

1. Amass all parts required.



a. PIC

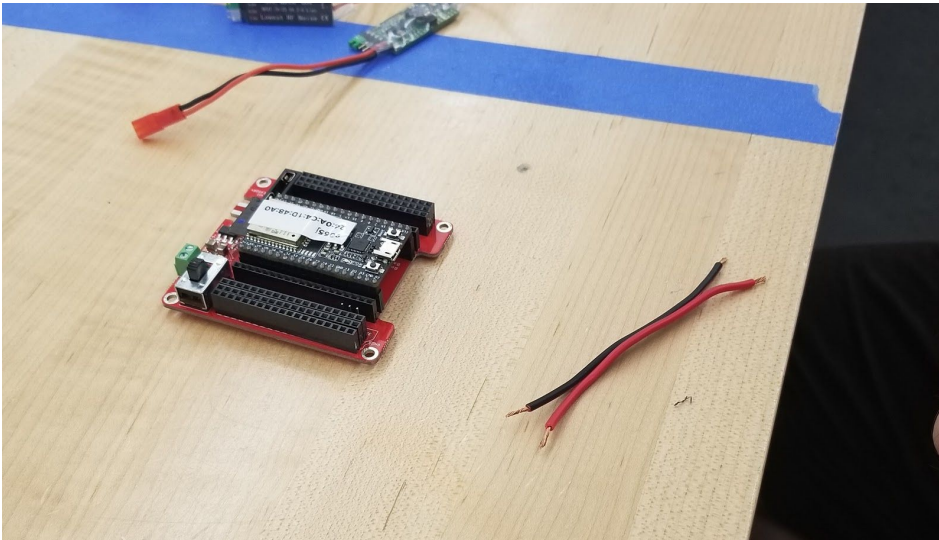


2. Remove all support material

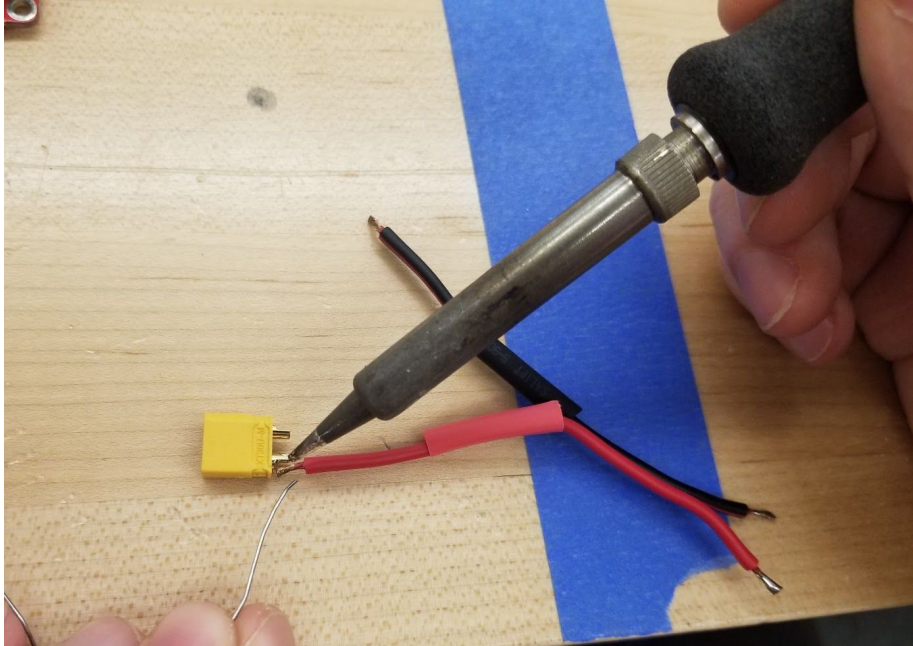


a.

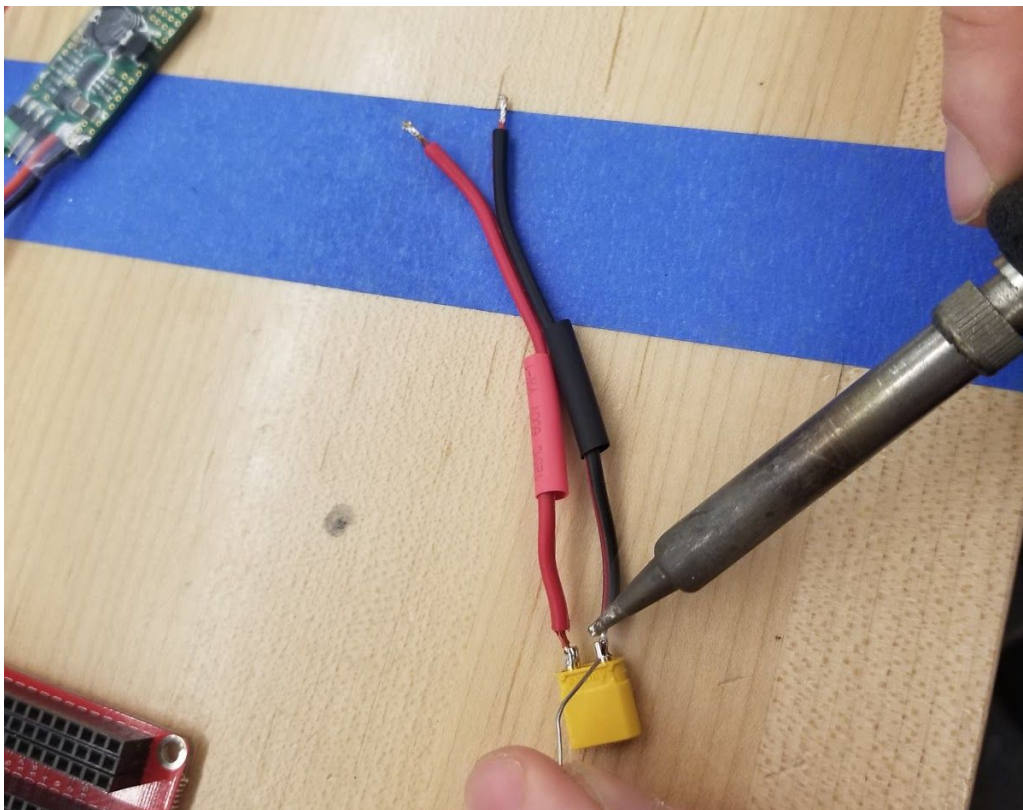
3. Solder and heat shrink leads to the female xt-30 connector



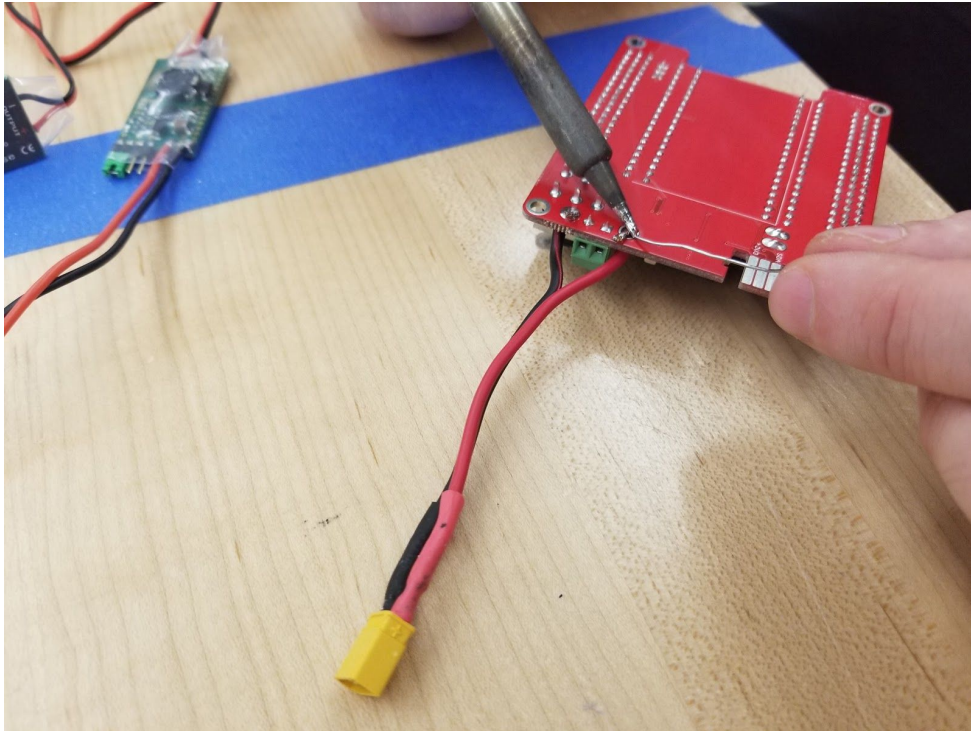
- 4.



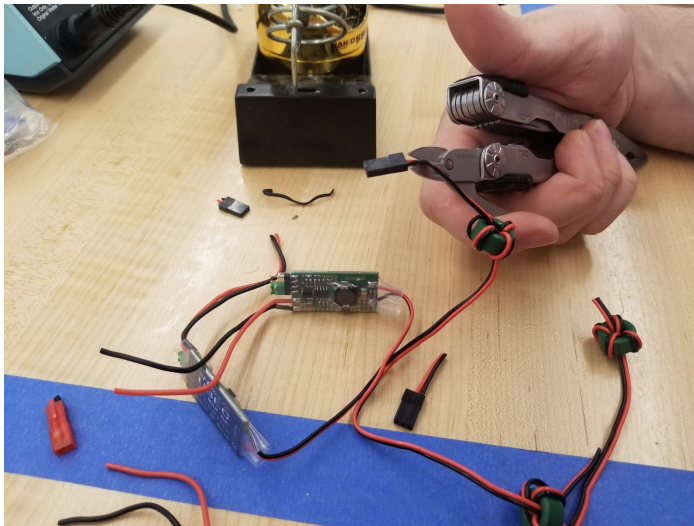
5.



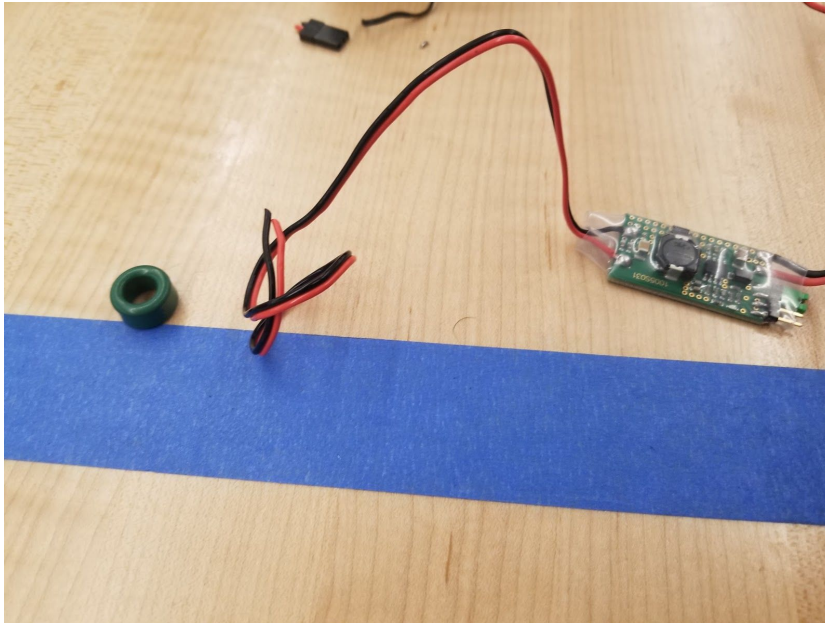
6. Solder the other end to the RIB power connectors



7. Make sure all BECs are set to 5V by moving the jumper closest to the input
8. Cut header pins off of all BECs

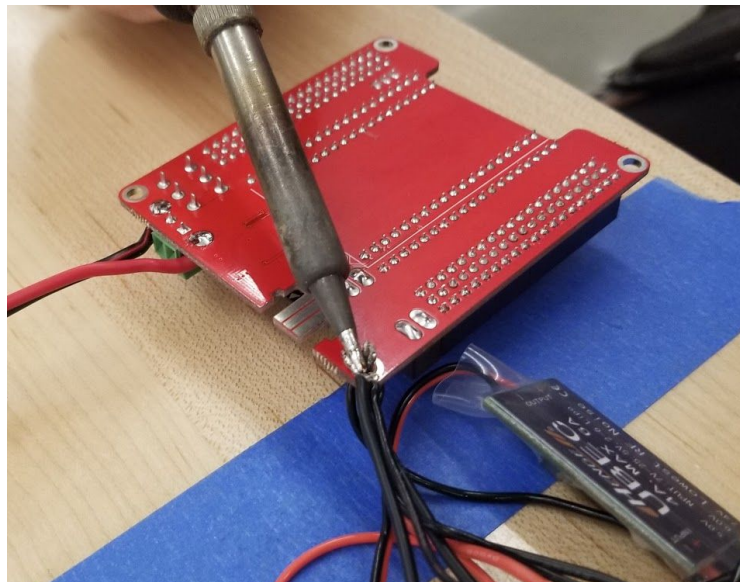


- 9.
10. Unspool the wire from the chokes of the BECs



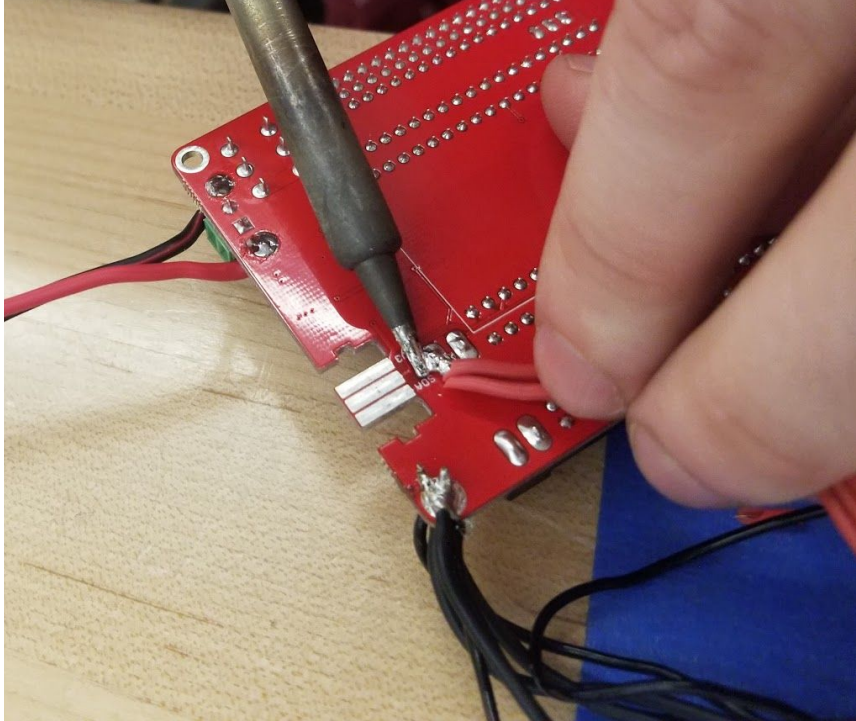
11.

12. Twist all BEC grounds (input and output) together, solder into a bolthole of the RIB



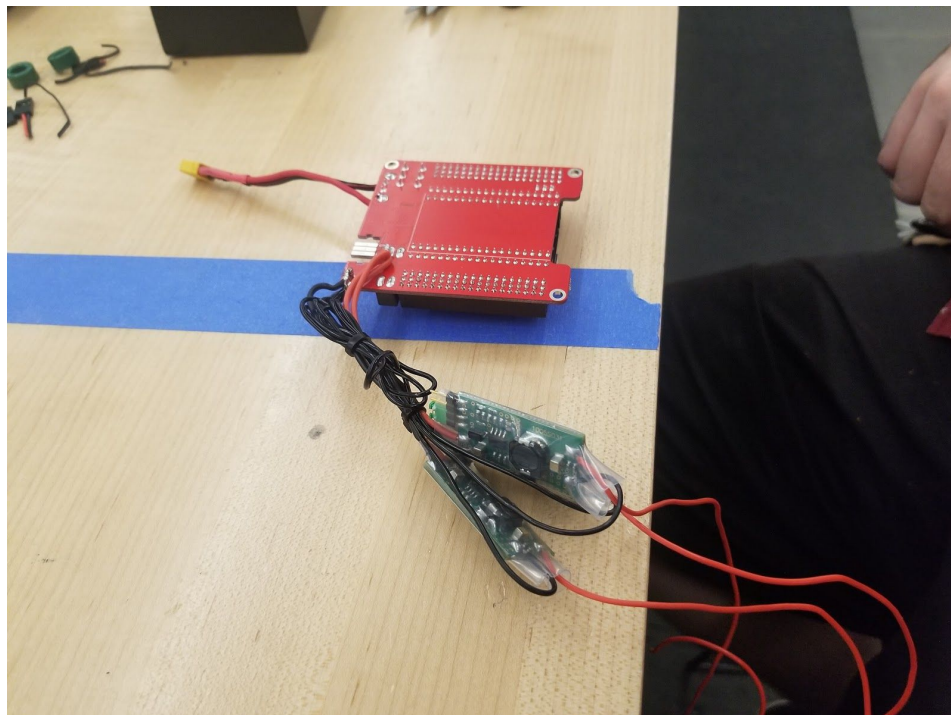
a.

13. Solder the high voltage side positive leads together, Solder to the bottom of the RIB as shown



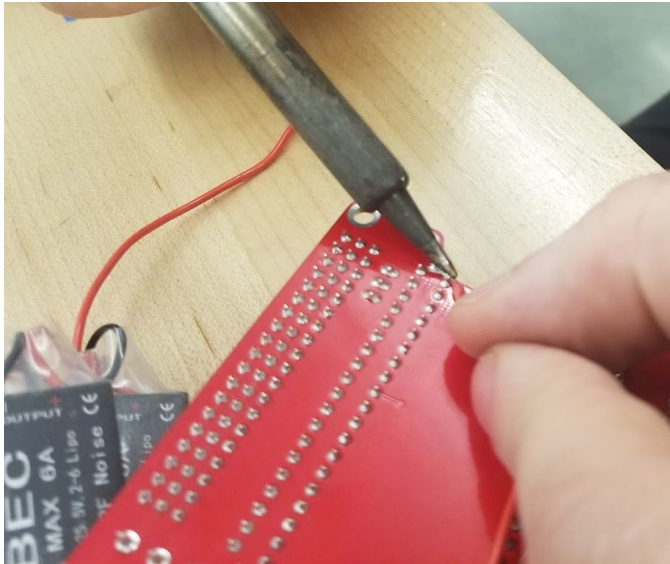
14.

- a. Should look like this when you are done, zip tie where appropriate

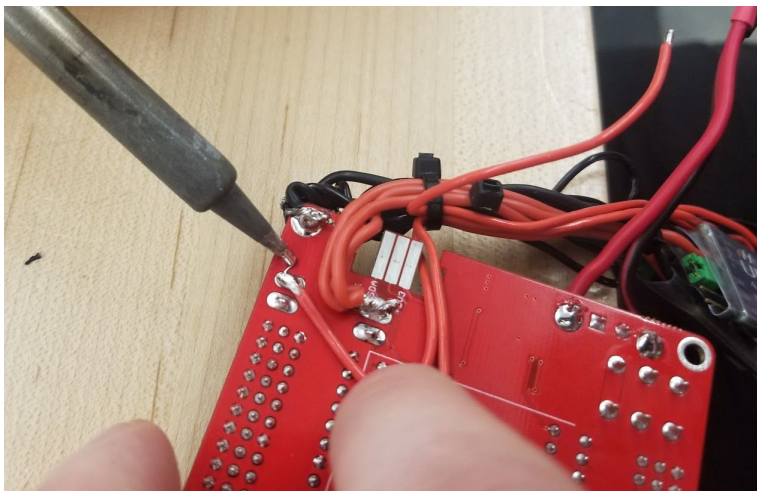


- b. You now have three high power 5v leads

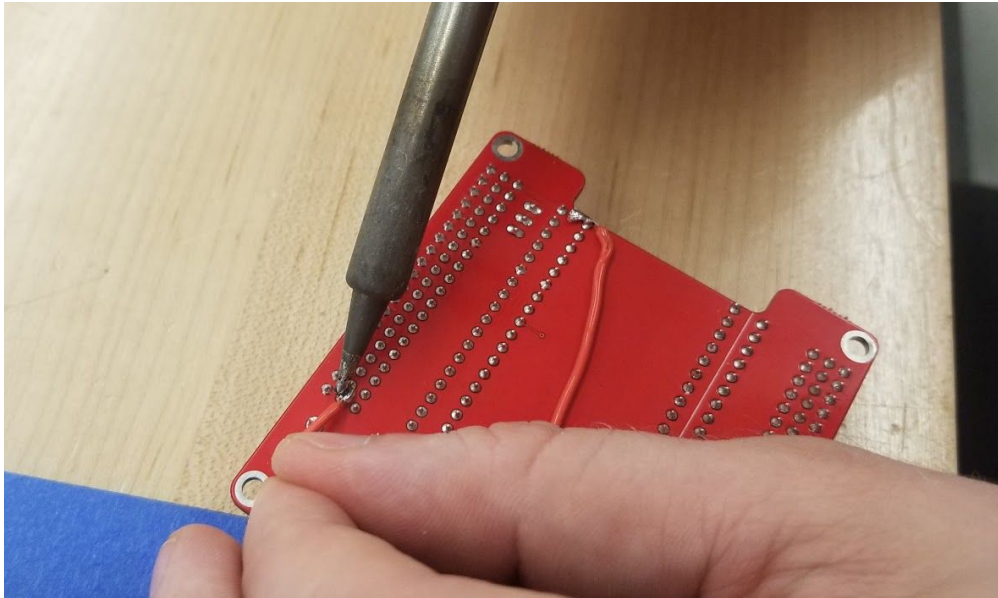
15. Solder one of the high power leads to the 5V pin of the ESP



16. Solder another one of the high power leads to the other side of the fuse

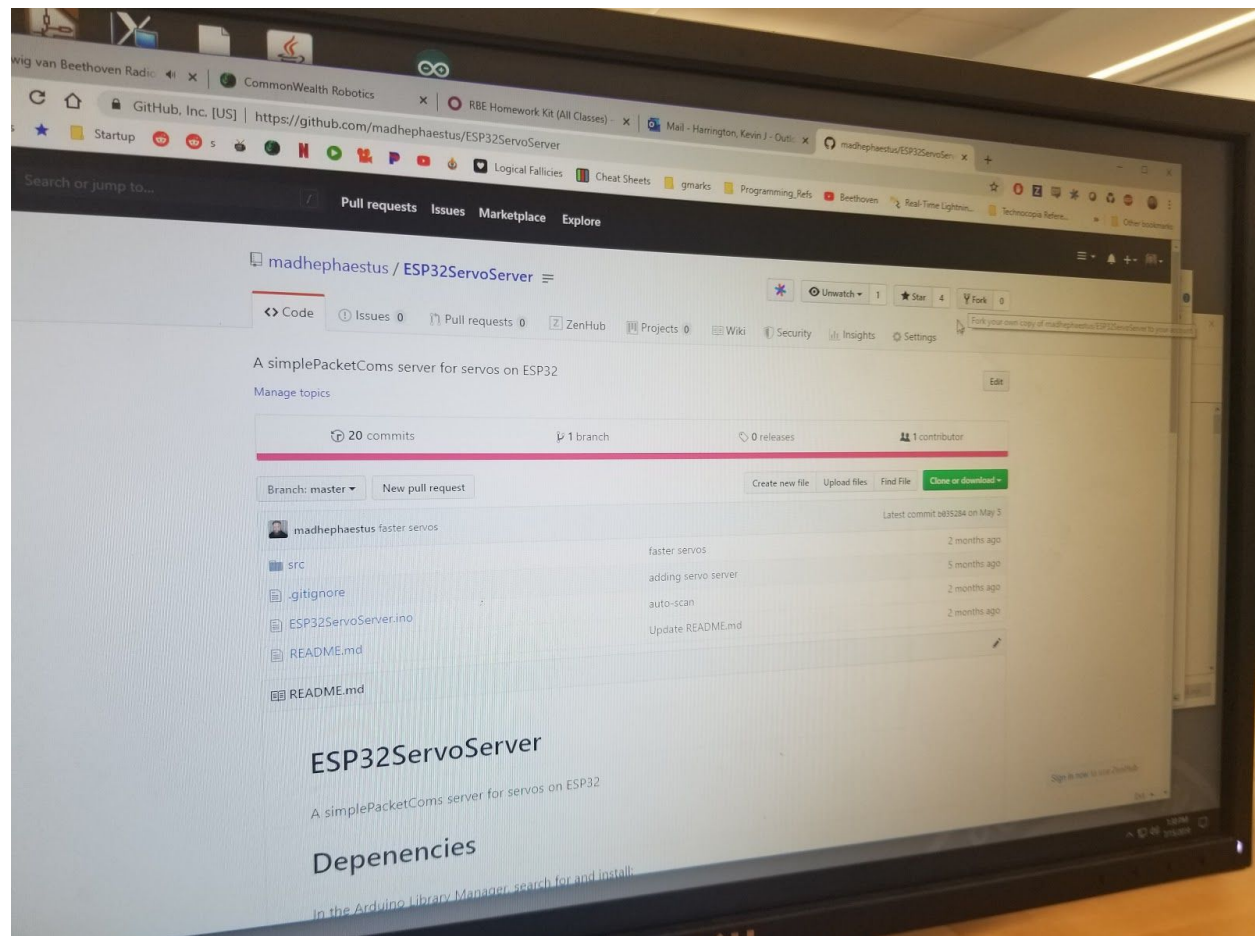


17. Solder the final power lead to the rail opposite of the fuse

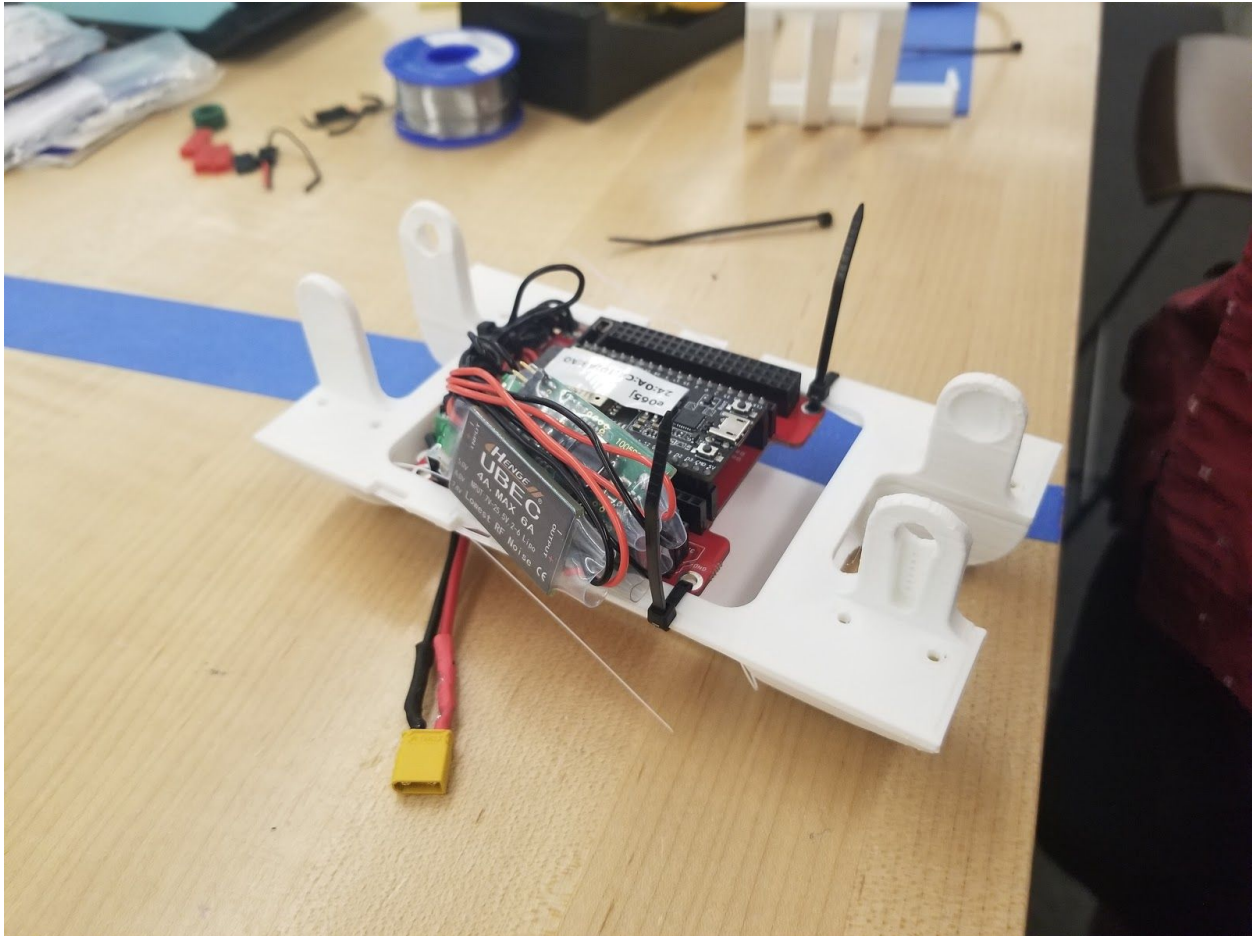


18. Program the firmware

- Plug ESP into computer
- Grab code for cat from github, ESP32ServoServer

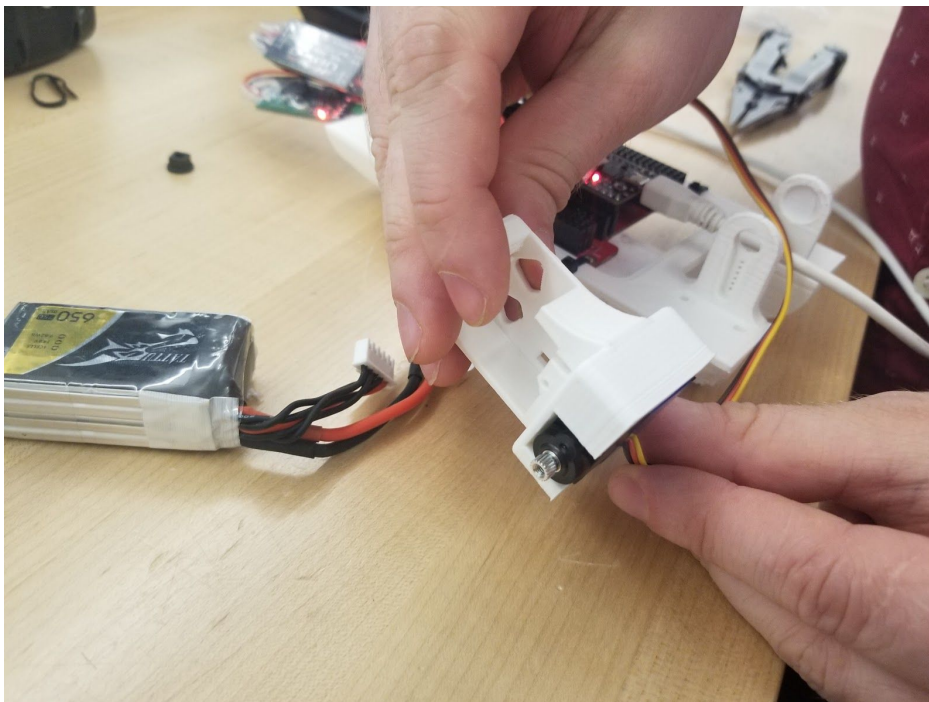
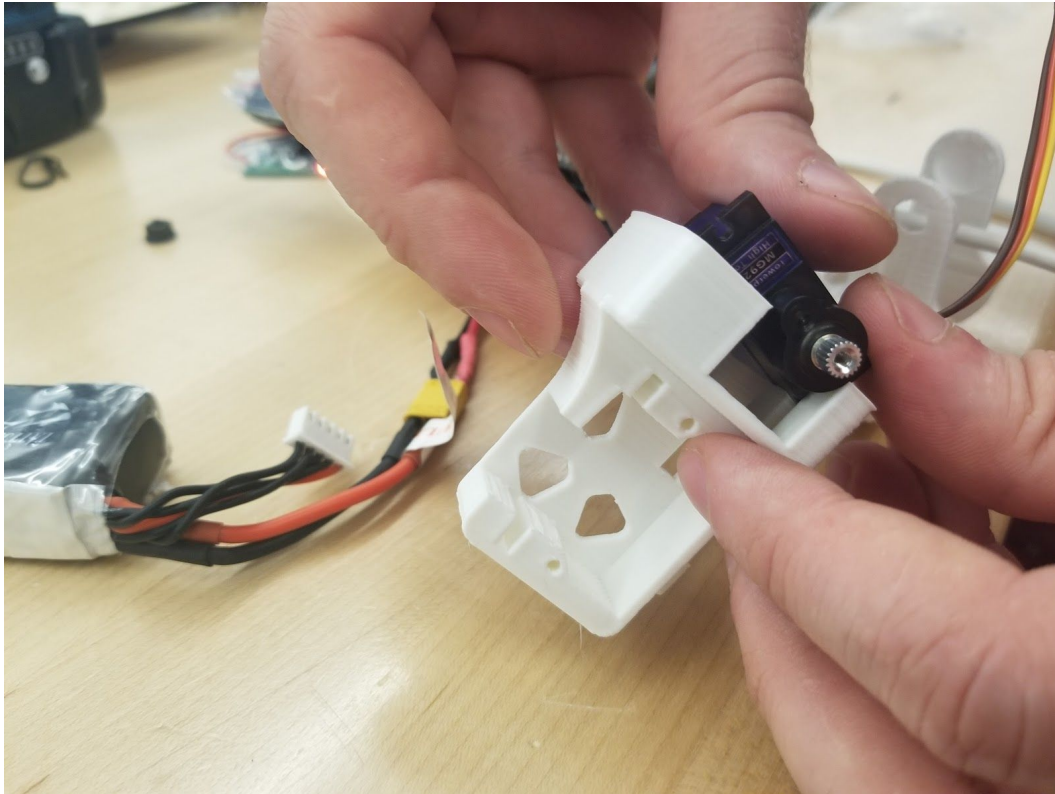


- c. Upload program
- 19. Place ESP into torso piece, use two zip ties as shown to secure



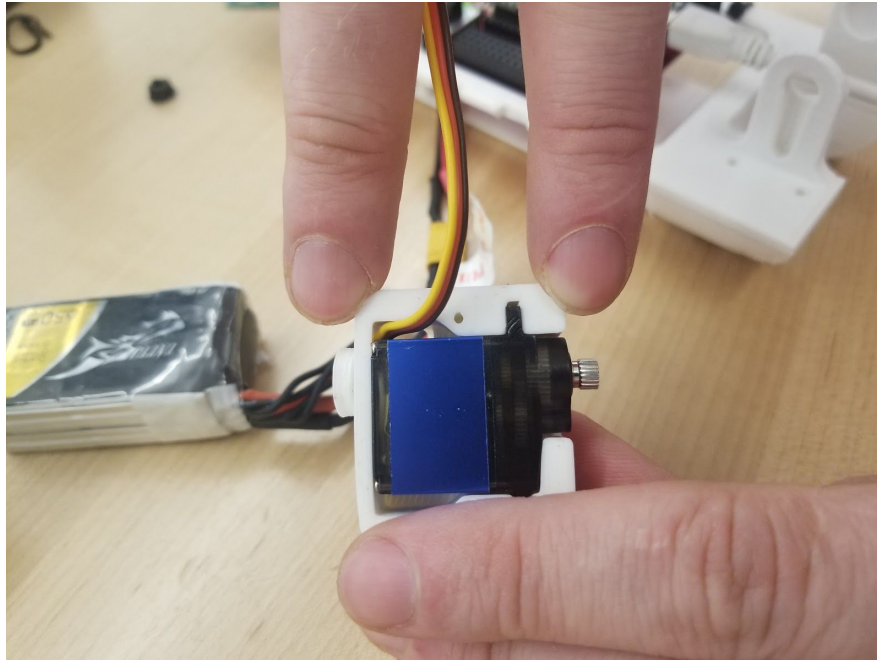
- a. Make sure that the sides of the torso are free of stray filament
- 20. Create a fork of OperationSmallCat/greycat on github
 - a. Take the git url and use it to modify the MediumKat.xml drive engine
 - b. Do the same for launch.groovy, replacing all instances of old git url with your own
- 21. Power on, start bowler studio, run launch.groovy
- 22. With that running, time to begin assembly
- 23. wiring servos
 - a. Start with head base pan
 - b. Use pinout from readme in the project library
 - i. **TURN OFF POWER RAILS BEFORE EACH ATTACHMENT OF A SERVO**
 - ii. After plugging in a link, one should be able to go into bowler studio and verify each connection by moving the servo individually in code

24. Place the servo into the head basepan linkage as pictured



a. Add bushing around the nub of the servo housing

- b. Ensure that the servo sits flush in the compartment and has its shaft aligned with the bushing on the back

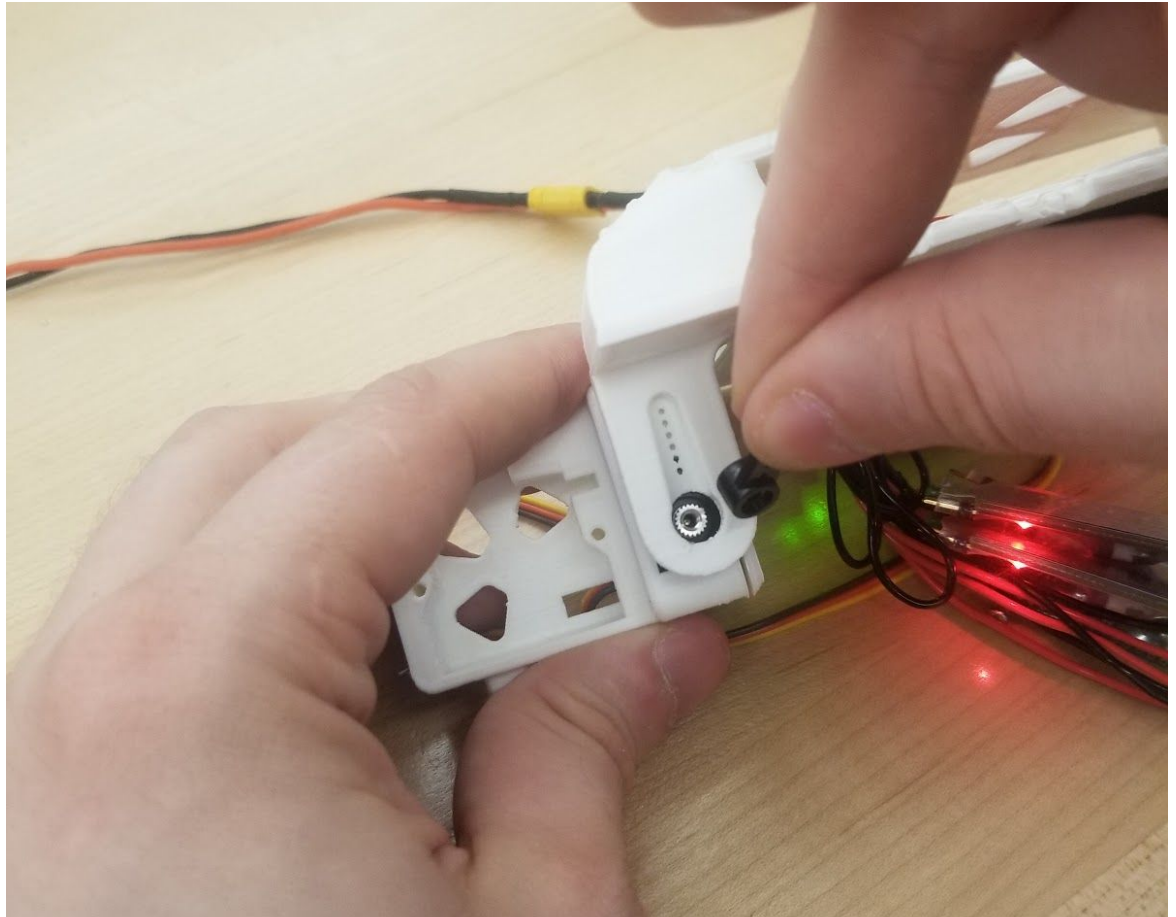


- c. Secure cover with M2x10s



- 25. Install motor and housing onto torso
 - a. Set servo to zero degrees in bowler studio

- b. Align at a 90 degree angle to mounting posts as shown

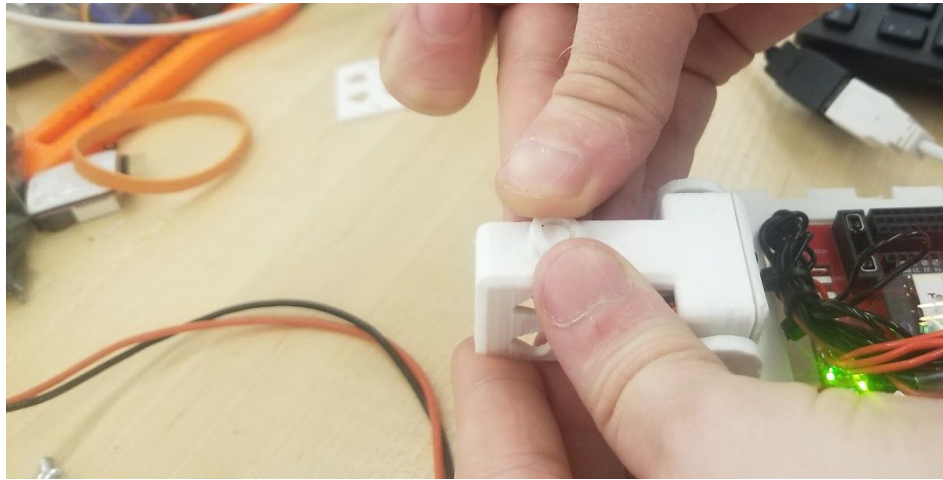


- c. Screw in servo horn
26. Use hardwareconfig basepan to fine tune where the servo's zero value is.
- a. The goal is to make the physical model exactly match the software model
- 27. After adjusting, publish every change**
28. Attaching head basetilt
- a. Attach the head bracket to the head with M3x10s and the holes on the back of the head as shown



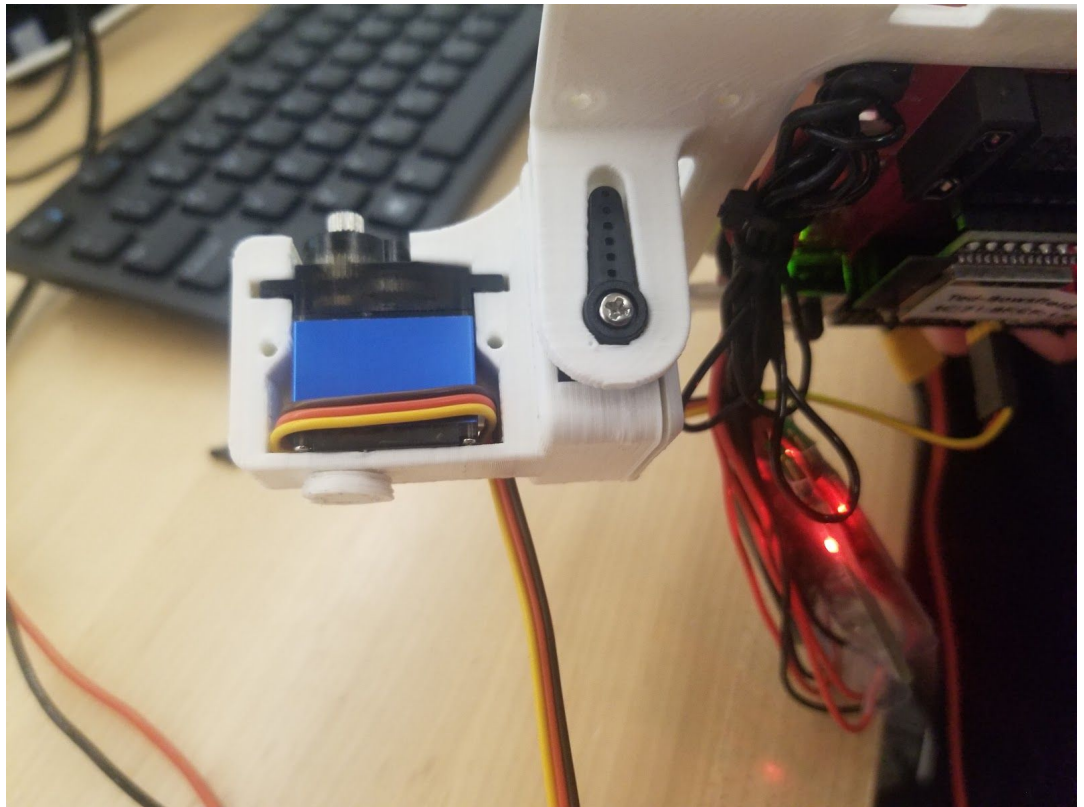
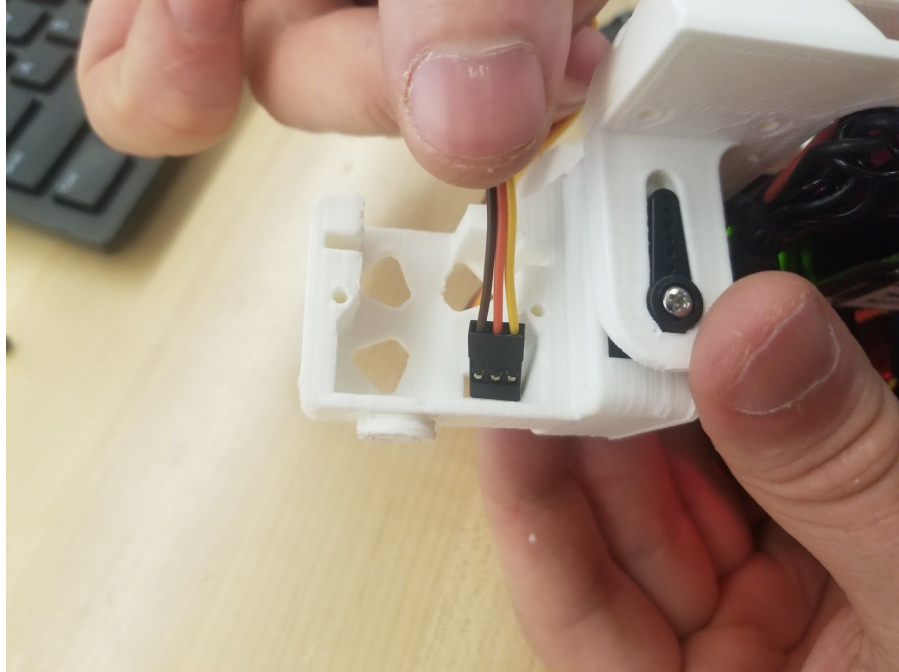
b.

c. Place a bushing on the nub of basetilt joint where shown



d.

e. Route a servo's wire through the hole in basetilt joint, then fit the servo into the slot and pull the wires tight

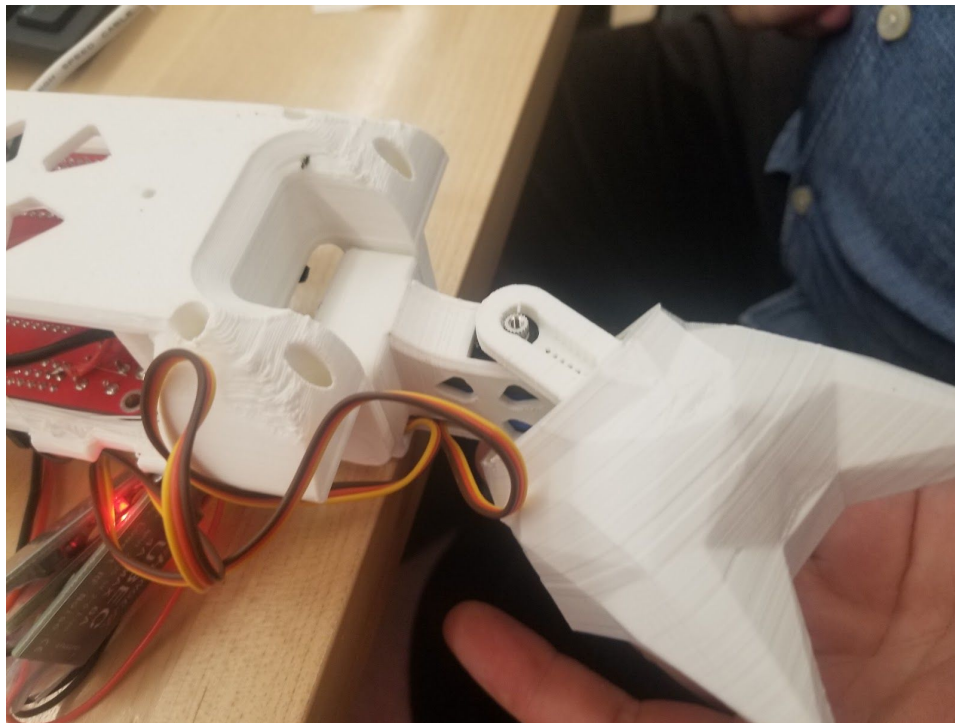


- f. Use a hooked cover to enclose the servo, screw in with M2x10s



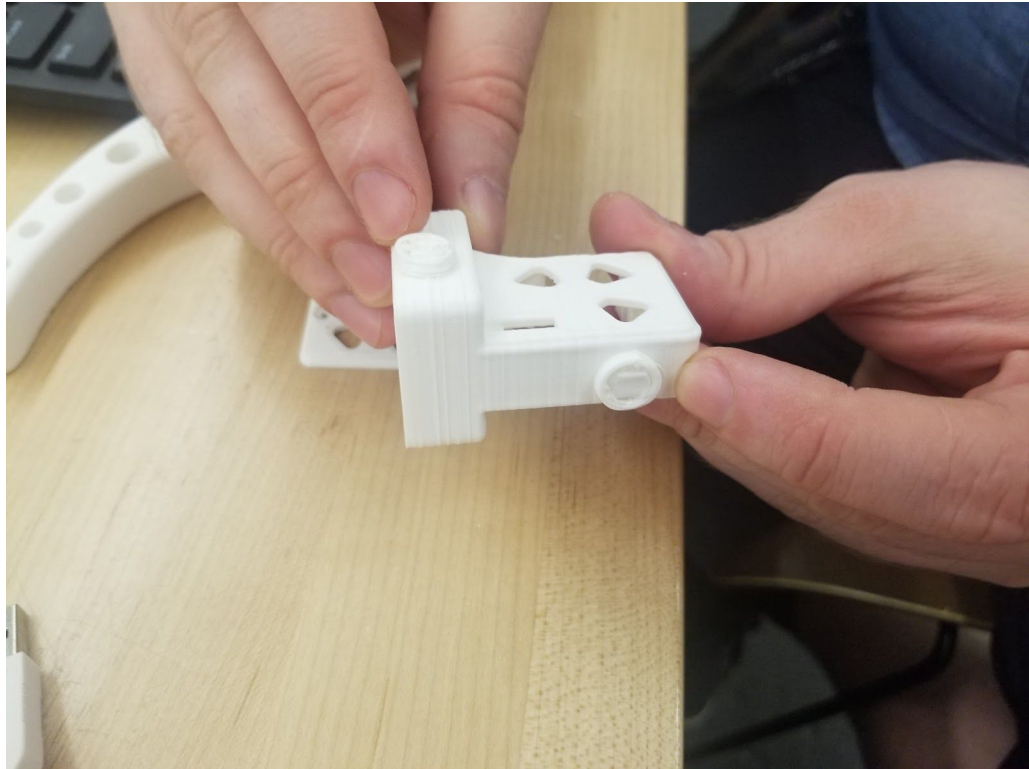
29. Wire the servo to head baseTilt pins

- a. Hook the head around the basetilt joint as shown

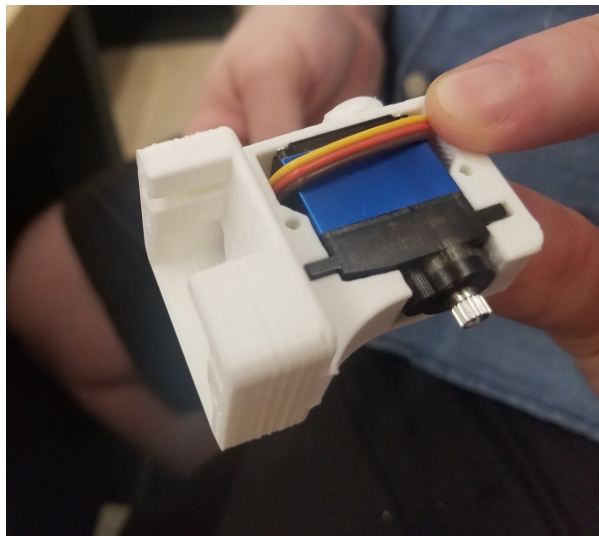
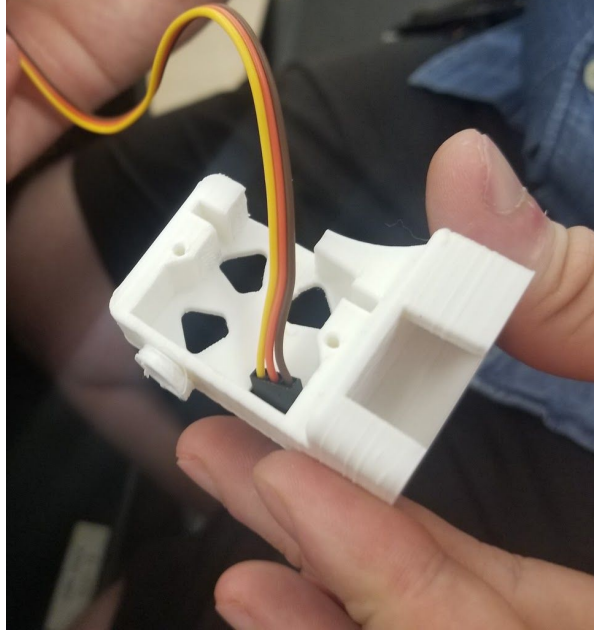


- b. Attach the servo horn with the head in a straight position, the baseTilt should be 0 degrees by default
- c. Adjust hardware config head baseTilt to match the physical and software models
30. Preparing the tail

- a. Attach two bushings to the two nubs of the tail basepan/tilt piece(identical to head basepan/tilt piece)



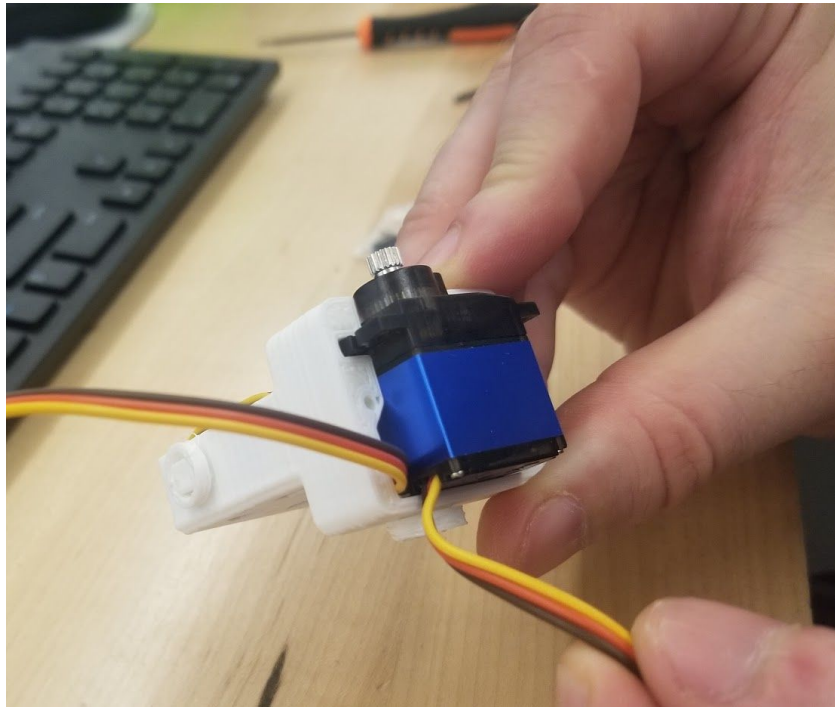
- b. Slide servo wire through the hole in the tail basepan joint, then follow with servo as pictured



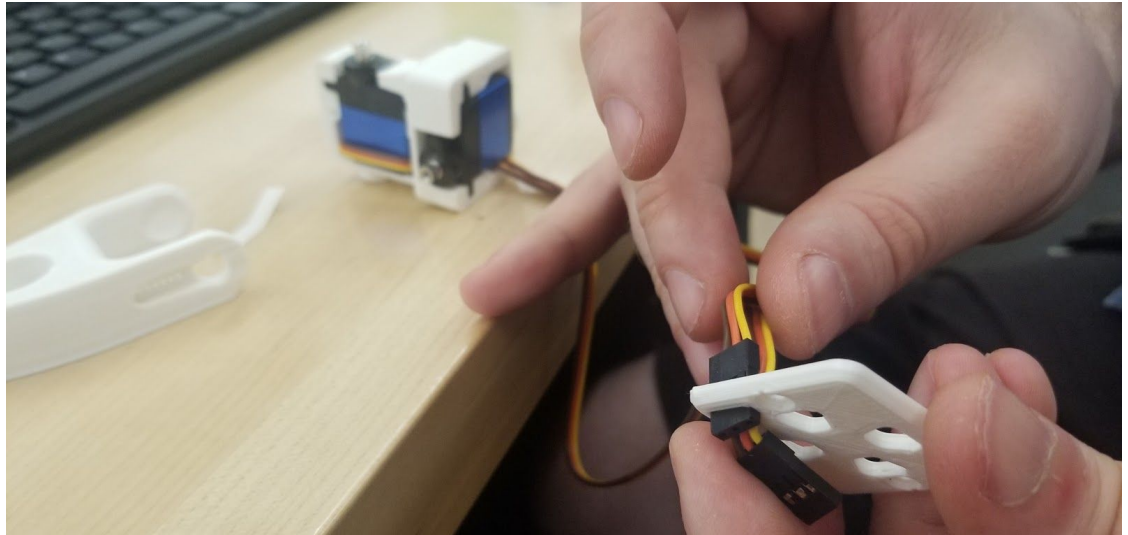
- c. Additionally, slide servo wire through back hole



- d. Move a second servo into place in the basetilt compartment



- e. Slide both servo wires through cover before screwing in covers with M2x10s.



- f. Attach a cover with a horn to the side of the basepan servo and secure



31. Attaching the tail to the basepan/tilt joints

- a. Snap the tail around the bushing and the tail basetilt servo just as the head to the head basetilt joint



b. Snap the basepan joint to the torso



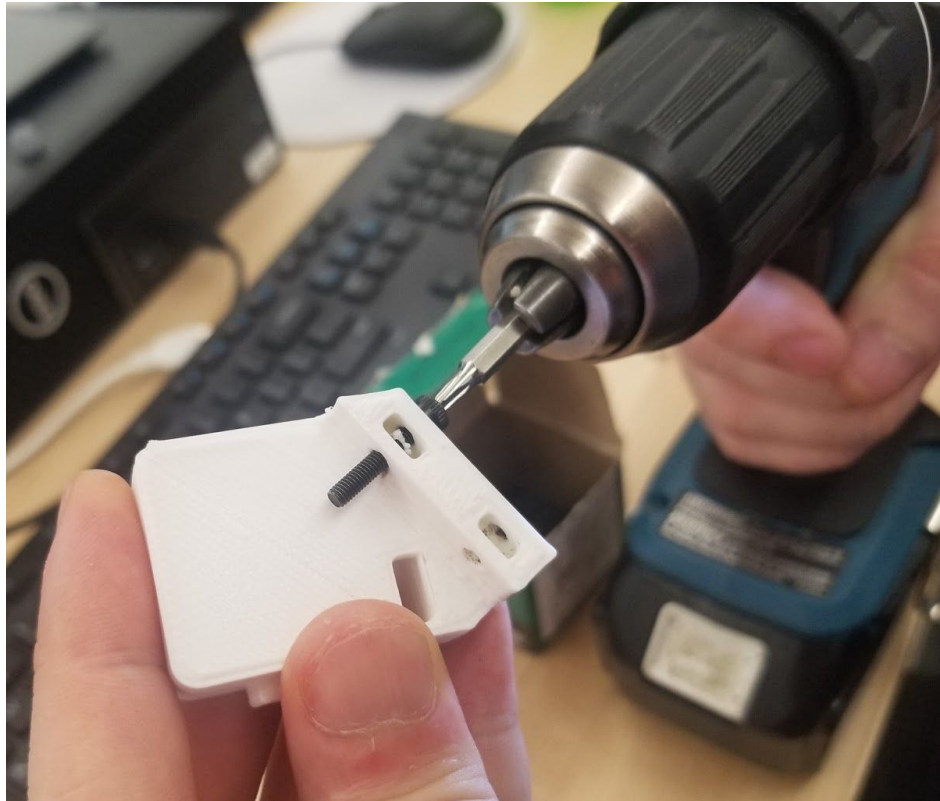
32. Wiring the tail

- a. The long servo cord will go to tail basePan



- b. Ensure the servo is set to zero degrees, place the horn on the servo with the tail looking as close to the software model's tail as possible
 - c. Use Hardware config baseTilt to properly adjust as close as possible
 - d. Screw on the servo horn
 - e. The shorter wire will go to tail basePan, again place the horn onto the servo but do not screw in
 - f. Adjust zero value for basePan so the tail matches the model
 - g. Screw in the servo horn
33. Nutsert shoulders and hips
- a. The leg and arm models are interchangeable but do come with a left and right pair, though the nutsert process is universal
 - b. We will be nutserting the arm/leg basepan joints of the cat

- c. Drive a M3x16 all the way through a screwhole (there are two on each piece)



- d. Screw the nutsert onto the threads coming out of the back of the hole until there is pressure on the plastic



- e. Using a ~600 degree soldering iron, push the whole assembly until the top of the nutsert is settled into the plastic



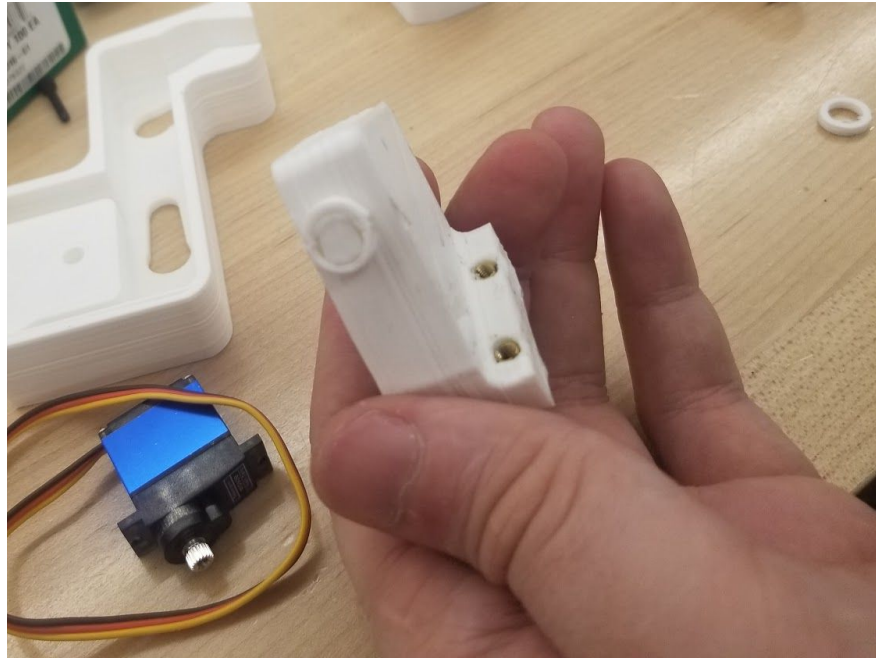
- f. Press into the sides of the plastic as it cools to get a tighter fit around the nutsert

- g. Drive the screw back to being flush and allow to fully cool
 - h. Repeat this for both screw holes in each BasePan
34. Assemble a leg/arm
- a. Put a bushing on all of the nubs
 - b. Collect all of the necessary parts for a leg
 - i. Ensure each part is from the correct side
 - ii. All of the parts pictured are for the cat's right leg/arm



- c. Preparing the basepan joint

- i. Place a bushing on the BasePan piece



- ii. Route a servo cable through the slot, pop the servo in



- iii. Cover the servo and secure the cover with an M2x10

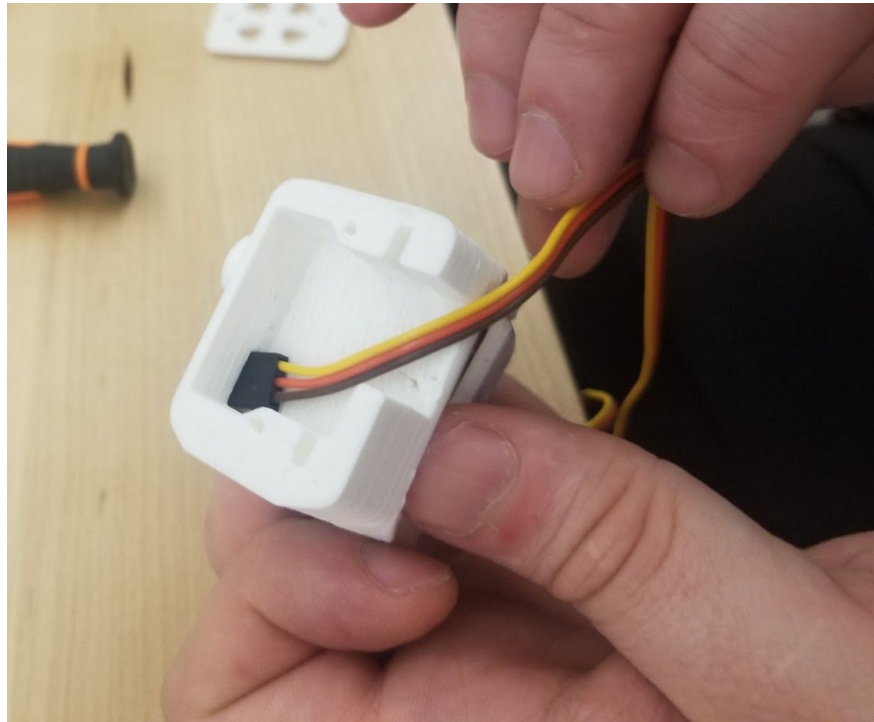


- d. Attach Shoulder to joint

- i. Snap pictured Pieces together



- e. Servo into joint
 - i. Wire the servo through the slot in the joint, then pull the servo through and cover as pictured





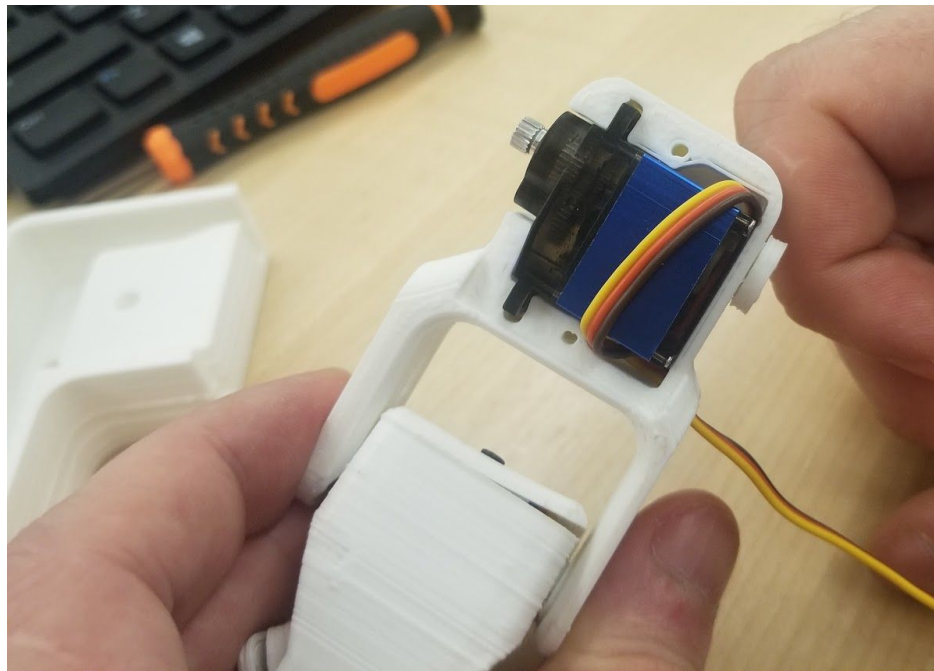
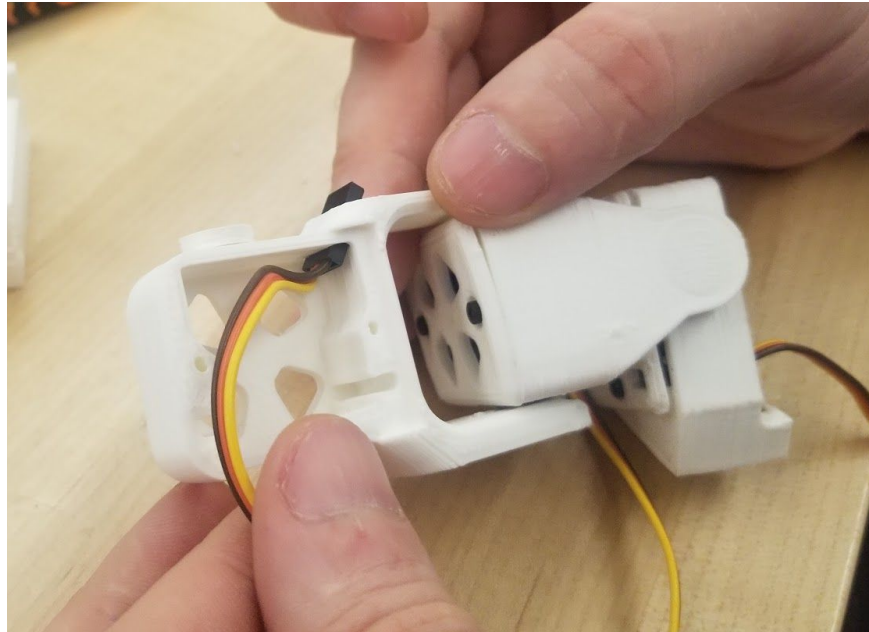
f. Attach elbow to baseTilt

- i. Snap around bushing and servo output

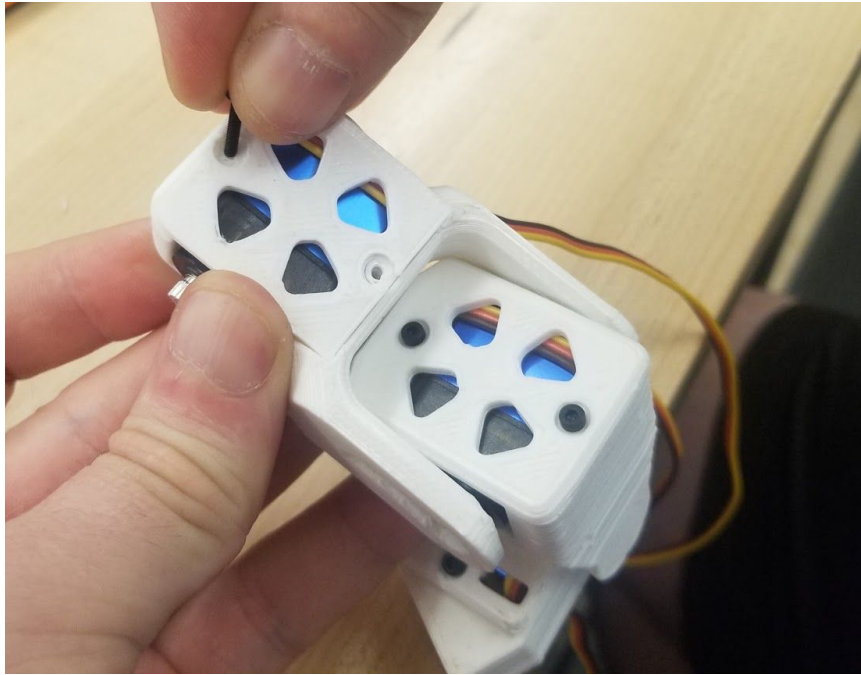


- g. Put servo in elbow

- i. Thread wire through, press servo in



- ii. Cover and secure



- h. Attach foot to elbow
 - i. Snap around bushing and servo output



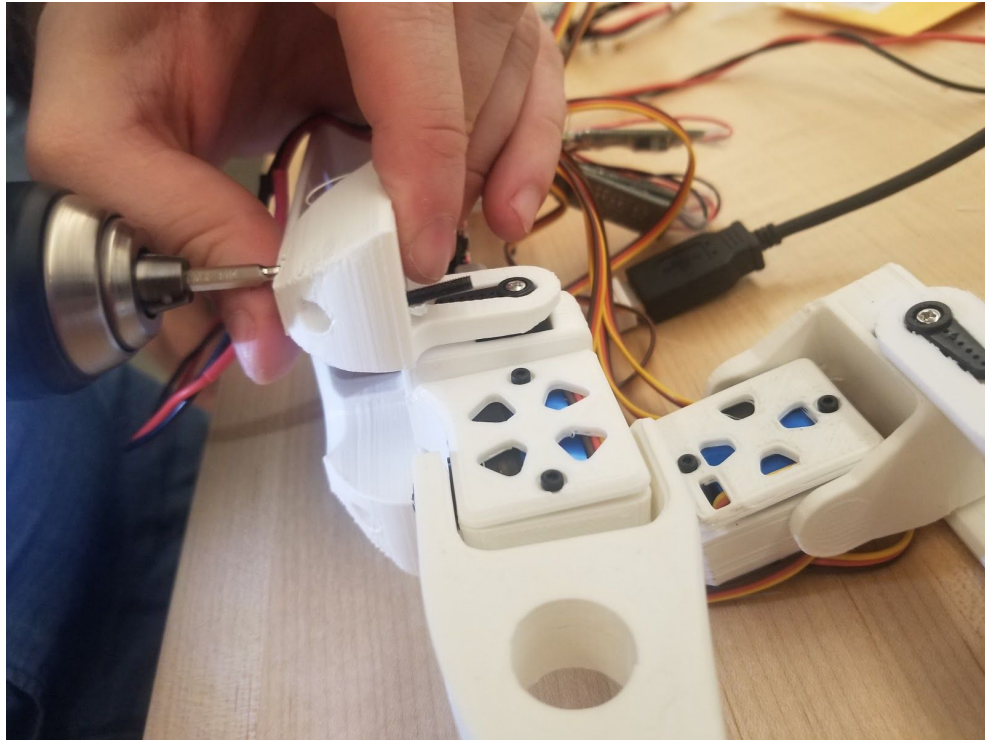
- 35. Wire the leg/arm
 - a. Follow readme to properly find every pin

- b. Double check that everything is wired correctly by manually moving them in bowler studio, just ensure that you return them to position zero before calibration
- 36. Calibrate the leg/arm
 - a. Insert the leg into the calibration jig to align physical robot to the simulation



- b. Place and screw in basePan
 - c. Adjust the hardware config of basetilt servo until it aligns with the jig
 - i. Hold piece where appropriate to isolate motion for more accurate calibration
 - ii. A piece can be aligned by sound, if the servo stops making noise it fits well in the jig
 - d. Publish changes after every change
 - e. Repeat steps a-d for the basepan and elbow,
- 37. Attach leg to torso

- a. Screw all the way through the mounting holes in the torso using m3x16s



- b. Align leg with the screws, incrementally tighten until both sides sit flush and are firmly attached to the torso



