ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
HAROKOPIO UNIVERSITY

# Harokopio University of Athens (HUA)

Christos Chronis, Iraklis Varlamis
Harokopio University of Athens (HUA)

# WP2 - Design and development of the open source educational robot

Partners: HUA, UniLaSalle, GFOSS and DigiCULT

- PR2 - Design and development of S.T.E.P.S., the new generation of open source educational robot (PR leader)
- PR3 - Test and evaluation of S.T.E.P.S. educational robot (PR leader)
- PR4 - Instruction manual for the assembly and programming of S.T.E.P.S. educational robot (PR leader)

# PR2 - Design and development of S.T.E.P.S.

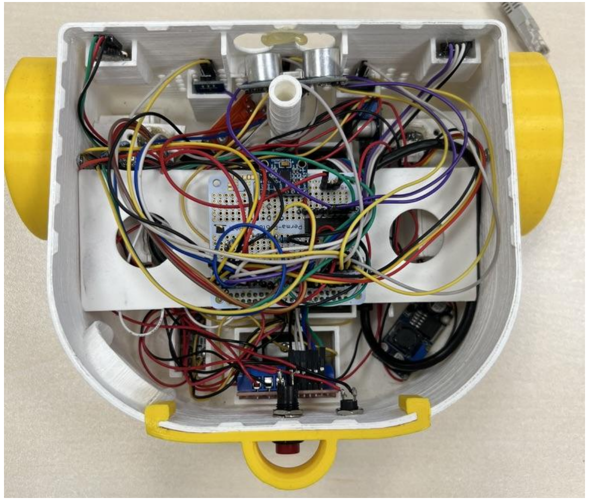
The new generation of open source educational robot

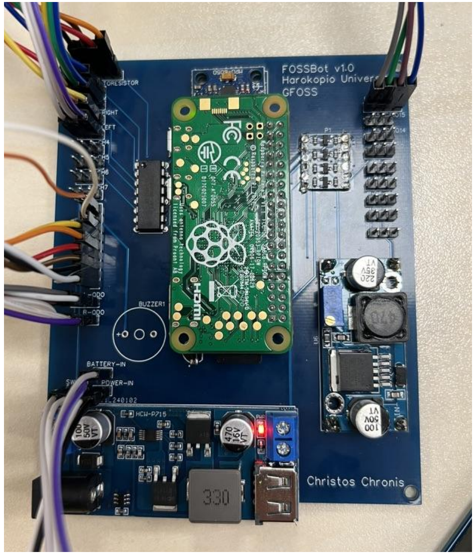
- Redesign the body and electronics to allow an easier assembly process
- Less printing time and material
- New peripherals
- Digital twin
- Produce a report outlining the method and phases followed

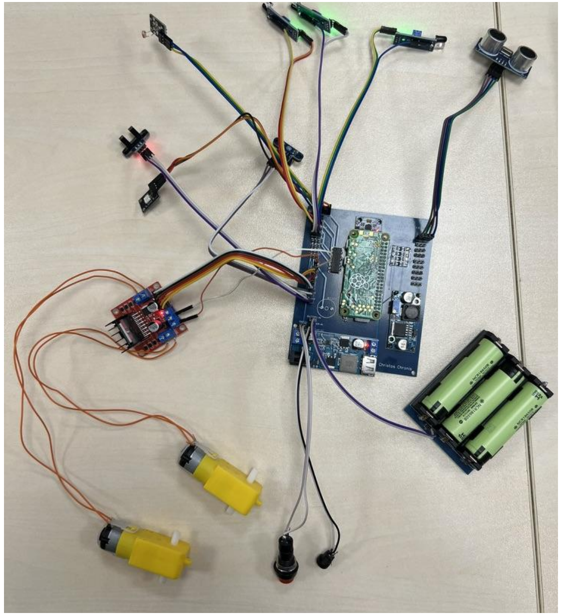
- Until **April 2024,** first version of the new prototype
- Total duration until **July 2024**

# PR2 - New PCB

Total assembly time for the electronics reduced from **4 hours** to **20 minutes**

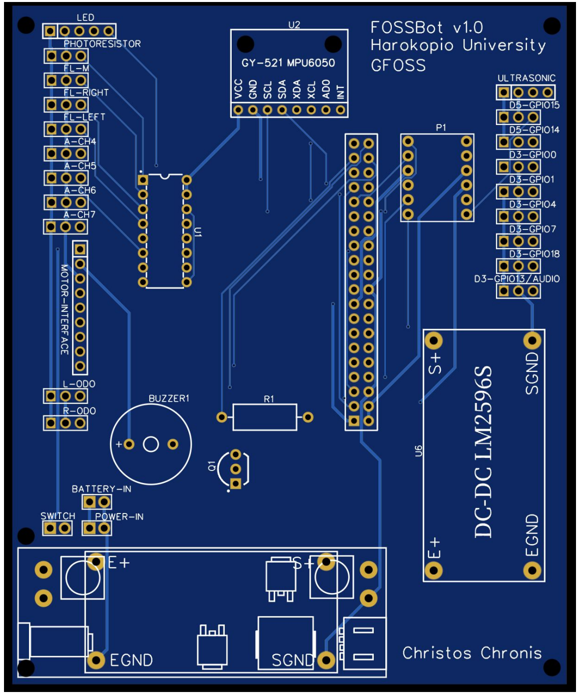




ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
HAROKOPIO UNIVERSITY

# PR2 - New peripherals




## Current Sensors

- Photoresistor
- 2X Odometers
- Ultrasonic Sensor
- Noise Sensor
- 3x IR Distance Sensors
- Accelerometer and Gyroscope
- RGB LED

## Extra Pins

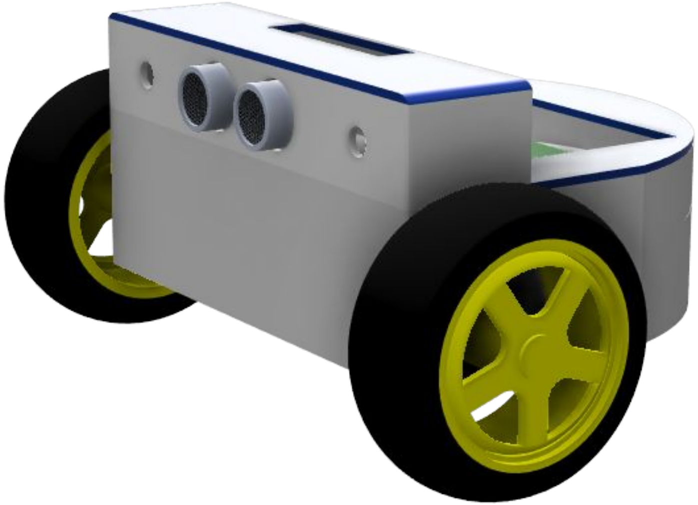
- 6 Digital Pins
- 4 Analogue Pins

## Possibly new Sensors

- $CO_2$ Sensor (1A pin)
- Temperature (I2C)
- Color Sensor (1D pin)
- Camera (Rpi)
- Potentiometers (1A pin)
- Buttons Plate (1D pin per button)
- Servo (1D pin per servo)

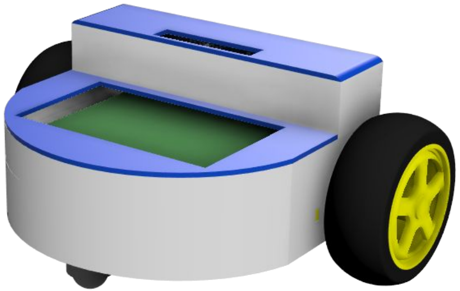
# PR2 - New Design


Old Design

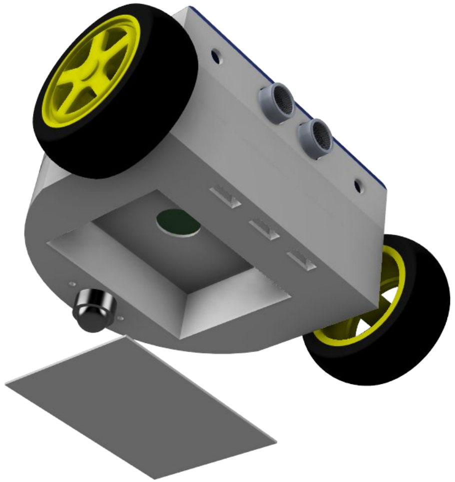


New Draft Design

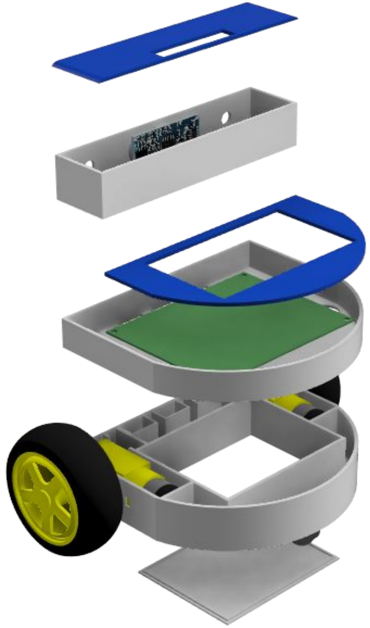
# PR2 - New Design



Modular Backplate with direct access to electronics

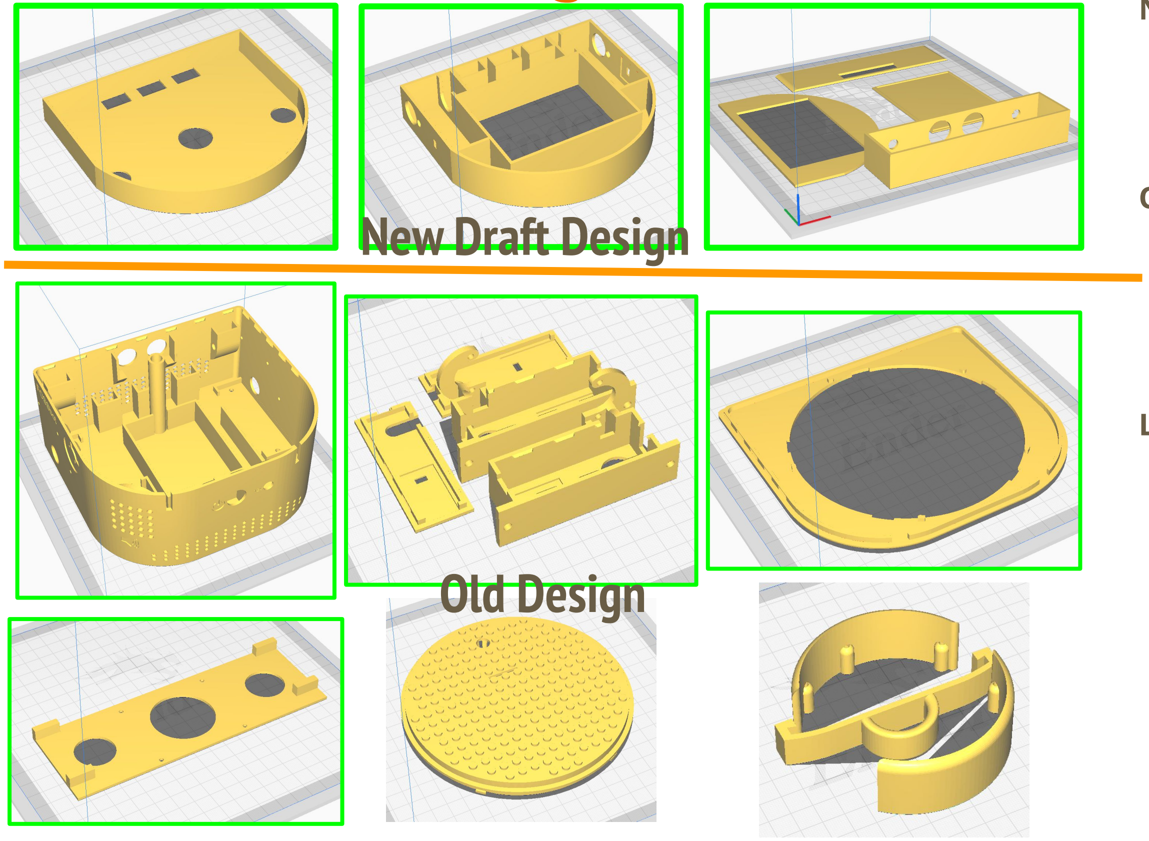


Easy access to battery with support for different types



Easier print and assembly

# PR2 - New Design




**New draft design**

- 10 hours 6 min 64g
- 5 hours 3 min 42g
- 7 hours 11 min 52g

**Old Design:**

- 1 day 9 hours 41 min 211g
- 6 hours 4 min 39g
- 4 hours 3 min 31g
- 2 hours 36 min 19g

**Lego top and Cosmetics**

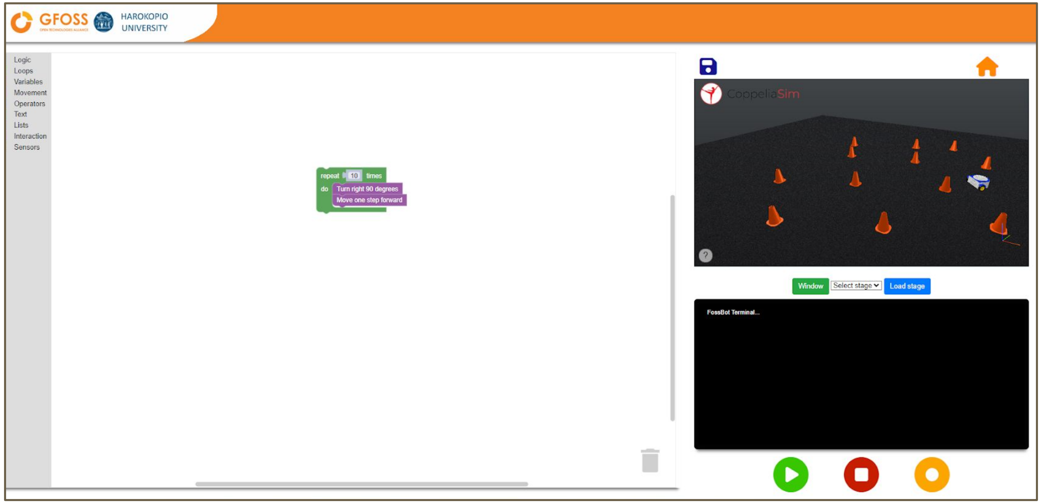
- 7 hours 48 min 52g
- 4 hours 16 min 26g

**Old ~46 hours and used 300g of plastic**
**New ~ 22 hours and 20 min and used 158g of plastic**
* Normal quality and 0.4 nozzle

**Print time reduction by 52%**
**Printing material reduction by 47.3%**

# PR2 - Software and Digital Twin

- Core library optimizations
- New sensors support
- CI/CD integrations
- Better multi language support
- Integration of the Coppelia inside the FOSSBot ap
- Better physics



ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
HAROKOPIO UNIVERSITY

# PR3 - Test and evaluation of S.T.E.P.S. educational robot

- Testing period: **April 2024** to **October 2024**
- The expected results is a stable version of the robot
- **July 2024 LTTA2 by UniLaSalle** - Test of S.T.E.P.S. educational robot (online)
- **HUA** will provide provide the initial draft versions of  the instructions of the robot assembly and the usage of all software parts including the digital twin version.

**Must be discussed how will proceed with the testing?**

# PR4 - Instruction manual for the assembly and programming of S.T.E.P.S. educational robot

- Period: **August 2024** to **January 2025**
- Expected results: Instruction manual for the assembly and programming
- Draft version: **November 2024**
- **November 2024 LTTA3 by DigiCULT** - Test of S.T.E.P.S. instruction manual  (online)
- **HUA** will provide provide the initial draft versions of  the instructions of the robot assembly and the usage of all software parts including the digital twin version during the the PR3.

# Thank you for your attention

Iraklis Varlamis
varlamis@hua.gr
Christos Chronis
chronis@hua.gr