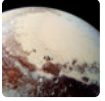




instructables

3D Printed Robotic Hand / Prosthetic Hand



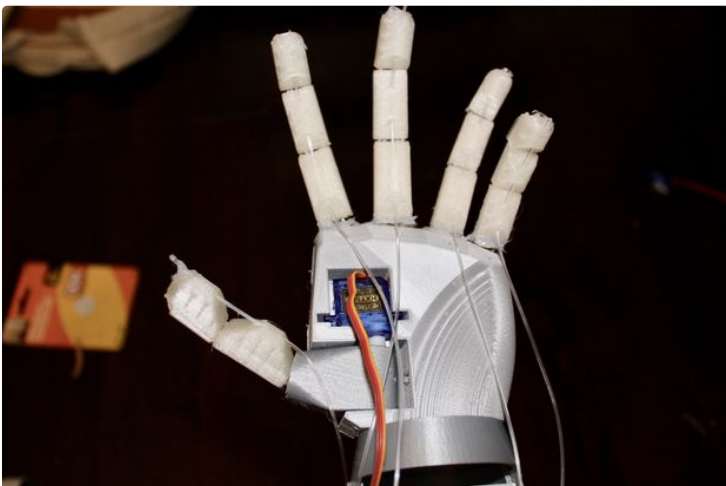
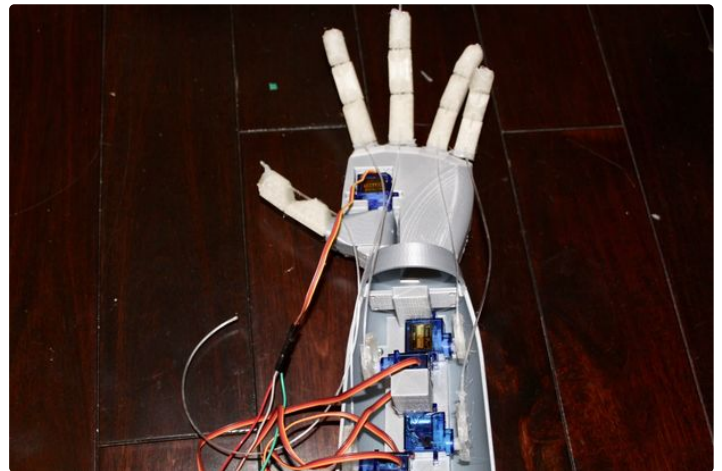
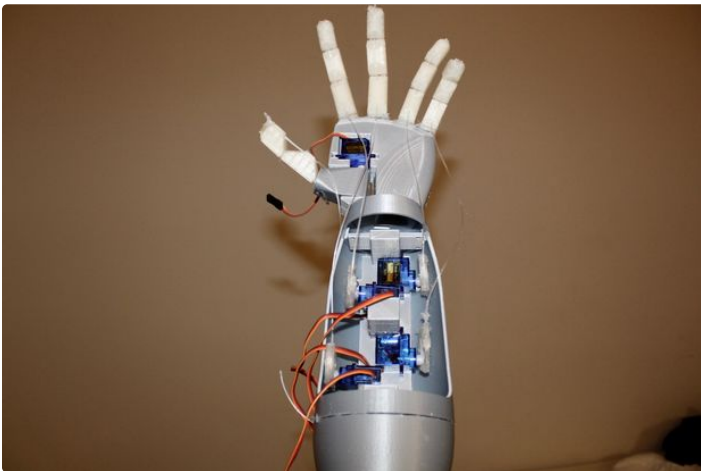
by TechMartian

Need a hand?

Well, unless you live really close to where I am, my arm probably reach you in time even if I shipped it by air. BUT, that's why I have made this instructable on how to make a robotic hand using 3D printed components. Fully actuated, individually controllable fingers! Now, you can make your own robotic hand

that's ready to lend everything it has at your aide (well, it is just a hand), so that you don't have to go around borrowing hands from other people.

[//www.youtube.com/embed/O9etSZXyAB8](https://www.youtube.com/embed/O9etSZXyAB8)



Step 1: 3D Print Materials

Print one copy of each stl part.

All the structural components of this robot hand are custom made through 3D printing. I am providing the 3D printable models below so you can print it with your own 3D printer or from a local 3D print-shop.

This was designed in **Fusion 360** and you can find the parts here:

<http://autode.sk/2wryFMW>

<http://autode.sk/2wruMYi>

<http://autode.sk/2wsmz6u>

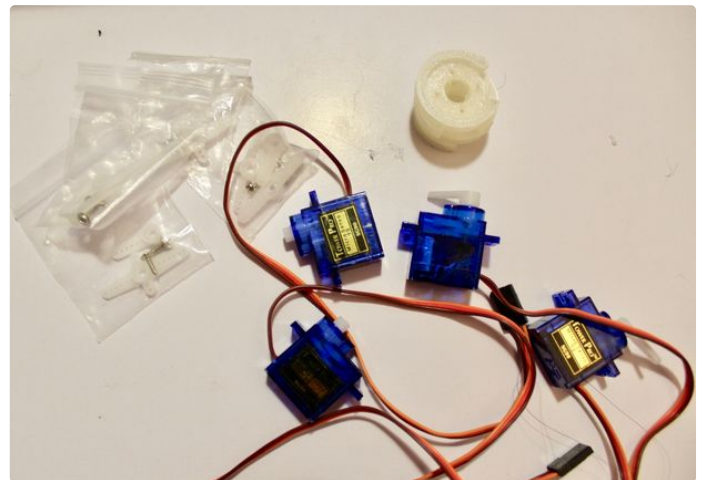
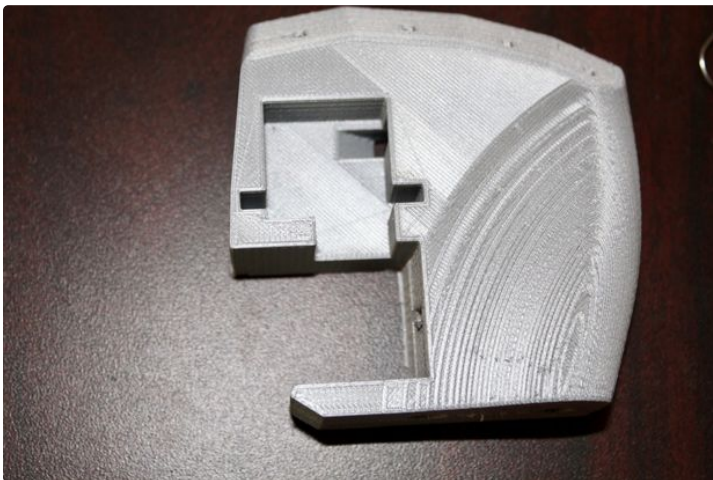
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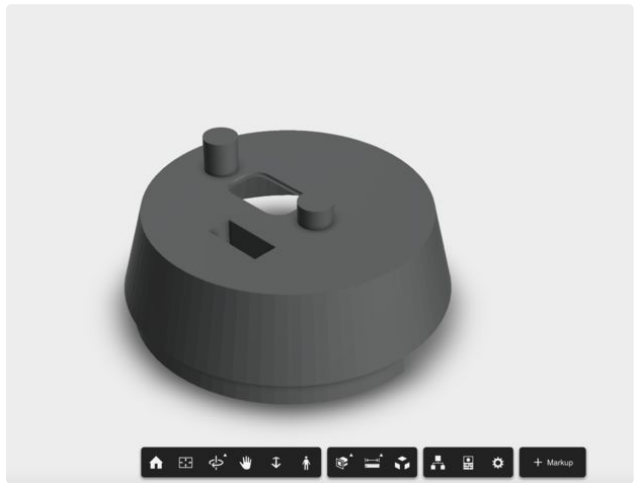
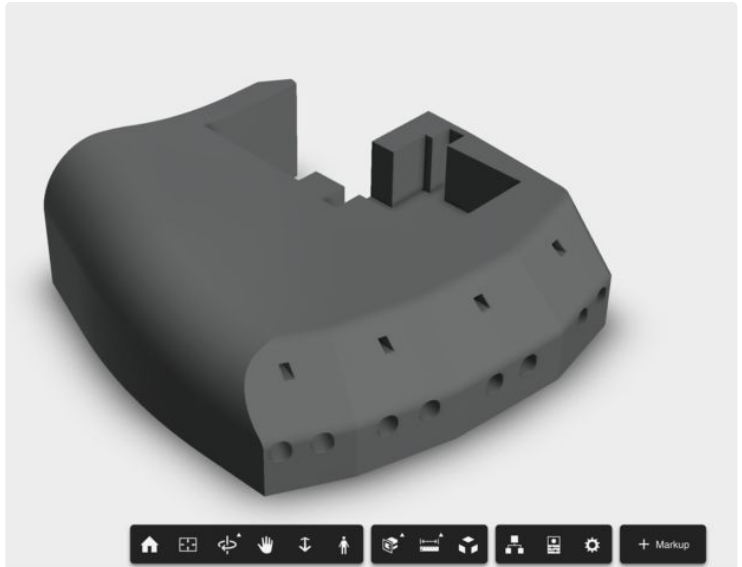
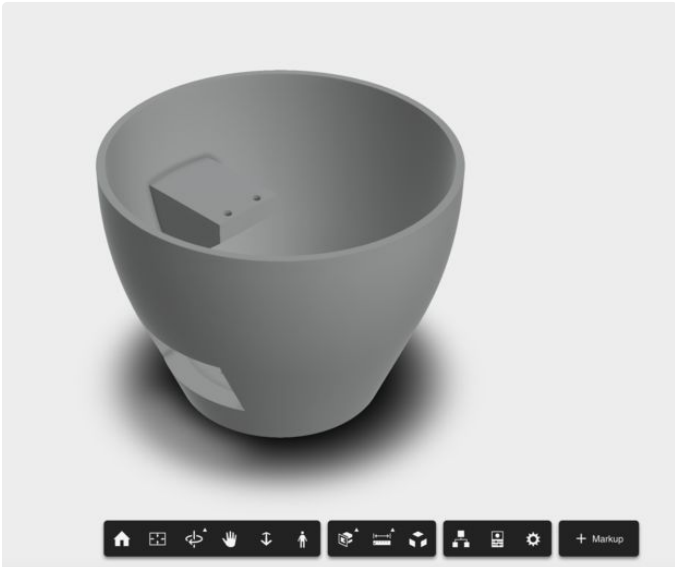
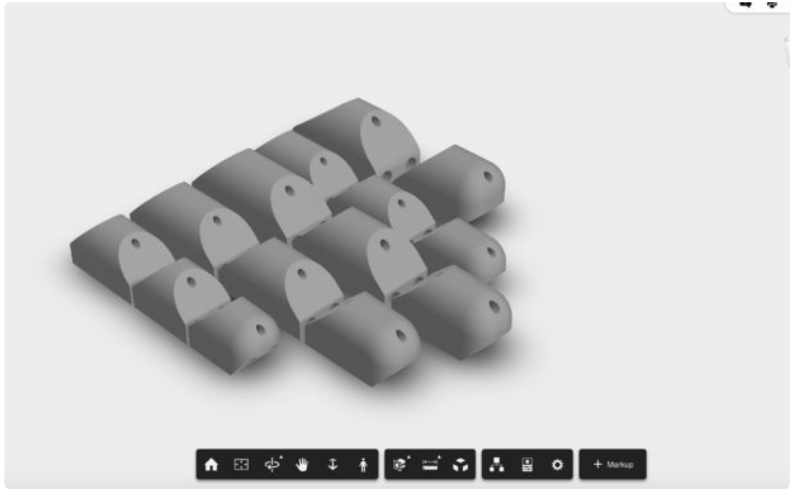
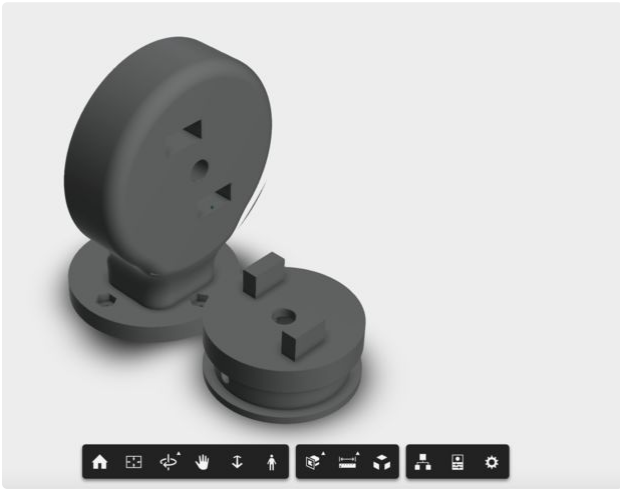
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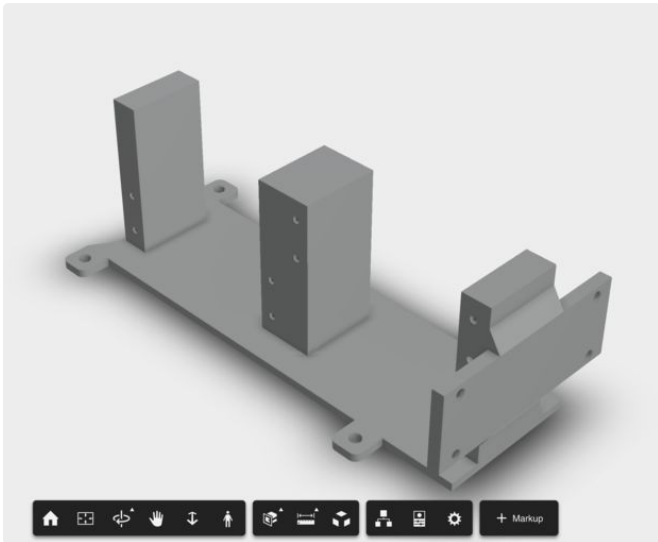
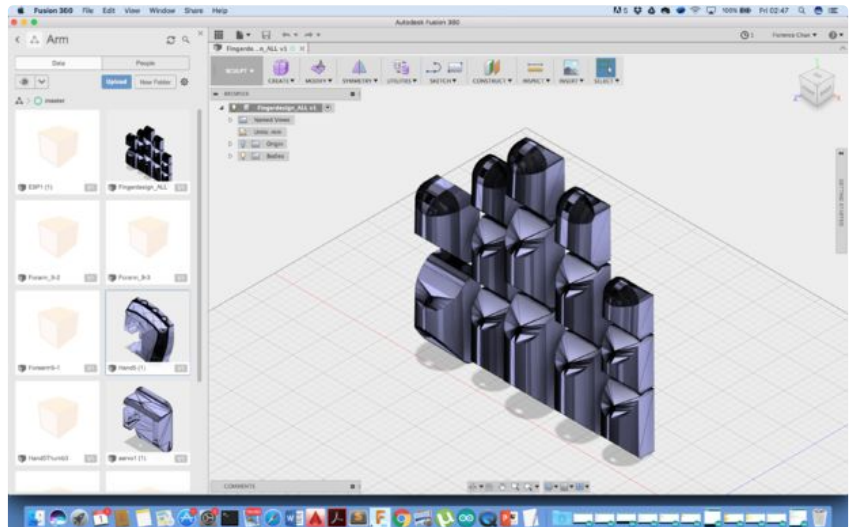
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<http://autode.sk/2wsfwe0>

<http://autode.sk/2vwFYWE>







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Step 2: Mounting Thumb Joint Motor

- Glue the servo horn to the thumb base joint
- Connect servo horn onto Servo motor and glue it in place with super glue.

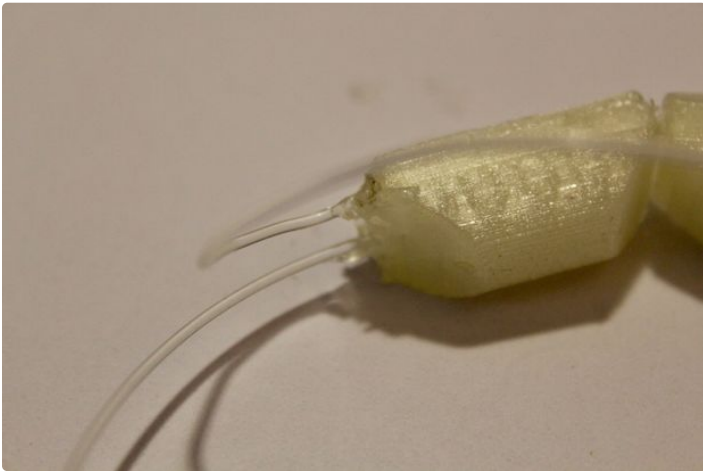
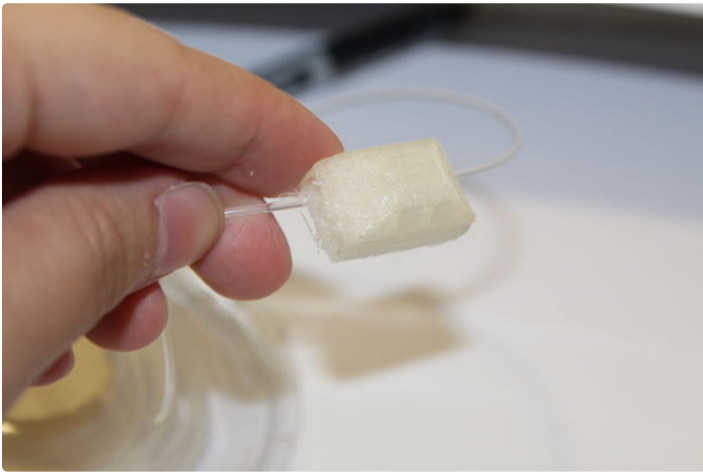
Give it some time to dry, the longer you wait the stronger the bond is (within a 24 hour period)



Step 3: Fingers

Chain link the fingers with a nylon or fishing wire. The one I have is a bit thicker than fishing wire since Home Depot did not have any thin ones.

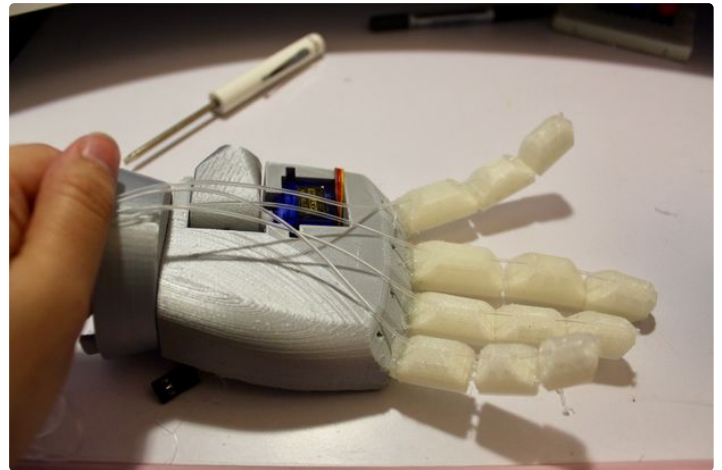
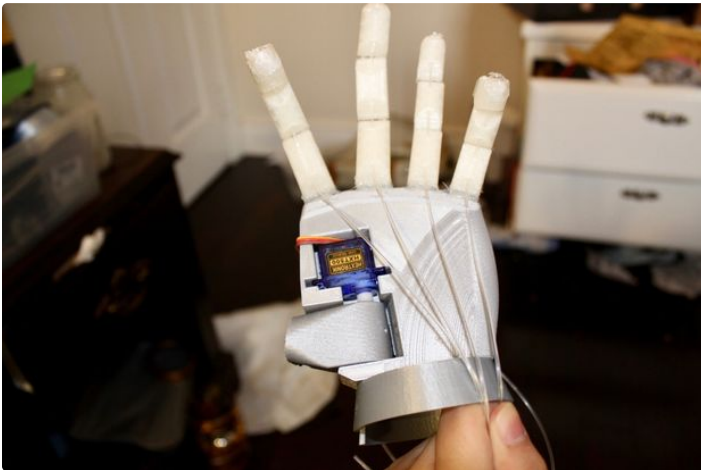
- Attach base joint to the anterior ligaments by threading a the wire one of the base holes, looping through the top and threading it back out of the other base hole.
- Leave about 5cm of wire on both ends of the base holes before cutting it.
- Thread another wire through the top hole. This will be the posterior ligament which will stabilize finger to complete the push-pull pair.
- Extend the fishing line from your palm to your elbow to have enough line for the servo mount.



Step 4: Tension Wire

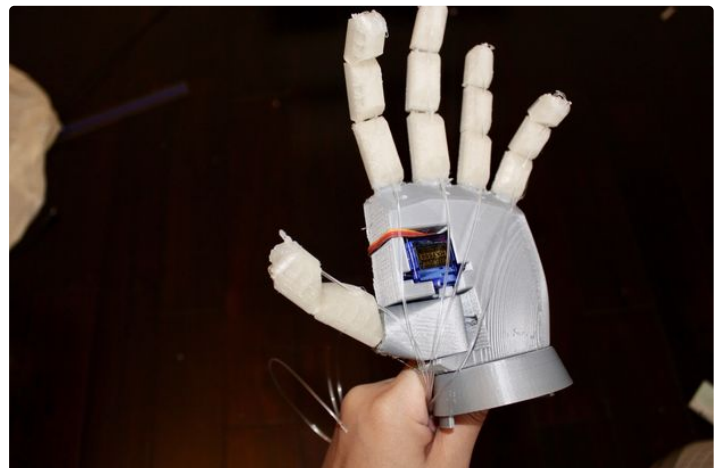
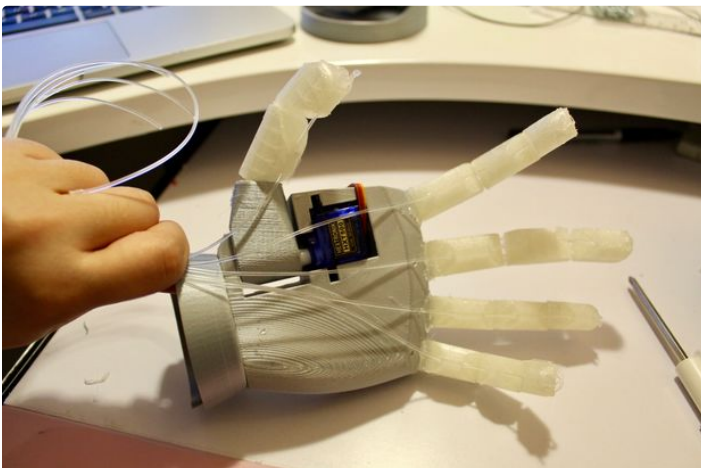
- Insert the base joints of each finger into corresponding slots in the 3d printed palm.
- Tie a knot between the two slots for the base joint. Then, further secure it by adding a bead of glue over the holes and knot so that the wire does not slip

I found it easier to temporarily glue the base joints of each finger onto the palm piece with hot glue which is easily removable.



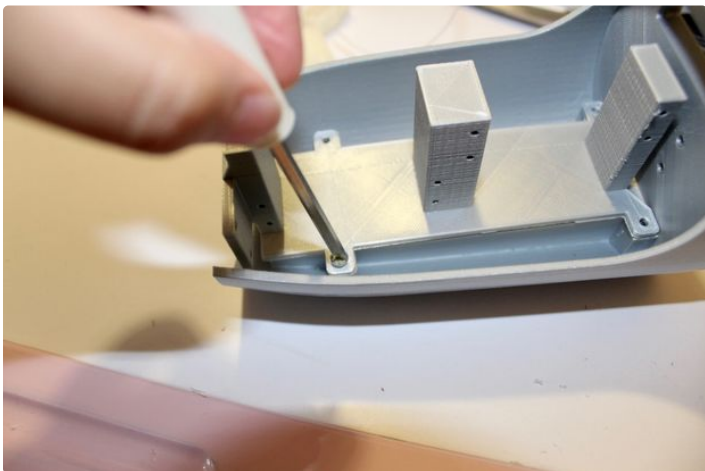
Step 5: Attaching the Thumb

- Like the fingers, thread a nylon wire through one of the base holes of the thumb joint attached to the servo motor through to the two distal joints of the thumb.
- Loop it through the top hole then back around and out the second base hole of the thumb joint.
- Tie a knot at the base hole and secure it with some hot glue with a hot glue gun.



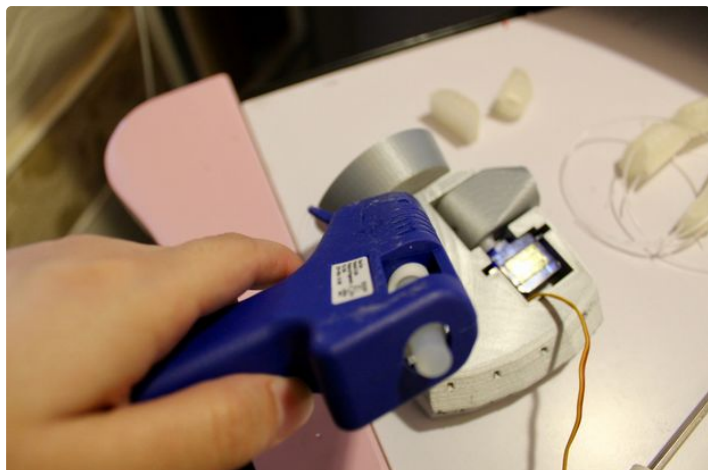
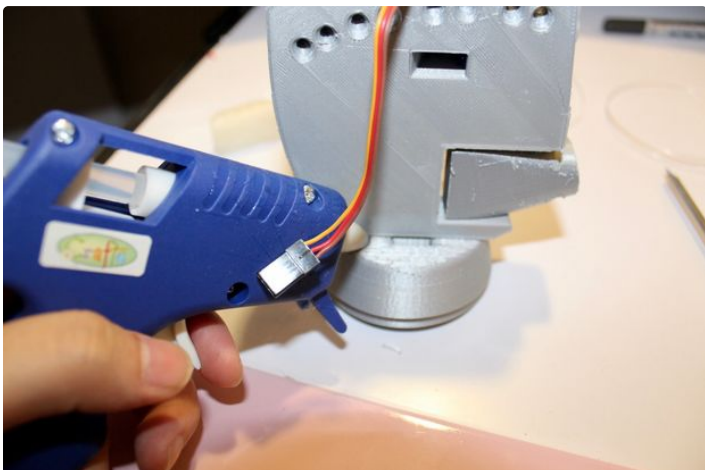
Step 6: Servo Holder

- Install servo holder assembly into the arm structural component using 4-40 machine screws. There are 4 screw-down points designed in the CAD model.



Step 7: Wrist

- * Glue the wrist onto the base of the palm. Apply sufficient amount of pressure to ensure a secure attachment.
- * Add a thin layer of glue around the wrist to secure it further.



Step 8: Glue Servo Mount

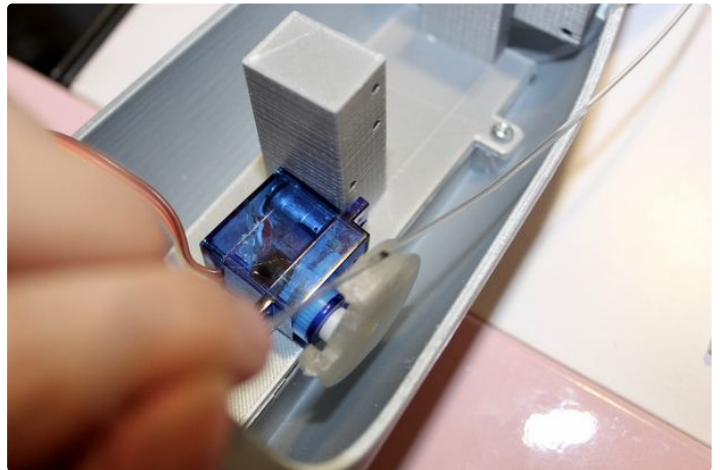
* Attach the arm to the wrist with the lock cap using a hot glue gun.

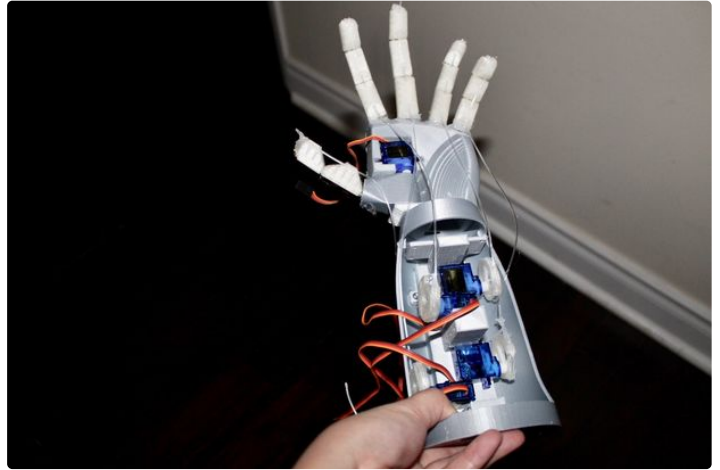
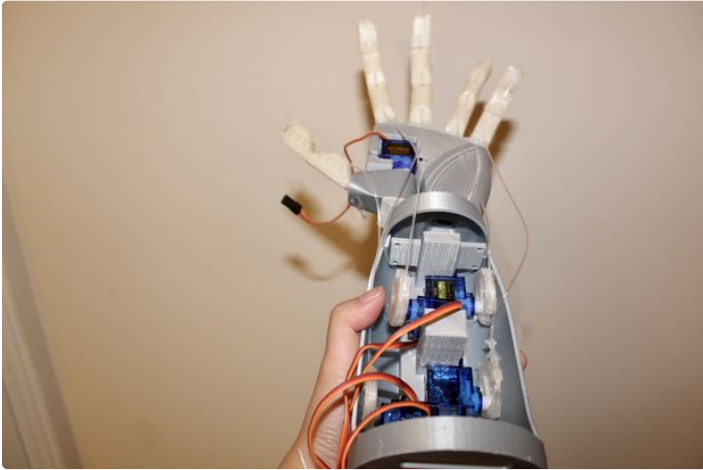
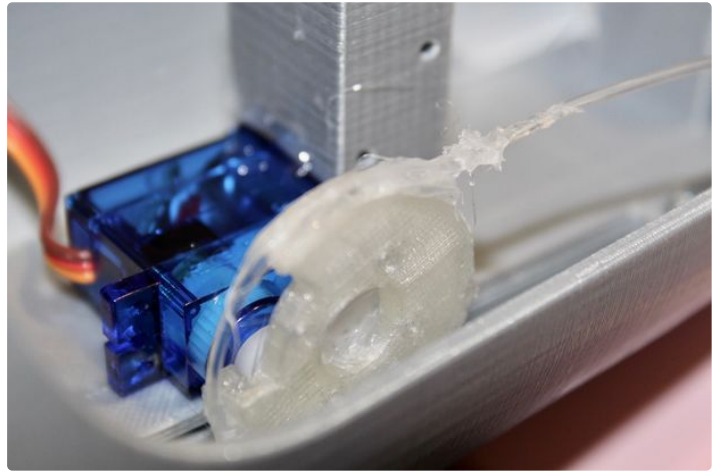
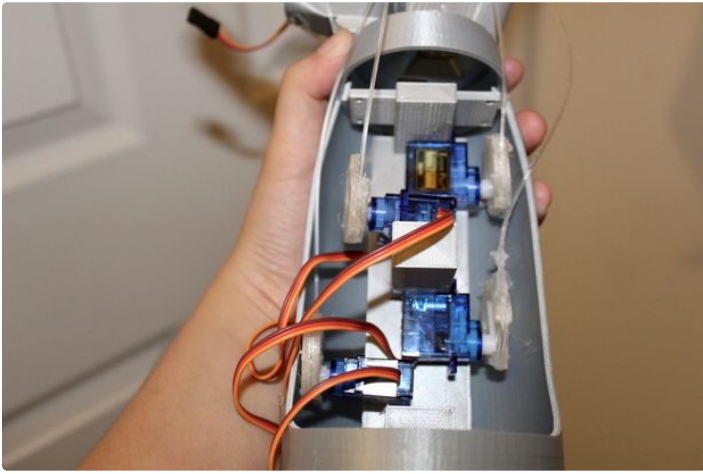


Step 9: Tension Wire Mount

* Wrap the tension wire around the 3d printed servo mount part.

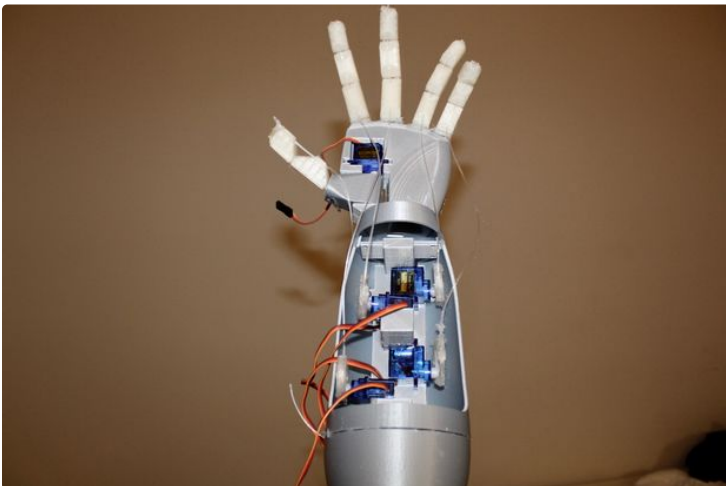
* Screw or Glue the Servo horn onto the circular mount





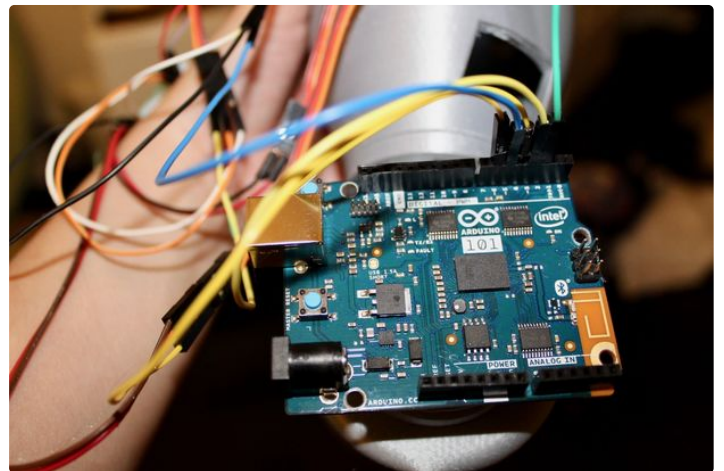
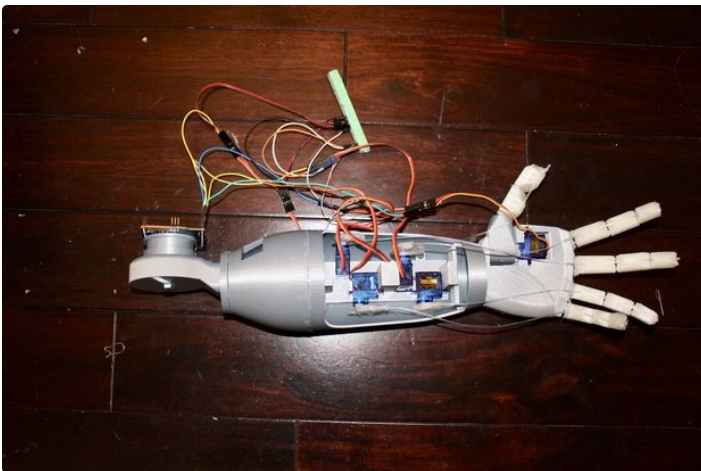
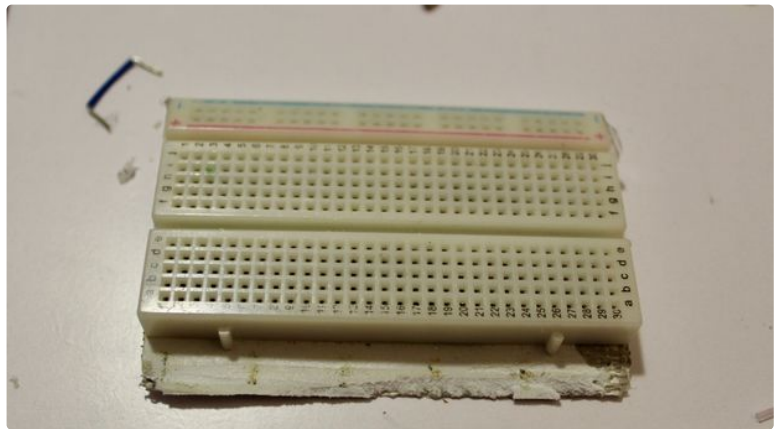
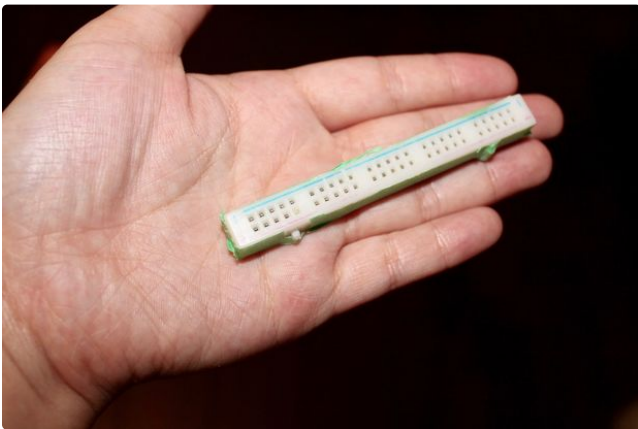
Step 10: Mount Base

- Attach the assemble hand-wrist complex to the elbow base to complete the structural assembly of 3D printed parts.



Step 11: Wiring

Servo Motor	Servo Motor Wire	Arduino Pin #	Breadboard Pin
Thumb	Brown	--	Ground Rail
Red	--	Power Rail	
Orange	2	--	
Index	Brown	--	Ground Rail
Red	--	Power Rail	
Orange	3	--	
Middle	Brown	--	Ground Rail
Red	--	Power Rail	
Orange	4	--	
Ring	Brown	--	Ground Rail
Red	--	Power Rail	
Orange	5	--	
Pinky	Brown	--	Ground Rail
Red	--	Power Rail	
Orange	6	--	



Step 12: Demo Program

This is demo program that moves each of the fingers to it's full extent:

```
#include <Servo.h><br>
```

```
Servo thumb;  
Servo index1;  
Servo middle;  
Servo ring;  
Servo pinky;
```

```
void setup() {  
  thumb.attach(2);  
  index1.attach(3);  
  middle.attach(4);  
  ring.attach(5);  
  pinky.attach(6);  
}
```

```
void loop() {  
  for (int i = 0; i<180; i++){  
    //thumb.write(i);  
    index1.write(i);  
    middle.write(i);  
    ring.write(i);  
    pinky.write(i);  
    delay(10);  
  }  
  delay(1000);  
  //thumb.write(0);  
  index1.write(0);  
  middle.write(0);  
  ring.write(0);  
  pinky.write(0);
```

```
}
```

