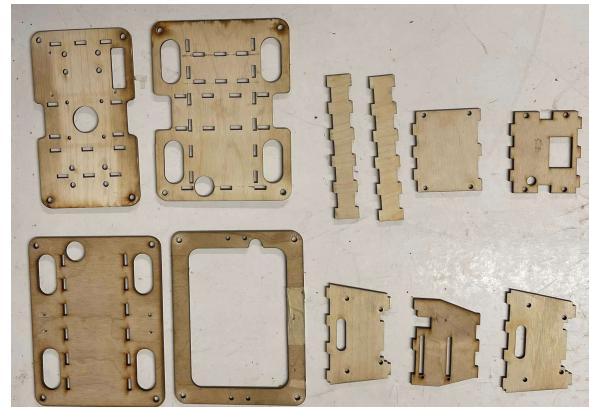


Build your robot !

Inventory

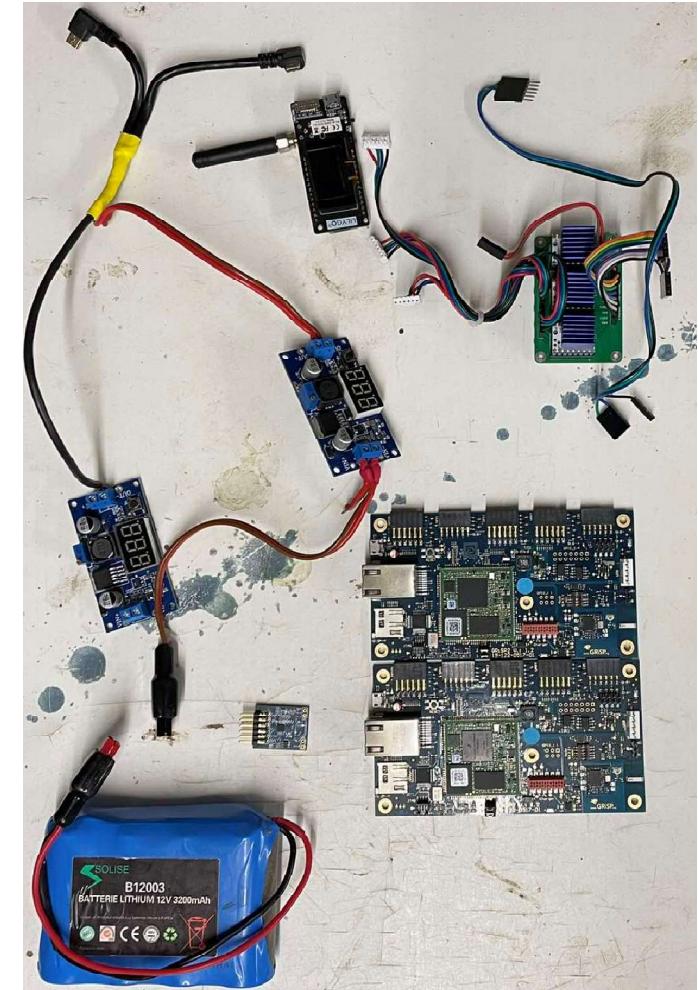
Components - Mechanical

- 11 laser cut wooden pieces
 - 13 3D printed PLA pieces
 - 3 stepper motors (nema 17 39)
 - 2 wheels + tyres
 - 2 stepper motor attachments
- }
- https://github.com/7dric/Opensource_self_balancing_robot/tree/main/prototype_files
- <https://www.amazon.com.be/STEPPERONLINE-bipolaire-connecteur-imprimante-fraiseuse/dp/B0B38GHRH8>
- <https://eu.robotshop.com/fr/products/roue-70mm-en-aluminium-alesage-5mm>
- <https://www.amazon.com.be/QWORK-pi%C3%A8ces-Support-Moteur-montage/dp/B09QLYLXFZ>



Components - Electrical

- 2 buck converters <https://www.amazon.com.be/AZ-Delivery-Convertisseur-Abaisseur-Affichage-num%C3%A9rique/dp/B08T1ZR6XG>
- LilyGo <https://www.tinytronics.nl/nl/development-boards/microcontroller-boards/met-lora/lilygo-ttgo-t3-lora32-433mhz-v1.6.1-esp32>
- custom PCB + 3 stepper drivers
https://github.com/7dric/Op_ensurece_self_balancing_ro_bot/tree/main/electronics <https://www.amazon.fr/QWORK-imprimante-tournevis-dissipateur-dimprimante/dp/B0BKPQ5V3B/>
- 1 or 2 GRiSPs <https://grisp.myshopify.com/>
- Pmod NAV (no longer produced)
- 12V battery <https://www.masolise.com/fr/12v-lifepo4/35-b12003l.html>
- Custom cables and their connectors
<https://www.amazon.com.be/CERRXIAN-C%C3%A2ble-micro-angle-gauche/dp/B071KWZBL3>



Component List

	name	link	cost	quantity	total (VAT incl.)
<input type="checkbox"/>	3D print parts	https://github.com/7dric/	5,00 €	1	5,00 €
<input type="checkbox"/>	Laser cut parts	https://github.com/7dric/	15,00 €	1	15,00 €
<input type="checkbox"/>	GRISP	https://grisp.myshopify.co	213,01 €	1	213,01 €
<input type="checkbox"/>	Custom pcb	https://jlpcb.com/	4,00 €	1	4,00 €
<input type="checkbox"/>	Electrical connectors		3,00 €	1	3,00 €
<input type="checkbox"/>	Stepper motor	https://www.amazon.com	8,00 €	3	24,00 €
<input type="checkbox"/>	Stepper drivers	https://www.amazon.fr/Q	4,20 €	3	12,60 €
<input type="checkbox"/>	Wheels	https://eu.robotshop.com	7,40 €	2	14,80 €
<input type="checkbox"/>	Lilygo LoRa32	https://www.tinytronics.nl	18,75 €	1	18,75 €
<input type="checkbox"/>	Battery	https://www.masolise.com	65,00 €	1	65,00 €
<input type="checkbox"/>	Buck converters	https://www.amazon.com	6,00 €	2	12,00 €
<input type="checkbox"/>	Pmod NAV	https://digilent.com/refer	30,00 €	1	30,00 €
<input type="checkbox"/>	Stepper attachment	https://www.amazon.com	3,00 €	2	6,00 €
<input type="checkbox"/>	screw,nuts and inserts		3,00 €	1	3,00 €
<input type="checkbox"/>	Cables micro usb	https://www.amazon.com	6,00 €	2	12,00 €
<input type="checkbox"/>					0,00 €
<input type="checkbox"/>					0,00 €
<input type="checkbox"/>					0,00 €
					438,16 €

Components - Screws

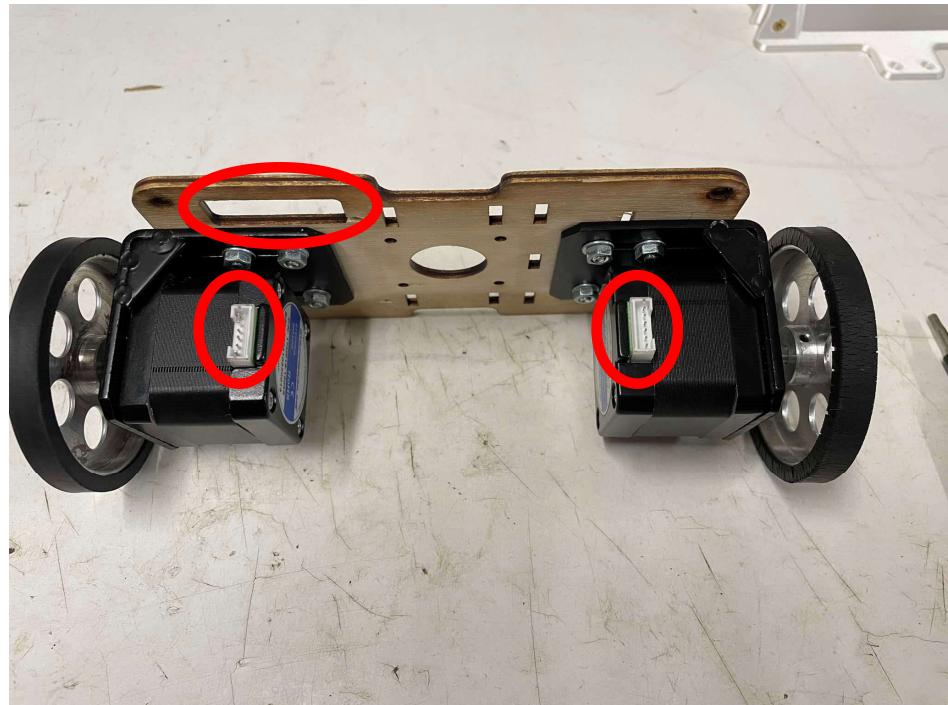
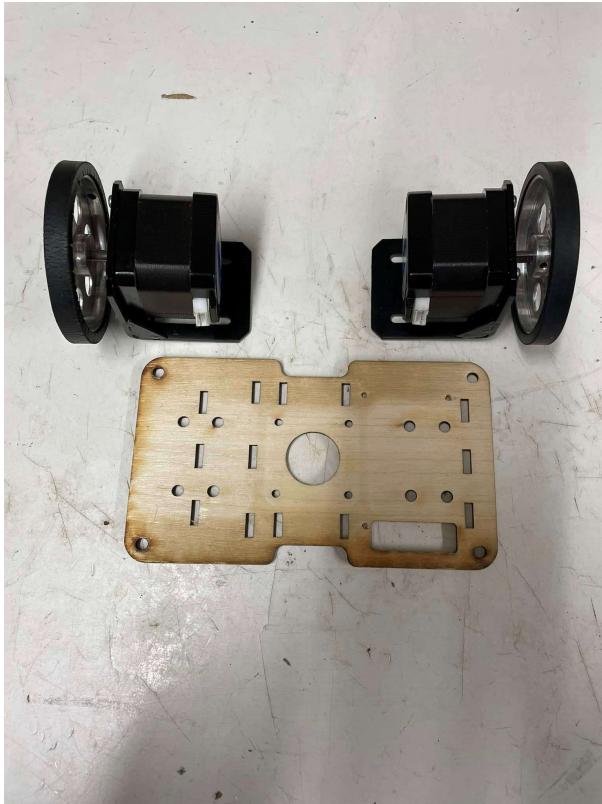


- Wheel motors • 8 M4x10 + nut + washer
- Lifting motor • 4 M3x10
- Buck converters • 4+2 M3x10 + 2 nuts
- LilyGo • 2 M2x10 + nut
- Structure • 3 M4x10
- Structure • 4 M4x150 threaded rod + 3 nuts + toothed washer
- GRiSPs • 8 M3x6
- Lifting • 4 M3x35 + nut
- GRiSP holder • 4 M3x8 +nut
- Pressure screw • 1 M3x6
- Structure • 6 M4 inserts
- GRiSPs and pressure screw • 9 M3 inserts

Note: not entirely representative, might need to add some nuts here and there

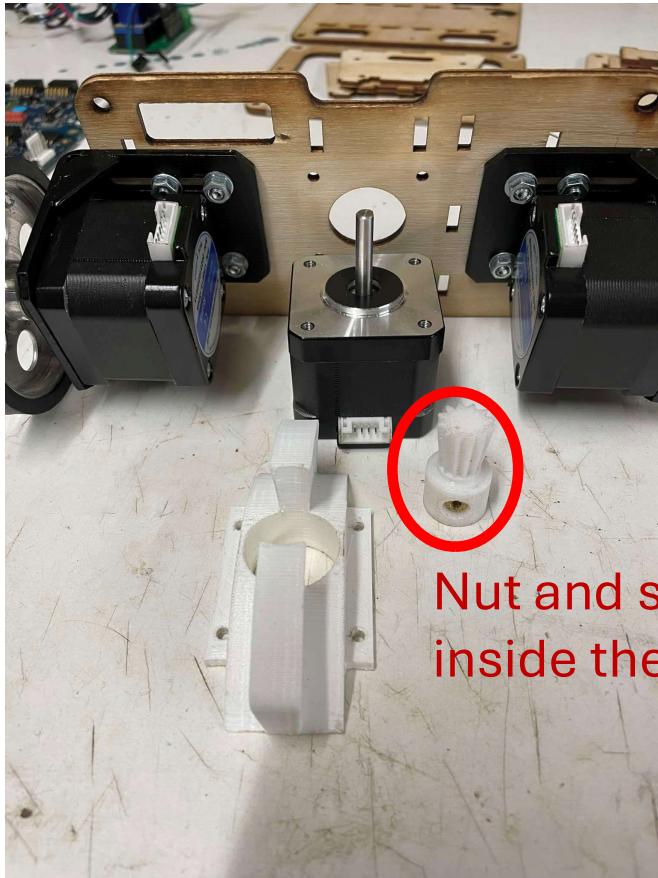
Building steps

Step 1 – Attach wheels

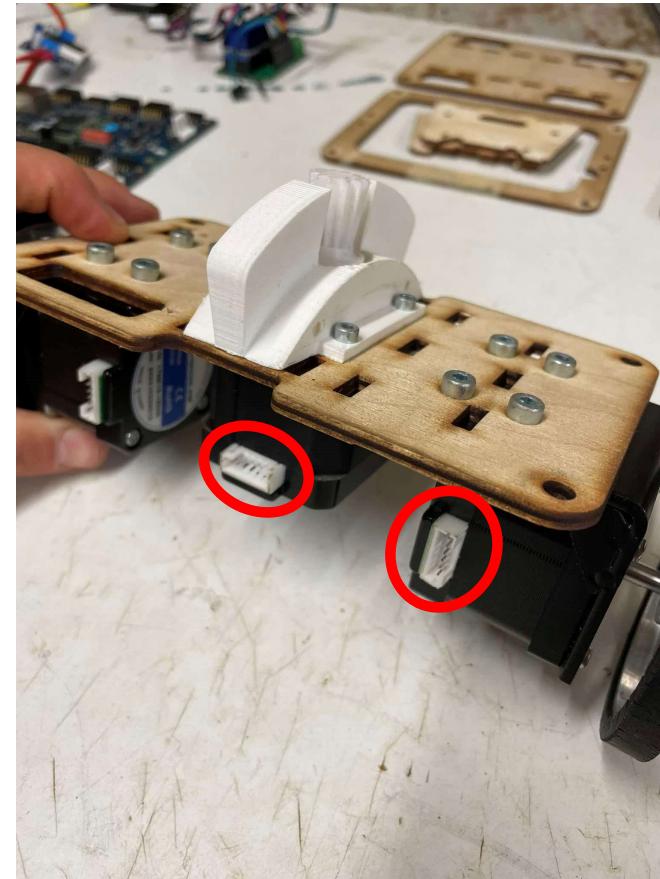


Note: watch out for orientation

Step 2 – Attach lifting mechanism

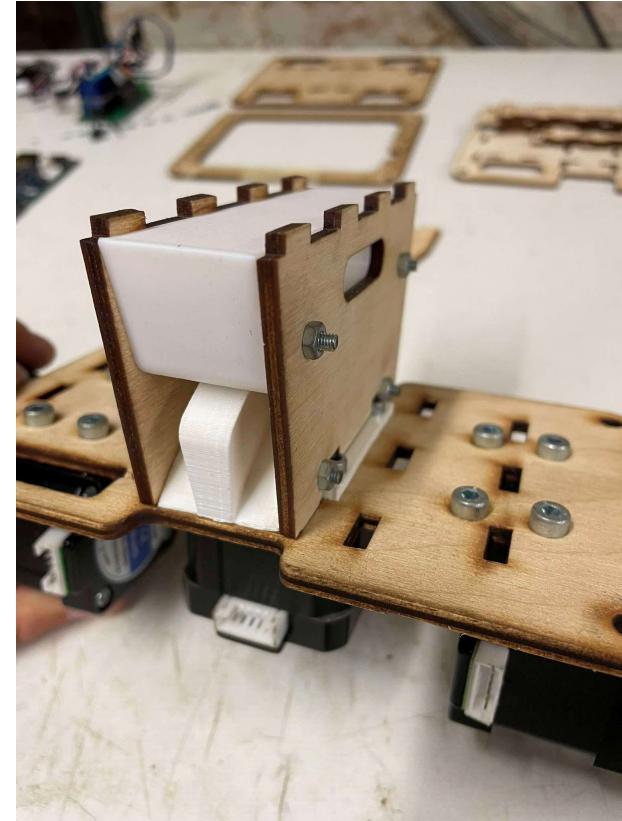


Nut and screw
inside the gear

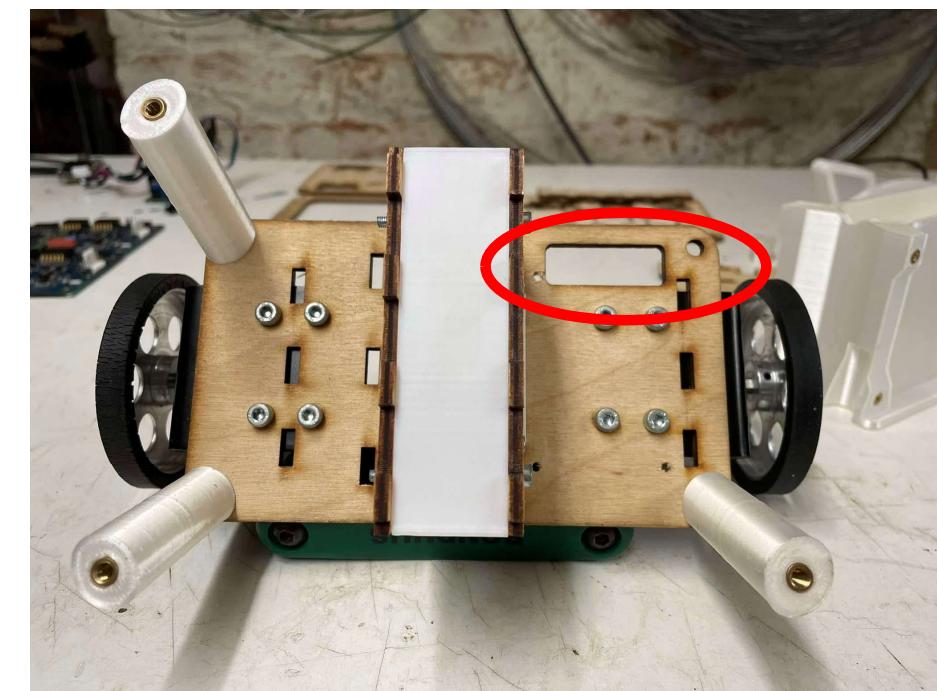
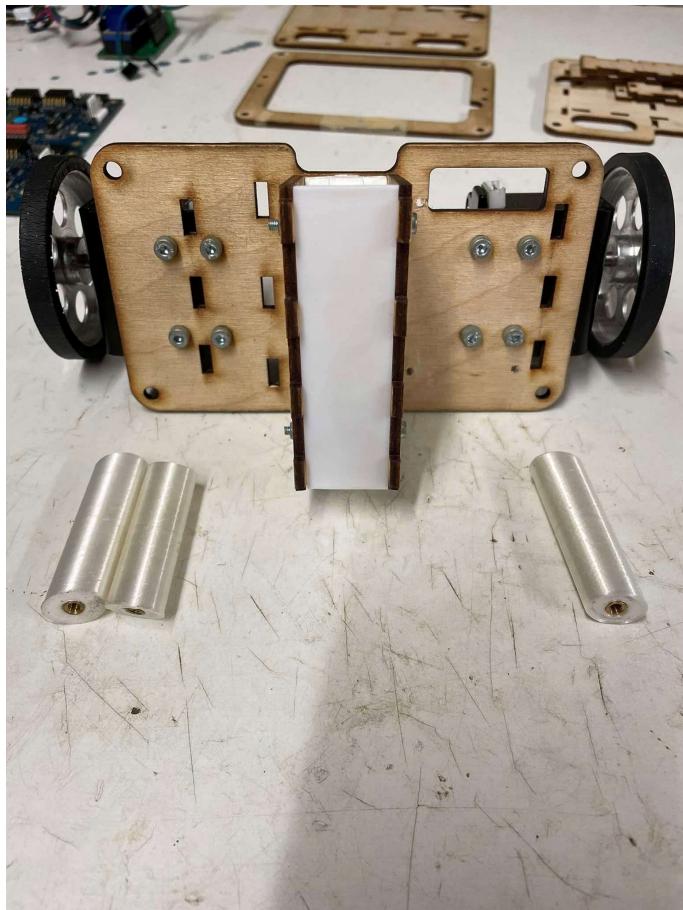


Note: watch out for orientation

Step 3 – Lefting mechanism continued

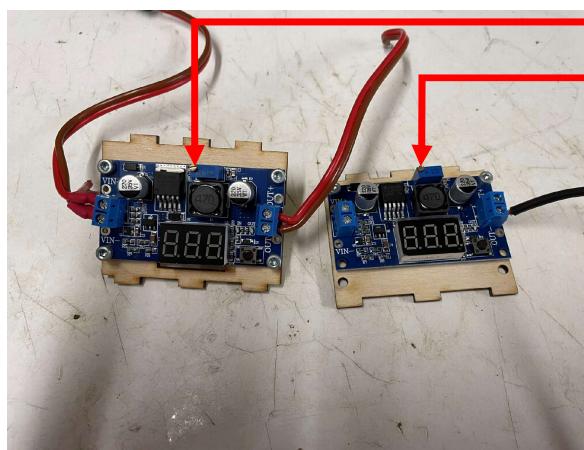
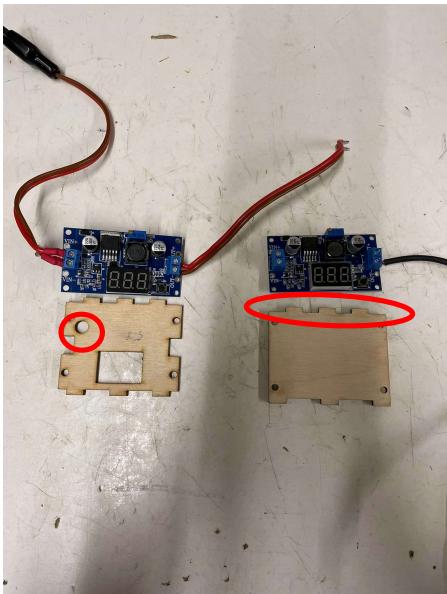


Step 4 – Spacers

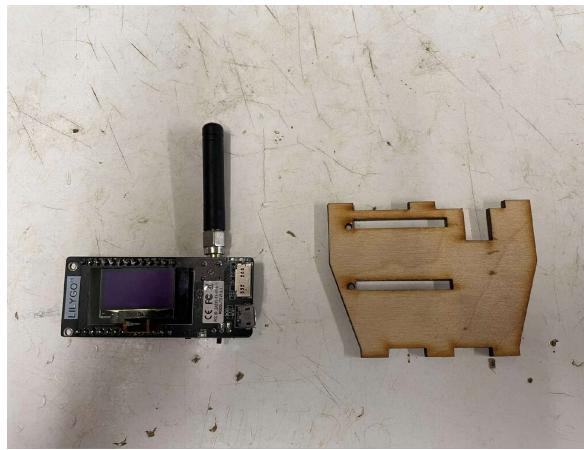


Note: watch out for orientation

Step 5 – Circuit board supports

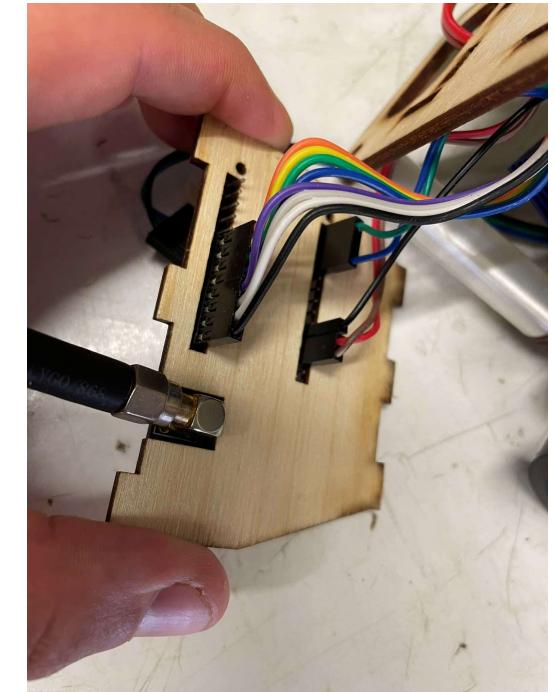
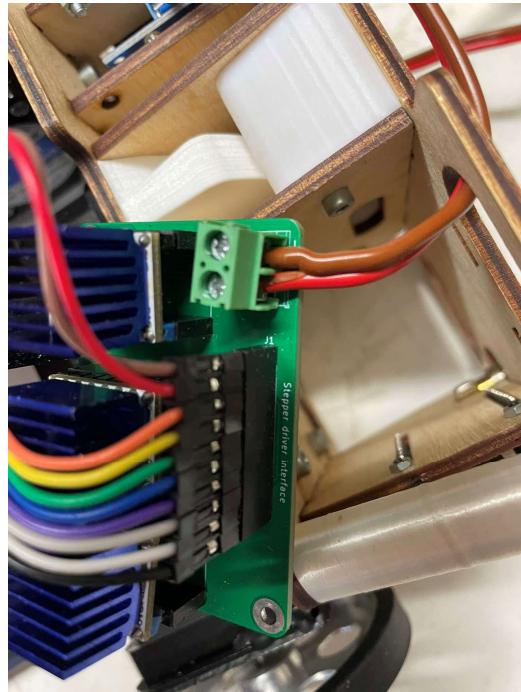
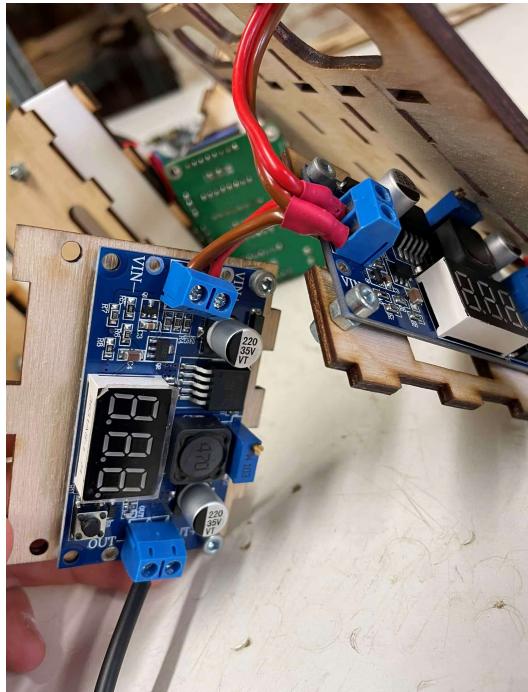


Set to 10V
Set to 5V

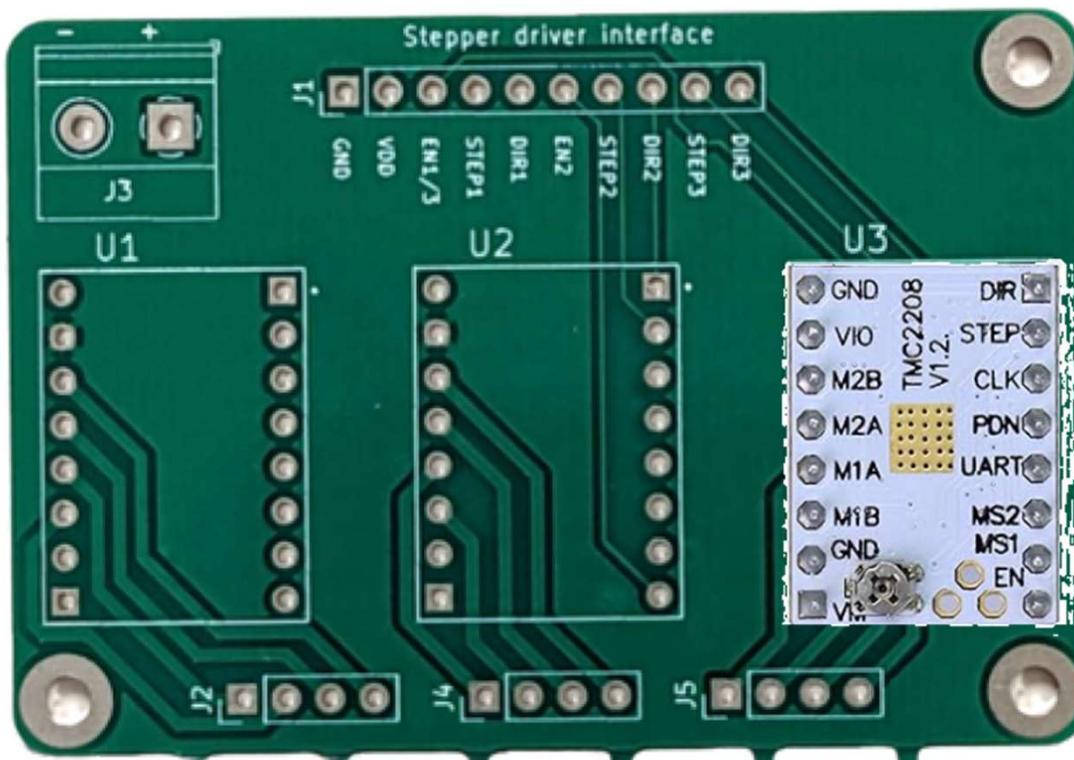


Note: watch out for orientation

Step 6 – Cable connections



Step 6 – Cable connections



Each TMC2208 should be mounted as shown, do not forget to put the heat sinks because it can get really hot.

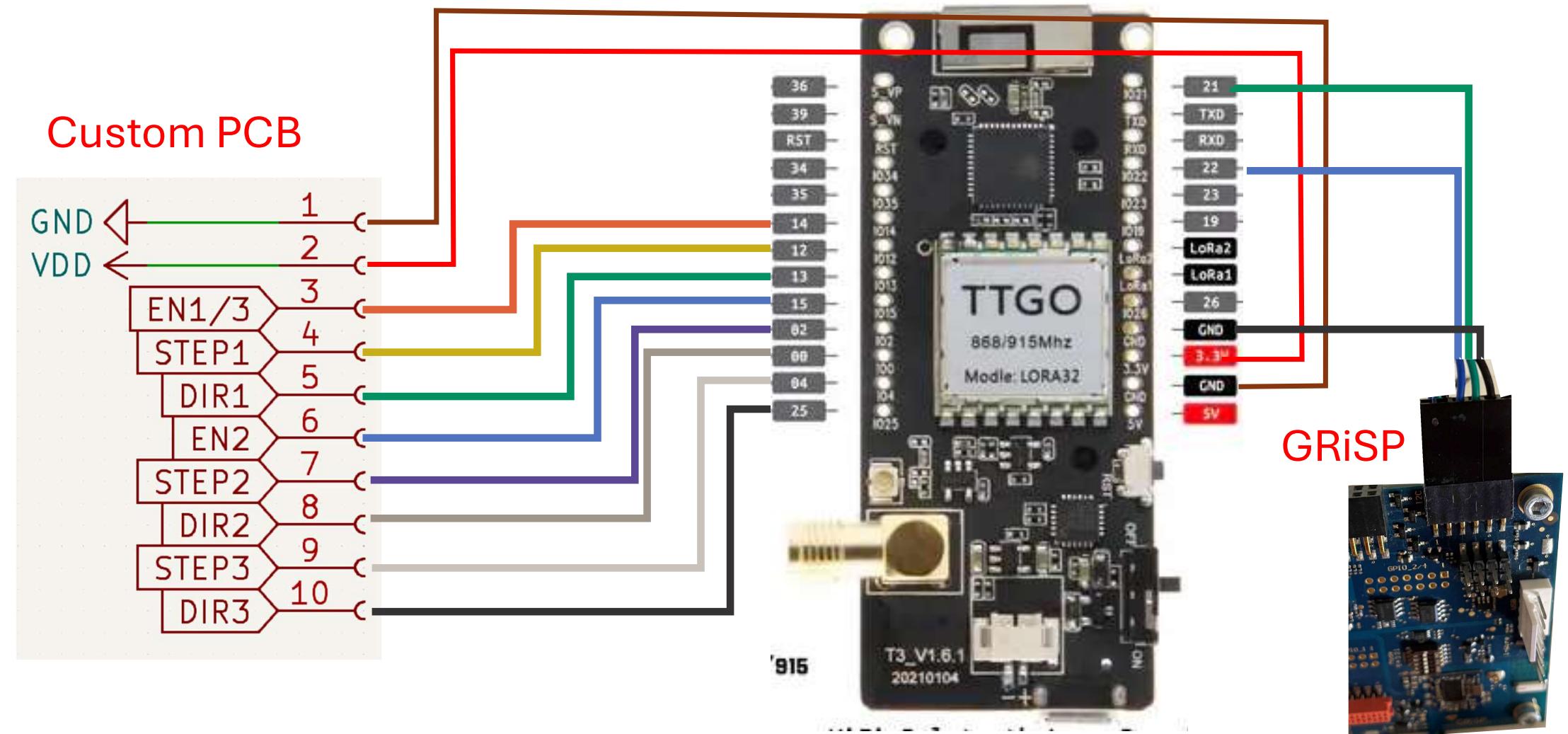
Turning the TMC2208 screw counter clockwise increases current and so motor torque but, it could overheat a lot, be careful !

On the back of the custom PCB, each MS1 copper pads should be connected with solder, same for each MS2

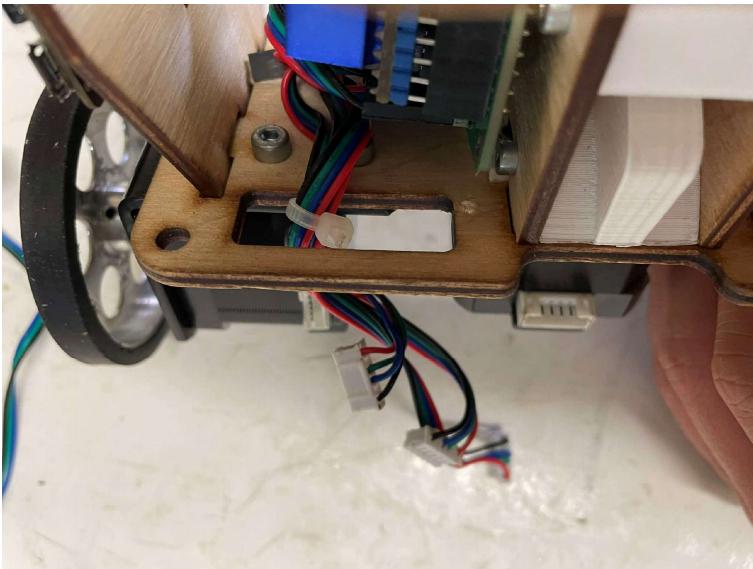
if not done the motor won't turn at the right speed

Step 6 – Cable connections

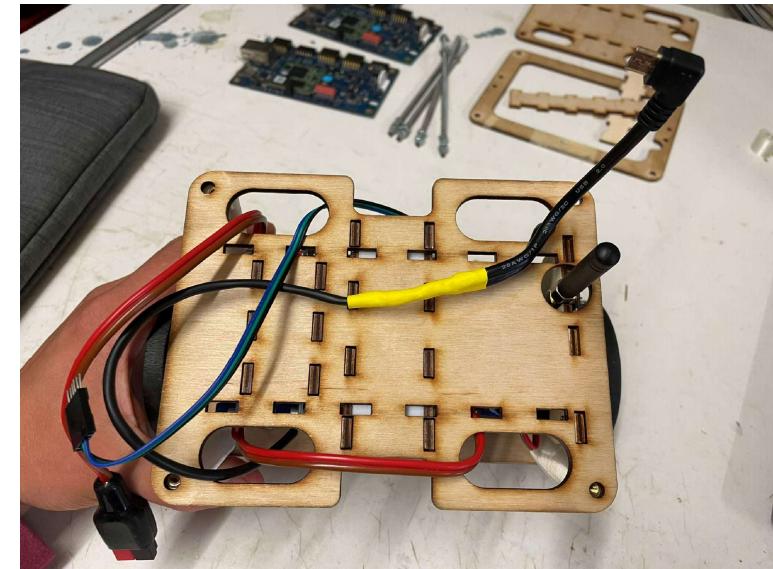
Lilygo



Step 7 – Cable passage + first floor

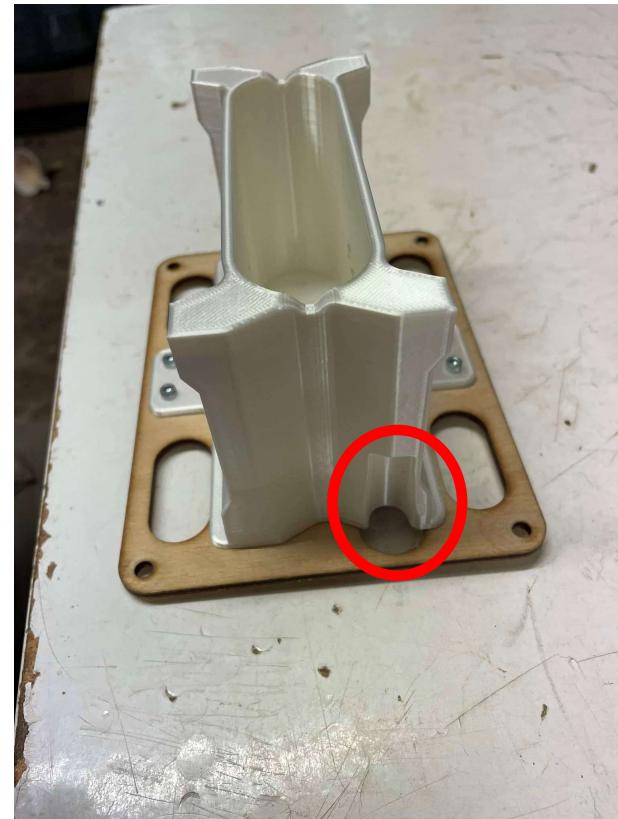


Note: adding the second floor is very tricky, but possible !

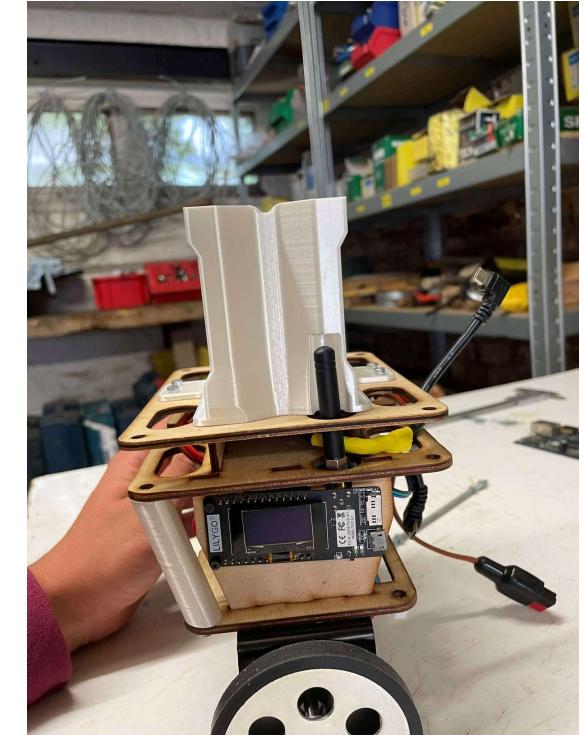
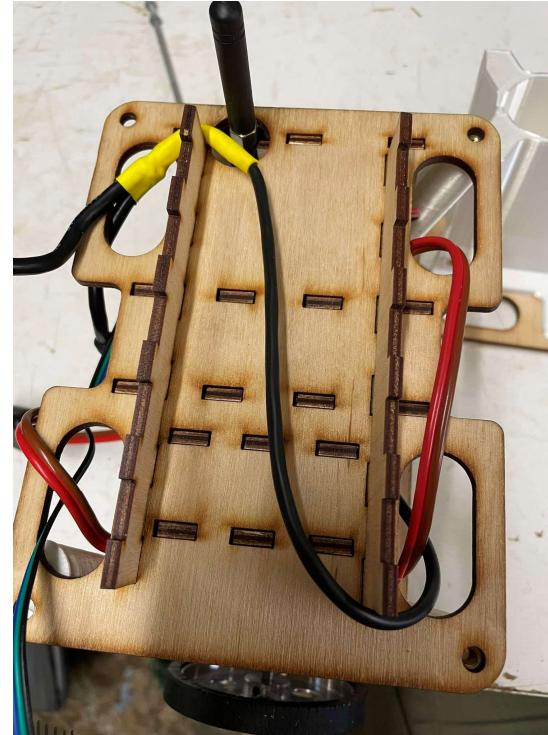
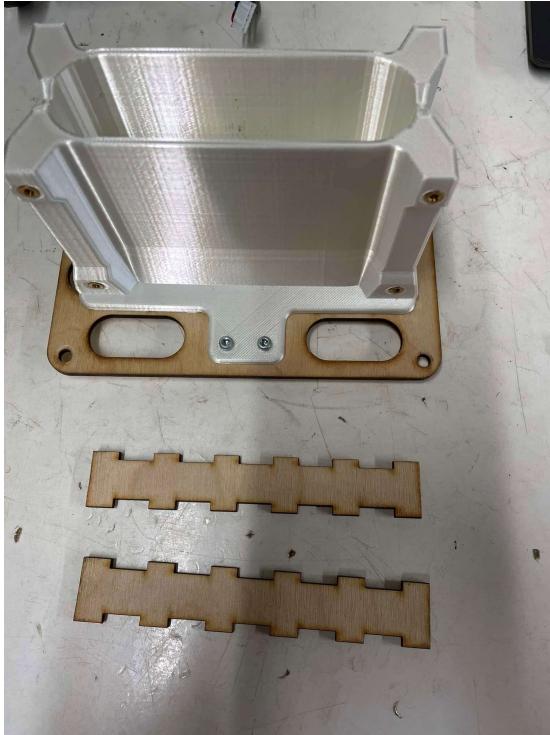


At this point, the floor isn't fully attached so be careful

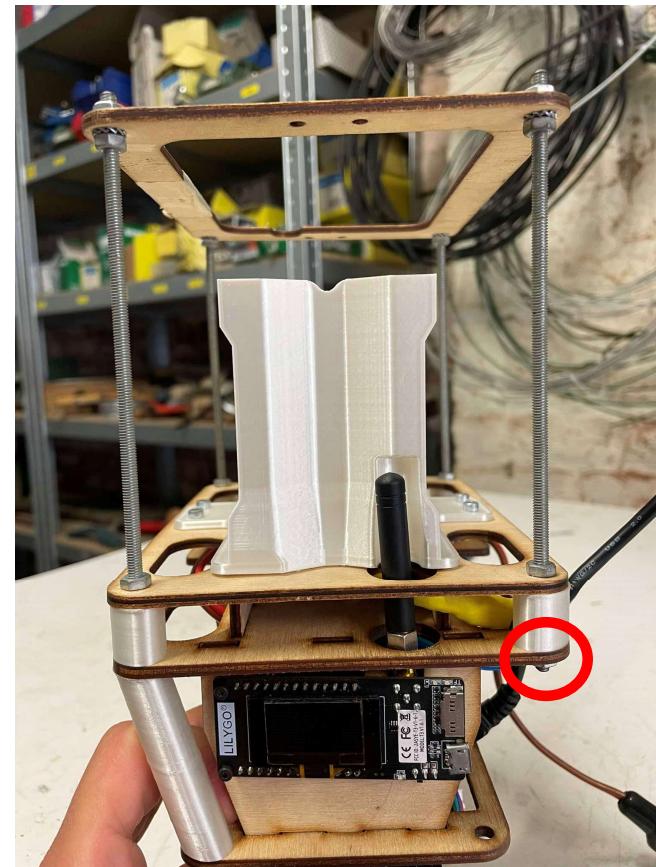
Step 8 – Attach battery casing



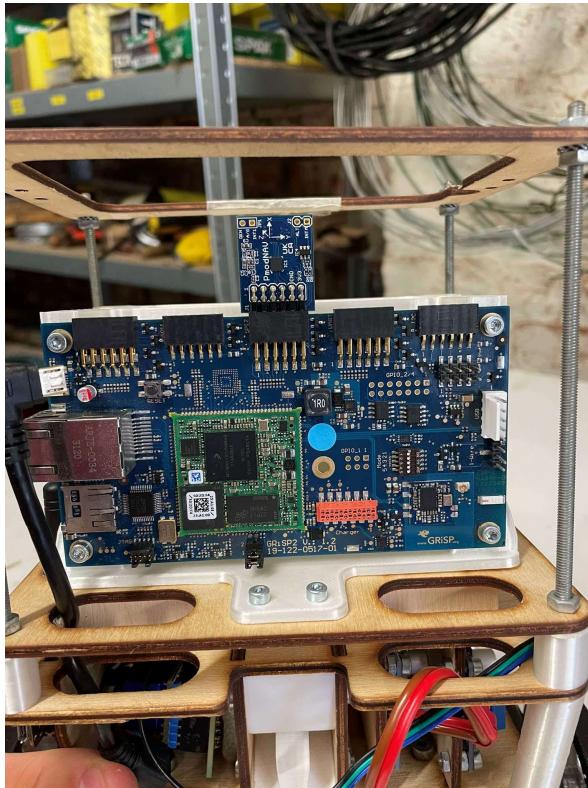
Step 9 – Add floor



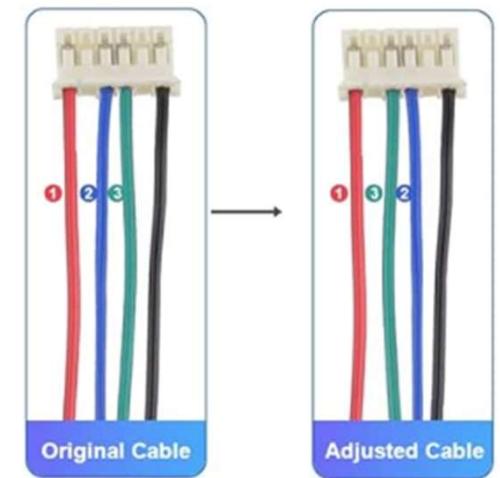
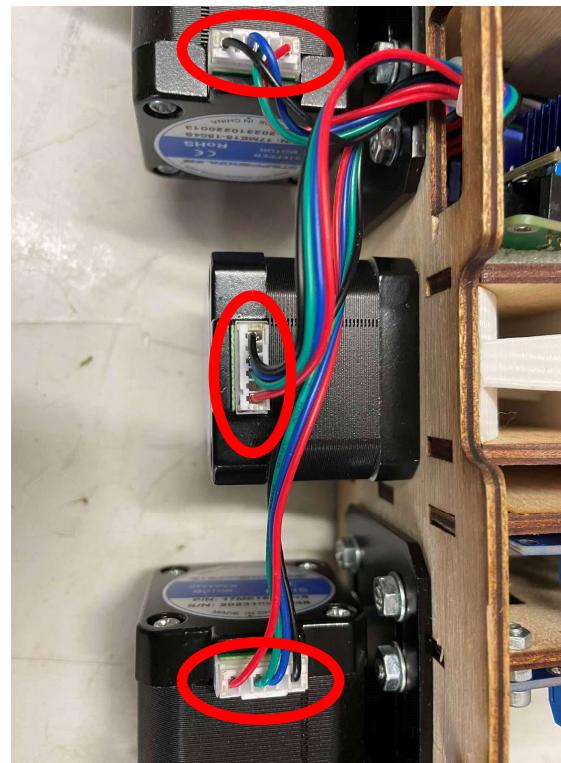
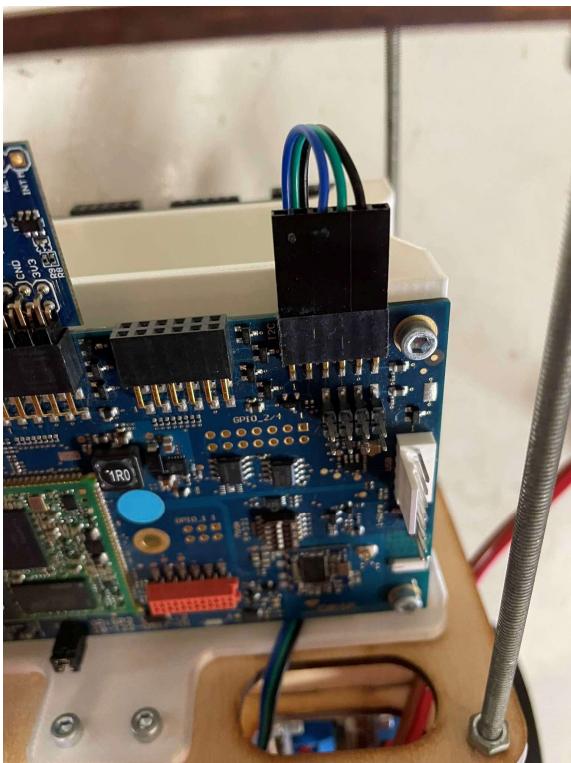
Step 10 – Add spacers and top



Step 11 – Add GRiSP boards

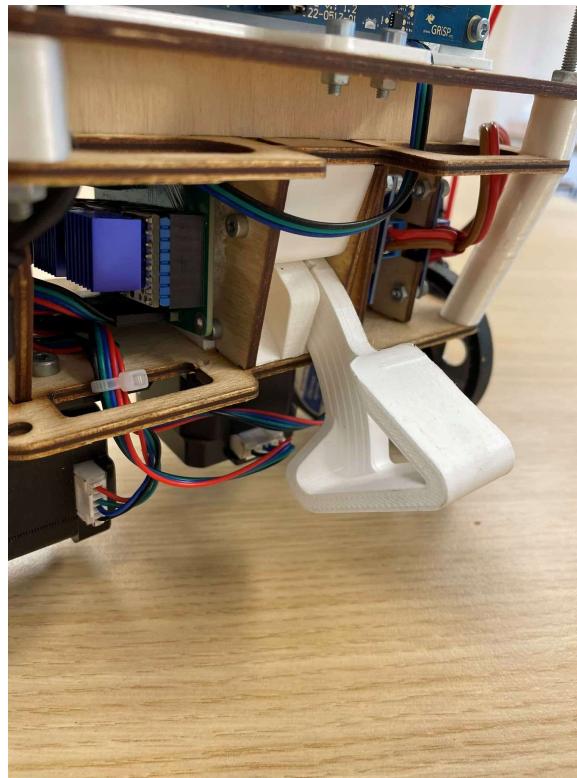


Step 12 – Cable connections



Warning : green and blue cable must be swapped , use a small metal pin to extract the cable from the plastic connector

Step 13 – Insert arms



Note: insert both arms simultaneously

Step 14 before power up

Before plugging the robot, be sure to not have short circuit → check with the “biiip” function of the multimeter on different voltage reference 5V, 3V and GND.

Et voila !

That's it for the mechanics and electronics...