



Project Polar Bear

Build Guide

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Shopping list/bill of material

ITEM	COST	SOURCE
Raspberry Pi Touch Screen	Not included in Costings (It's the Screen)	https://bit.ly/3MLEWK8
Raspberry Pi 4	Not included in Costings	https://bit.ly/3vZkSy0
32GB Micro SD Card	Not included in Costings	https://amzn.to/3JpkuwH
Pallets x3	Free	On the street corner.
Web cam	£14.90	https://amzn.to/34w5wWY
Bins x3	£24.99	https://bit.ly/3tTAi4j
Servo x3	£24.00	https://bit.ly/3ogNYlt
50mm Wood Screws x 50	£1.99	https://bit.ly/3vWv4r7
3D printed plastic	£3.72	https://bit.ly/3pJliU 3.8p per gram. pi mount 32g, servo mount 66g. 124g total.
Zip ties	£3.99	https://amzn.to/3KjiDJ
Display Ribbon Cable (30 cm)	£3.13	https://amzn/4GtuSA
Stand offs x4	£2.50	https://bit.ly/3vMR8Ej
200mm Wood Screws x 6	£3.60	https://bit.ly/3vHPmo2 £29.99 per 50. 60p per screw. 6 screws
General waste bin sign	£1.50	https://amzn.to/3vBdEAb
Paper recycling bin sign	£1.50	https://amzn.to/3IKx1ud
Wood recycling bin sign	£1.75	https://amzn.to/35NDTzC
Wire	£0.45	https://bit.ly/3t4IJKQ 10p per meter x 4.5m
Jumper Wires (20cm Male to Female)	£1.70	https://bit.ly/3I7afM6
Jumper Wires (20cm Male to Male)	£1.70	https://bit.ly/3w17XLX
Shrink Tubing	£4.67	https://bit.ly/3udK8xT
Final Price	£96.09	

Task 1: Prepare the Raspberry Pi

Tools Needed:

Raspberry Pi 4
SD Card
Power Cable
Keyboard + mouse
Power cable
Screen and HDMI Cable
Micro SD Card Reader or SD Card reader and Adapter
The Raspberry Pi Imager

1. Download the .img file from [this link](#). **This will take some time**
2. Plug the Micro SD Card into your computer with the adapter
3. Open the Raspberry Pi Imager
4. Click 'Choose OS' and scroll down
5. Select 'Use custom' and locate the file which you downloaded earlier
6. Click 'Choose Storage' and select the Micro SD Card.
7. Select 'Write'
8. Wait for it to Write the data. **This will take some time**
9. Plug the Micro SD Card in!

Task 2: Creating the stand

Tools Needed:

Pallet x3

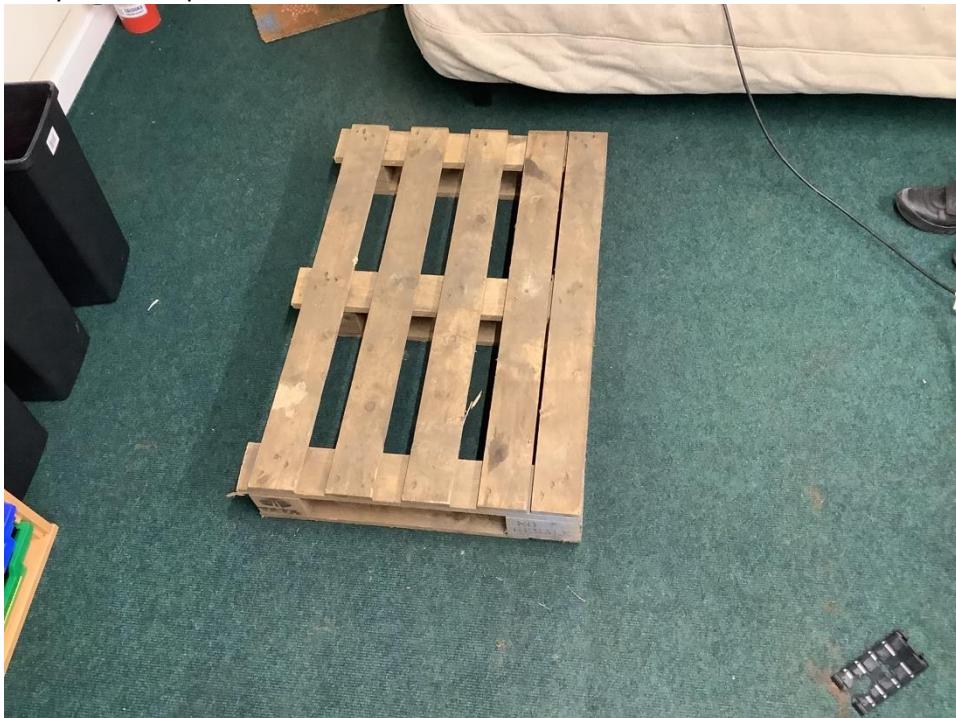
Dremel + (SpeedClic: Metal Cutting Wheel)

Drillbit <https://github.com/Mr-mongoose-com/project-polarbear/blob/main/ServoTest.py> + Screw attachment that fits the screws (green 2) and drill bit (HSS)

2cm screws

Wafer head timber screws

1. Get your three pallets and saw one of them in half.



2. Remove the planks from all the pallets



3. Remove or blunten all the screws on the pallet and planks using a Dremel.Put all the planks that you can fit on the half next to each other and screw them.



4. Then get another pallet and take off all the planks. Then put them back on and screw them all in next to each other.



5. Now cut off the edges of the pallet with a jigsaw.

6. Put this pallet(the taller one) vertically on the back of the half pallet and screw it in with the wafer head timber screws.



7. Put the bins on the pallets and drill them in.



Task 3: Mounting the screen

Tools needed:

Spade (15mm)

Drill

Jigsaw

Raspberry Pi Screen

Standoffs

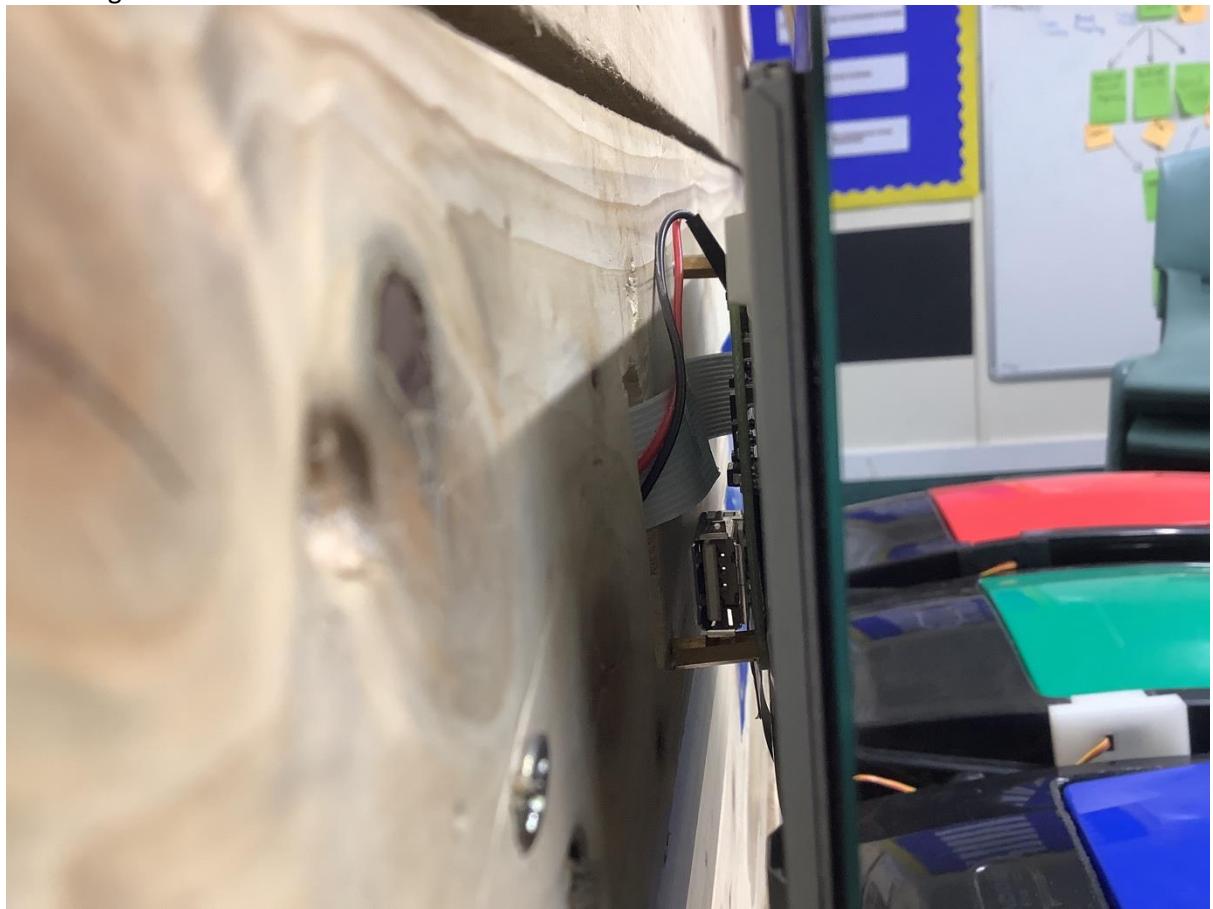
1. Drill 2 holes, using a spade(15) which are 2cm apart, and is close to the edge of the pallet.



2. Get a jigsaw and cut a gap between the two holes.



3. Connect video cable and the jumper wires that came with the screen to the screen before mounting it.



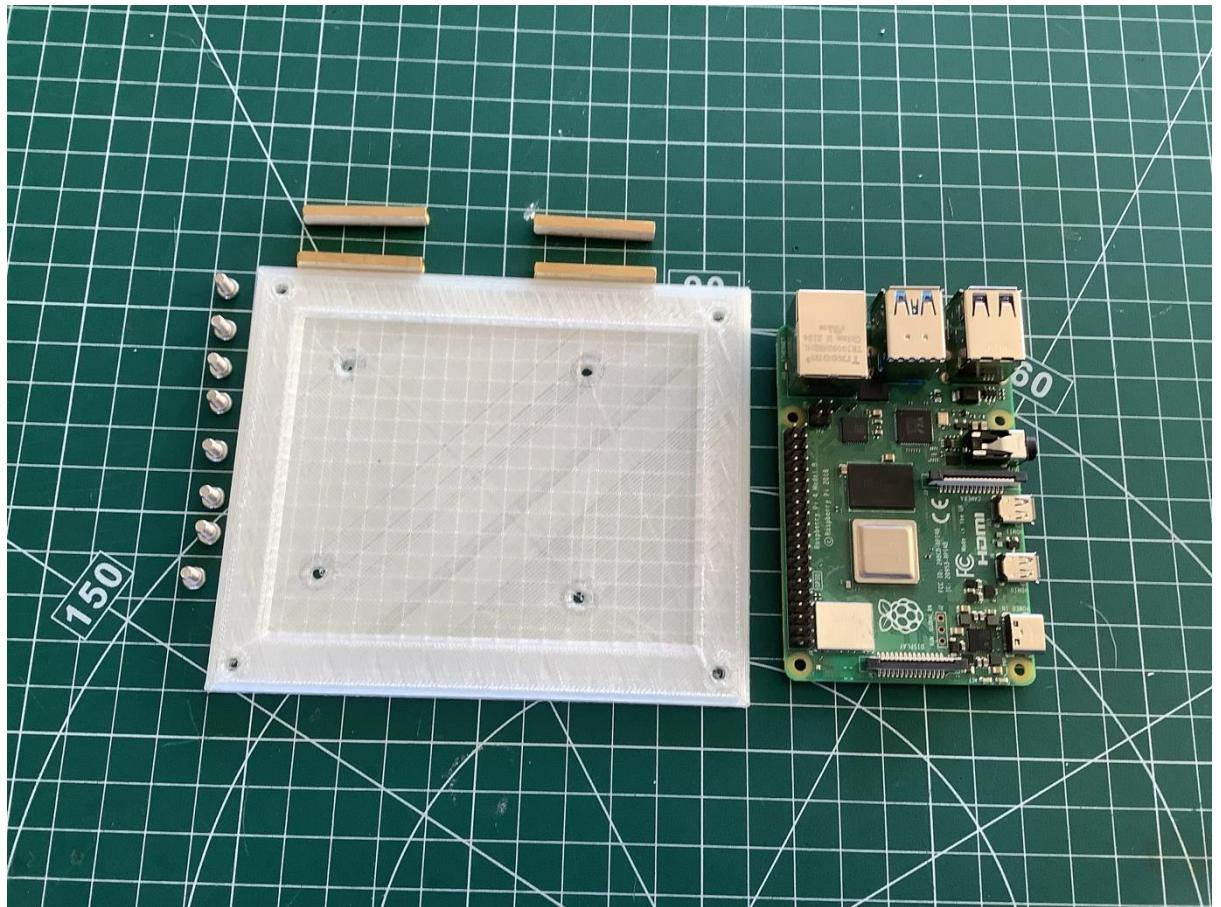
4. Mount screen (the right way round) over holes and thread wires through
5. Plug wires into raspberry pi (do this after next step)

Task 4: Mounting the Raspberry Pi.

Tools Needed:

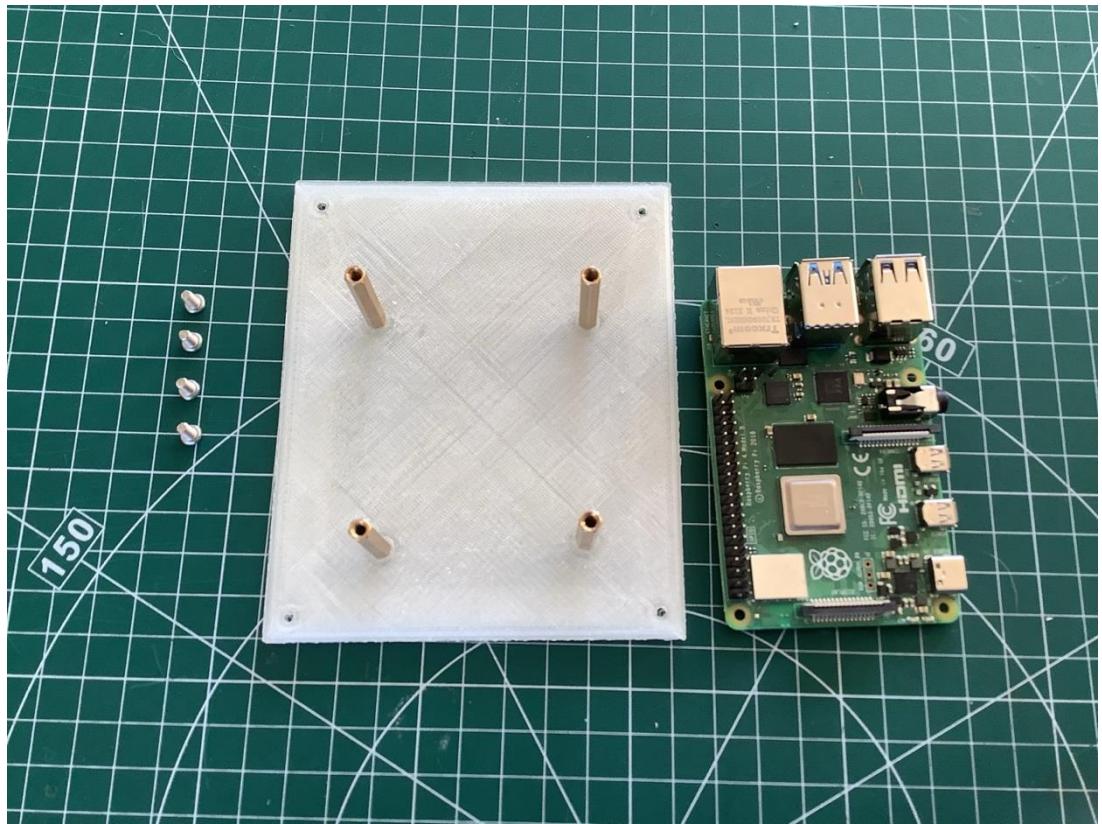
3D Printer
Screwdriver
8x screws
4x stand-offs
1x raspberry pi 4

1. Print off the mount using [the link](#)



2. Place head of screws in the indent of the mount

3. Screw on stand-off

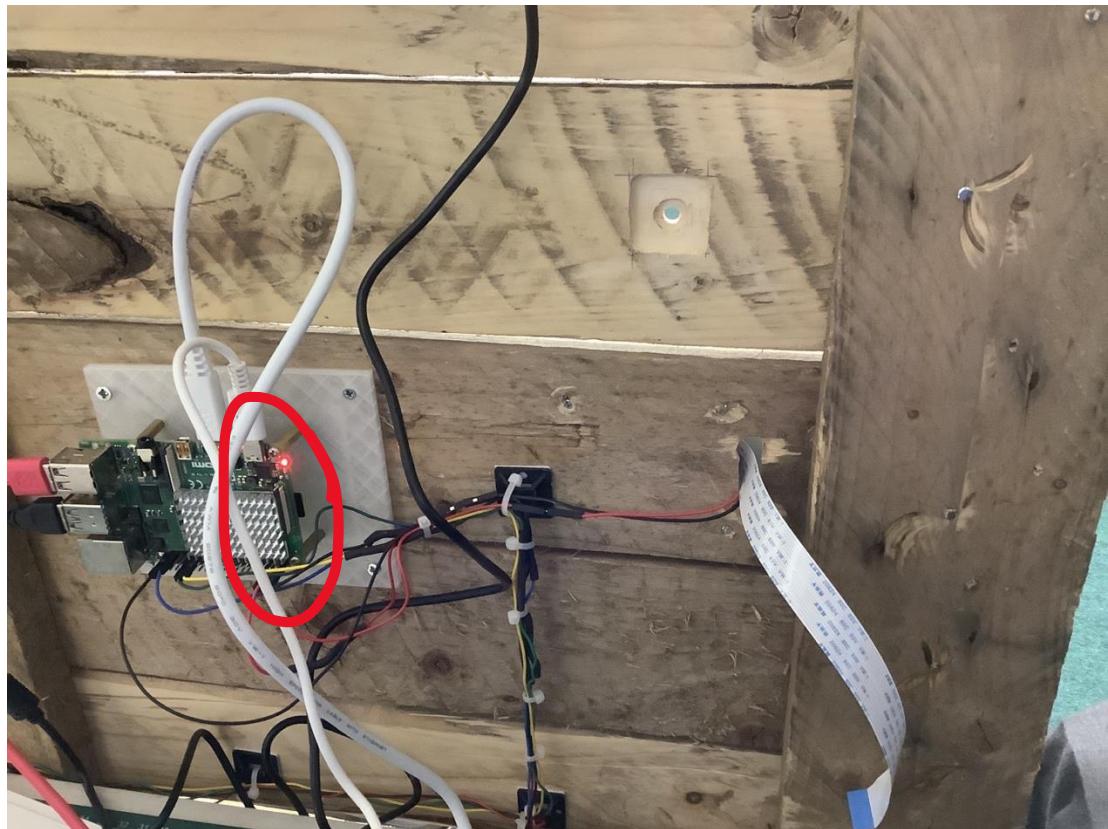


4. Place raspberry pi on stand-off and screw in place



5. Mount on the back of the stand using longer screw. Note: place mount on backboard on the opposite side of screen. And make sure it's the right way round

6. Plug screen wires into raspberry pi.



Task 5: Mounting the Camera

Tools needed:

Web cam

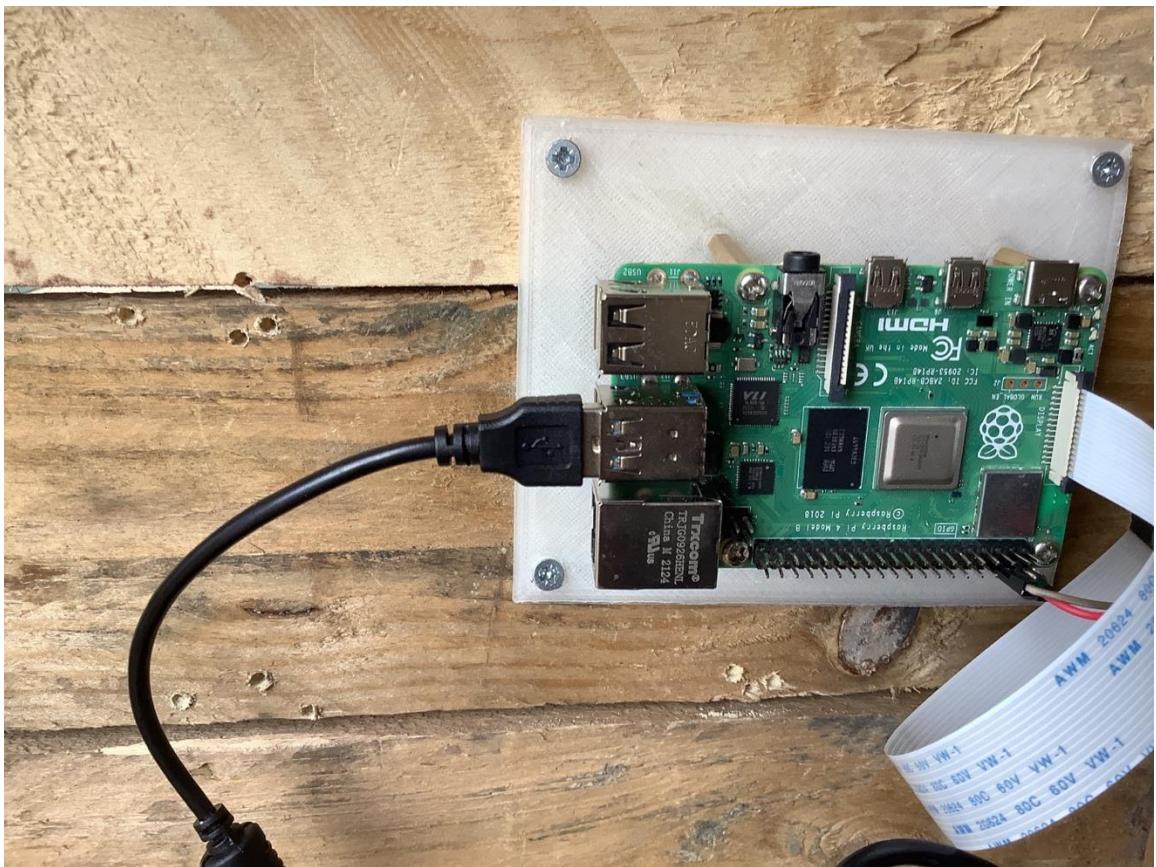
Drill

Screw

1. Drill a hole at the top of the web cam next to the one already provided



2. Drill a screw into the hole that connects it to the stand and plug into the raspberry PI



Task 6: Building the Lids

Tools Needed:

Hacksaw
3D Printer
Drill
Servo x 3
Cross Head Screw Driver

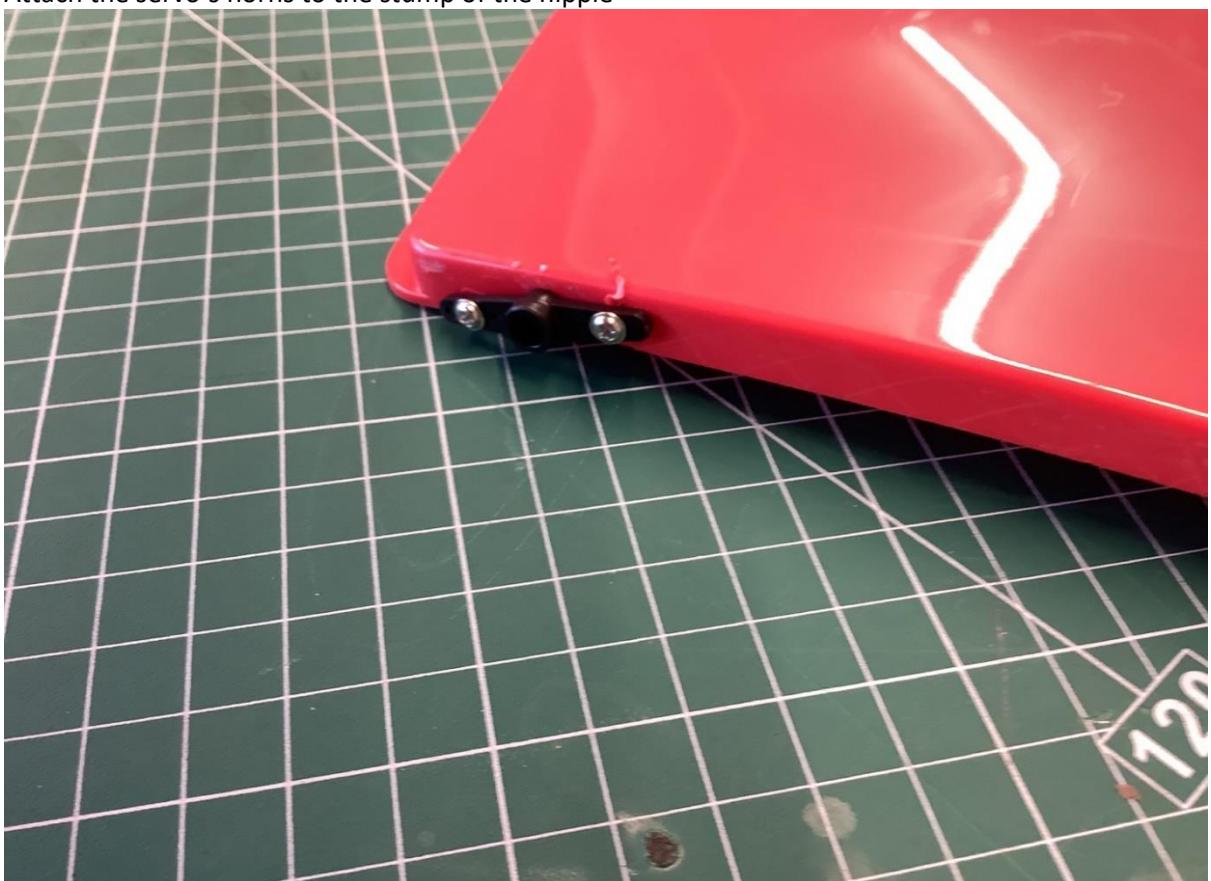
1. Print off 3 Servo Mounts. The STL file is found using [this link](#). Servo mounts.
2. Take out the flap from the bin lid



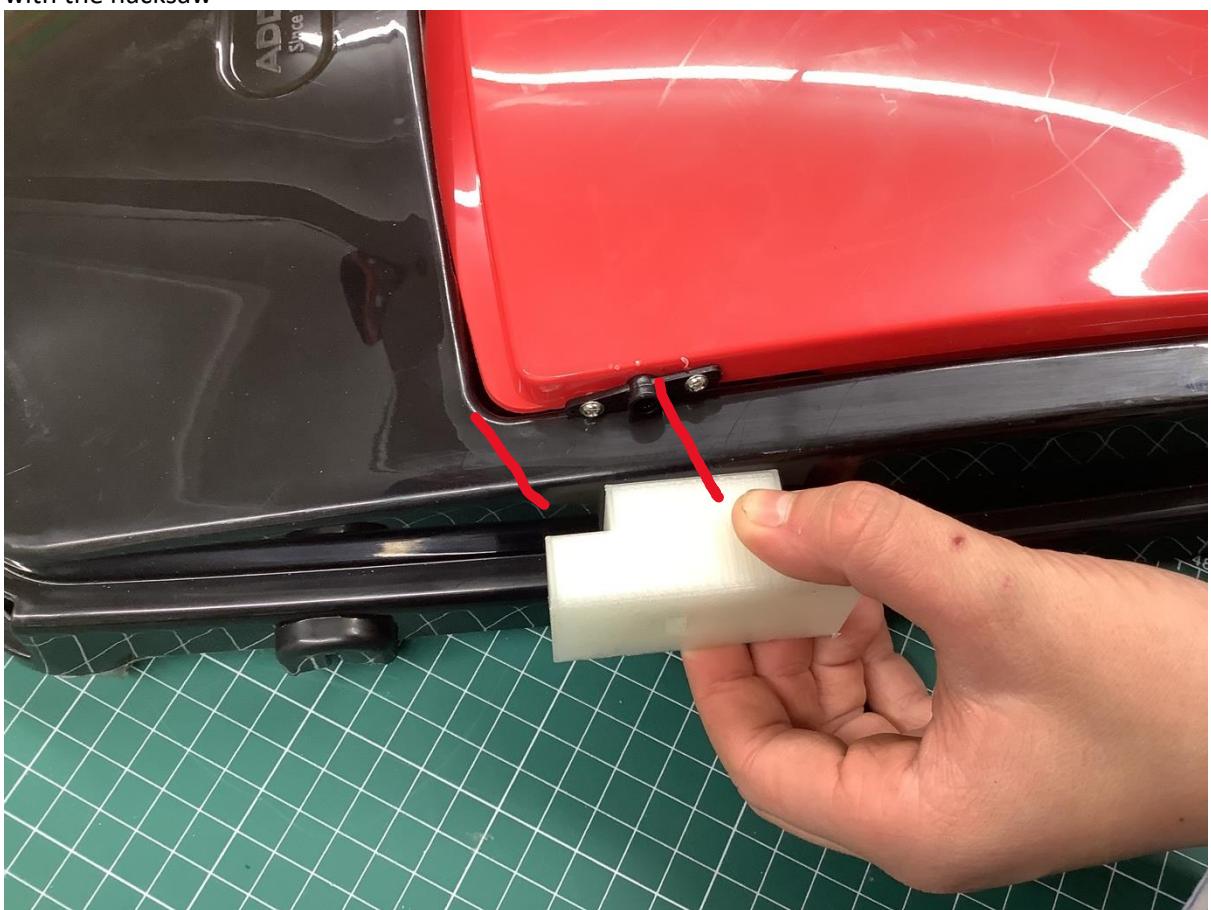
3. Cut off the left nipple



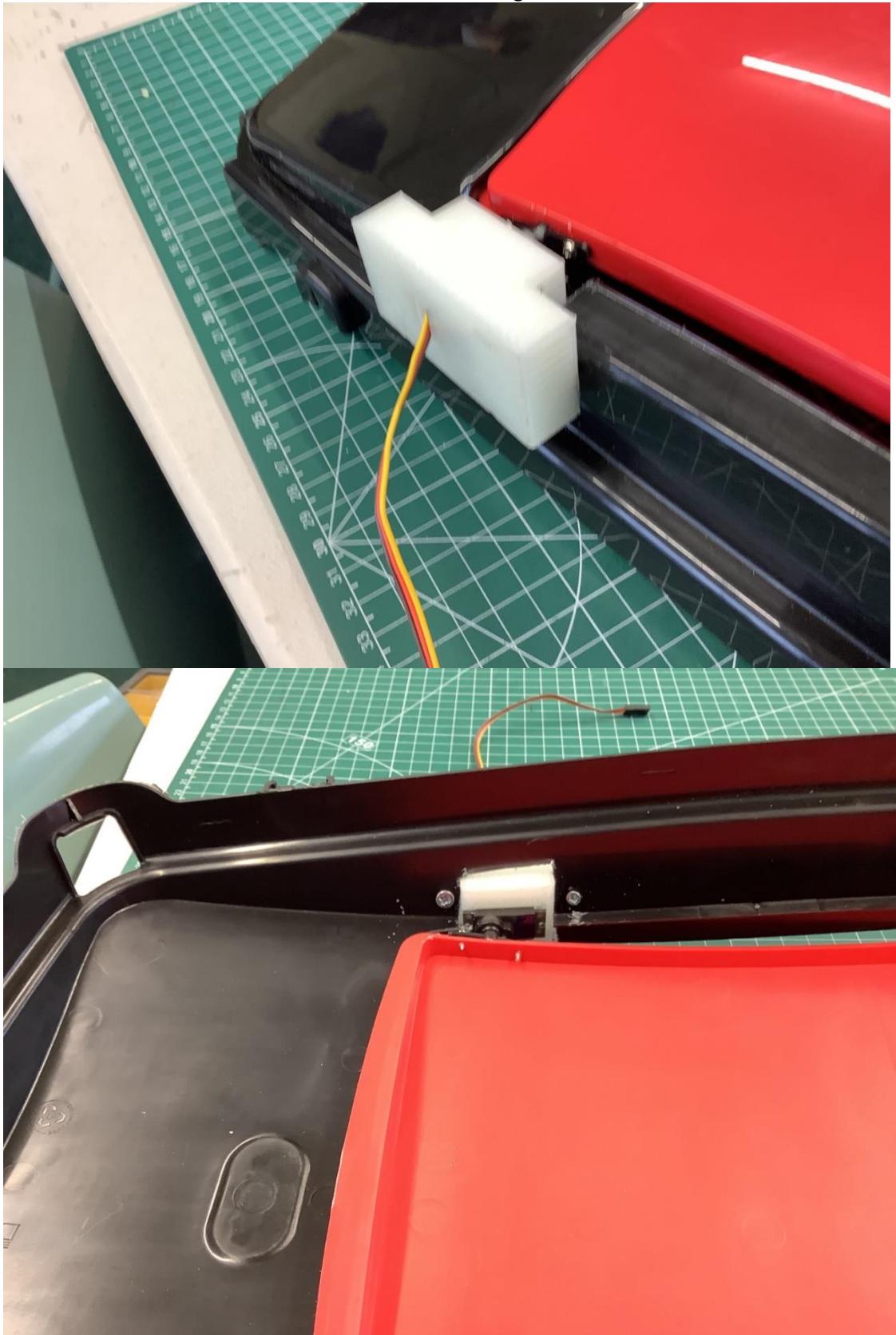
4. Attach the servo's horns to the stump of the nipple



5. Put the flap back in the bin and aline the servo horn with the mount and cut along the edges with the hacksaw



6. Attach the servo to the mount and screw the two wings of the mount into the bin



7. Now do this with the other two bins.

8. Put the lids on the bins and make three holes in the pallets next to where the servo mounts on the bin-lids are. Push the three wires connected to the servo through the holes in the pallet so they come out on the other side

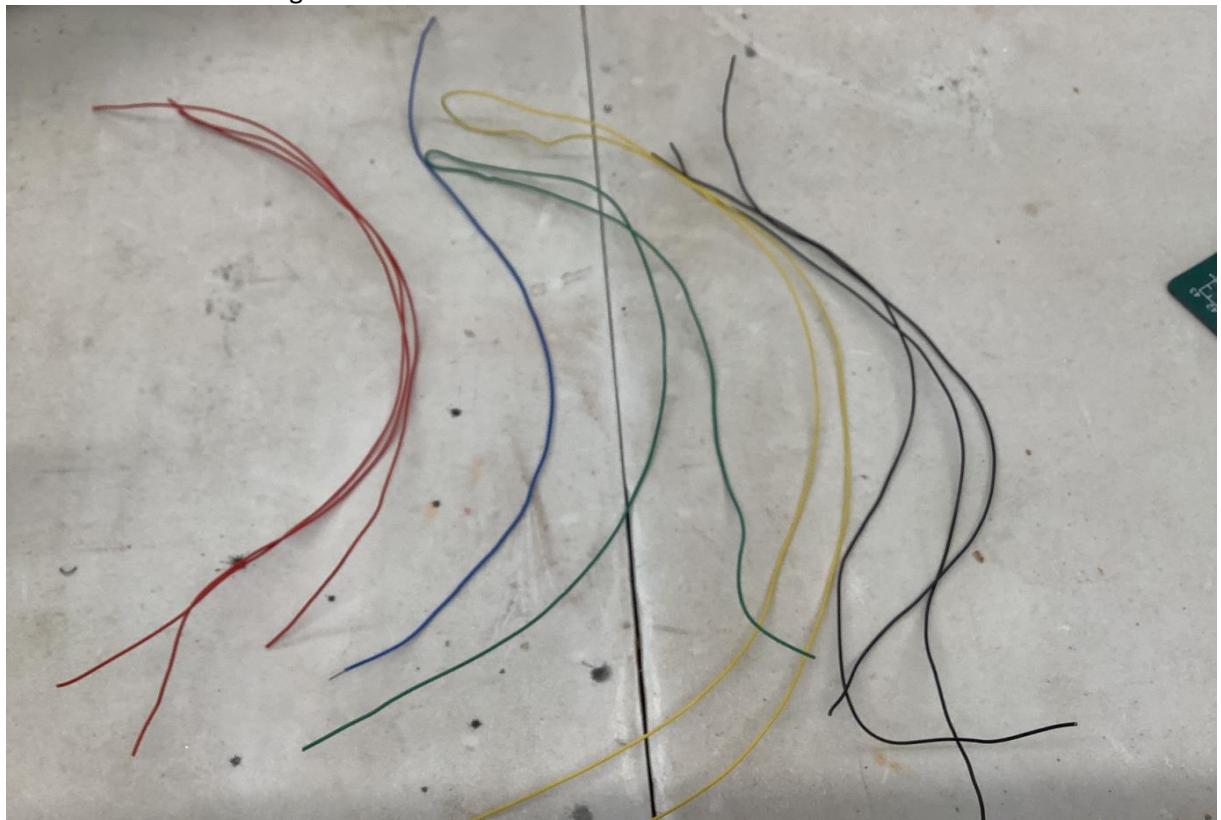


Task 7: Creating the Wiring Loom

Tools Needed:

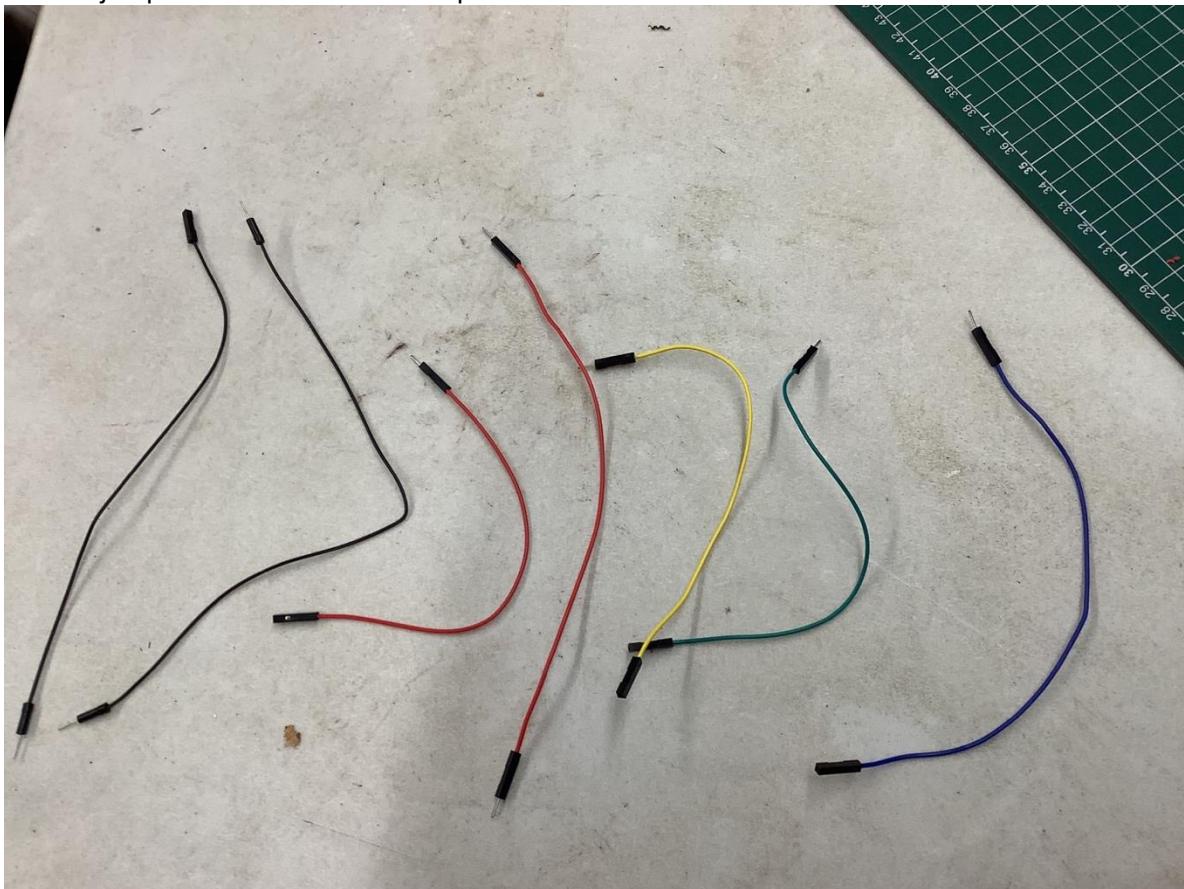
Soldering Iron
Soldering Iron Stand
Wires(colours: blue, green, black, red, yellow)
Zip ties
Shrink tubing
Heat gun

1. Cut out wires at this length



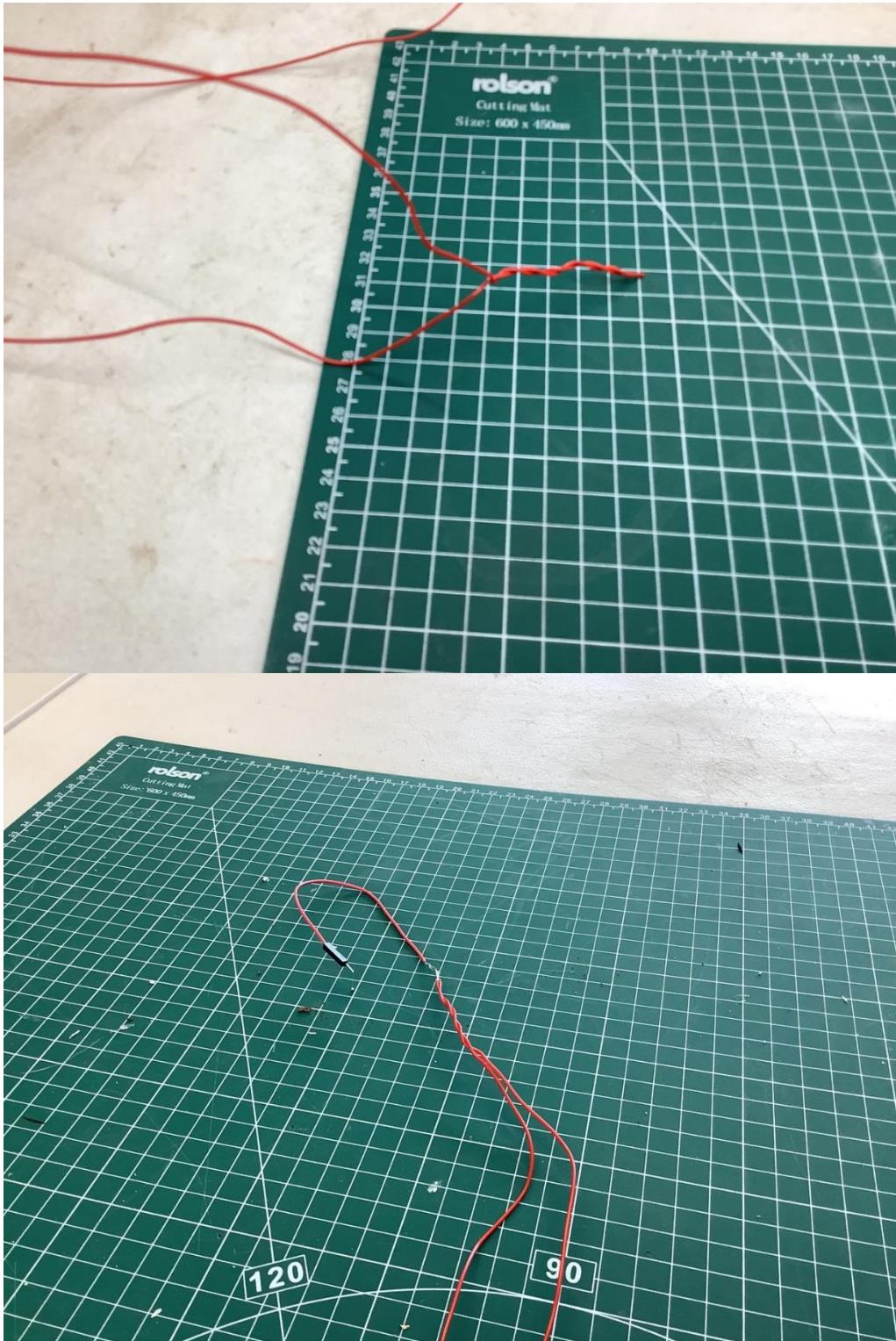
- Red x3: 40cm
- Black x3: 40cm
- Blue: 40cm
- Green: 75cm
- Yellow: 100cm

2. Get the jumper wires as shown in the picture



3. Cut all the jumper wires in half

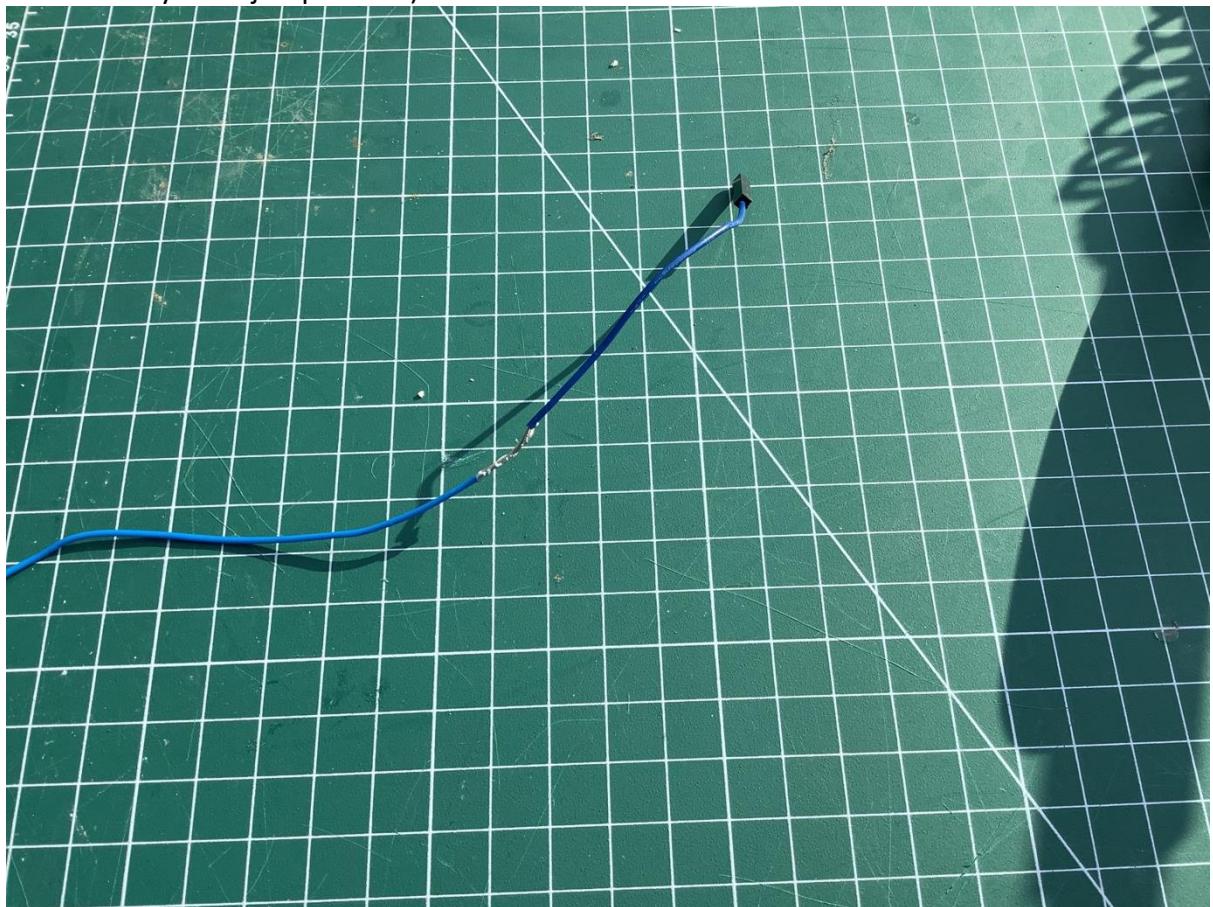
4. Cut and tie all the red wire together at the points where it's going to connect to a servo and then take off the end of the wires using a wire stripper and solder half a male red jumper wire to it. Do the same with the black wires but with black jumper wires



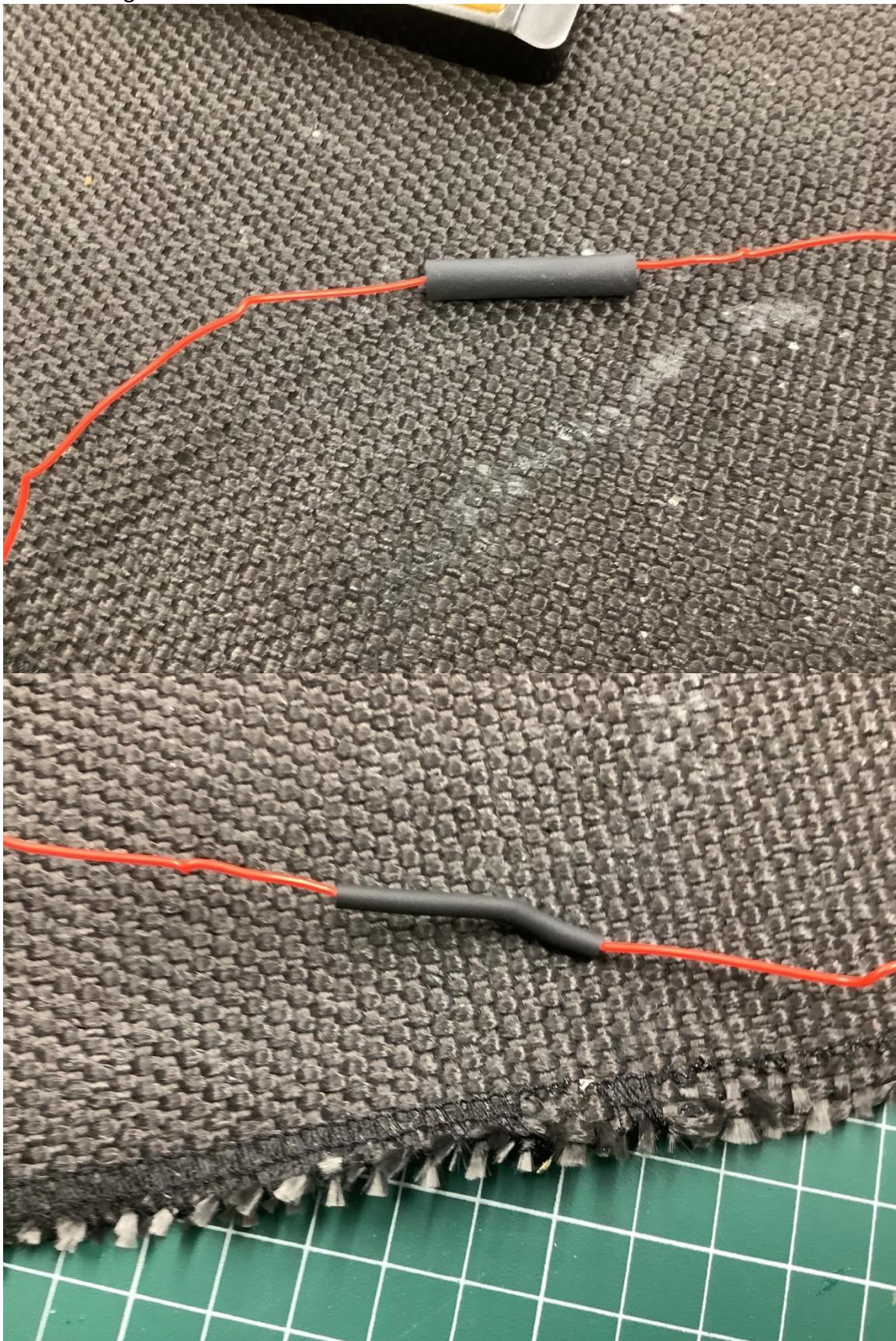
5. Attach half of a male jumper wire depending on the colour to the other three wires
(so a green wire will have a green jumper wire)



6. At the other end attach the rest of the wires (should all be female) to the wires depending on their colour (red wire attaches to red jumper, wire yellow wire attaches to yellow jumper wire)



7. After you have soldered the wires together put shrink tubing over and heat gun the shrink tubing until it has shrunk

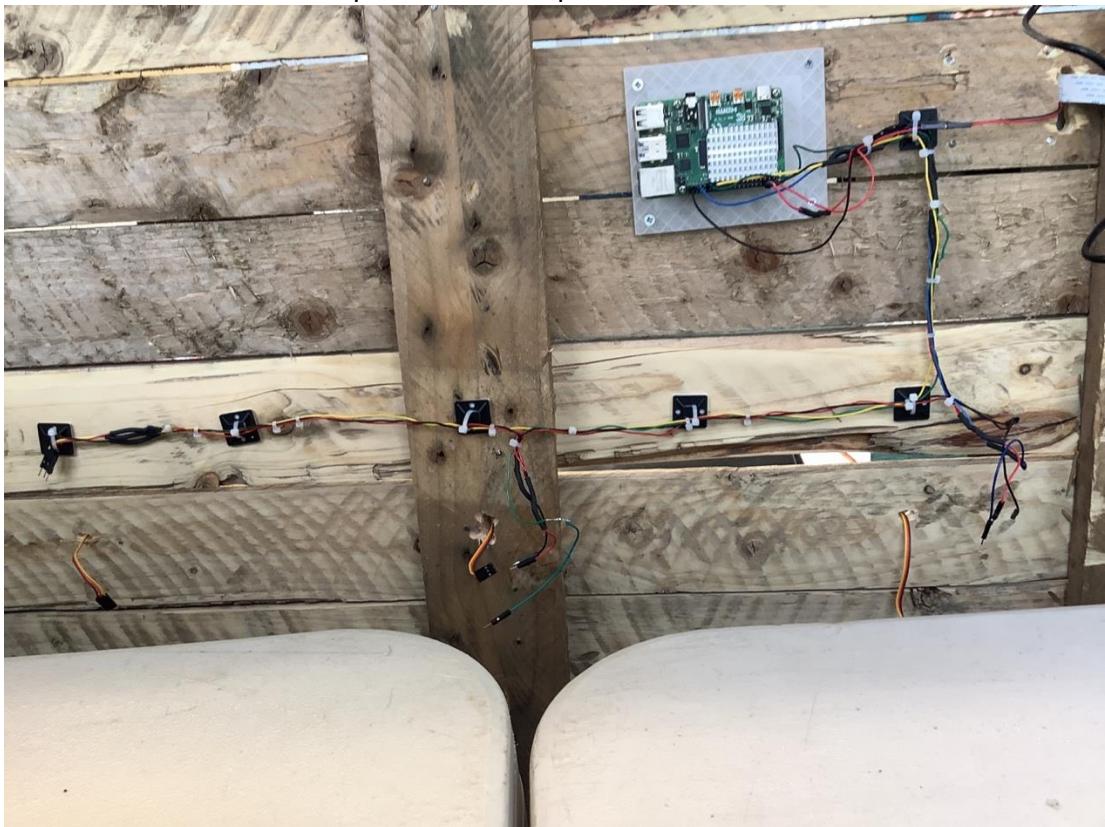


8. Connect all the wires to the Raspberry Pi in this order

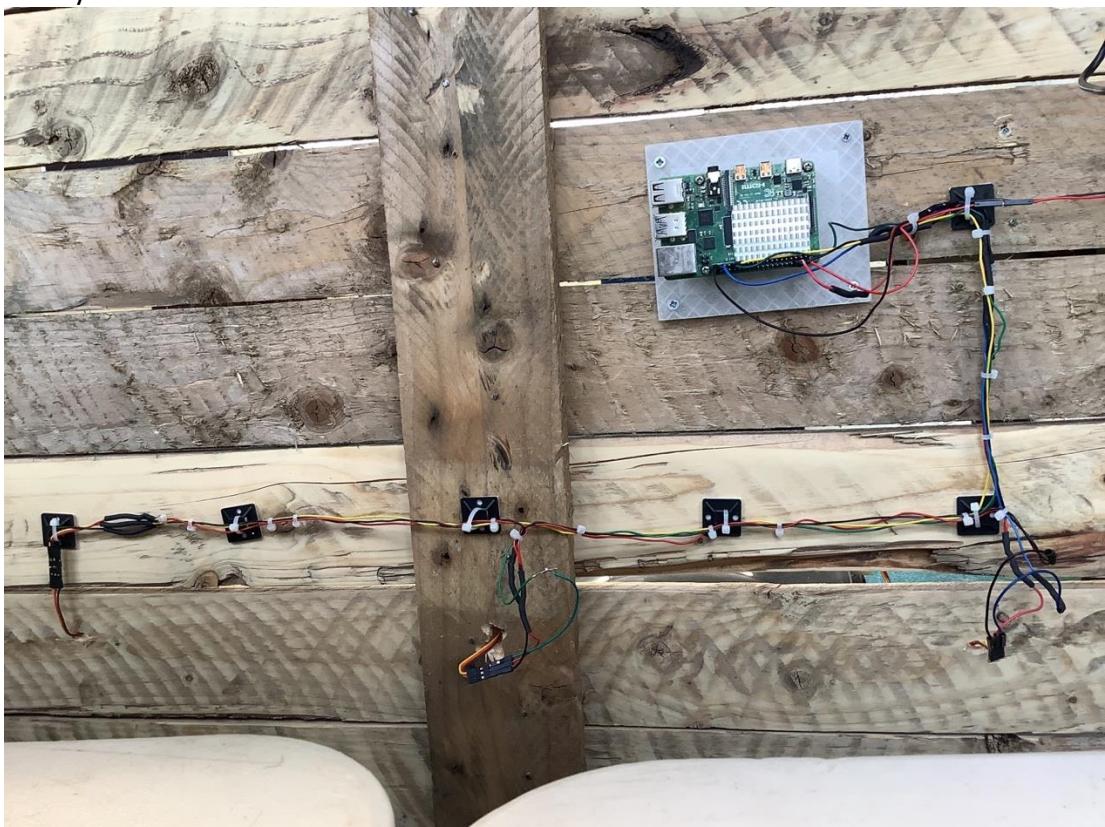
- Blue GPIO-26
- Green GPIO-6
- Yellow GPIO-5
- Red GPIO-5v
- Black GPIO-GND)



9. Connect the wires to the zip ties and the zip tie holders. In this order



10. Finally connect the wires to the servos



11. Test the servo using [this test](#) program.

Task 8: Running the Project

1. Complete Task 1 to Task 7
2. Put the Micro SD Card in the slot, and plug the power cable in.
3. Right-click the 'PS.py' file and select 'Visual Studio Code'
4. Wait for it to load
5. Click the play button in the top-right of the window.
6. Wait for it to load the model... This might take some time
7. Well done! You've successfully built Project Polar Bear!