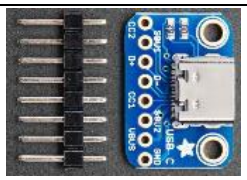
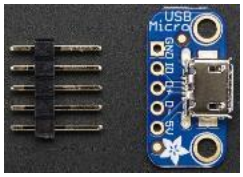
Q. ty	Part	link to the shop I used	Cost (€)	Notes
1	Rubik's cube 2x2x2 (recommended MoYu RS2M 2x2x2)	https://www.amazon.com/Evolution-Cube-Structure-Stickerless-Mini/dp/B09ZXBZRB6?ref_=ast_sto_dp or Aliexpress (link in the instructions)	6	
2	Servos I used in first place: TD-8325MG (**180deg** 25Kg metal, **Pulse width 1to2ms**) and metal arm "25T" **Check the (better) alternative servos on next pages**	https://www.aliexpress.com/item/32298149426.html?gatewayAdapt=glo2ita&spm=a2g0o.9042311.0.0.5d1e4c4d14Qjaz	25 (2 servos + 2 arms)	 max 31mm protrusion under the flange
1	Raspberry Pi Zero2W (H needed, yet the header can be bought at side)	https://www.sossolutions.nl/	24 (2W version, Dec 2023)	
1	microSD HC 16GB	https://www.dataio.nl/sandisk-ultra-micro-sdhc-16gb-uhs-i-a1-met-adapter/	8	
1	PiCamera V1.3 (PiCamera V2 can be used, by changing the *s_mode* parameter)	https://www.amazon.nl/gp/product/B01M6UCEM5/ref=ppx_yo_dt_b_asin_title_o05_s00?ie=UTF8&th=1	7.5	
1	30cm cable Raspberry Pi Zero/Camera	https://www.amazon.nl/gp/product/B079H33VCM/ref=ppx_yo_dt_b_asin_title_o05_s01?ie=UTF8&th=1	5	
1	SPI TFT 128x160 Pixels Display (1.77 inch) with ST7735 driver	https://www.amazon.nl/gp/product/B078JBBPXK/ref=ppx_yo_dt_b_asin_title_o03_s00?ie=UTF8&th=1	8	
1	(white) Led module 3W	https://www.aliexpress.com/item/1005001984730729.html?spm=a2g0o.cart.0.0.58be3c00SgxRBT&mp=1	2.6 (4 pcs)	
1	2.5-5.5V TTP223 capacitive touch switch button self-locking module for Arduino	https://www.amazon.nl/-/en/gp/product/B07BVN4CNH/ref=ppx_od_dt_b_asin_title_s01?ie=UTF8&psc=1	4 (5 pcs)	

Qty	Part	link to the shop I used	Cost (€)	Notes
1	AMS1117-3.3 DC 4.75V-12V to 3.3V Voltage Regulator	https://www.amazon.com/Ambest-AMS1117-3-3-4-75V-12V-Voltage-Regulator/dp/B07CP4P5XJ	6 (5 pcs)	
1	USB Type-C BREAKOUT BOARD	https://www.adafruit.com/product/4090	3.5	
2	**Alternative solution** USB MICRO-B BREAKOUT BOARD **(not suitable for Raspberry Pi 3 or 4)**	https://www.kiwi-electronics.nl/nl/usb-micro-b-breakout-board-3908	3.8	
~500g	Filament 1.75mm		~10	Suggested PETG, yet other material will do the job

Electrical small parts:

Qty	Part	Notes
1	Prototype board	To connect all the parts
1	40pin (2x20) GPIO male header	In case you could not get the WH version of Raspberry Pi
1	40pin (2x20) GPIO female header (Plastic body height ca 8 to 8.5mm)	To connect the Connections board to Raspberry Pi Zero 2
1x8	Female Header (plastic height ca 8.5mm)	To connect the display to the Connections board
4x3	Male Headers 90deg	To connect the servos, touch pads, Led module
2x3	Female Headers	To connect the touch pads, Led module
3	Capacitor 16V 220uF	To limit voltage, drop when servos are activated
1	Heat sink for Raspberry Pi	Optional

Screws:

Quantity	Dimension	Head type	Info
1	M4x20	Cylindrical	Pivot for Top_cover
~20	M3x12	Cylindrical	
~30	M3x12	Conical	
4	M2.5x10	Cylindrical	Rpi to Structure (can be used L=6mm or L=x8mm)
8	M2.5x4	Cylindrical	MicroUSB break-out boards to PCB cover
1	M2.5x20 + 4 nuts	Cylindrical	Used on the Connections_board as spacer for the display

Power supply:

- If USB type C: 1x 3A (recommended the original Raspberry Pi power supply)
- If micro-USB: 2x 2A phone charger with micro-USB cable

Other:

Off course some other common materials are needed (wires, solder and solder device, tire wraps, self-adhesive rubber feet, hot glue, etc).

Alternative servos

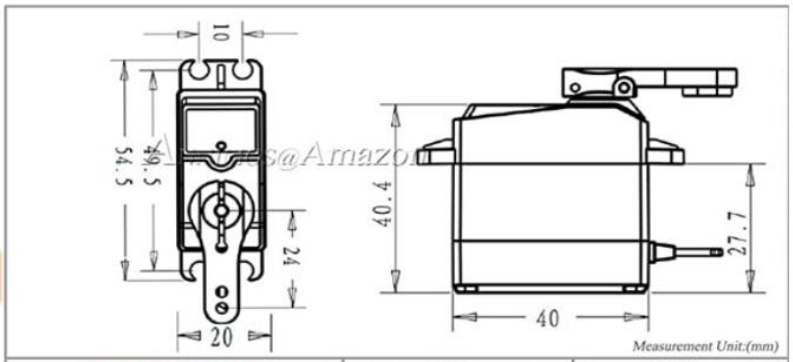
It is possible to use servos having 270deg rotation combined with an extended Pulse Width (from 500µs to 2500 µs): When I started the CUBOTino platform project, I didn't know about the extended pulse width… a missed opportunity I would call it now!
Rotation and Pulse Width ranges makes this servo a much better choice for this robot:

- Servo rotation range will always be sufficient, preventing from soldering resistors into the servo to enlarge the range.
- The resolution is higher, making easier the servo angle setting process.

This model isn't cheap yet is seems widely available.

As reference this servo has these characteristics:

Qty	Part	link to the shop I used	Cost (euro)	Notes
2	Servo DS3225MG (**270deg** 25Kg metal, **Pulse width 500 µs to 2500µs**) and metal arm "25T"	https://www.amazon.com/ANNIMOS-Digital-Waterproof-Crawler-Control/dp/B07GK1G5FV/	38 (2 servos + 2 arms)	



Operating Voltage	5V	6.8V
Idle current(at stopped)	4mA	5mA
Operating speed (at no load)	0.15 sec/60°	0.13sec/60°
Stall torque (at locked)	21 kg-cm	24.5 kg-cm
Stall current (at locked)	1.9A	2.3A
Control System	PWM(Pulse width modification)	
Pulse width range	500~2500µsec	
Neutral position	1500µsec	
Rotating direction	Counterclockwise (when 500~2500 µsec)	

For the tests I've ordered the 180° version from Amazon Netherlands:
https://www.amazon.nl/gp/product/B01MU78A29/ref=ppx_yo_dt_b_asin_title_o02_s01?ie=UTF8&psc=1

On the received servo, the real rotation range is about 192°, therefore still ok for the robot.
I've measured a resolution <1° (vs 1.8 of the servos I've initially used, and suggested), making easier the angles settings.
When moving from a 180° to a 270° version, the angle resolution should still be around 1.4°: Again, better than the servo I initially used and suggested.

Raspberry Pi ZeroW (instead of Zero2W)

In case Raspberry Pi Zero2W will suffer again for severe chip shortage, then Raspberry Pi ZeroW board is a valid alternative for this project:

Pro:

1. In 2022 and 2023 it had better availability than Zero2W, see notes below.
2. Hardware and Software compatibility.
3. Size.
4. Price.

Cons:

1. Performances deteriorates on OS10, yet acceptable results:
    a. The Boot with script loading takes about 120secs, roughly double the time of Zero2W.
    b. Cube status detection takes about 10 seconds more than Zero2W.
    c. Solving time takes about 5% more than Zero2W.
    On average the cube status detection and solving takes 90 seconds vs 70 seconds of a Zero2W.
2. Performances deteriorate too much on OS11, making the robot unpleasant to work with.

Purchasing a Raspberry pi Zero (Info valid at the moment of writing, 18 January 2024)
Both Raspberry Pi ZeroW and Zero2W are back in stock, notably in Amazon and AliExpress.
The Raspberry Pi official site (https://www.raspberrypi.com/products/raspberry-pi-zero-w/) displays the availability of the products through the official dealers in various countries. Select *Buy now*, enter your Country and check one by one the proposed shops for availability.

Notes:

- In some Countries / shops restrictions are applied: In the Netherland, where I live and placed my order, it has been periods in which orders were restricted (only one board per person per month).
- On December 2022 I spent 18.6€ (+ 3€ for shipment) and I got my first ZeroW in a couple of days. Yes, this is not the 'old' price, but competitors aren't cheap either….
- On February 2023 I spent 20.8€ (+ 10€ for shipment, ordered abroad) and I got my second ZeroW in a couple of days.
- On March 2023 I spent 21€ (included shipment) and I got my third ZeroW in a couple of days.
- On July 2023 I spent 22€ (+ 2.5€ for shipment) and I got a Zero2W from an official dealer in The Netherlands.
- In December 2023, a Raspberry Pi Zero2W without headers was 27,50€ through AliExpress, shipping included.