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Homecage Assembly Manual

Prerequisites:

1. 3D Printed Parts

Arm

Hopper

Light Holder

Beam Breaker Mount

Motor coupler

Moving stage top

Standard

Moving stage bottom

Tube holder (Camera holder / living room)

All the parts can be downloaded by this link:

https://drive.google.com/drive/folders/171QfuPhz_QIpAmTQq7dS1A7sy8fYZyb8?usp=sharing

2. Other Parts

Arduino Nano x 1

Stepper Motor Driver x 2

Buck Converter x 2

Electrical Switch x 1

Female Power supply connection x 1

Capacitor (Around 33 uf) x 1

Stepper Motor x 2

Servo Motor x 1

Connect Limit Switch x 2

3W IR Light x 2

RFID Reader x 1

Moving Stage x 2

Beam Breaker x 1

Mirror x 1

Square Hollow Tube x 1

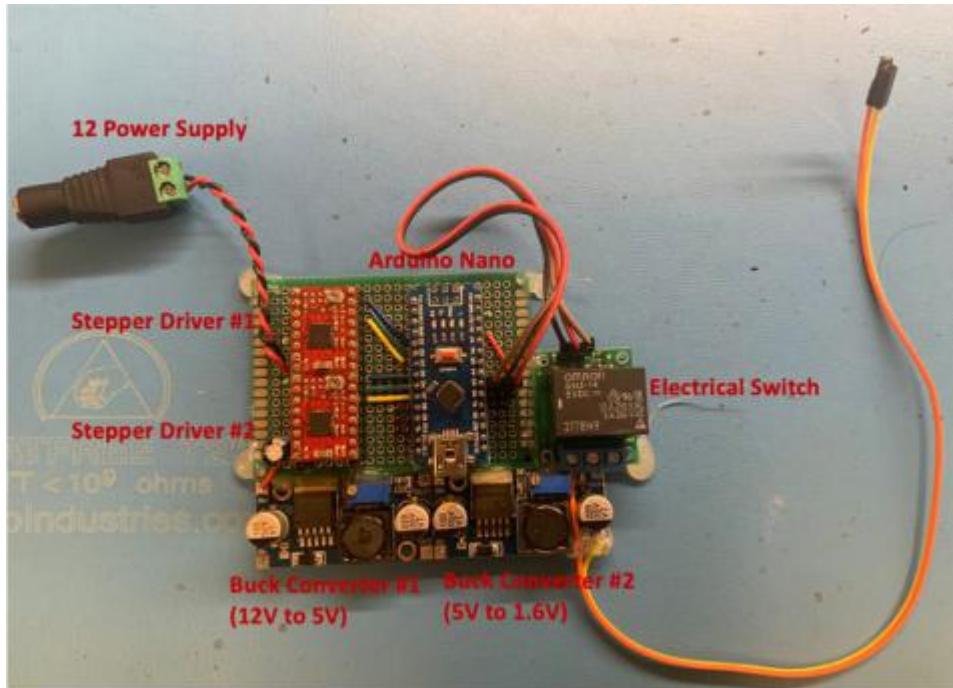
Camera x 1

12V Power Supply x 1

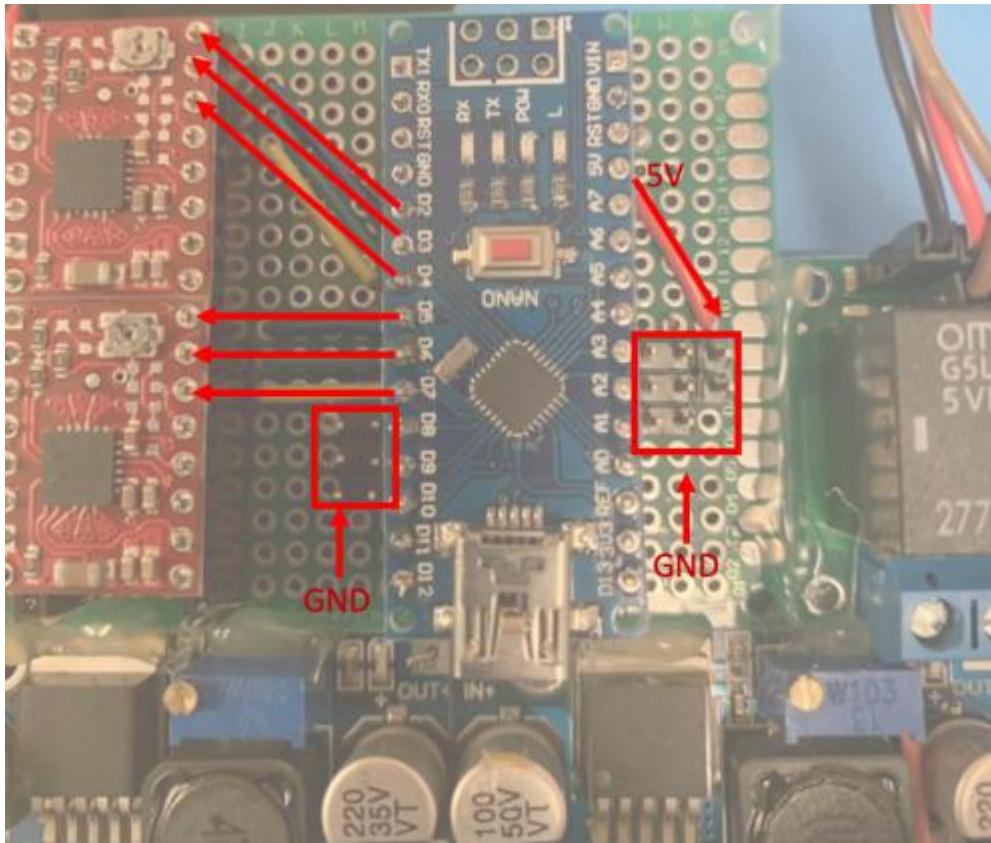
Arduino Cable x 2

5 x 7 cm PCB Board x 1

Assemble the electronic components:

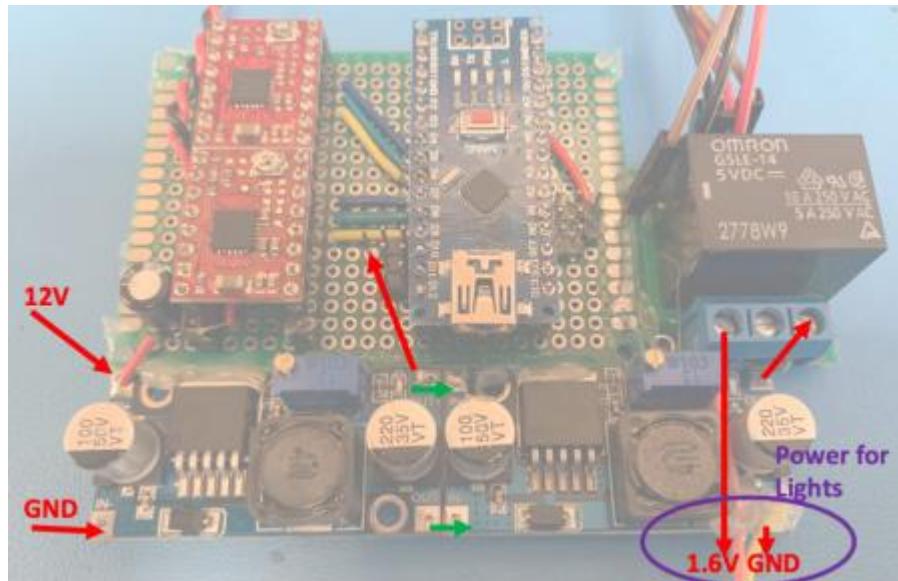
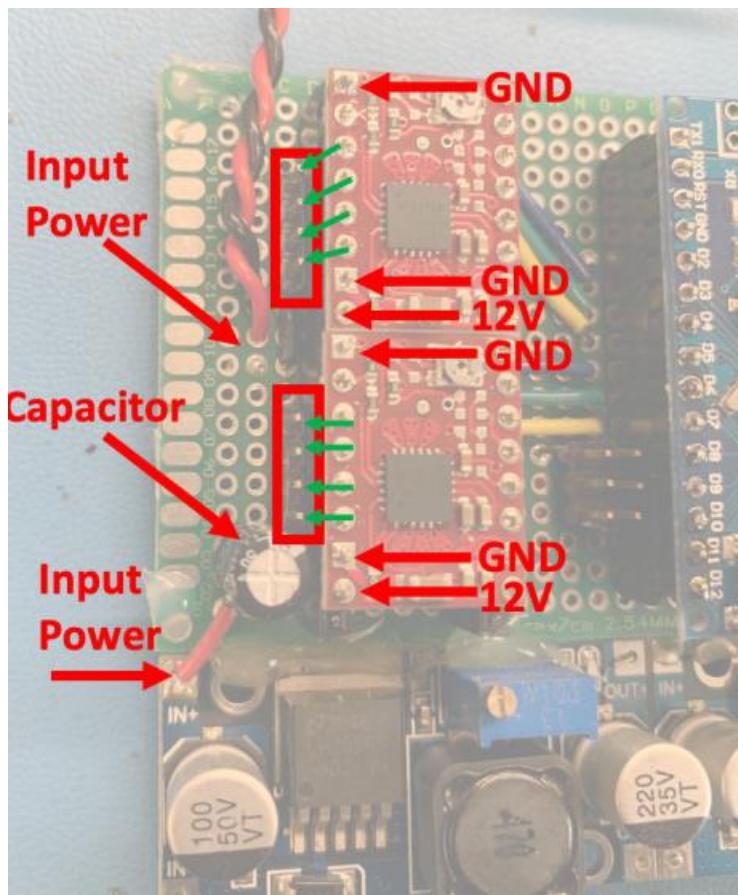


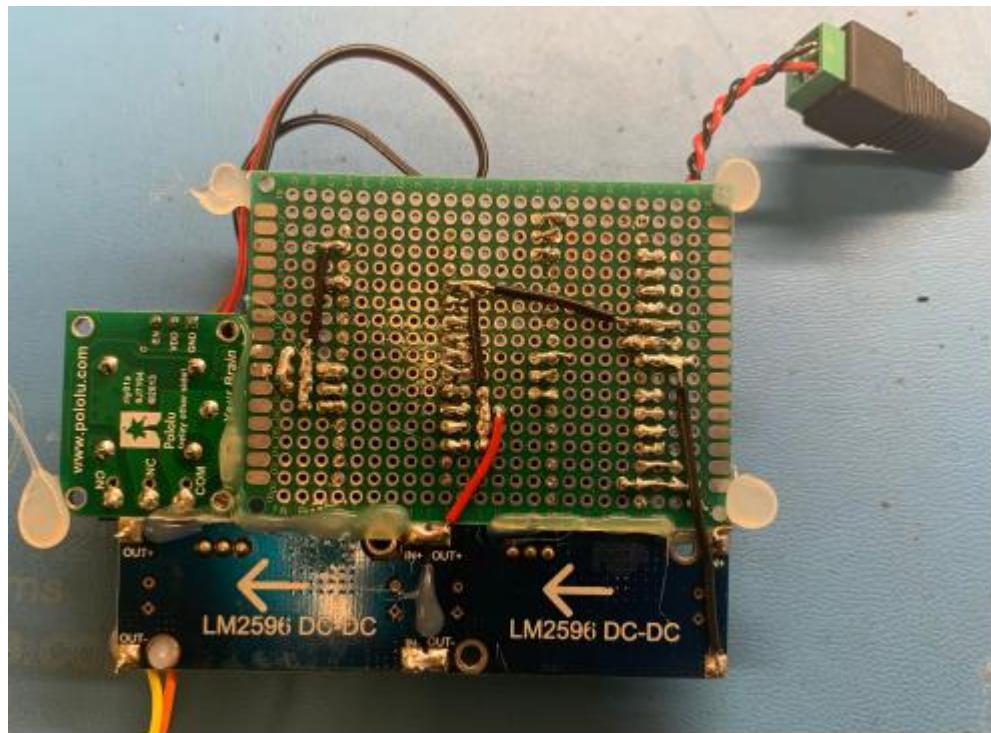
1. Soldering Arduino and stepper motor drivers as the figure above shows, leave 3 lines space at left and right of the circuit board. (do NOT breath in the solder)
2. Adjust the screw on the buck converter to let the output voltage to be 5V (for servo motor).
3. Adjust the second buck converter to let the output voltage to be 1.6V to 1.8V (for IR light).
4. Soldering male headers as shows in red boxes above near D8, D9, D10, A1, A2, A3.
5. Connect the stepper driver pins and Arduino together as the red arrow shows above. (D2, D3, D4 for bottom stepper motor, and D5, D6, D7 for upper stepper motor)
6. As the graph above shows, connect all the left column pins in the left red box to the GND pin on the Arduino.
7. Connect all the left column pins in the right red box to the GND pin on the Arduino. Connect all the middle column pins in the right red box to the GND pin on the Arduino. Connect all the right column pins in the right red box to the 5V pin on the Arduino.



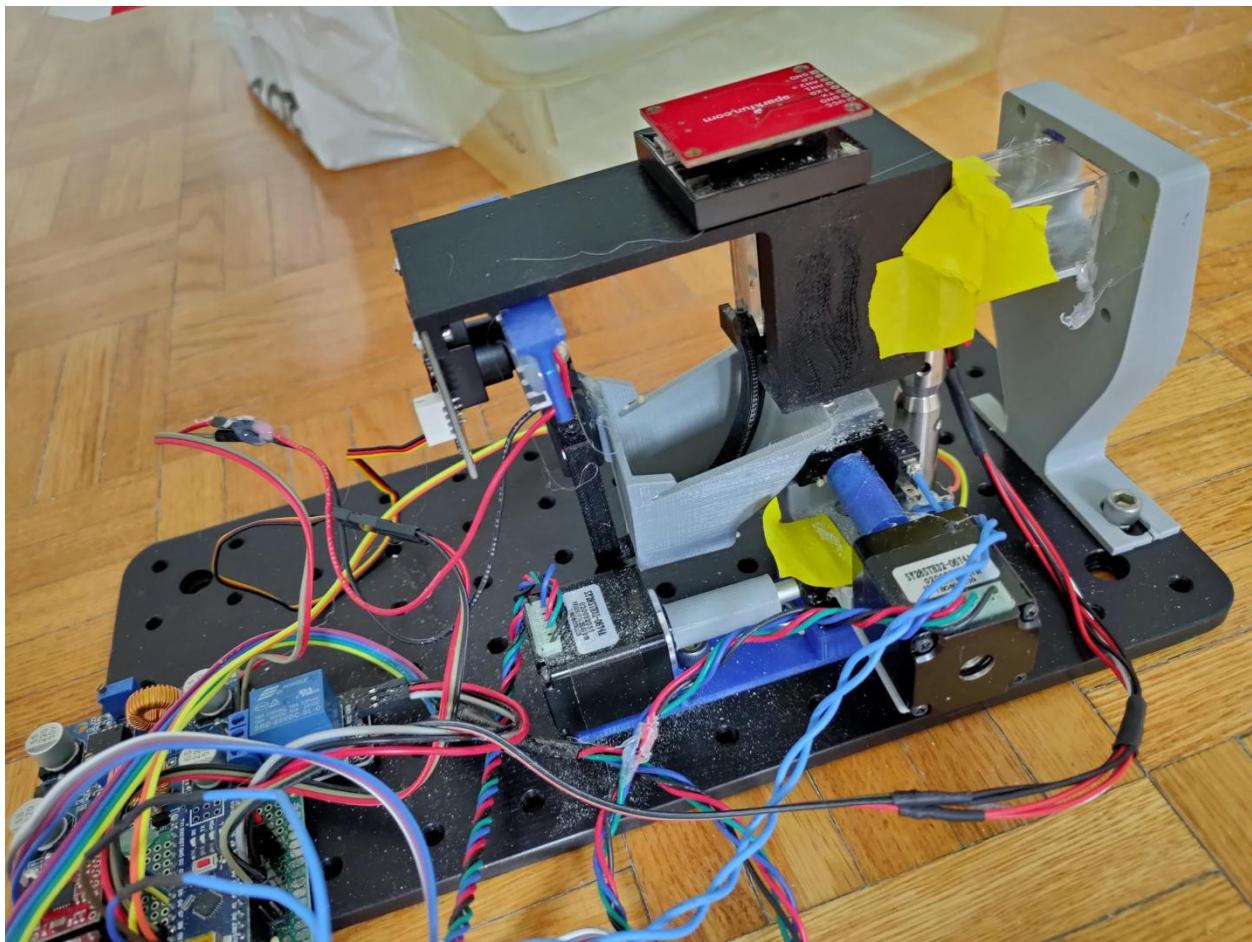
8. Connect the input power to stepper driver as the figure above shows, make these two stepper drivers and the buck convertor #1 to be parallel.
9. Soldering a 33uF capacitor parallel to the power supply.
10. Soldering 4 pins for each stepper driver as the figure above shows in red boxes and connect them to stepper drivers.
11. Connect the positive output of buck converter #1 to a pin near the Arduino pin D8 as the middle red arrow at the figure above shows and connect it to the input of the buck converter #2.
12. Connect the negative output of buck converter #1 to positive input of the buck converter #2.
13. Connect the positive output of buck converter #2 to the right pin on the electrical switch and put a jump wire from the left pin on the electrical switch.
14. Connect a jump wire at the negative output of buck converter #2. (Used to power the IR Light)

15. Connect stepper driver GND to Arduino GND. Check to make sure all grounds are connected.





Assemble the mechanical components:



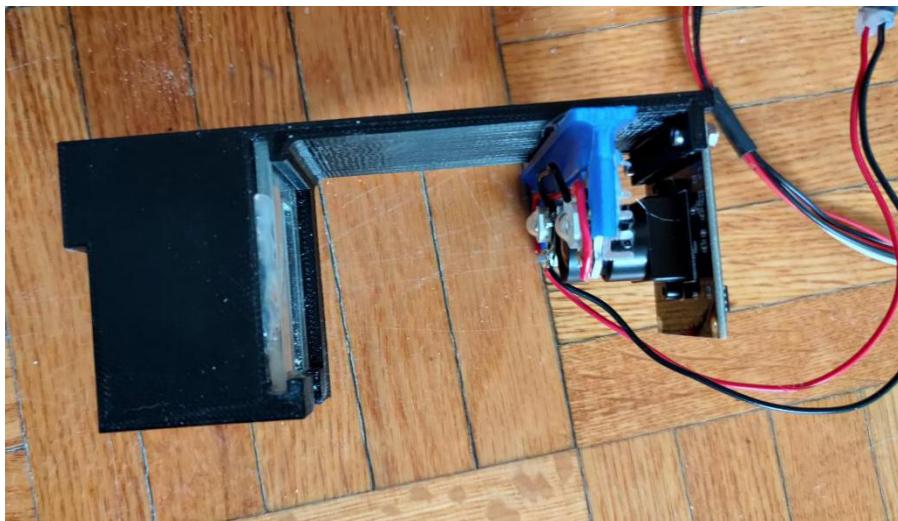
1. Camera Holder Module

1.1 Tube and support

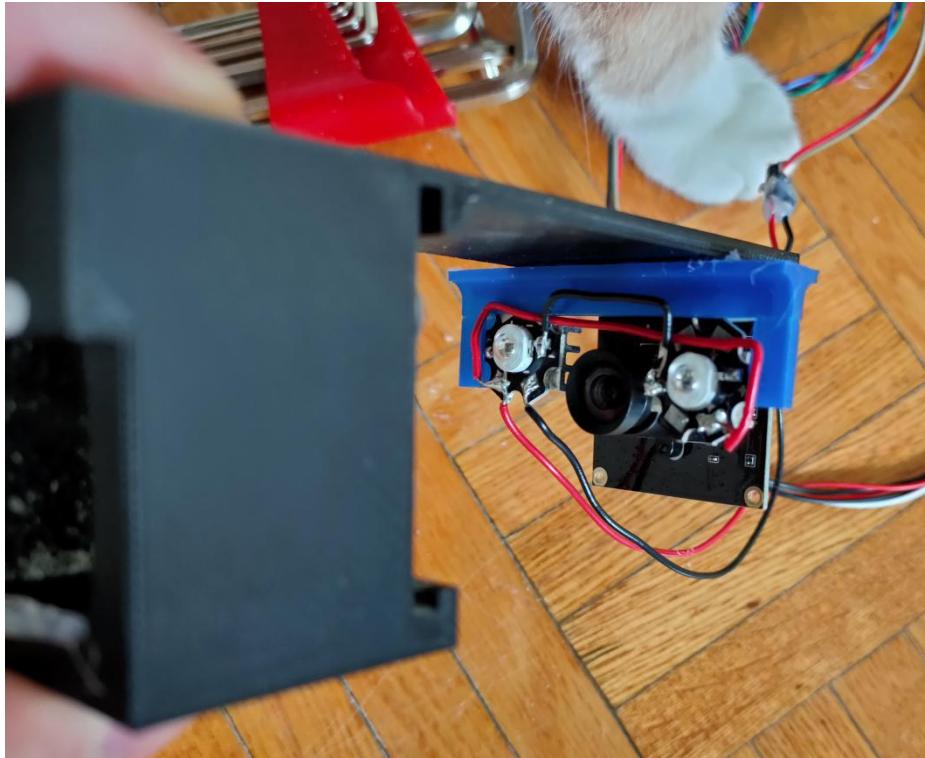


Insert the tube into the 3d printed support. The top of the front part of the tube needs to be cut off.

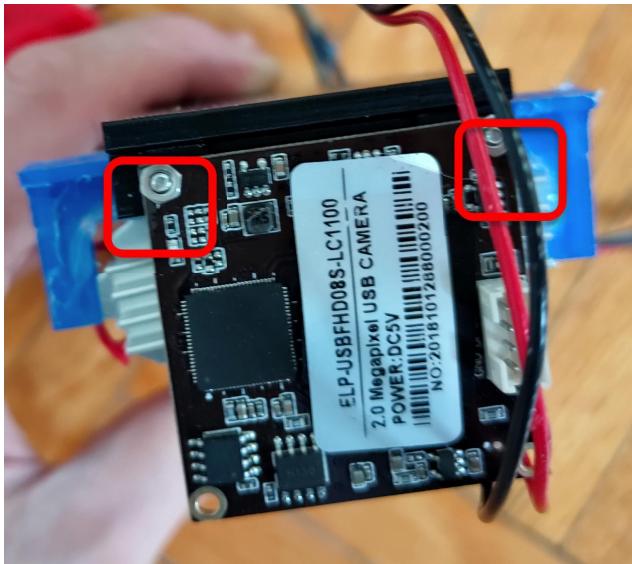
1.2 Camera holder(Living room)



1.2.1 Glue the light holder to the roof as shown below:



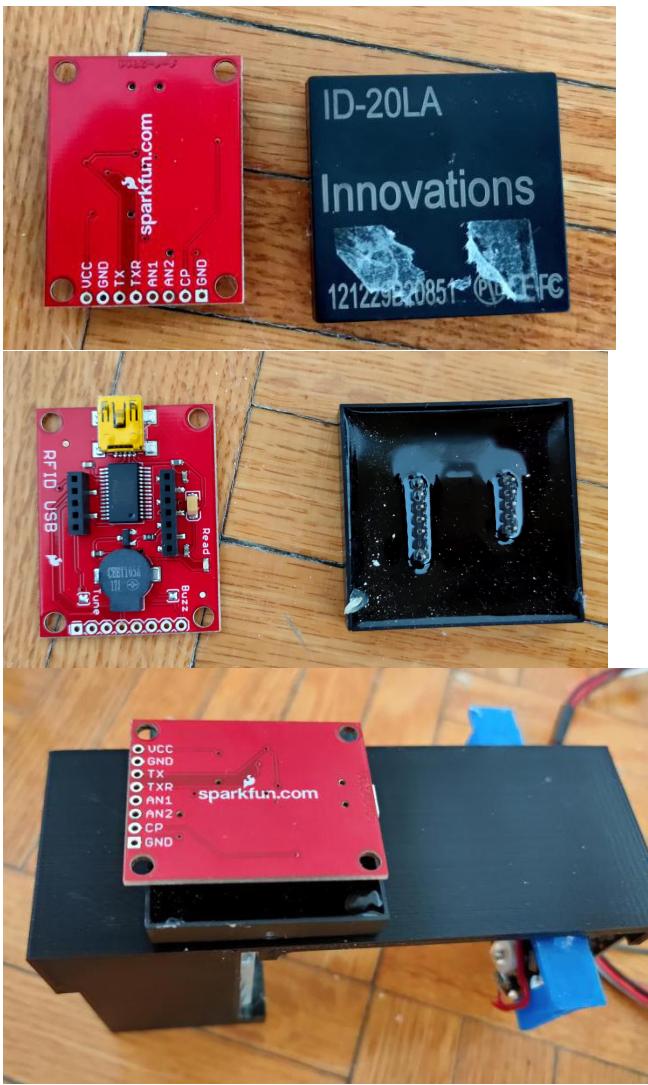
1.2.2 Attach the camera to the camera holder(living room) by placing the screws and nuts



1.2.3 Insert the replaceable Acrylic front piece



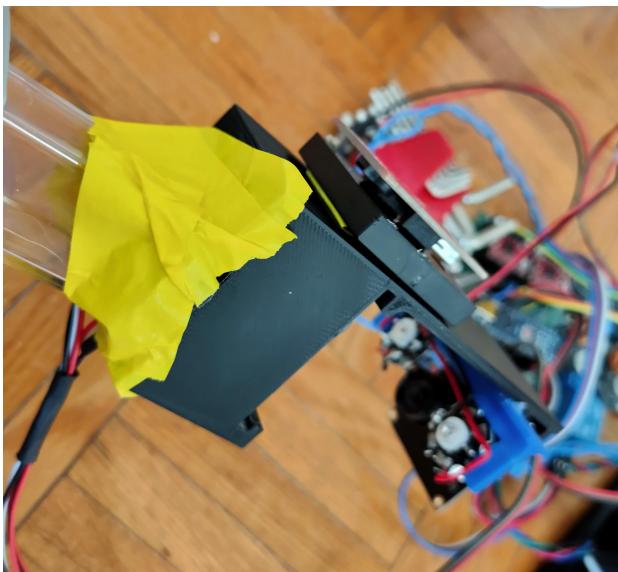
1.3 Attach the RFID Reader



1.4 Attach the beam breaker



Tape and anything could block the light are strongly recommended to apply here. Sometimes the beam breaker cannot detect the mouse, because the receiver is continuously triggered by external light source.



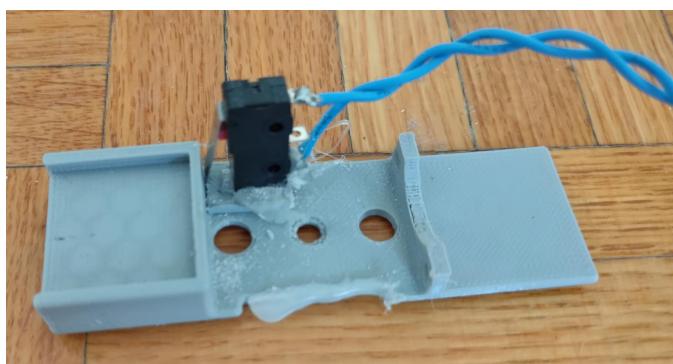
1.4 Fit the tube into the camera holder(living room)



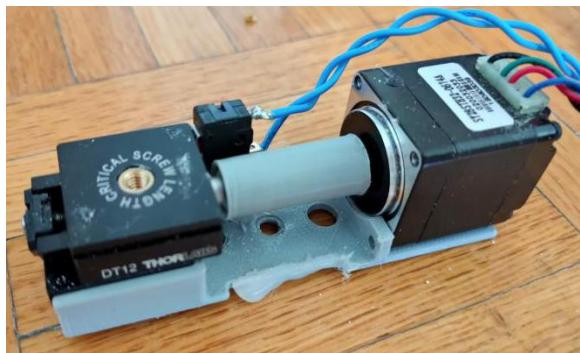
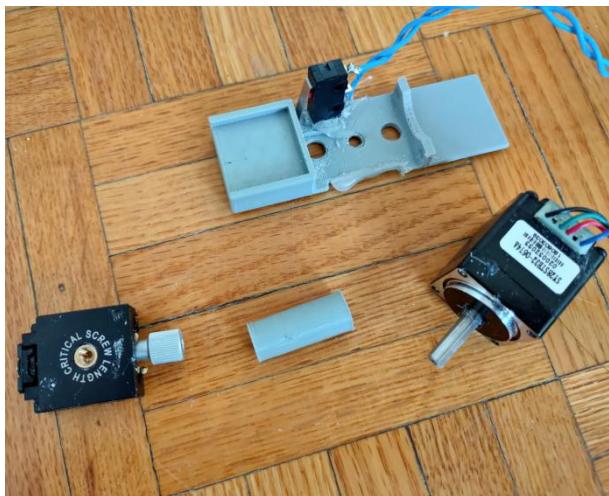
2. Motor Module

2.1 upper stage(controlling left and right)

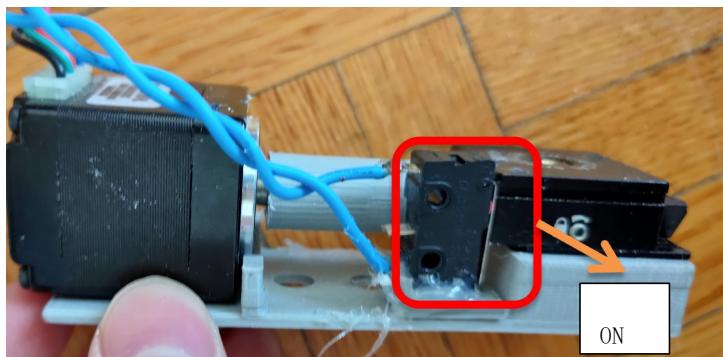
Glue the switch like this:



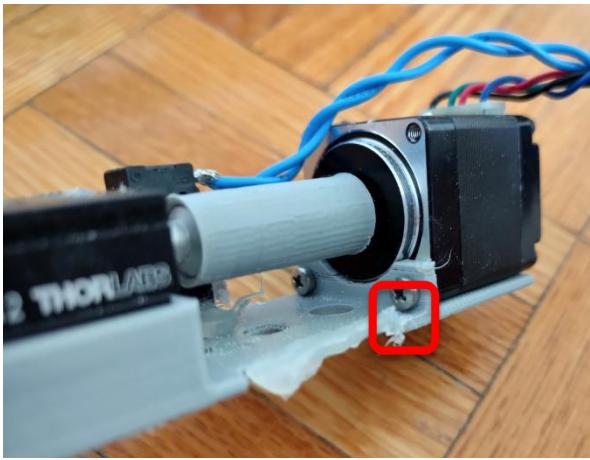
All the parts we need for this stage.



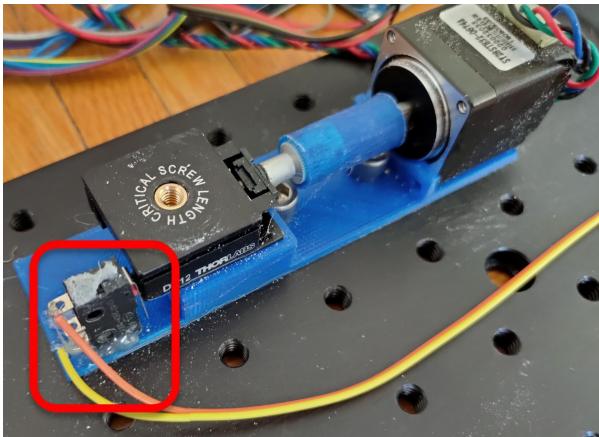
Tips: make sure the switch can be triggered correctly as shown below.



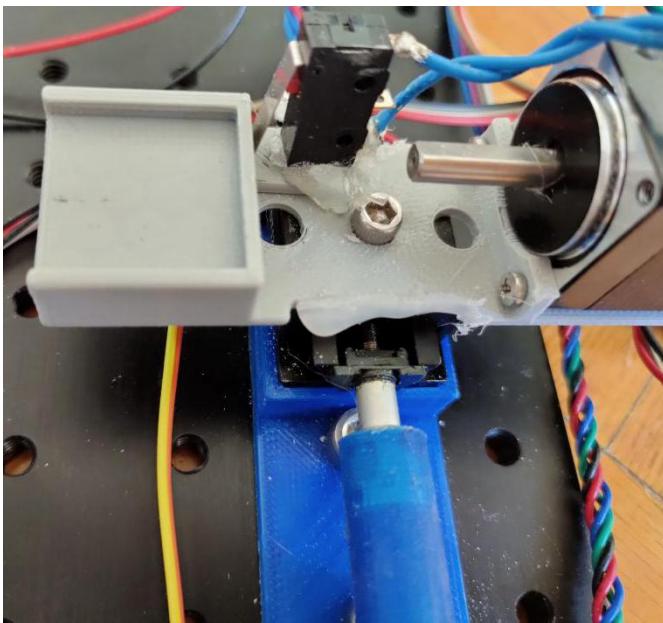
Use screws to attach the motor to the 3d printed stage.



2. 2 Lower stage (Front and back)

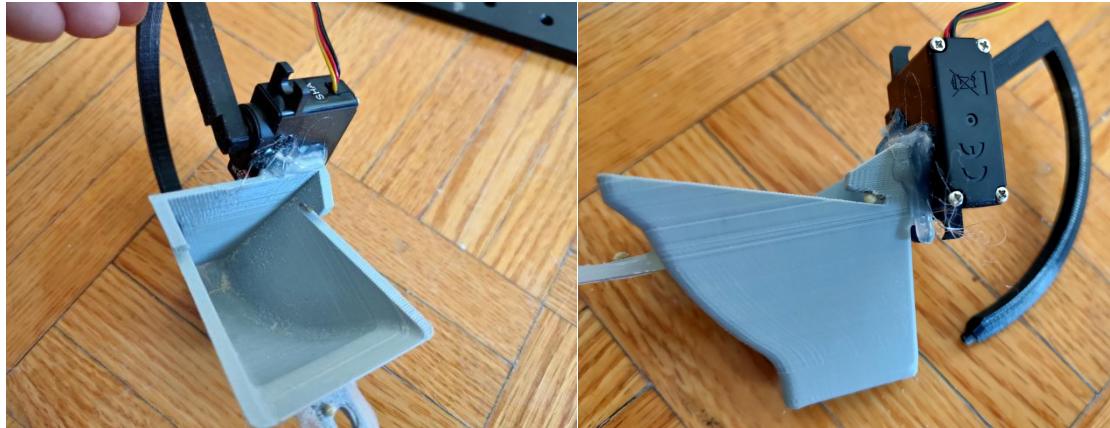


Only the position of the switch is different. Make sure it is screwed on the metal board.



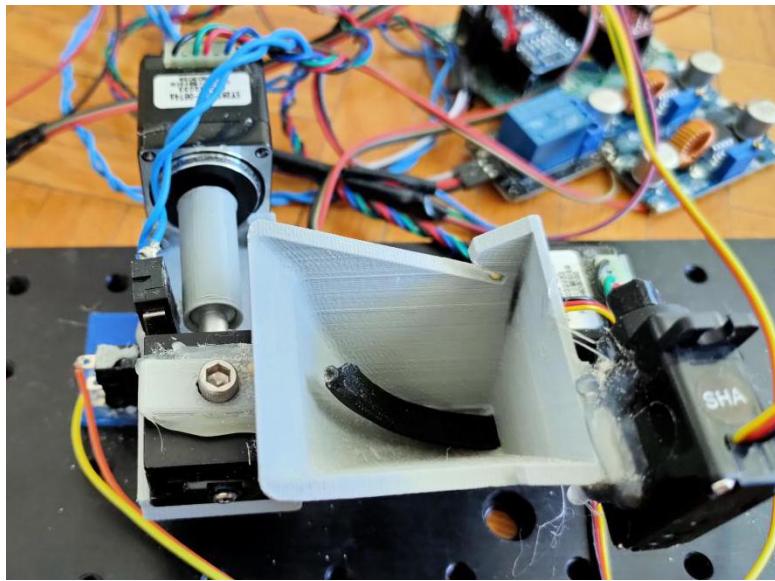
Place the upper stage on the top of lower stage.

2.3 Attach the servo motor and the arm to the hopper

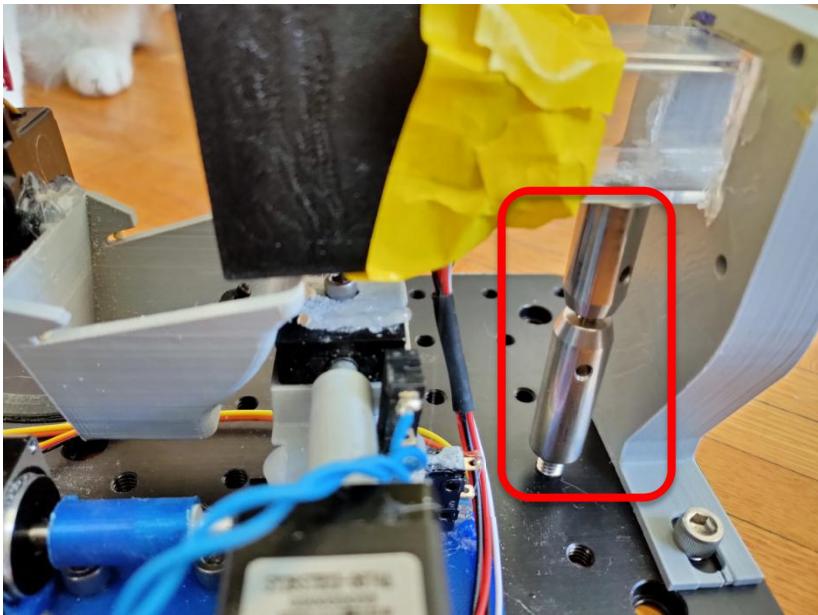


Note that you need to find a proper position before you glue the servo motor. Test it by moving the arm manually, make sure it is smooth.

Then attach the whole part to the upper stage.



2.4 Add an additional support



By doing this, you can make sure the whole system is working with sufficiently stability.

Connect Components on the PCB Board:

Simple and easy.

- Connect all the component to it's right pin.
- Distinguish signal pins, GND pins, 5v pins
- The beam breaker and the electrical switch use the 5v power from the Arduino, and the servo motor use the 5v power from buck converter #1.

Check the figure below for other details.

