Tic tac toe demonstrator

Making instructions

NIRYO

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Laser cutting

First of all, to make the Tic tac toe demonstrator, you need to make all the wood pieces to fasten all the different parts of the demonstrator – especially, the robot, pawn's distributors, and the board game – and also set the robot in his environment.

For these wood pieces, you will need wood planks of 5 mm thickness quite rigid, plywood, for example. Then, you will need to cut these pieces with a laser cutting machine. All cutting files are made for a machine of dimension 600×300 mm, as the TROTEC Speedy 100 (https://www.troteclaser.com/fr/machines-laser/machines-gravure-laser-speedy/).

Three types of pieces are necessary:
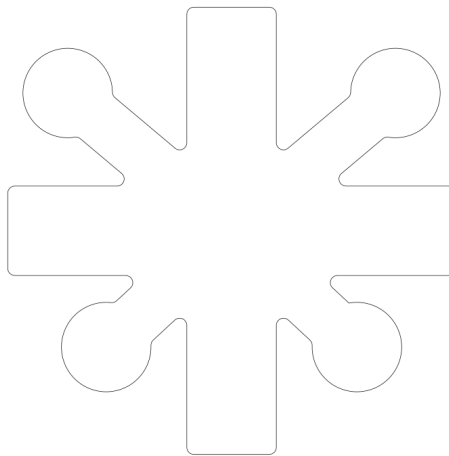
- 1 niryo stand, to fasten the robot

figure 1: niryo_stand.dxf

dimensions: 250x250 mm
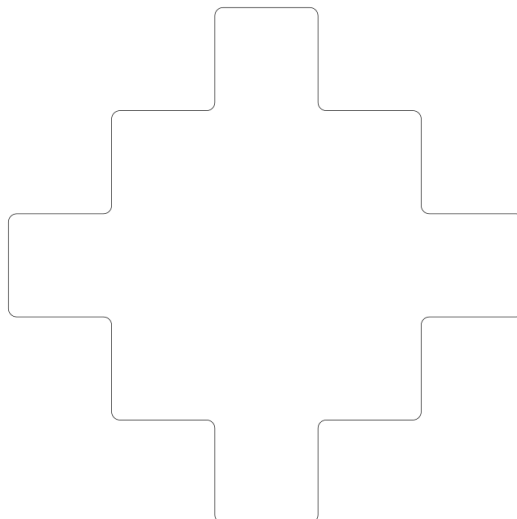
- 1 centre, to set the board game

figure 2: centre.dxf

dimensions: 250x250 mm

- 2 long straight blocks, to set the pawn's distributors

figure 3: straight_block(long).dxf

dimensions: 250x50 mm
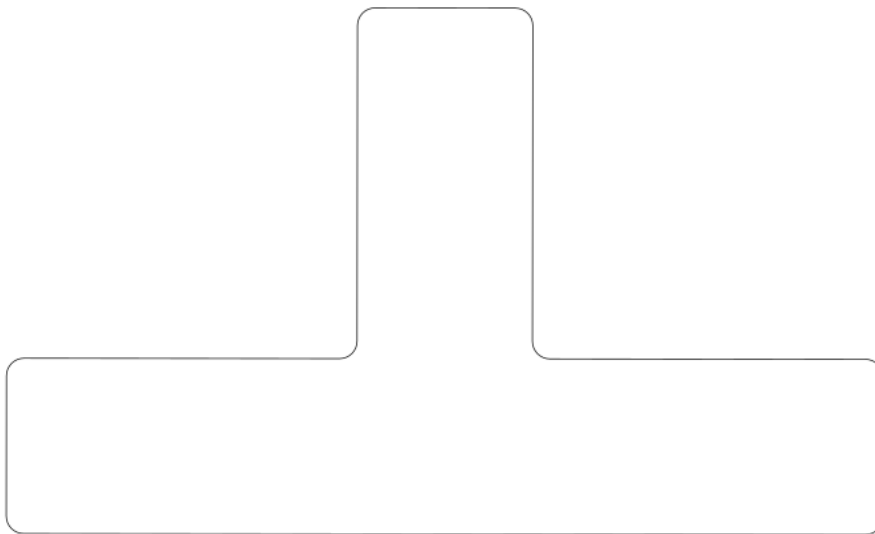
- 2 T blocks, to link everything

figure 4: T_block.dxf

dimensions: 250x150 mm

To cut these pieces, you will need two planks of 600×300 mm, one for the niryo stand, the centre, and one long straight block, and another one for the last long straight block and the T block.
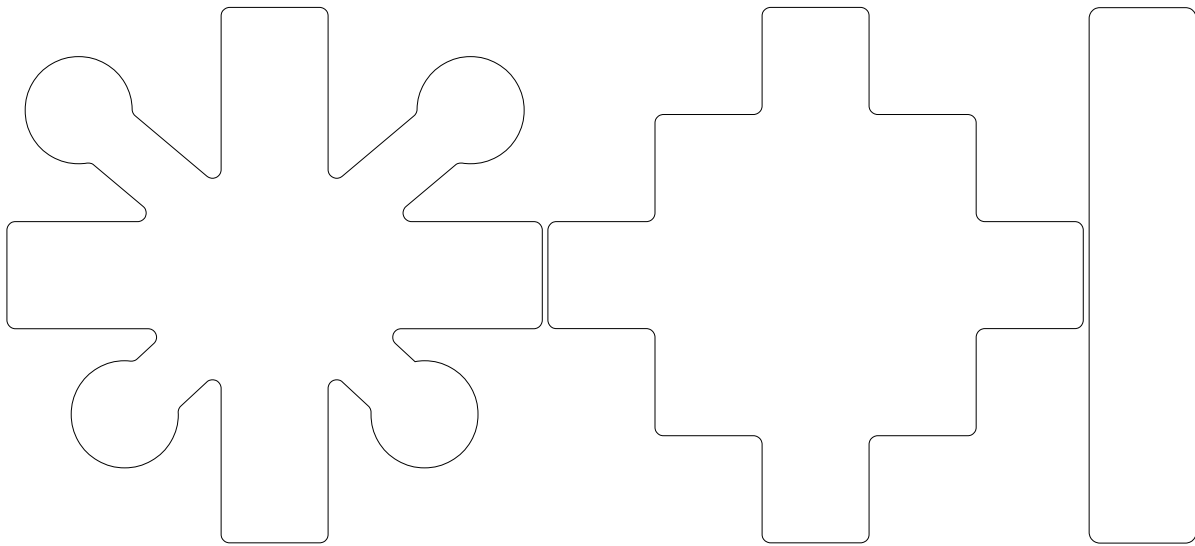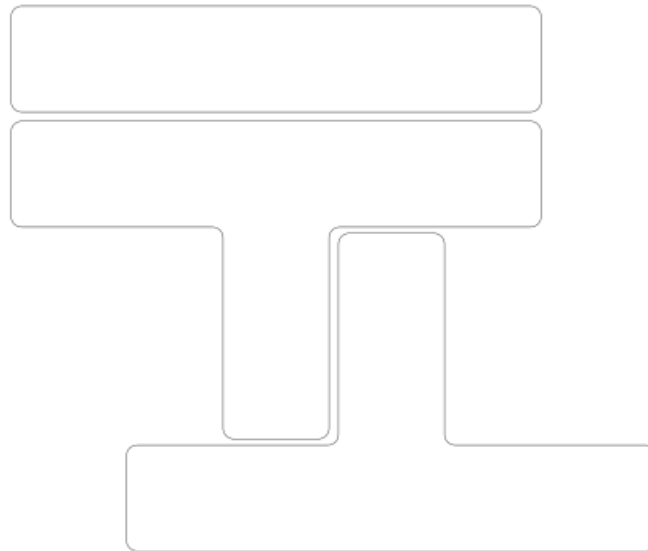
figure 5: Tic-Tac-Toe1.svg

figure 6: Tic-Tac-Toe2.svg

3D printing

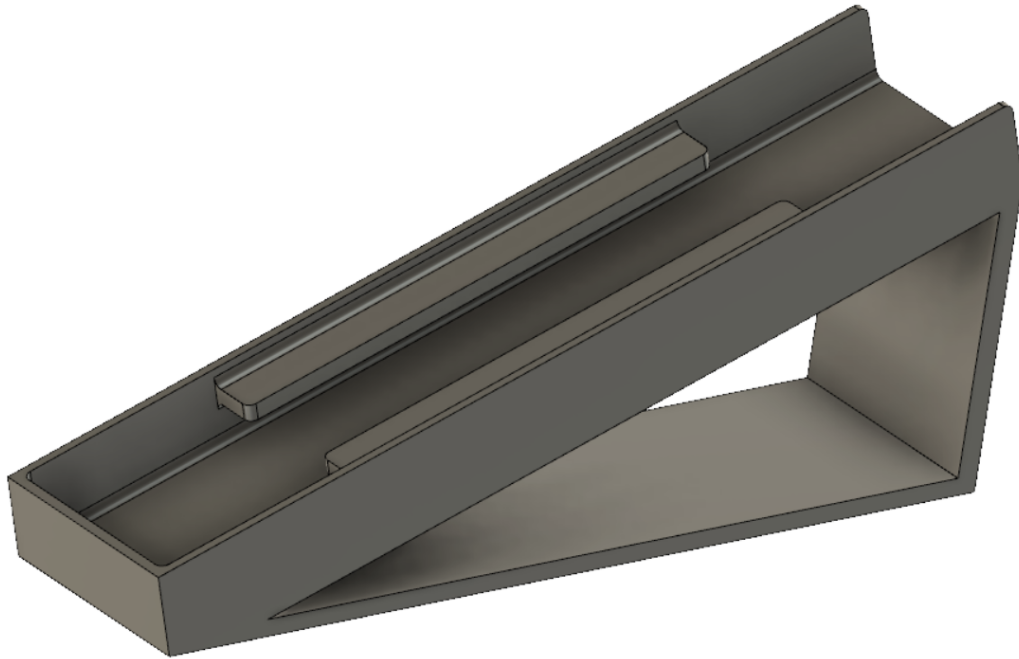You will need to print different pieces in 3D:

- 2 pawn's distributors

figure 7: distributor.stl

dimensions: 216.325x50x87.076 mm
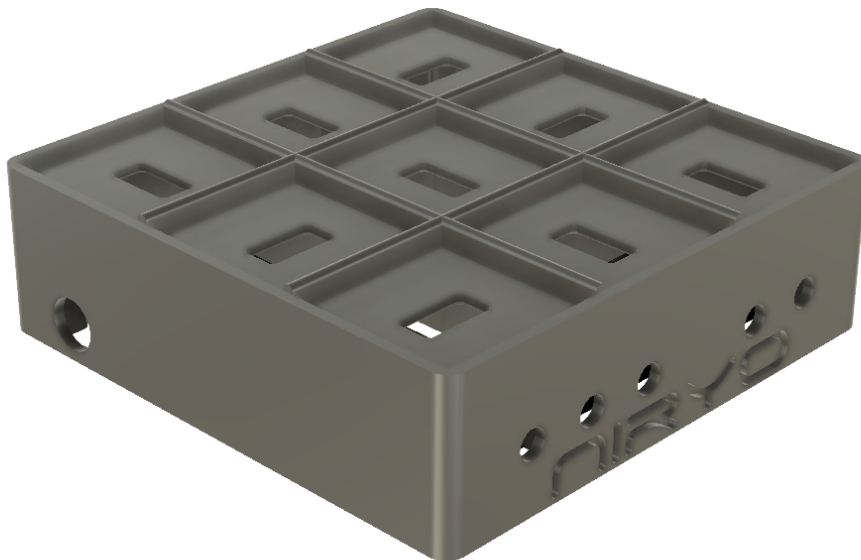
- 1 board game

figure 8: board_game.stl

dimensions: 150x150x47,099 mm
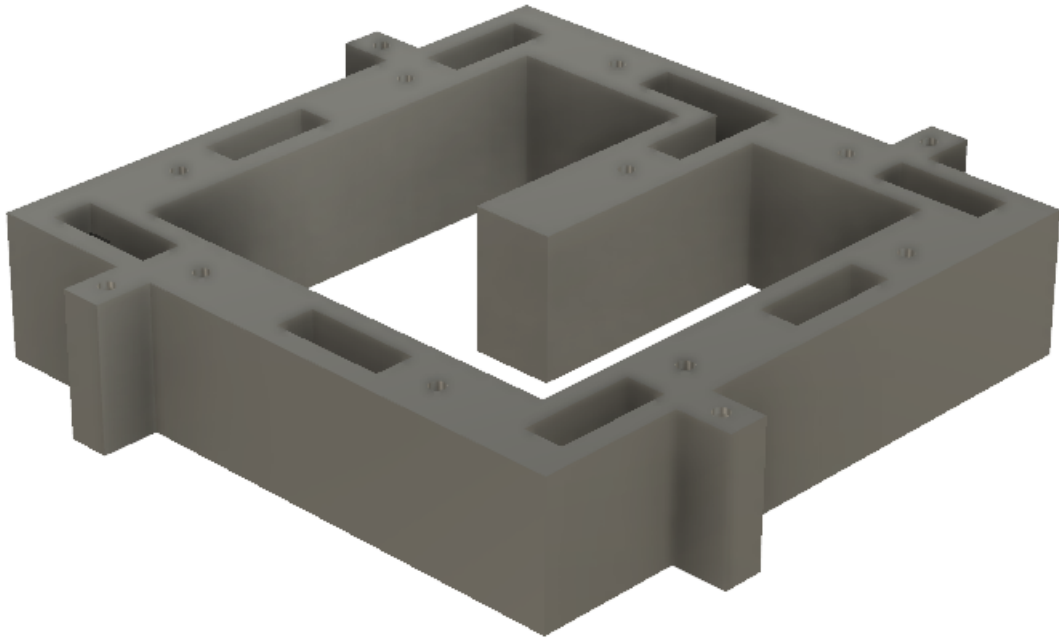
- 1 cable's gutter

figure 9: gutter.stl

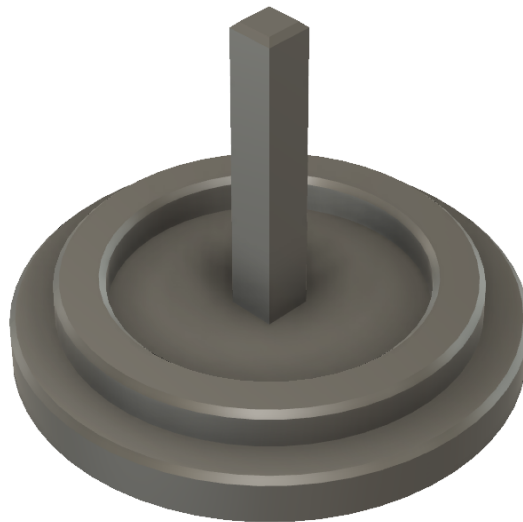dimensions: 133x133x25 mm

- 5 O pawns

Figure 10: tic-tac-toe_O.stl
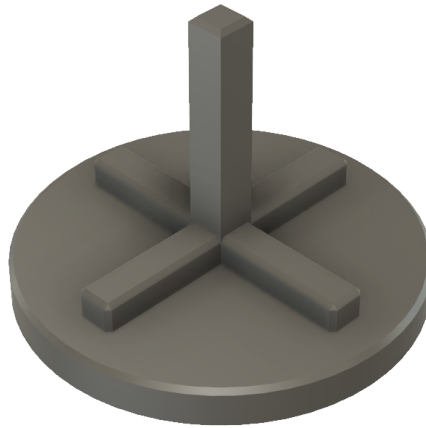
dimensions: 40x40x29 mm

- 5 X pawns

figure 11: tic-tac-toe_X.stl

dimensions: 40x40x29 mm

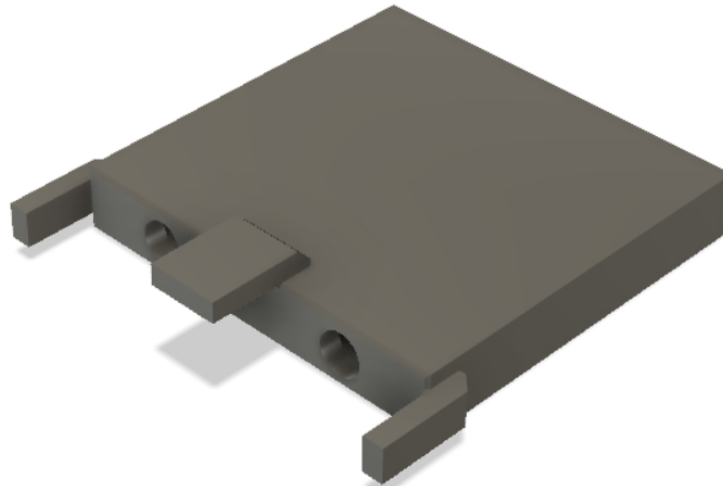- 6 left magnet fastener

figure 12: magnet_fastener_left.stl

dimensions: 63x61x12 mm

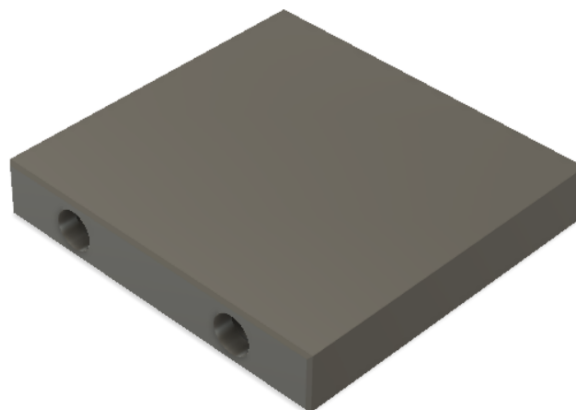- 6 right magnet fastener

figure 13: magnet_fastener_right.stl

dimensions: 53x55x9 mm
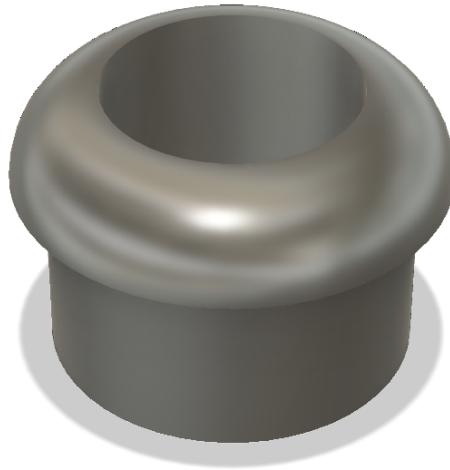
- 5 led's fixations

figure 14: led_fastener

dimensions: 9x9x6 mm

All 3D pieces need to be printed with these printer characteristics:

- Nozzle size: 0.4 mm

- Layer thickness: 0.2 mm

- Filling: 15/20 %

Demonstrator assembly

When all the pieces are cut or printed, you can start the assembly of the demonstrator.
Begin by introducing the little round magnet in the hole provided for this purpose in the pieces
« magnet_fastener_right » and «magnet_fastener_left».
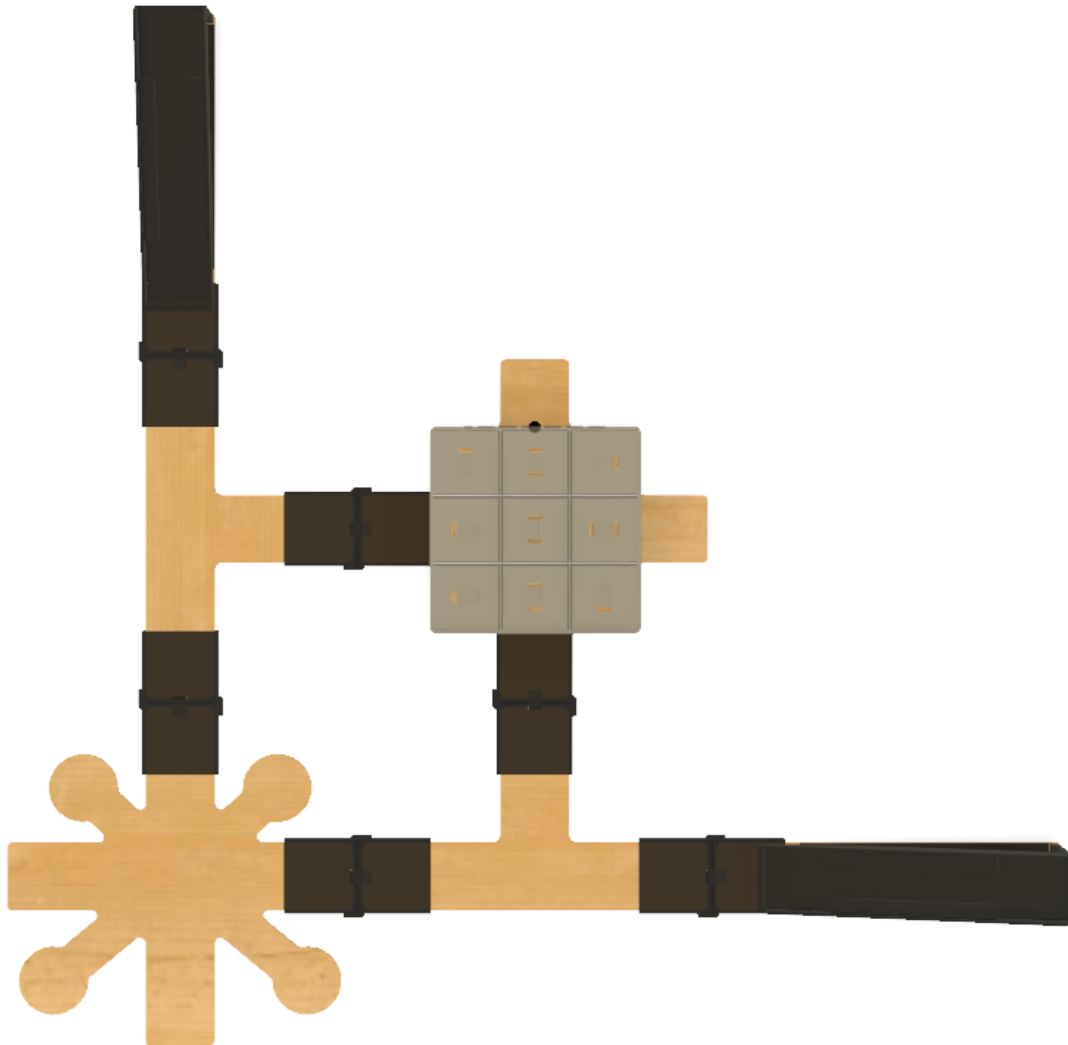Then, you can assemble the different pieces of the demonstrator following this scheme:

figure 15: Tic tac toe assembly

dimensions: 772x772x92.076 mm

Robot

The robot needs to be set on his stand the back part (the one with connectors) backward according the scheme above, and the front part forward.

Be sure to bolt the robot pads with the hand bolts so that the robot is securely fastened to his stand.

Board game

The board game needs to be positioned above the centre and oriented to have leds oriented to the right as shown on the scheme above.

Pawn's distributor

You can put the two pawn's distributor on the long straight block, and be sure that it is as far ahead as possible.

Then add the pawns in each distributor without mixing them, five O in one and five X in the other.

To be sure the sensors work well, you need to stick white labels under each pawn.

Wiring

The first step is to position and wire the infrared sensors on the cable gutter.
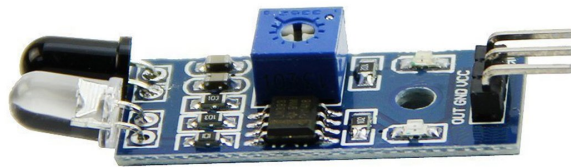

Figure 16: infrared sensor

Start by orienting the two leds to the top by folding them on each sensor. You can then connect jumper wire to the three pins of each sensor, VCC, GND et Output. And then connect all GND pins together and all GND pins together.

Then put the sensors on the gutter so that holes for screws are aligned and pins are oriented towards opening to put the wires.

When all sensors are fixed on the gutter, you can wire the led. To do this, you need to solder a 220Ω resistor followed by a jumper wire to the anode (the longest leg), and solder a jumper wire to the cathode (the shortest leg).
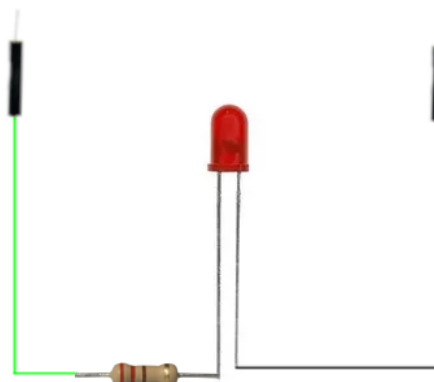

Figure 17: led wiring

You can now wire the push button with a 10kΩ pull-down resistor as you can see on the scheme below.
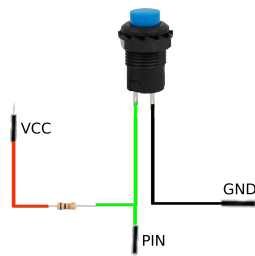

Figure 18: button wiring

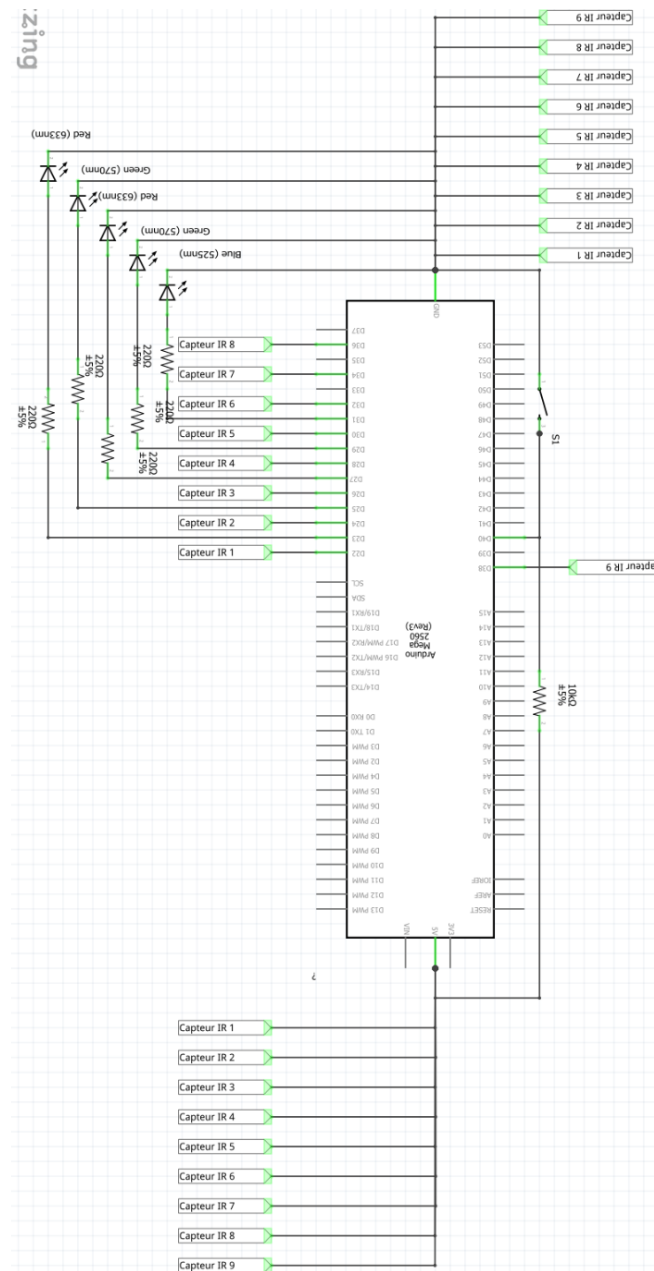At last, solder all GND wire together and all VCC wire together and connect all the wires to the Arduino board as shown on the scheme below:

Figure 19: Arduino board wiring