III Workshop 2024 - EMBM-VD

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CONTEXT:

- Interactive table – Design and construction

- Detect and avoid – Sensors mounting

GOALS OF THS PRESENTATION

- Update and present the work that was done since July 1st up to date

- Our next goals

SUMMARY

- Tools used
- Interactive table
- Support for devices in the Matrice 350
- Gimbal for the Matrice 350

Tools and techniques used

Tools and techniques

- 3D printer
- Fusion 360
- Ultimaker CURA
- Arduino IDE

Fusion 360

- CAD – Computer assisted design
- Eletronic
- C/C++

Interactive table

For the CONCEPTIO laboratory

Interactive table

- Design and manufacture a interactive table using the 85” TV and a touch screen surface that was already in the lab.

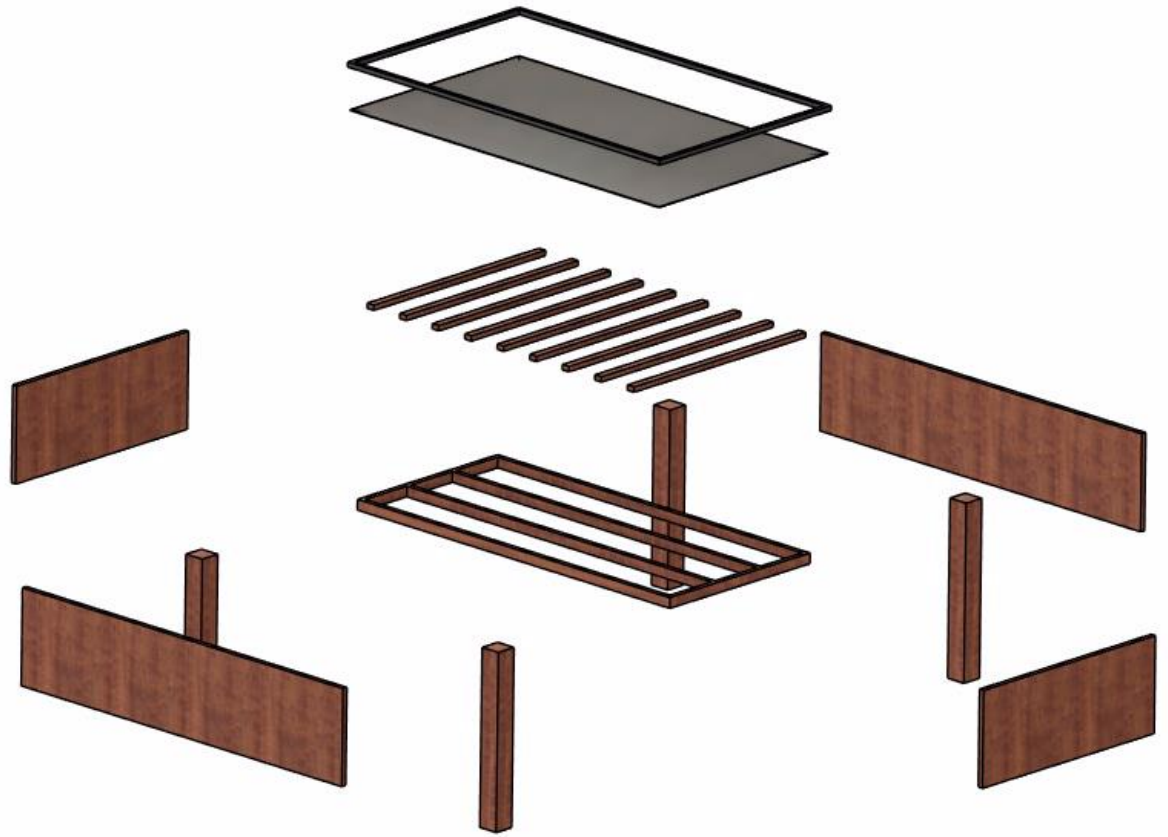
- Smart TV 85" Crystal UHD 4K 85CU8000
- Unionboard 85" Interactive Frame

Interactive table – First design

- The first project was done with wood planks and MDF in all construction.

- It was discarded because it would be expensive, hard to cut and find the necessary wood for the legs and it wouldn't be strong enough.

Interactive table – First design

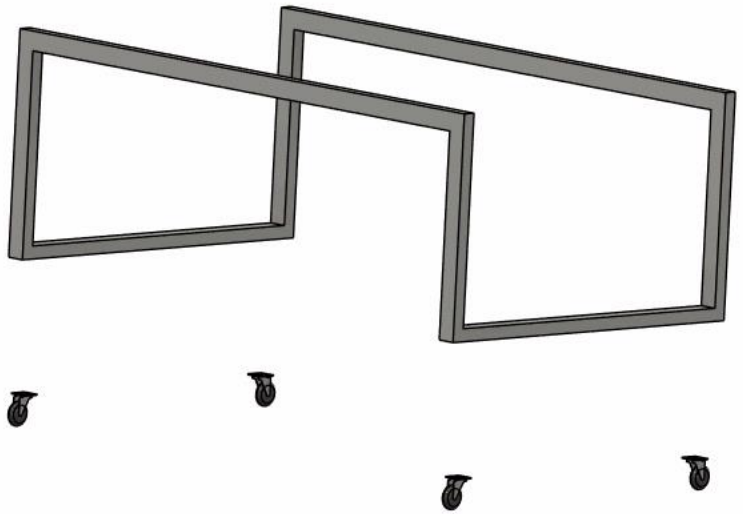


Interactive table – Second design

- The second project was done using MDF in the TV support and the legs of the table were made of steel and wheels, and foam to support the TV.

- It was discarded because it would still be expensive and would waste a large amount of steel that would be bought to make the legs of the table.

Interactive table – Second design



Interactive table – Third design (Metallica)

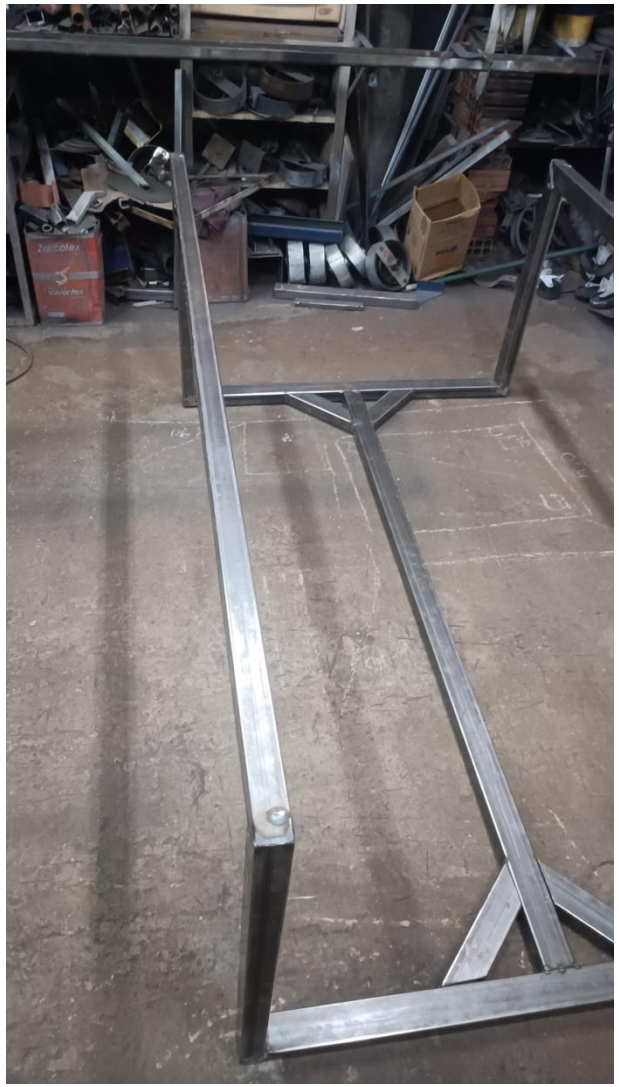
- The third project was done using an all metal construction for the leg structure and the touch screen surface, it was used a thin strip of MDF and foam to support the TV.

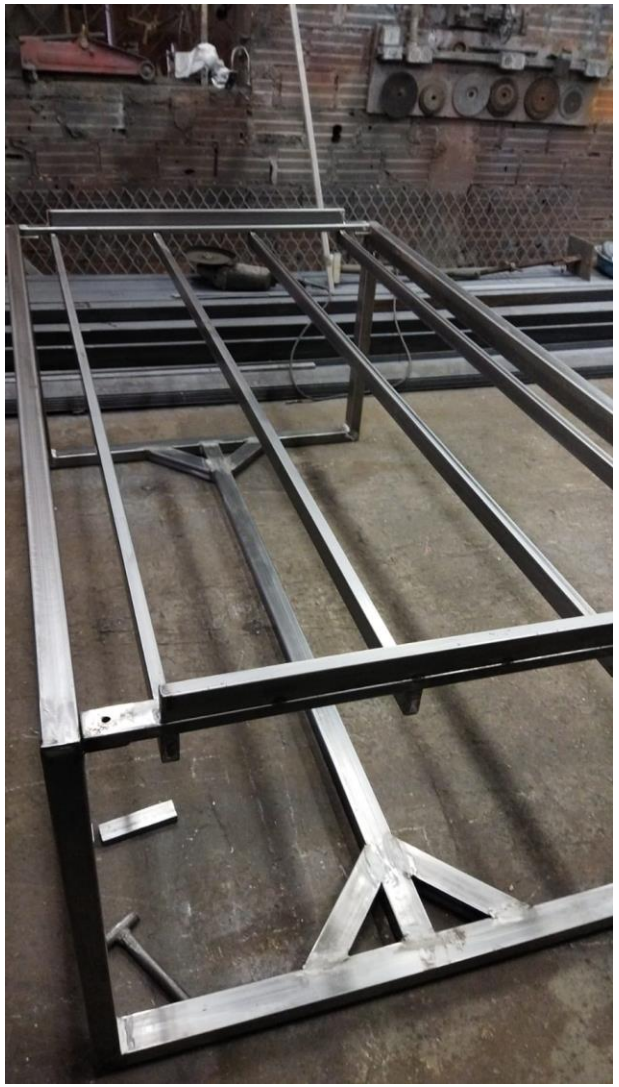
- It was made in two parts, the base and the grill.

Interactive table – Third design (Metallica)

Interactive table – Assembly

Interactive table – Assembly





Interactive table – Assembly

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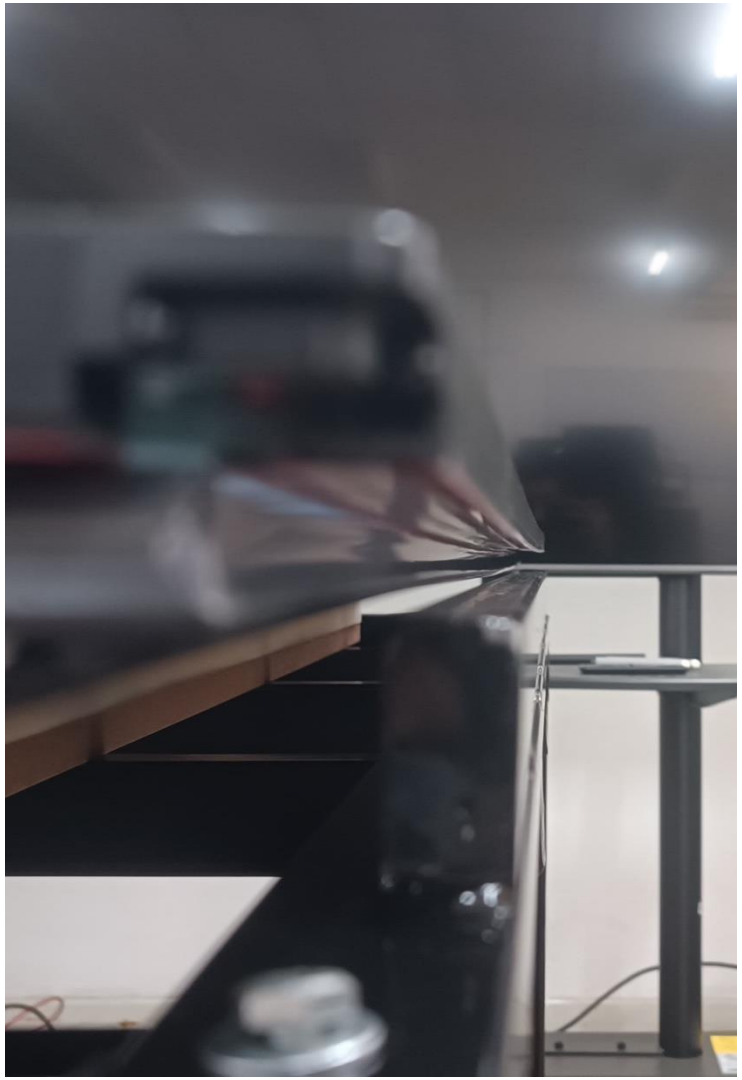
Interactive table – Assembly problems

- The wheels didn’t align with the floor because of the unleveling of the floor.
- The wheels were slipping on the wooden floor, so they were replaced with rubber feet with adjustable height.
- The foam was too stiff, and it wasn’t squished enough, so it had to be cut the height in half.



Interactive table – Assembled

Interactive table – Assembled

Interactive table – Future parts

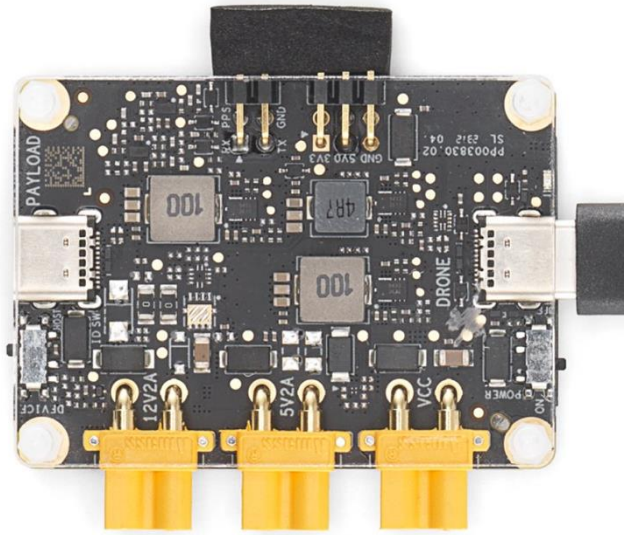
- Using MDF to hide the parts and to give a better finish.
- Power outlets for laptops and other devices.
- CONCEPTIO logo with custom lighting.

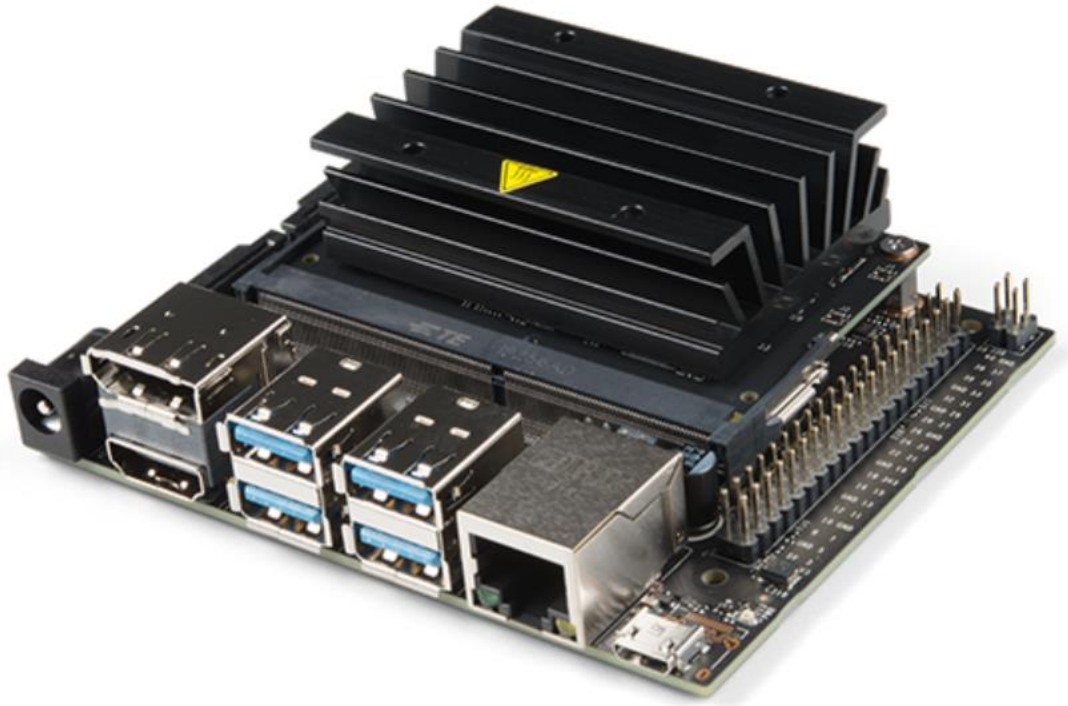
Supports for boards and sensors

For the DJI Matrice 350 RTK

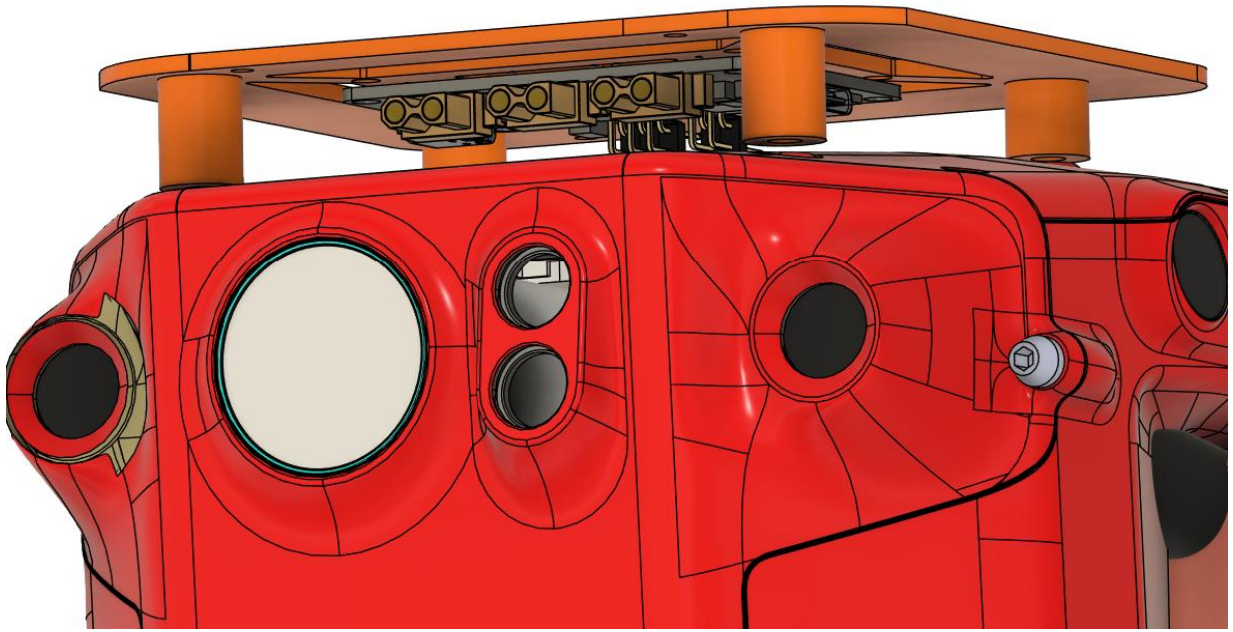
Support for devices – Matrice 350 RTK

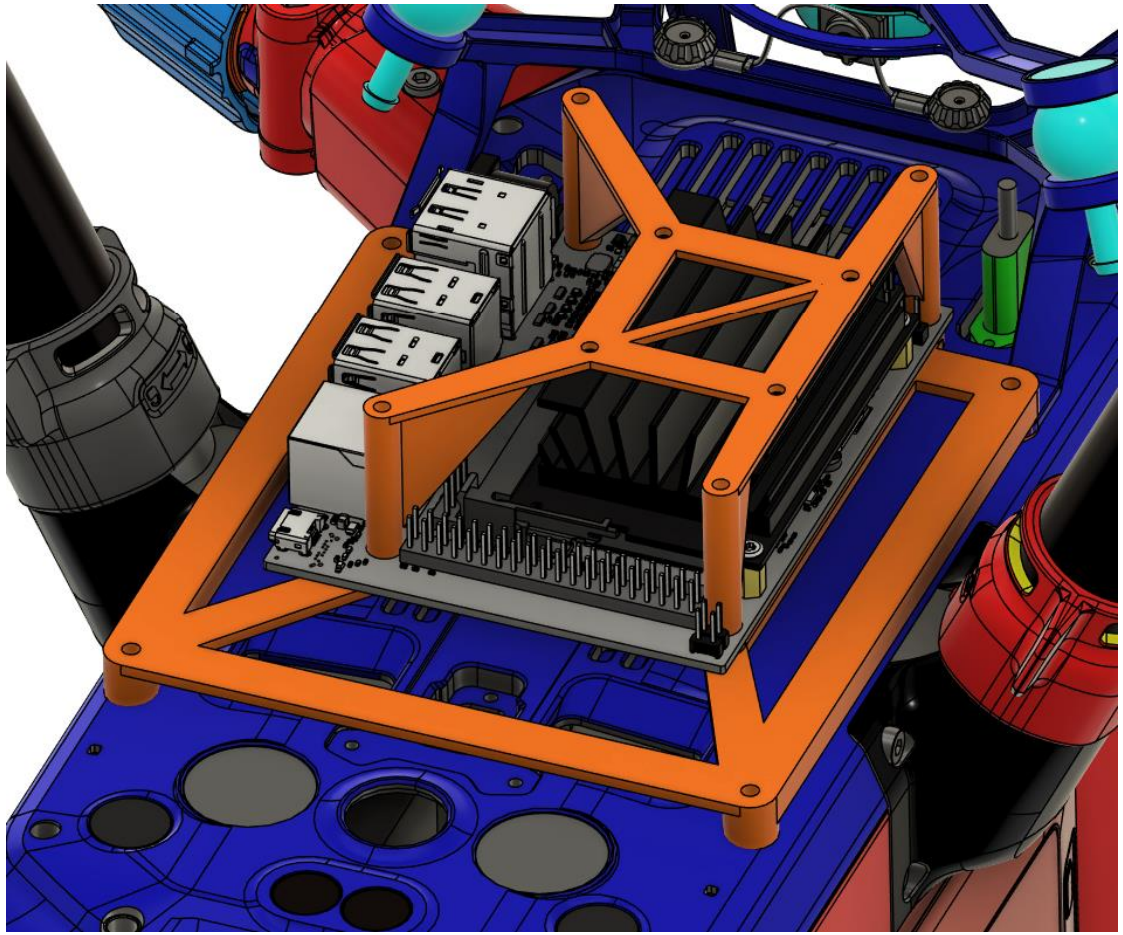
- Design and build supports for the Nvidia jetson nano, E-Port board and other parts.
- Use as many internal parts and manufacturing methods as possible.
- Light and reliable.





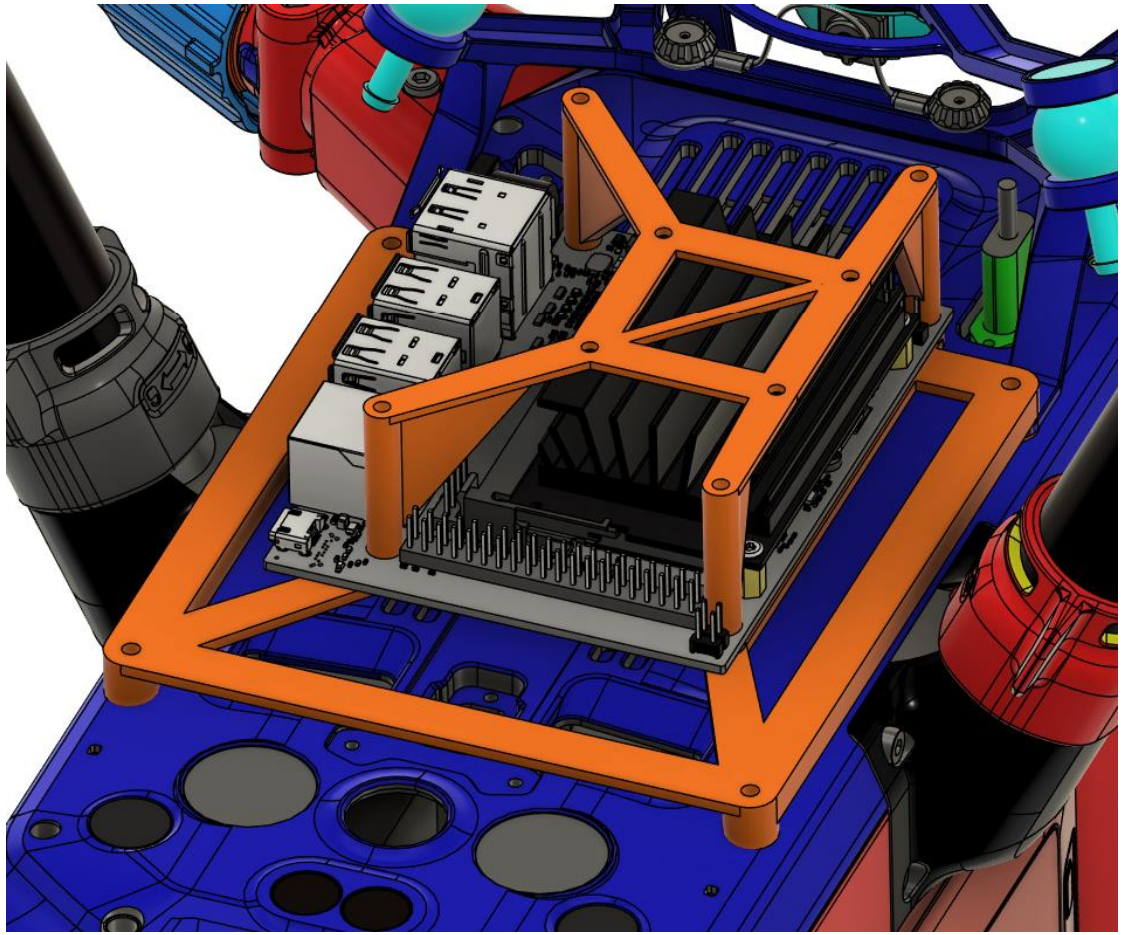
Support for devices – Matrice 350 RTK





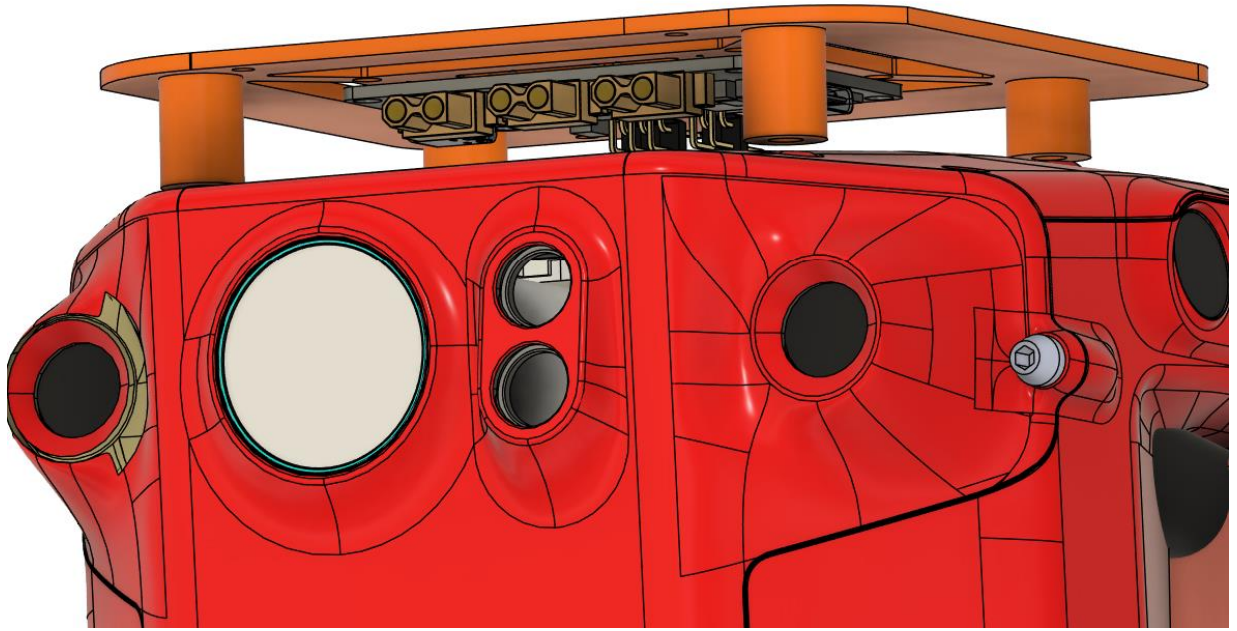
Support for devices – Matrice 350 RTK

- The Nvidia jetson will be secure in the lower part of the drone.
- Supports will be 3D printed and secured using M3 screws in the designated screw points of the drone.



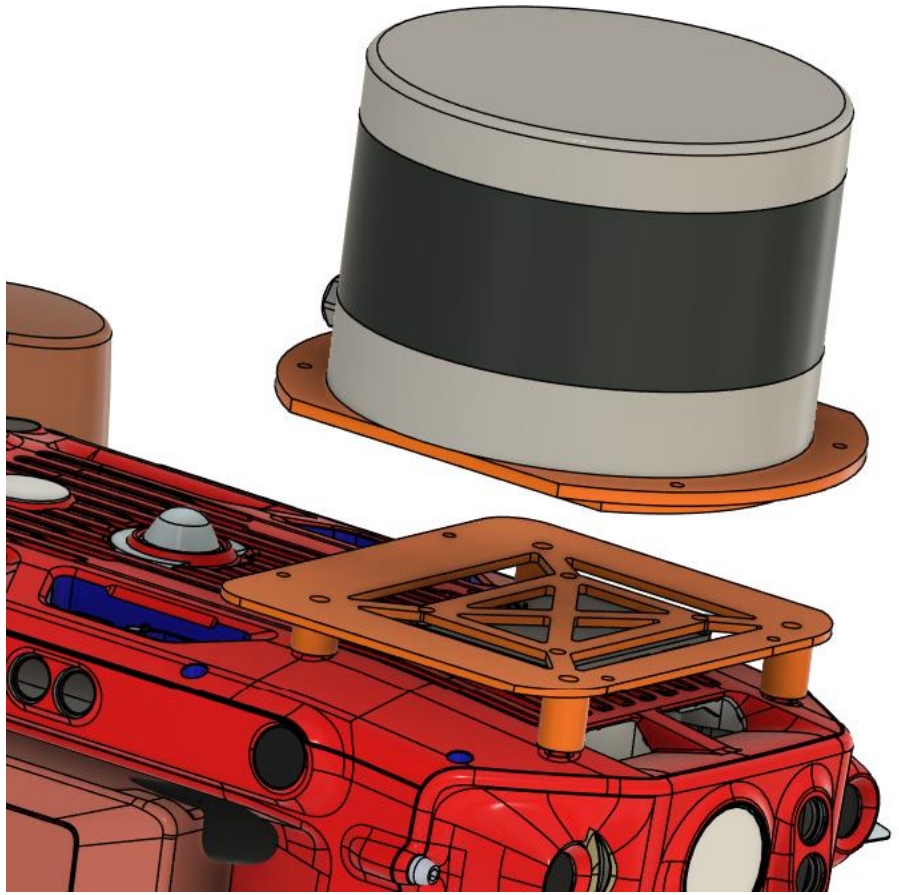
Support for devices – Matrice 350 RTK

- The E-Port develoment board will be in the top part of the drone below the gimbal.
- It will be secured with M3 screws in the designated screw points of the drone.



Support for devices – Matrice 350 RTK

- The next goal is to implement a gimbal for the VLP-16 to maintain stability independent of the drone.



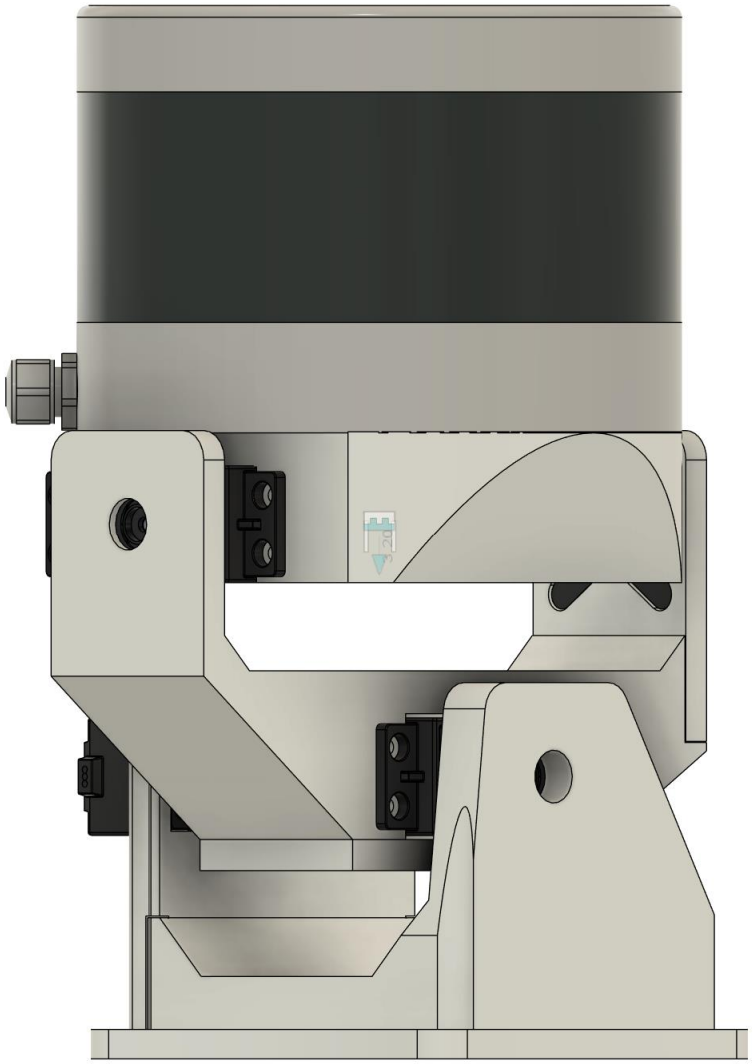
Gimbal for the VLP-16

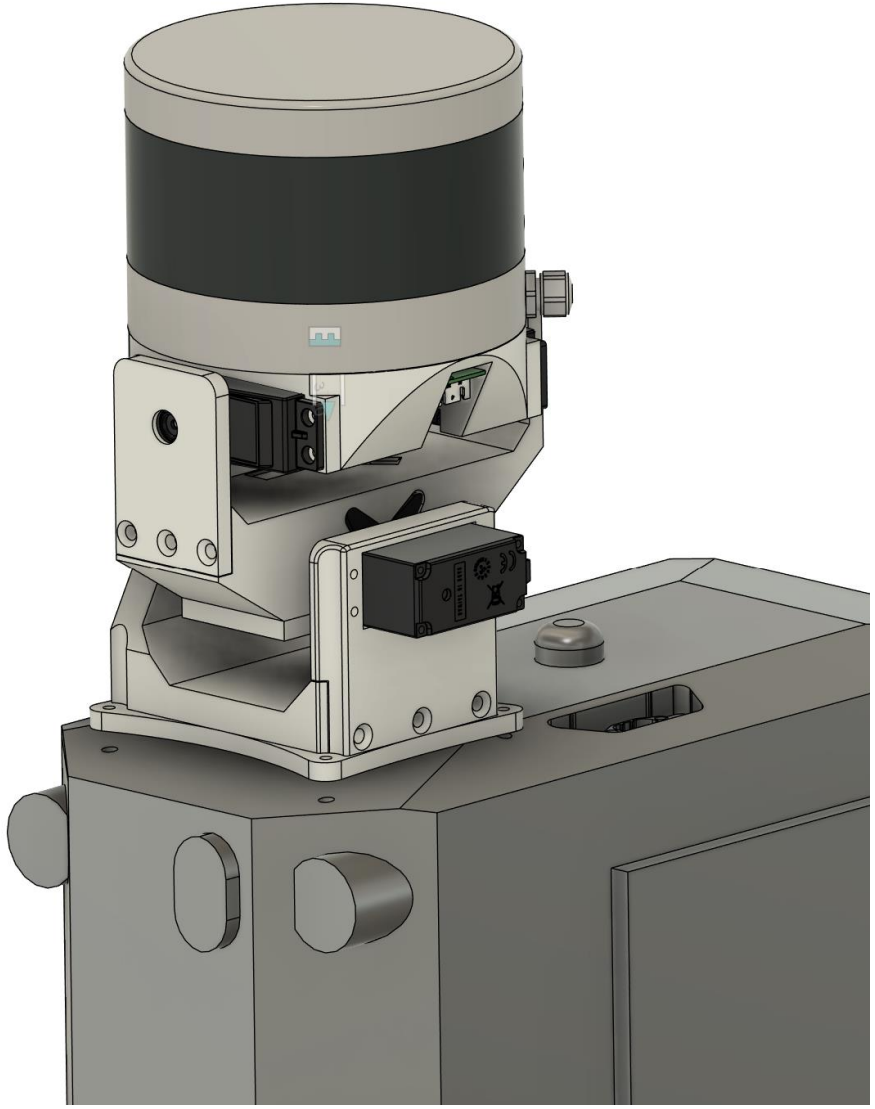
For the DJI Matrice 350 RTK

Gimbal for Matrice 350 RTK

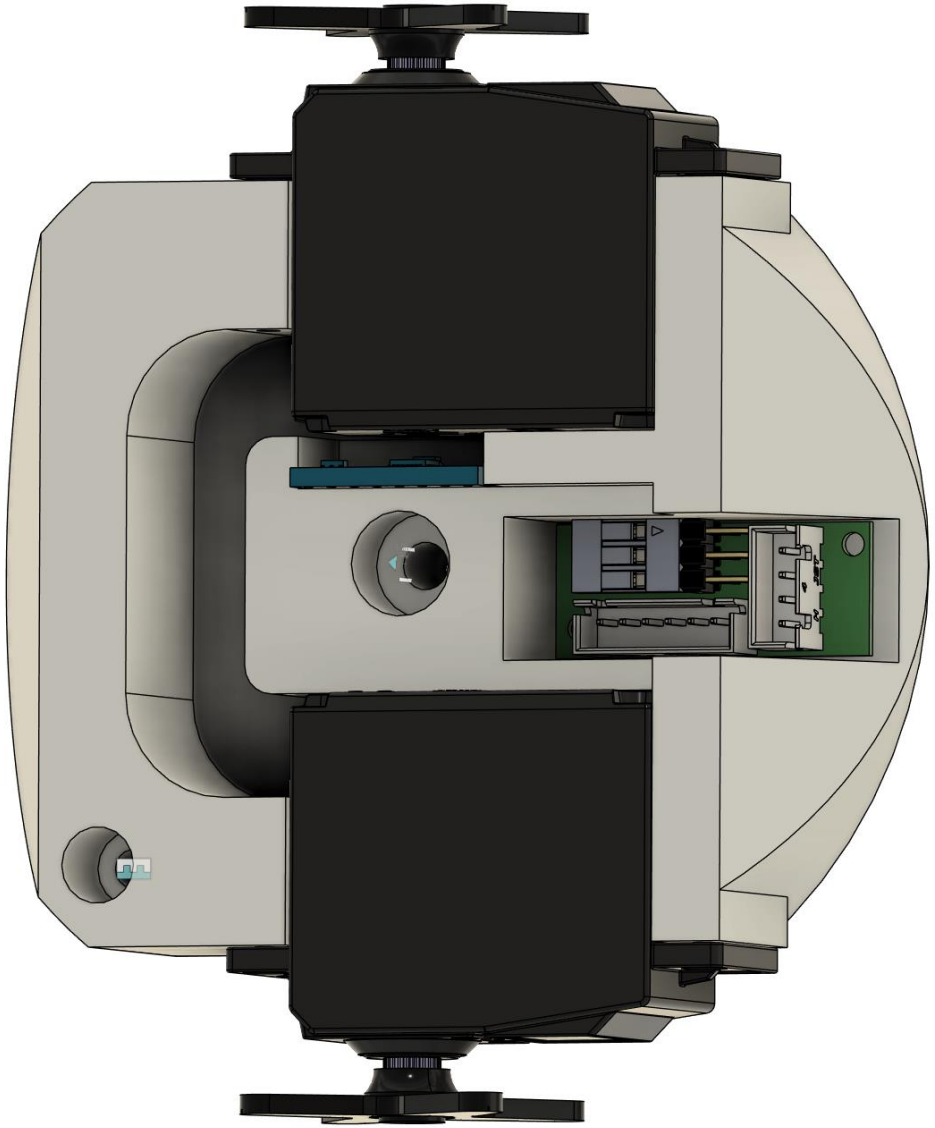
- Design and build a gimbal using servo motors to stabilize the Lidar VLP-16 sensor.
- Use as many internal parts and manufacturing methods as possible.
- Lightweight and reliable.
- Safety cable for the sensor.

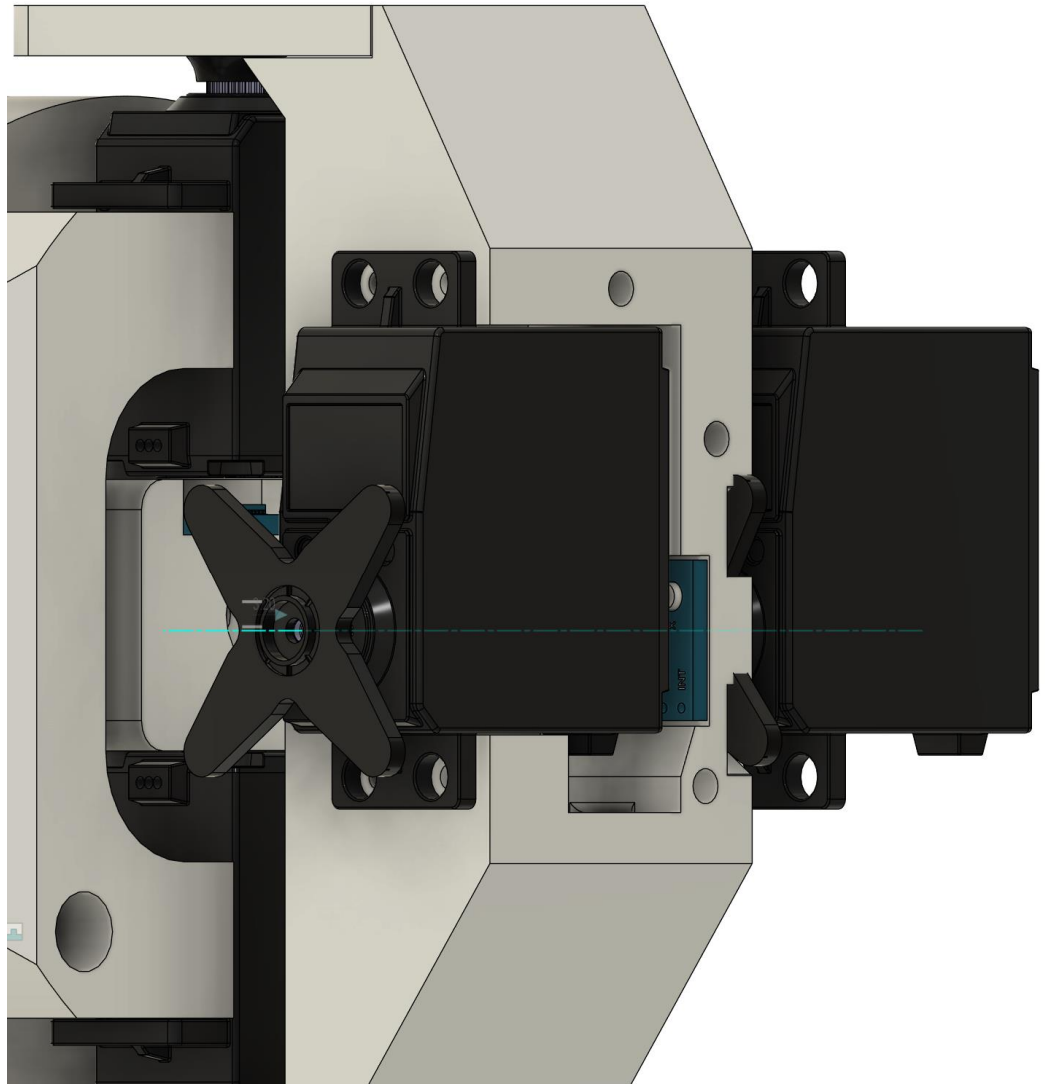
Gimbal for Matrice 350 RTK – 3D model





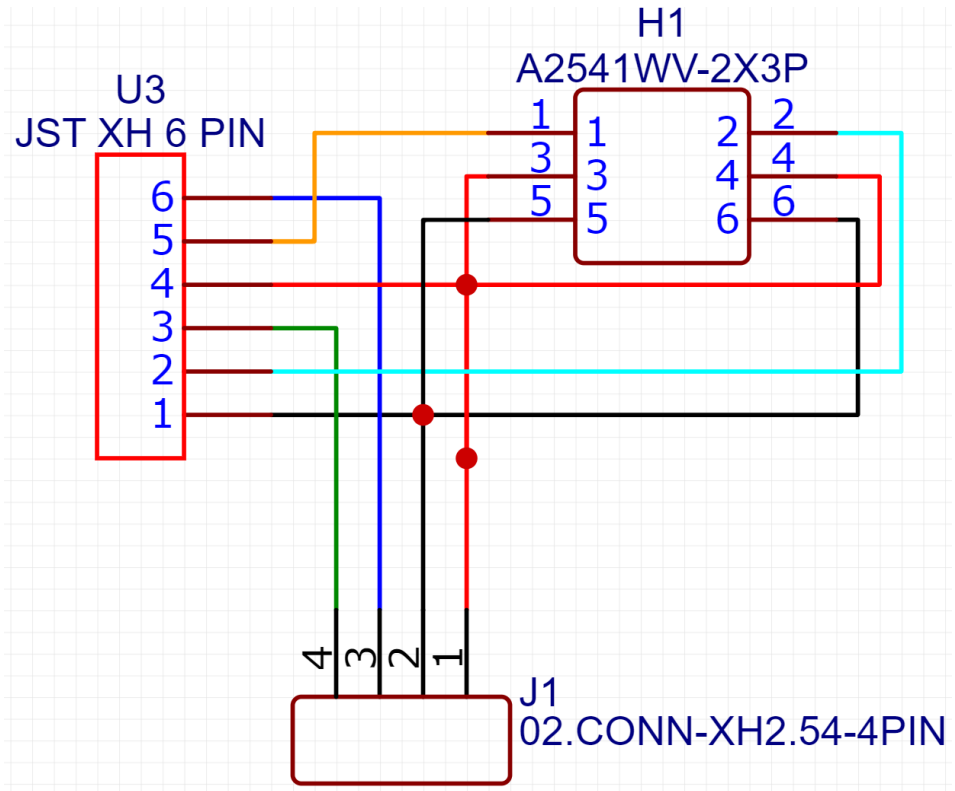
Gimbal for Matrice 350 RTK – 3D model

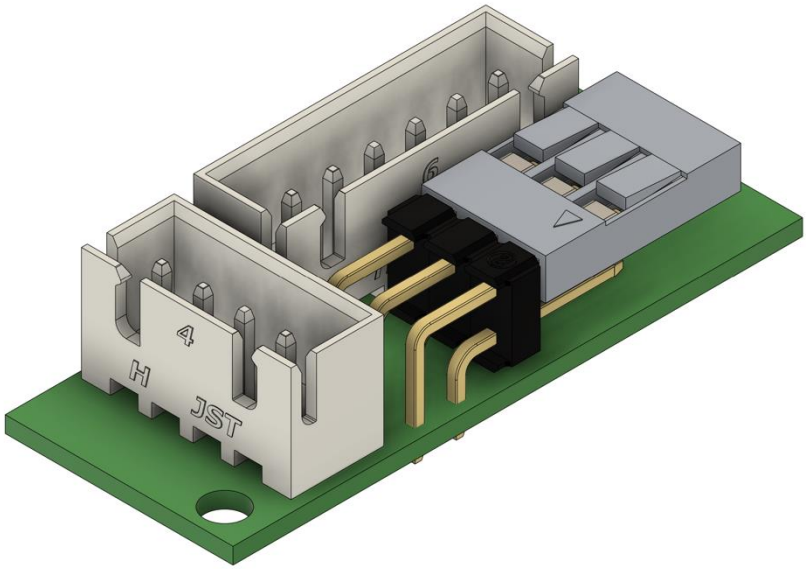


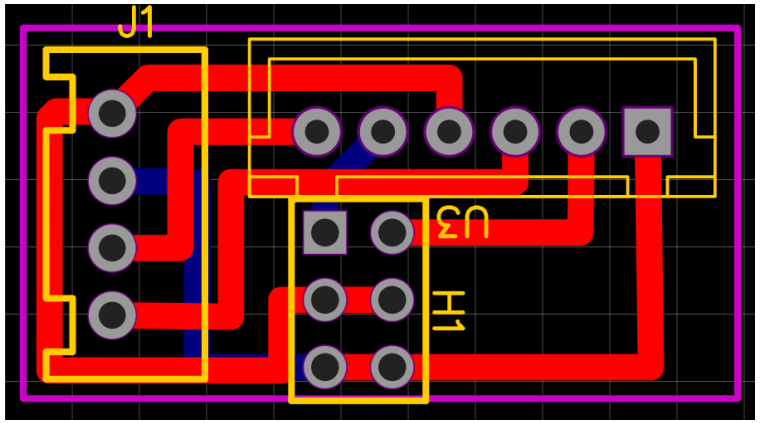


Gimbal for Matrice 350 RTK – Interconnection board

- Design and build a custom PCB to avoid using cables and connectors that may have poor connections or be lost due to vibration, and reduce the amount of cables.

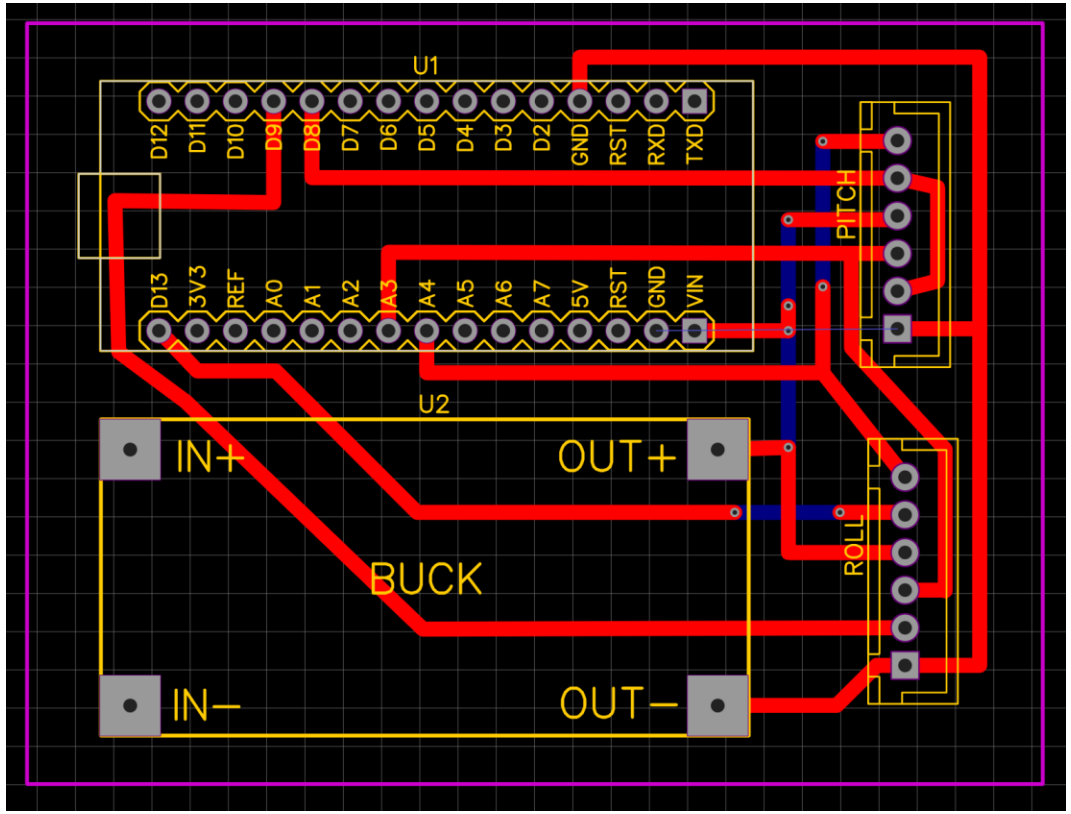


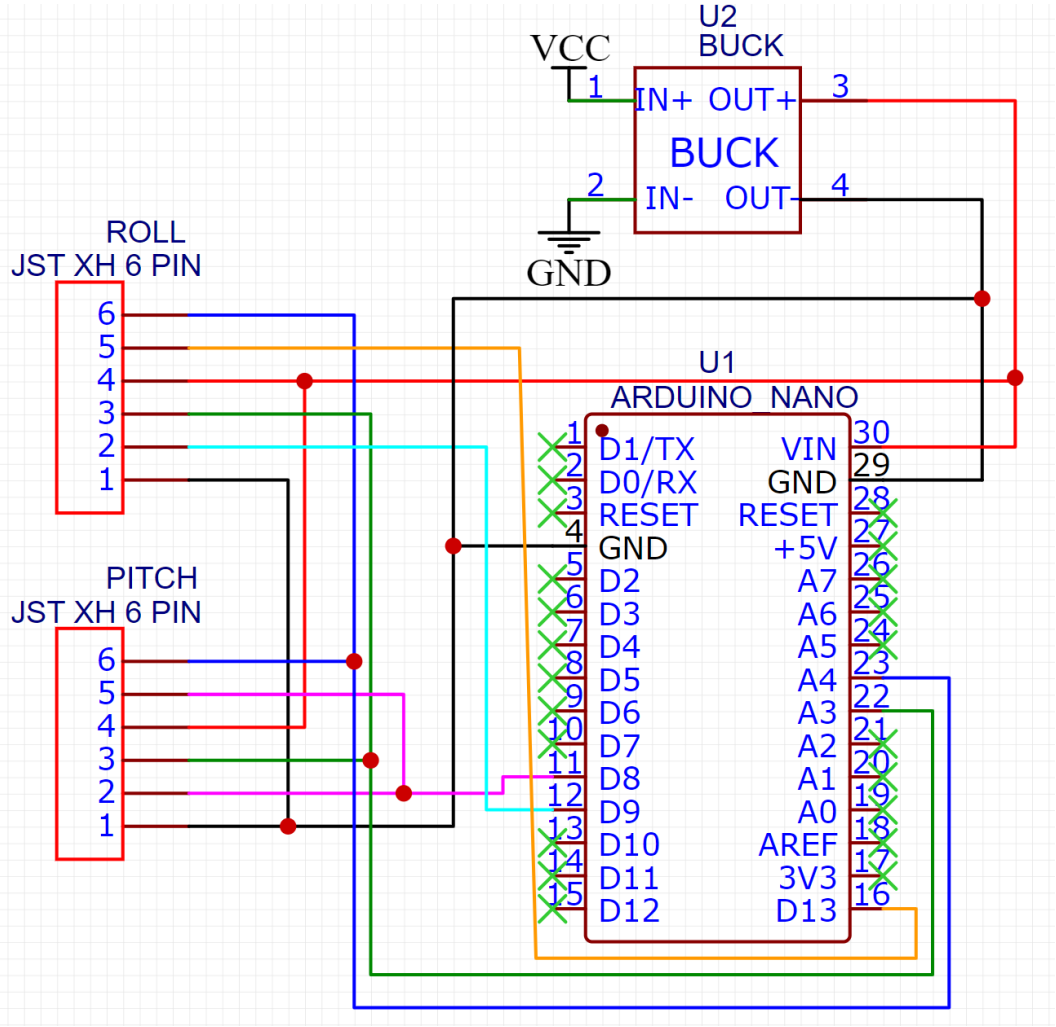




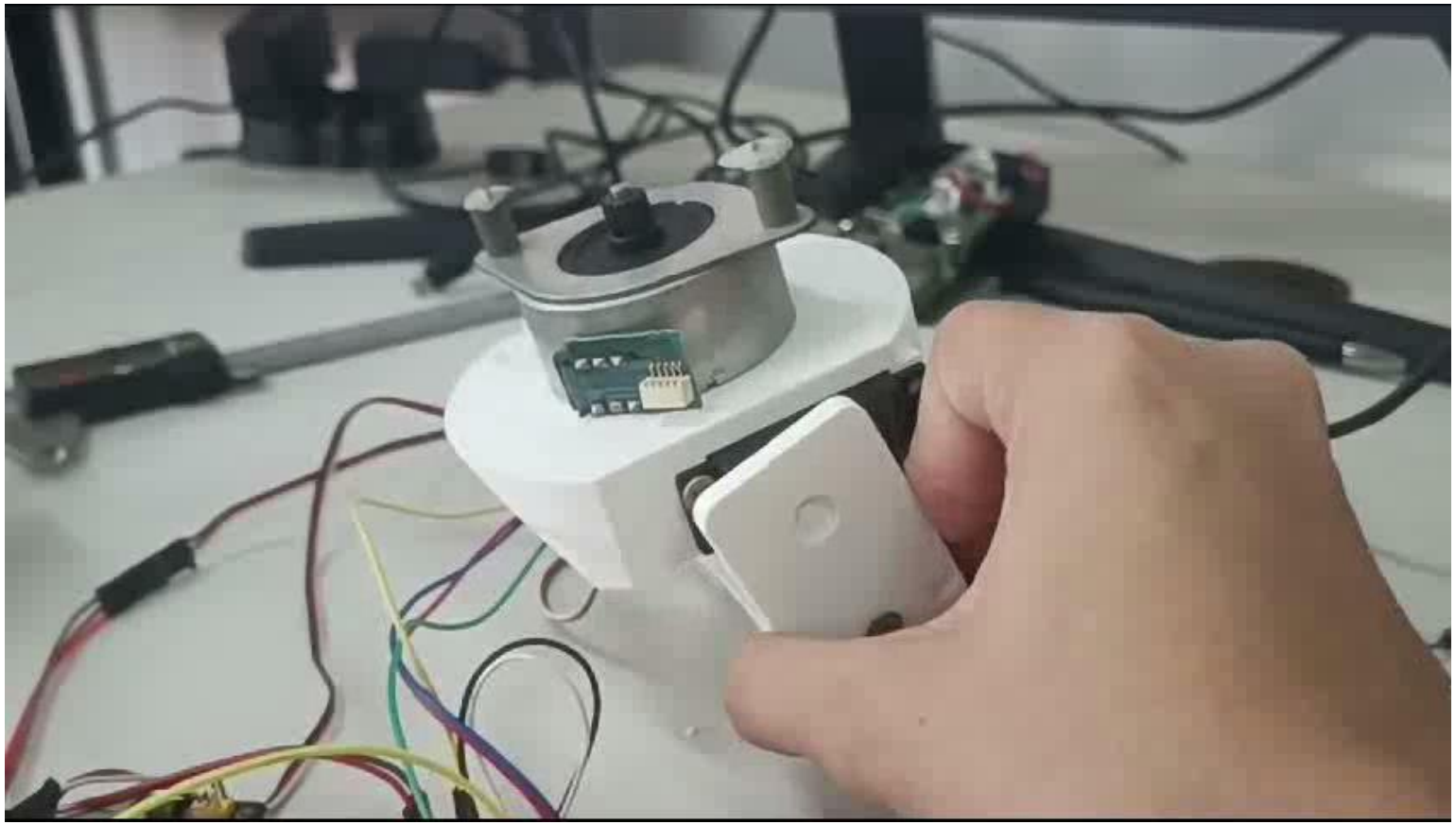
Gimbal for Matrice 350 RTK – Gimbal Motherboard

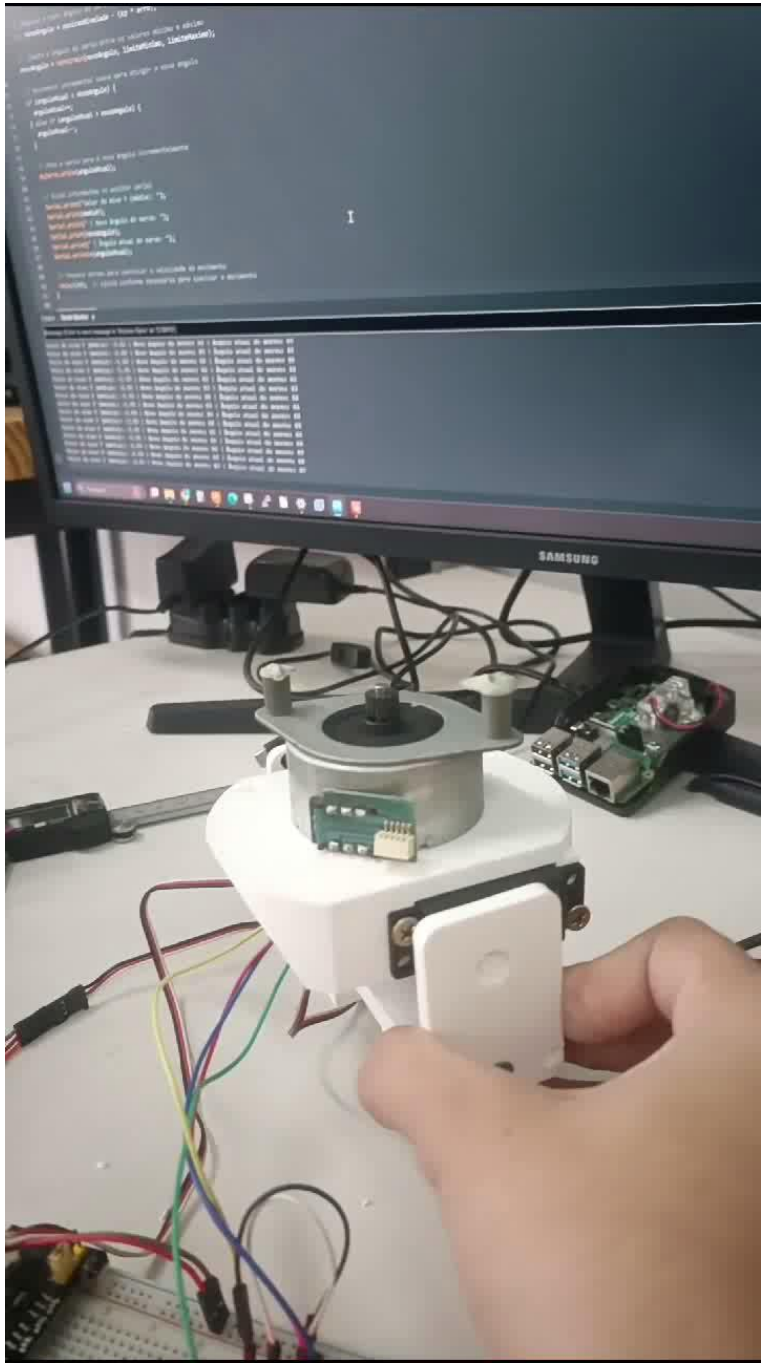
- The motherboard will have connectors for 2 interconnection boards that can control 4 servo motors and 2 MPU-6050 accelerometer and gyroscope modules.





Gimbal for Matrice 350 RTK – Prototype





Gimbal for Matrice 350 RTK – Future

- Refine and make a better design for 3D printing and with better materials for this specific application.
- Do more testing to better calibrate and adjust the gimbal and power consumption tests.
- If necessary, redesign with new motors and more accurate measurements and torque.

Final considerations

Next steps

- Wait for the drone and parts to arrive and do a test in a real environment.
- 3D print a mock-up of the VLP-16 with the original weight to calibrate and test in flight to avoid damaging the real sensor.
- Do the design, manufacture and install of the final parts in the interactive table.
- Design the housing for the extra cameras that will be used in the drone for the detect and avoid.

Questions/Comments?!

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