

Coursera Robotics Capstone

Assembling the Rover

1 Introduction

This document will provide the step by step instructions to assemble the rover designed for the Coursera Robotics Capstone. Before following this instructions, please follow the instructions for soldering the motor hat and IMU and for flashing the SD card so that everything is ready.

These instructions were adapted from the Adafruit Simple Raspberry Pi Assembly instructions at:
<https://learn.adafruit.com/simple-raspberry-pi-robot/assembly>

2 Instructions

Step 1:



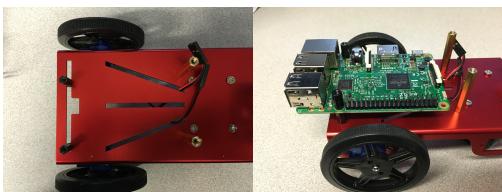
Start by screwing the DC motors to the back of the chassis (i.e. the end farther away from the angled front). Make sure the motors have the same orientation, with the side that the wire exits facing forward.

Next, screw in the caster to the center mounting holes.

Assemble the wheels by stretching the tires onto the hubs, then push the wheel into place on the motor head and screw it in. (Note that you will need to remove the wheel on the left hand side to connect the HDMI cable later).

You can feed the DC motor wires up through the angled mounting slots in the chassis.

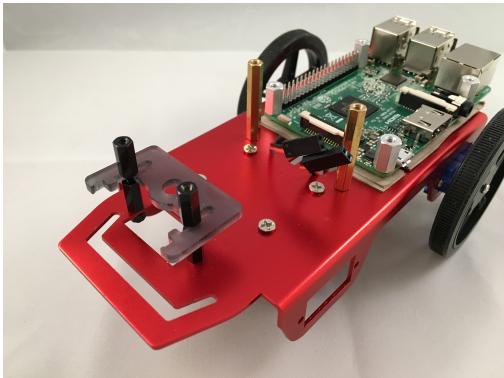
Step 2:



Screw two of the M2.5 standoffs to the back cutout of the chassis with the nuts provided as mounting points for the Pi. It's preferable for the standoffs to be closer to the right hand side of the chassis to allow easier access to the HDMI and power ports. Also attach the two long, gold standoffs that came with the chassis.

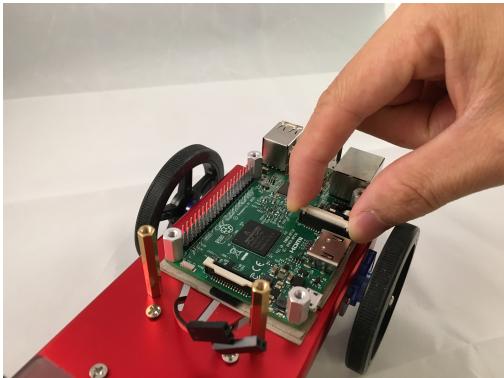
Then, attach the Pi with two more standoffs.

Step 3:



Next, attach the base of the camera mount with two sets of standoffs (if you have access to M2.5 screws, you can replace the second set of standoffs with those). The standoffs will not slide exactly into the smaller slots of the mount, but this is fine. It will hold if you push the mount so that the standoffs are as far in as they can go. Also, make sure that the open side of the mount faces forwards.

Note: at this point, your rover might be a little different to the one in the image, as we used our own screws and standoffs to mount the Pi. However, ignore this difference, your Pi should be mounted as in Step 2.



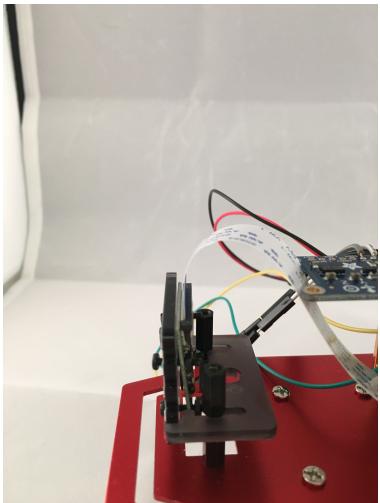
Step 4:

Unclip the camera connector on the Pi by pulling the white tab straight up.



Step 5:

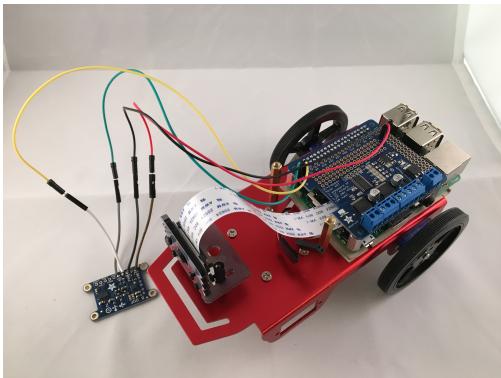
Insert the camera flex cable into the camera connector with the silver connectors pointing forwards as shown. Close the connector by pressing the white tab back down.



Step 6:

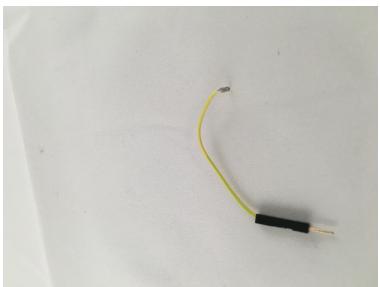
Screw the camera onto the second part of the mount, and insert it into the bottom of the mount as shown.

Be careful when screwing in the camera. You only need to lightly turn the screws so that the camera does not fall out. Absolutely no tightening is necessary. If you tighten the screws, it may bend the camera board and cause it to stop functioning. The camera should be sit at an angle when mounted. You may also need to remove the protective cover over the camera lens and possibly the camera connector on the back of the camera.



Step 7:

Mount the motor driver by inserting it into the GPIO pins on the Pi. It should rest on the standoffs at the back of the Pi.



Step 8:

Prior to connecting the motors to the motor driver, you will need to cut and strip four wires as shown. You will need around 5cm of wire, with the stripped end connecting to the driver and the non-stripped end connecting to the motor.

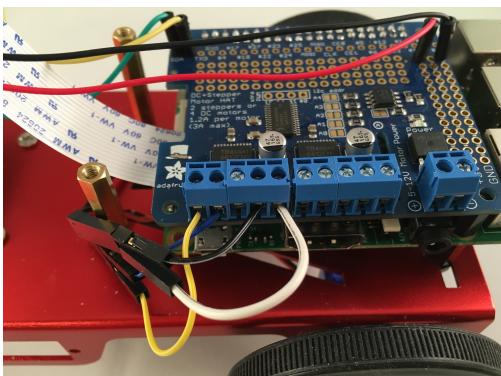
You may need to fold the stripped wire a few times to get it thick enough so that it will hold in the motor driver.

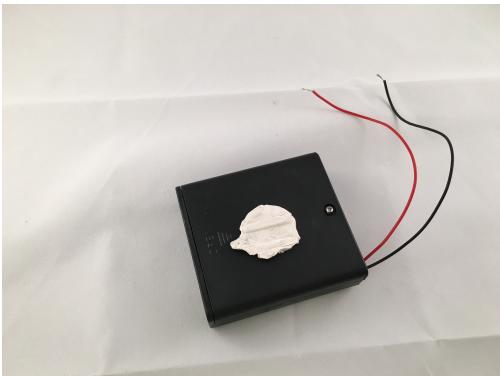
Step 9:

Connect the motors to the motor driver according to the following (Terminal 1 is left most in the image):

Left motor + (Red)	Terminal 2
Left motor GND (Black)	Terminal 1
Right motor GND (Black)	Terminal 4
Right motor + (Red)	Terminal 5

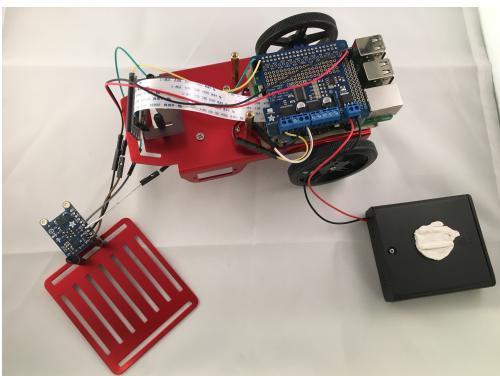
To secure the wires, tighten the screw above the terminal until it is tight.





Step 10:

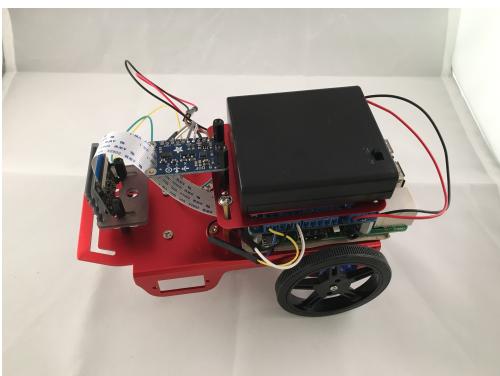
In order to fix the motor battery holder onto the top plate, you will need to have some kind of adhesive. Here, we use adhesive putty, but some kind of double sided tape will work also.



Step 11:

Mount the IMU onto the top plate of the chassis using two pairs of the standoffs. Make sure that the x axis on the IMU is pointed in the forwards direction of the rover. It should sit roughly in the middle of the front of the plate as shown in the image.

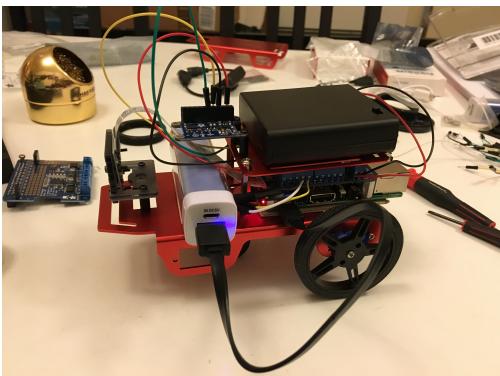
Also, connect the motor battery holder to the motor driver (red to positive, black to negative).



Step 12:

Screw the top plate onto the chassis, and attach the motor battery holder to the top of the plate.

Note: you will need to turn on the switch on the battery holder to drive the motors.



Step 13:

Finally, insert the USB battery underneath the camera flex cable. To secure it in place, you can put a piece of double sided tape under the battery.

This should be the final step. Congratulations on building your own rover!