add a way to fasten the motor to the claw itself

b. Start assembling the claw by orienting each half of the claw in such a way that the gears intertwine and the tips are touching
c. Put the walls on the corresponding sides. The side with 7 holes will work correctly with the side of the claw that has the screw printed into it



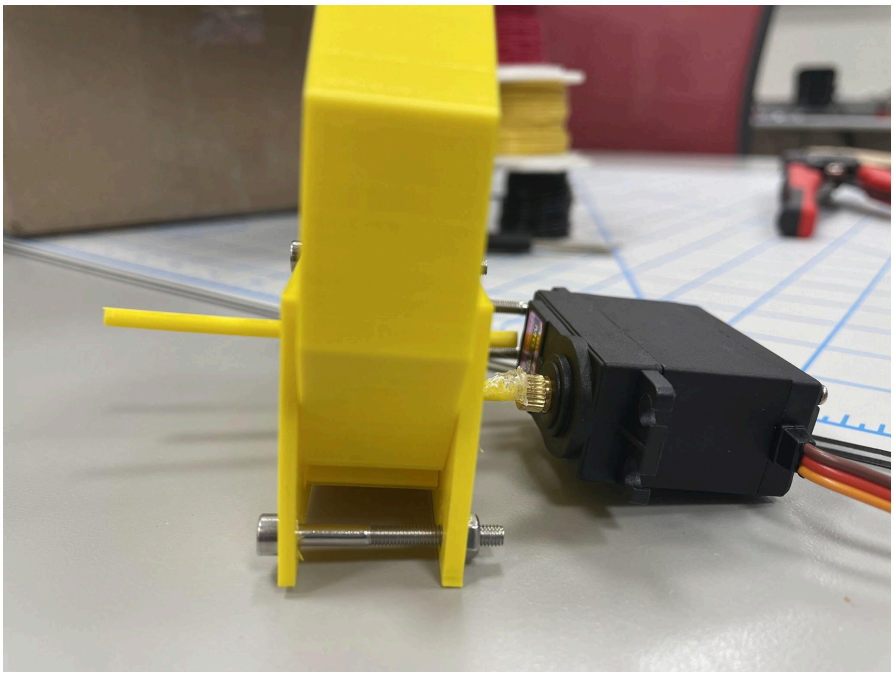
d. Put the long pole through the half of the claw with the hole all the way through
e. Take three(3) screws and seal the sides together by the top center, and bottom right and left, use the hex nuts to hold them on.



NOTE: at this point, you may trim the long pole, but remain aware that if it slips

out it will be difficult to put it back in

f. Screw the motor onto the 3D-printed screw, then use the 2 remaining screws to fasten it in place. Do not screw them too tight, or they will scrape against the claw. You may use some sealant or glue to assure the motor does not spin out on the screw.



2. Arduino hard/software

For this portion, you're going to need:

- Arduino Uno
- Arduino IDE software
- Externally powered USB hub
- USB to USB-b cable
- Linksprite power base shield (**optional**)

a. Similar to the 3D print file, you can either copy and paste the code below into the **Arduino IDE**, or you can follow the very loose suggestions and clues I give below that

```
#include <Servo.h>

Servo myservo;

int pos = 0;
```

```
int neg = 0;

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  myservo.attach(2);
}

void loop() {
  // put your main code here, to run repeatedly:
  int sensorValue = analogRead(A0);
  if(sensorValue >= 200){
   (pos = 0, pos <= 160, pos += 1);
    myservo.write(pos);
    delay(15);
  }
  if(sensorValue < 200){
   (pos = 160, pos <= 0, pos +- 1);
    myservo.write(pos);
    delay(15);
  }
}
```

i. Clues and suggestions are as follows:
   1. Insert the servo library
   2. Assign a variable to keep track of the servo position
   3. While the extent of the servo is 180, keep it at around 160 to be safe

b. When the code is completed, compile it to be assured it is written correctly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    myservo.write(pos);
    delay(15);
  }
  if(sensorValue < 200){
   (pos = 160, pos <= 0, pos += 1);
    myservo.write(pos);
    delay(15);
  }
}
```

NOTE: any issues with the code can be either researched on google, or you can go on the **Arduino Forum** and look for a solution

c. Once the code is written and compiled in the Arduino IDE program, we can begin working on the hardware. Plug the USB hub into your device of choice

d. Plug the USB to USB-b cable into the hub

WARNING: DO NOT plug the USB to USB-c cable directly into your device. This can result in, worst case scenario, burning out of its motherboard

e. You can plug the Arduino into the USB-c cable at this point, but do not upload the code yet

f. If you have it, plug the Linksprite Powerbase shield into the Arduino board

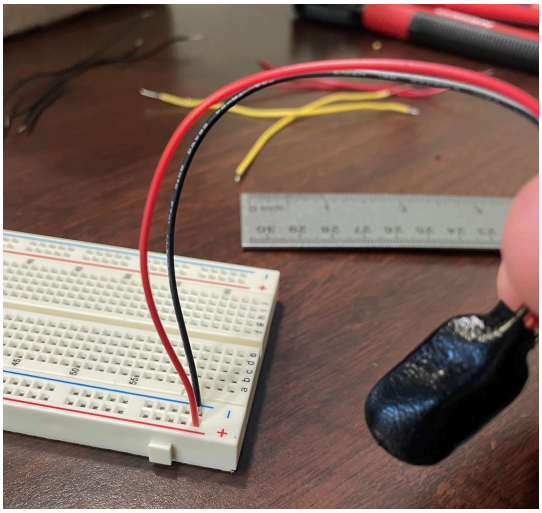
3. Wiring/electronics

For this portion, you are going to need

- Myoware Muscle Sensor (design based on 1.0)
- Arduino Uno
- Electronics Breadboard
- 9 Volt Battery Snap Connector
- 9-volt battery
- Tower Pro MG996R servo
- Linksprite power base shield (**optional**)
- Stranded Aluminum wire (Red, Black, White)
- Snap electrodes

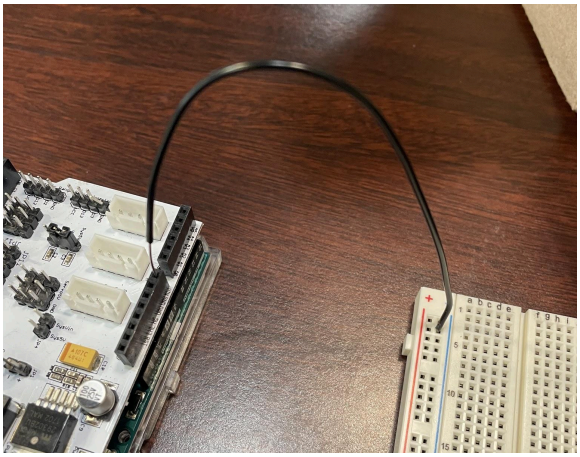
a. In preparation, cut and strip the ends of 3 black wires, 2 yellow wires, and 3 red wires. Each should range between **3 inches and 5 inches**

b. Plug in the 9-volt battery into the snap connector, plug the black ground wire into the negative side of the breadboard, and the red wire into the positive side

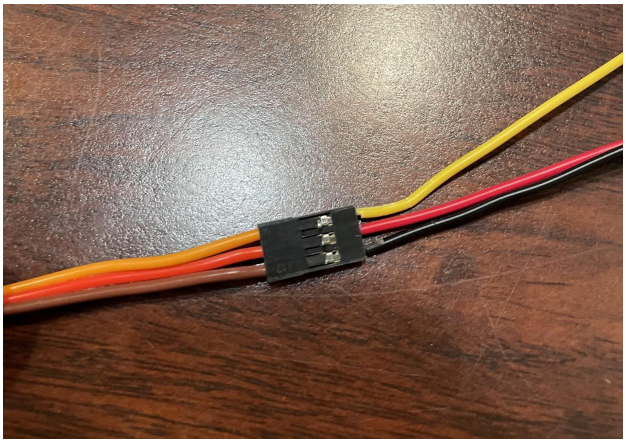


c. Take one of the stripped black wires, connect it to the negative side of the breadboard, and connect the other end to a negative port on the Arduino/Power

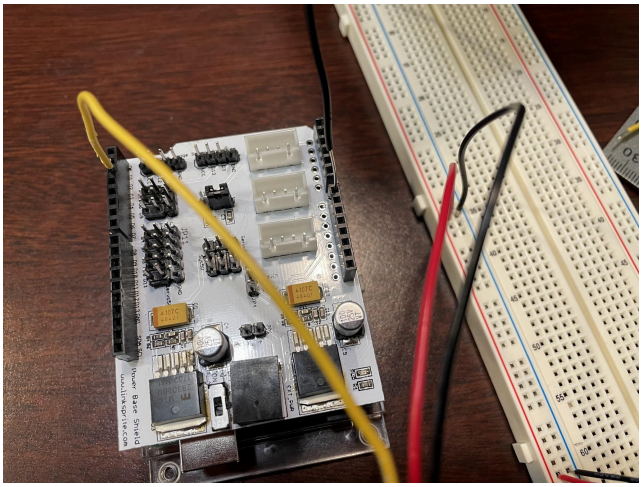
Base Shield



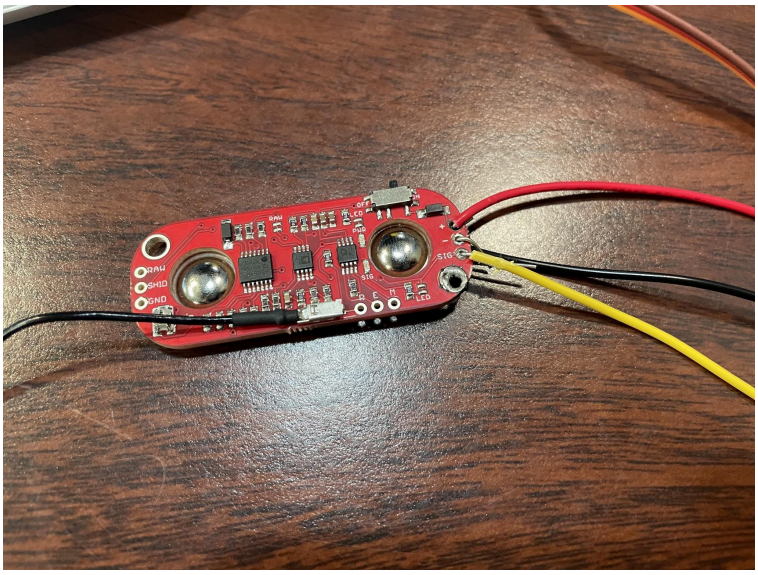
d. Take a red, black, and yellow wire, and plug them into the servo as such:



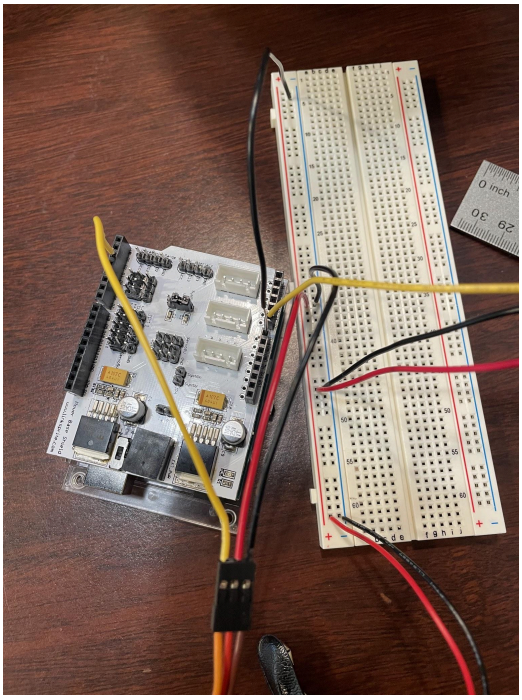
e. Plug the black wire into the negative side of the breadboard, the red wire into the positive side, and the yellow into the port of the Arduino/Power base Shield labeled “D2” (digital pin 2)



f. Take your final red, black, and yellow wires and plug them into the Myoware Muscle Sensor as such:



g. Once again, plug the black into the negative side of the breadboard, and the yellow wire into the Arduino/Power Base Shield pin labeled “A0” (Analog 0)

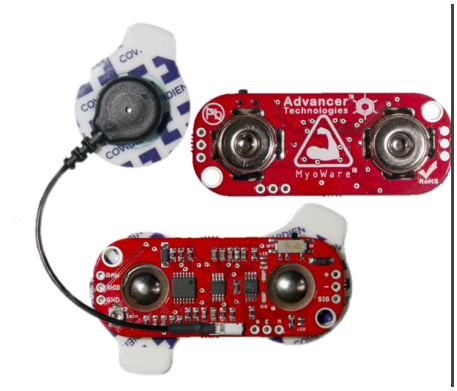


4. Final setup/operation

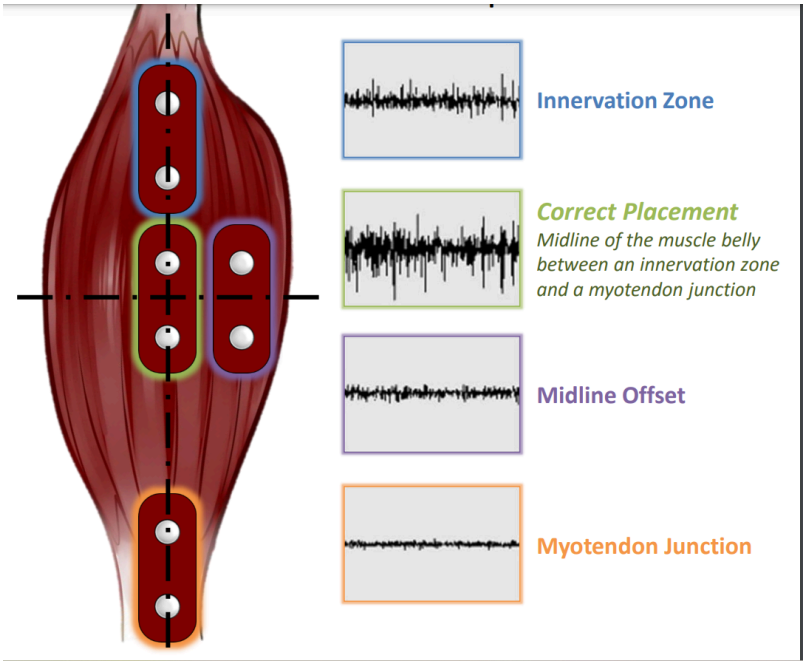
For this portion you're going to need:

- All previous work

a. Take your snap electrodes and plug them into the Myoware Muscle sensor as such:



b. Be assured the Arduino is plugged in but not operating
c. Attach the electrodes to one of your muscles. The two primary electrodes should be placed going up and down at the center of the muscle, the remaining electrode should be placed away from the active muscle. See the diagram below for more accurate placement



d. Upload the code to the Arduino and the device should function as such:
e. If the device remains not working, troubleshoot by checking the wiring and researching the problem on the Arduino Forums.