JETROS: A Guide to Building It

with Jetson Nano Orin

Francisca Donoso Bastías
Nelson Salvador Pinilla

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Contents

1 Development **2**
- 1.1 Parts of the Chassis . . . 2
- 1.2 Assembly of the Second Floor – Caster Ball Holder Side . . . 2
- 1.3 First Floor – Motors with Encoder and Motor Driver . . . 3
- 1.4 Return to the Second Floor – Power Bank Side . . . 4
- 1.5 Third Floor – LiDAR . . . 4
- 1.6 Jetson Orin Nano y UPS preparation . . . 5
- 1.7 Fourth Floor – Jetson Orin Nano with Camera . . . 6

2 Annex **8**
- 2.1 Preparation of the N20 motor+encoder wires . . . 8

1 Development

1.1 Parts of the Chassis

Figure 1 shows the main parts of the chassis. Among them, the 3D-printed floors stand out. Currently, four floors are considered: (1) the first floor, which will hold the motors with encoders and the motor driver; (2) the second floor, which has the caster wheel on one side and the power bank that powers the motors on the other; (3) the LiDAR floor; and (4) the floor where the Jetson Orin Nano, along with its UPS and the camera, will be placed. Additionally, M3 standoffs are used to connect the floors, and M2 screws are used to secure the caster wheel mount and the motor driver. On the other hand, M2.5 screws are used to mount the LiDAR.

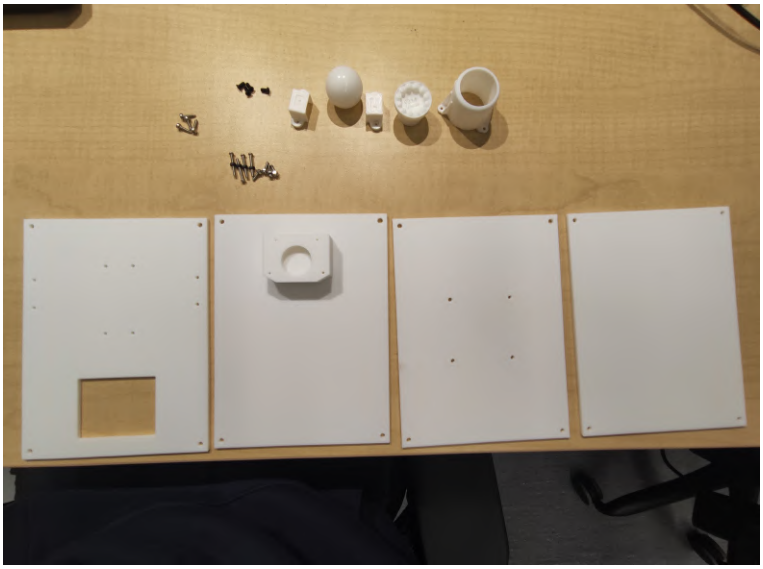


Figure 1: Main parts of the chassis.

1.2 Assembly of the Second Floor – Caster Ball Holder Side

In this step, the caster wheel is mounted on the second level. It's not particularly complex, just place the stopper behind the wheel, then place the holder on top of it. After that, screw everything in place.

(a) Second floor parts, caster ball holder side.

(b) Caster wheel mount (temporarily placed).

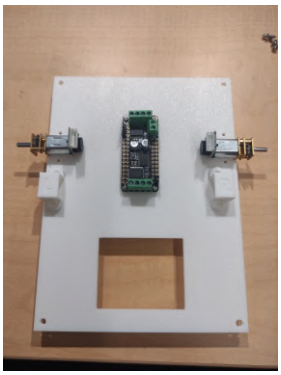
(c) Caster wheel mount (screwed in)

Figure 2: Assembly of the caster ball mount.

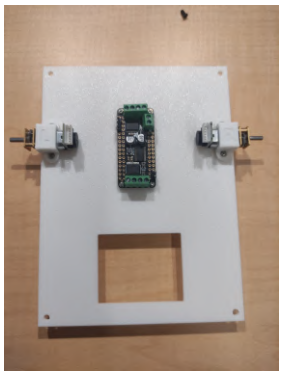
1.3 First Floor – Motors with Encoder and Motor Driver

Here we begin building the first level. It's important that, regardless of the orientation of the motor driver, the pins to be used are identified beforehand. As a personal recommendation, the M1 and M2 connectors should face the back of the robot, this way, they won't stick out at the front (where they could be seen by the camera).

(a) Motor Driver Temporarily Placed on the First Floor.

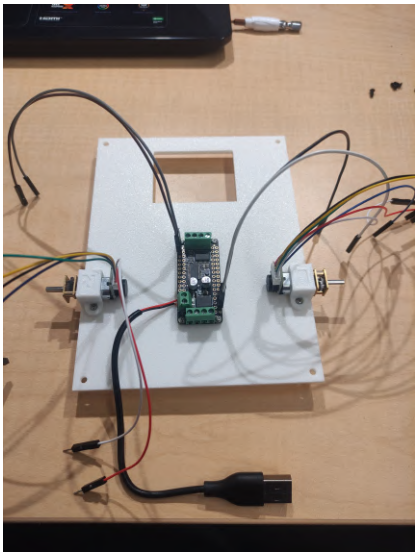


(b) Position of the Motors with Encoder.

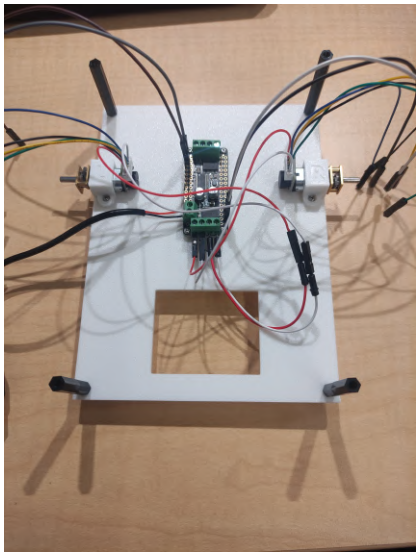


(c) Motor Brackets Screwed In.

Figure 3: Assembly of the first floor.



(a) Cable Connections: I2C on the Motor Driver and Wires from the Motor with Encoder

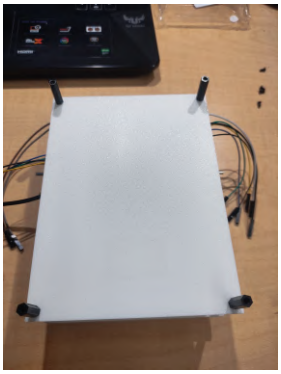


(b) Connection of the Motors to the Motor Driver

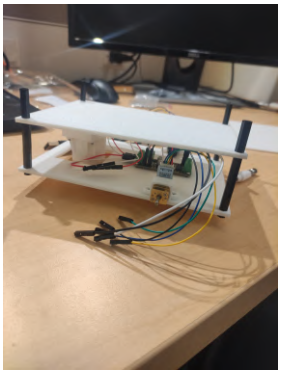
Figure 4: Jumper wiring of the first floor.

1.4 Return to the Second Floor – Power Bank Side

The standoffs are placed on the first level, originally, one 1.5 cm and one 1 cm standoff are used, taking into account the height of the connectors and wiring. On the second level, the power bank is attached using double-sided tape. It's important that the USB connector of the power bank is positioned at the back of the robot.



(a) Assembly of the second floor



(b) Side View Between the First and Second Floor

(c) Battery Position with Double-Sided Tape

Figure 5: Second Floor Assembly – Power Bank Side.

1.5 Third Floor – LiDAR

For the LiDAR mounting, the bottom threads on the device are used. The M2.5 screws are inserted from below, securing it firmly. After that, it is connected to the second level using the standoffs. It's important to mention that the cable must face

backward. This is critical for proper operation, as the program relies on a specific angle in the LiDAR's orientation.

(a) Third Floor and LiDAR

(b) LiDAR Screwed In

(c) Third Floor Mounted

Figure 6: Assembly of the Third Floor.

1.6 Jetson Orin Nano y UPS preparation

Before connecting the 21700 Li batteries, it is important to ensure that the UPS switch is set to OFF. After connecting the batteries, the standoffs are installed and the protective cover is placed. On the other side, the Jetson Orin Nano is mounted. Care must be taken when connecting the pogo pins, as they could be misaligned or make poor contact. Once this is verified, it is screwed in place.

For convenience, to prevent them from hanging loose, the WiFi/Bluetooth antennas are secured to a part of the UPS. Afterwards, double-sided tape is applied to the protective cover, and it is attached to the fourth level of JETROS.

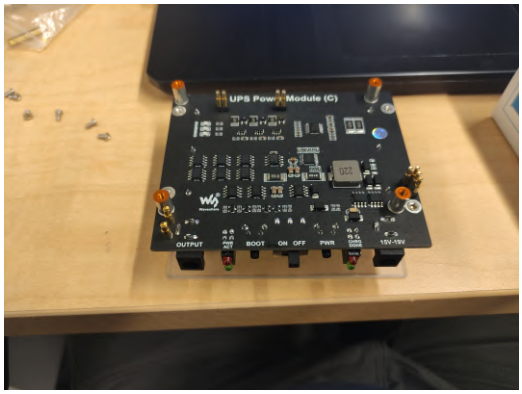
(a) Waveshare UPS for Jetson Orin Nano

(b) Position of the Batteries According to Their Power Polarity

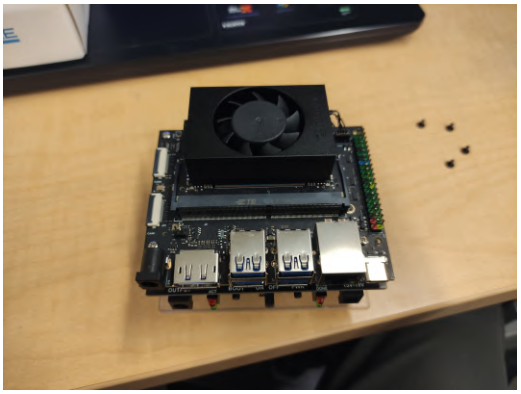
(c) Standoffs Installed for Screen Protection

Figure 7: Battery Installation on the Waveshare UPS.

(a) Placement of the Protective Screen



(b) Top Part of the Waveshare UPS



(c) Assembly of the Jetson Orin Nano on the UPS

(d) Adjustment of the WiFi/Bluetooth Antenna Placement

Figure 8: Placement of the Jetson Orin Nano on the UPS

(a) Visual of the Jetson Orin Nano on the UPS

(b) Battery Charging

(c) Placement of Double-Sided Tape on the Screen Protection

Figure 9: Charging and Preparation of the UPS for Placement on the Fourth Floor.

1.7 Fourth Floor – Jetson Orin Nano with Camera

Unfortunately, we didn't account for a screw to mount the camera, but it works to use double-sided tape or regular tape to secure it in place at the front. The camera

should be positioned at an inclined angle, but this can be adjusted later during the training of the neural network.

(a) Placement of the Fourth Floor

(b) Placement of the Jetson Orin Nano and the Camera

(c) Diagonal View of JETROS so far.

Figure 10: Completion of JETROS.

After positioning the camera, only the connection of the sensors and actuators to the Jetson Orin Nano remains. For detailed information, you can refer to the connection table available on GitHub.

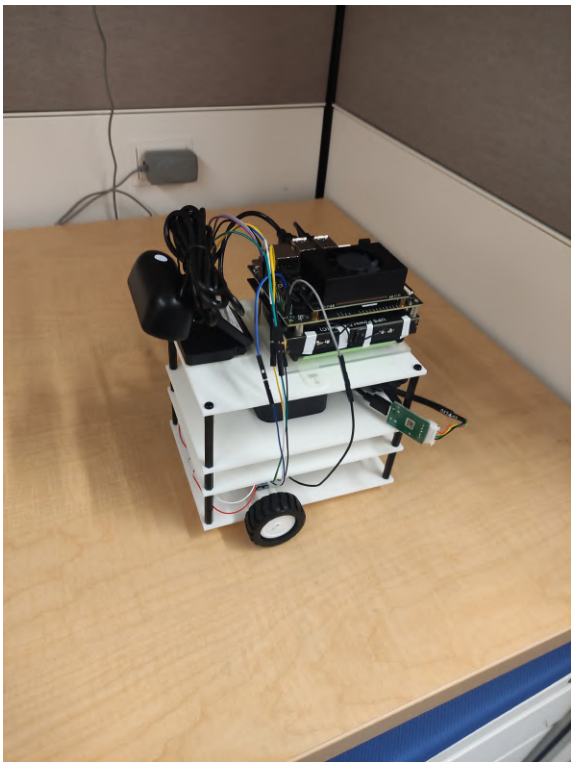


Figure 11: Final Result.

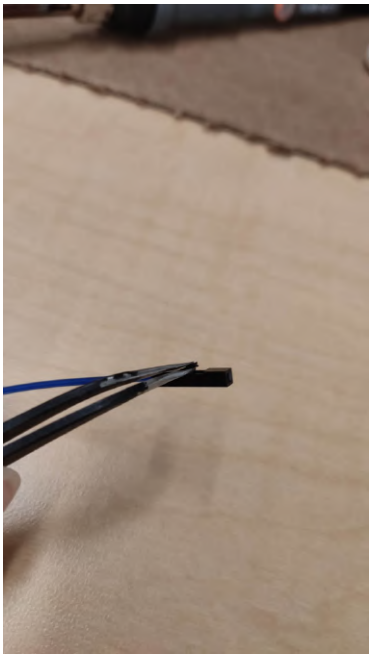
2 Annex

2.1 Preparation of the N20 motor+encoder wires

The motor encoder cables had to be adjusted since they came stripped but without any specific connectors. To interface with the pin header of the Jetson Orin Nano, female and male connectors from jumper wires are reused. This involves removing them from the original jumpers and soldering them onto the motor encoder cables.

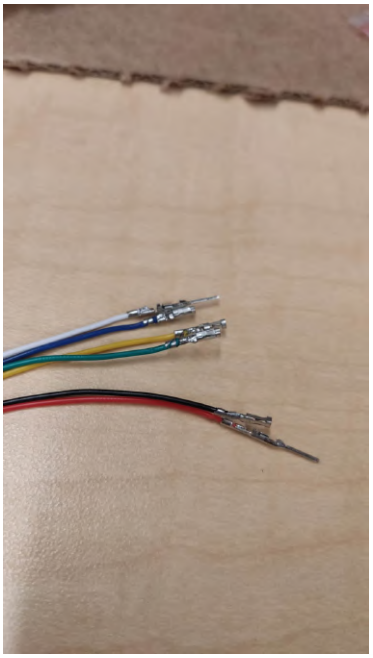
(a) N20 motor wires with encoder

(b) Identify the plastic housing of the jumpers

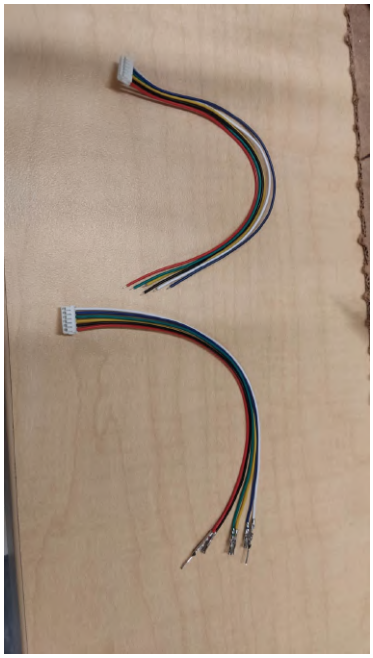


(c) Remove the plastic housing by lifting the latch.

(a) Remove the metal connector from the wire.



(b) Solder the metal connector onto the wires of the N20 motor.



(c) Comparison of the wires with and without the metal connector.