



# Escornabot Singularis

## Introduction

Escornabot is an **open educational robot** project, to initiate children in **robotics** and **programming** fields, from the youngest (> 3 years) up to the oldest ...



The construction of it can be done by almost anyone. DIY -Do It Yourself. The body of the robot is made with a 3D printer, and the control with Arduino.

**Escornabot** can execute sequences of movements that are programmed by the user, pressing the robot's buttons. It can also be extended to be managed from a mobile phone or a tablet via Bluetooth or Wifi.

## History

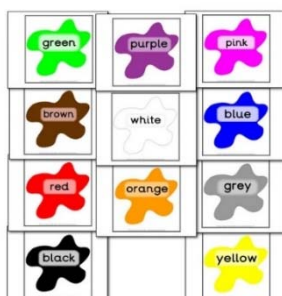
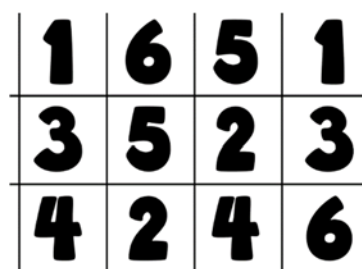
In 2014 a Galician team formed by Tucho Méndez (had the idea), Rafa Couto (programmer), Xoán Sampaíño (3D design) began working on this project in the Bricolabs association. Then Xabier Rosas (developed the printed circuit board), Jorge Lobo and Miguel Gesterio have also been added with more people who collaborate in their dissemination and grow their benefits.

**Whence comes the Escornabot name?** It is a happy composition of escornaboi and robot (escorna+bot). Escornaboi is the word in Galician language for the [lucanus cervus](#) (the biggest beetle in the well-known universe).



## Playing with Escornabot

Escornabot is a didactic means that allows with simple commands to carry out games on top of a template or map. From >3 years old until do you want, you can play and learning.





## Philosophy of the project

It is an Open Hardware (OSHW) and Free Software (FOSS) project, so its evolution is open to the community and anyone can contribute to its development.

You can find details of development of the project, as well as guides and manuals on Github.

<https://github.com/pablorubma/escornabot-v2.12>

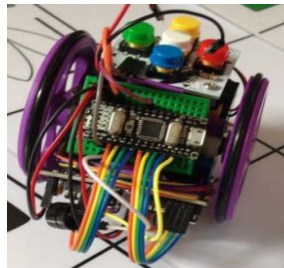
The slogan of Project is: **Build, Use, Modify and Share**

## Types of Escornabot

There are different models, even its operation is practically the same, and we will focus on the Singularis model.



Placidus



DYI



Brivoi



Singularis

This documentation is dedicated exclusively to the Singularis version with the CPU v2.12

## Parts of Escornabot Singularis

The structure is built with a 3D printer, which is available to everyone for its low price. The filament is biodegradable.

STL files available in: <https://github.com/pablorubma/escornabot-v2.12/tree/master/archivos-stl>



Arduino Nano Processor

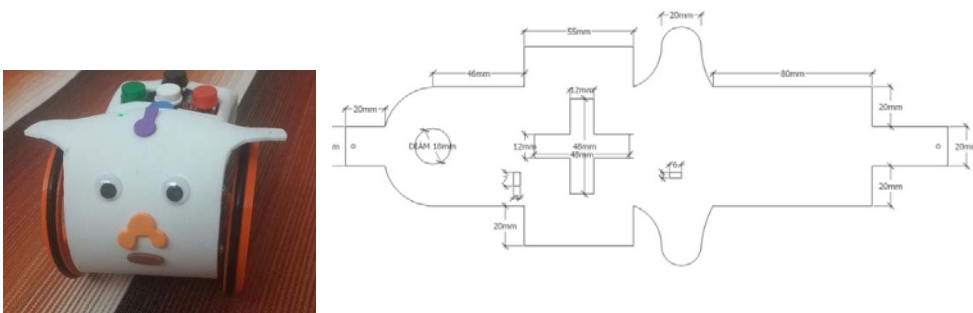


Stepper Motors, LEDs, buttons, EscornaBoard, battery holder...





Escornabot has a switch power, 4 buttons allow you to program the movements, you can move forward (blue button), move backward (black button), turn left (red button), turn to the right (green button) and the white button run the sequence of programmed movements. The white button can stop the sequence when the Escornabot is running.



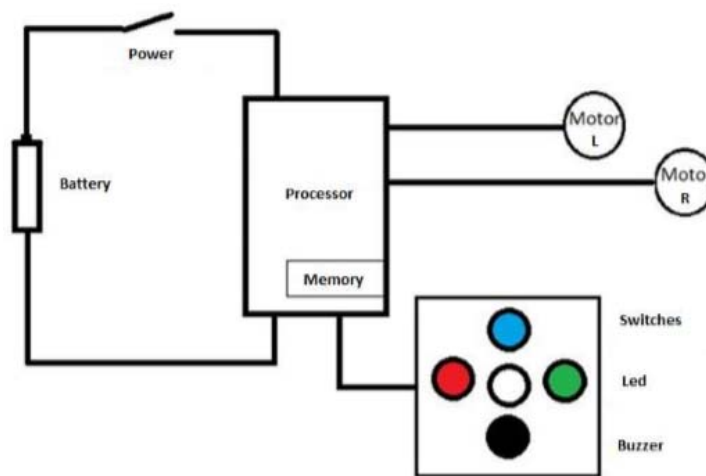


## Escornabot in deep

### Parts of Escornabot

- 2 Stepper motors for to move every wheel
- 1 Arduino processor to sequence the orders to motors and lights.
- 1 Memory to save the orders.
- 5 Push buttons for to introduce the orders.
- 5 lights for indications.
- Buzzer, sound indication.
- 4 battery AA.
- Power switch.

### Escornabot Scheme



### Stepper Motor

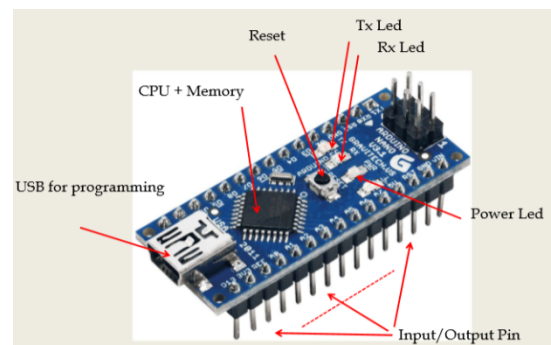
Escornabot have two stepper motors, which means that they move by impulses, they have a reducer, every 64 pulses take a turn, which allows great precision.



If they rotate in the same direction the robot moves forward or backward, if one rotates in one direction and the other in the opposite direction, the robot will rotate 90 degrees to the right or 90 degrees to the left. There is a new firmware revision that can rotate at 45 and 90 degrees, this is for expert users, and allows to go in diagonal.

### Arduino Processor

The Arduino process control unit is the brain of the robot, it is where are stored the instructions received from the keyboard and where the motors, LEDs and buzzer are controlled. Also have an USB connector for to update the firmware of the robot.





## How to change batteries?

The battery life is not unlimited, and it is necessary to turn off the robot every time finish to playing.

If you see that the programmed sequence does not end, probably have empty batteries, even if the power LED is on.

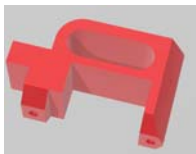
To change the batteries, first turn off the robot, flip the robot and will find 2 screw for to fix the battery.

Then move out the battery holder and remove the batteries and place the new ones, put battery holder in the support, the screws.

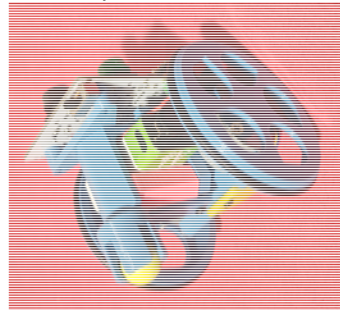
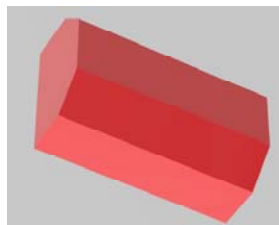


## Option with batteries

If you want to use rechargeable batteries, you need to modify the support of the current Escornabot, so you need to print the part of the battery holder.



or to print the next part that will be placed in the current battery holder and then the battery.



These batteries are of the 9V type, and can be charged from a USB Type C to 5V cable, the current of the model shown is 650mA/h and does not last longer than batteries, but recharging and a single cell can improve depending of the activity that is done.

On the one hand, it can be loaded without disassembling the wheel to change it. When buying this type of battery, you must pay attention to the position of the USB connector, as the manufacturer puts it in one position or another.

Finally, a 9V battery clip cable must be purchased







## How to do a board for the Escornabot

From a sheet or cardboard, you can draw lines every 10cm making a grid. The Escornabot moves in 10cm steps inside the grid. Then, the imagination is endless to design new boards to "play" learning, you can use any recycled material to put obstacles in the way, you can join several boards with a huge pattern (like the "parchis" that was designed with 12 cards) or a Star Wars board.



There are a collection of boards and some explanation of the activity to be performed:

[https://github.com/escornabot/docs/tree/master/Escornabot\\_Mats](https://github.com/escornabot/docs/tree/master/Escornabot_Mats)

Also, a board repository with some instructions: [bit.ly/escornamats](https://bit.ly/escornamats)



## How is it programmed?

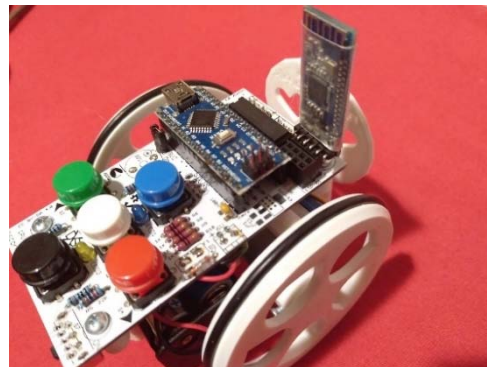
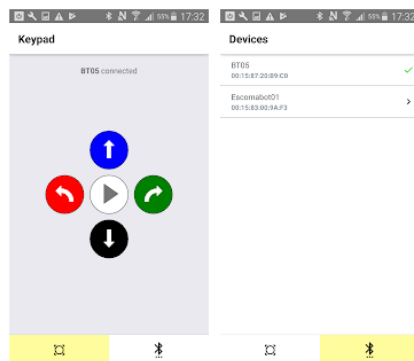
Escornabot uses an Arduino module, very popular in the DIY world, where the firmware must be programmed, it is fully available and documented at <https://github.com/escornabot>

The Arduino integrated development environment (IDE) can be used for developing the partial or full operation of Escornabot and can be done as a workshop, obviously adapting to the corresponding age.



## Escornabot keeps growing

In addition, Escornabot is ready to add a Bluetooth module (like HM-10) with App available for Android and IOS.



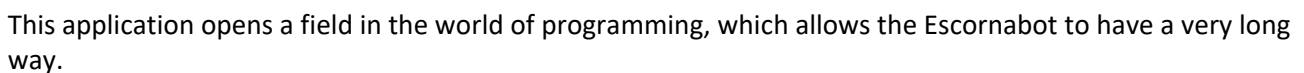
Also is ready for to use a Wifi module, but it is not recommended due the power consumption vs Bluetooth, but it is possible to use.

The remote control is not recommended for younger users, is better to work on the table or on the floor. Instead, the remote control allows other workshops like designing it for smartphone with AppInventor.



Thanks to Ángel Villanueva, he has developed an Extension specifically for the Escornabot robot from the mBlock development environment.

For more information: <http://www.mecatronicalab.es/programando-escornabot-con-mblock/>



<http://www.mecatronicalab.es/escornavoz/>

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## Visualino for Escornabot

Blocks have also been created to work with Visualino, it is a great contribution.

<http://josema966.gitlab.io/bloques-en-visualino-para-escornabot.html>

## New libraries for Escornabot

News libraries developed by Prudencio Luna (@plunax) and Pedro Ruiz (@pedroruizf) from Club de Robótica de Granada. <https://github.com/escornabot/libreria-arduino/tree/master/manual>

You can download from <https://github.com/clubroboticagranada/libreria-arduino-escornabot>

## Escornabot anywher

Escornabot has been used in workshops exhibitions like MakerFaire, Robotac ... but also in children's oncology hospitals, even in geriatric centers and with people with disabilities.

