#ElectromakerKitsCompetition

By aRGiRob

This is the lamp that I thought, designed, created and assembled for the competition.

The main objective was to create a lamp that respected the competition criteria and at the same time was completely different from the original one. This for two simple reasons: I do not have an Arduino Nano and not even Neopixels and in this period it is difficult, here in Italy, to obtain non-essential items. I therefore opted to make a lamp by recycling as many pieces as possible, looking for the waste that, my goodness, I had not yet thrown in the bin.

A second objective was to be able to use the standard parts to assemble the lamp, for this you will find between the files to be printed two types of base, one specific for this version the other redesigned to accommodate the Arduino Nano and Neopixel.

This lamp, unlike the Electromaker one, does not foresee particular light effects (which are typical of Neopixels), however there are two light sections, one in the stem the other in the shade, in the stem it is possible, through the appropriate potentiometer, to adjust the intensity of the LEDs from completely off to completely lit; on the lampshade, on the other hand, it will be possible to adjust, always using the appropriate potentiometer, the flashing frequency of the LEDs. The switch turns off both effects.

Having said that, this is the materials list to build my personal mod of the lamp:

Recycled/recovered Material		
1	arduino uno	not a real recycling, a have one spare
1	USB	
2	potentiometers	disassembled from a broken toaster
1	switch	recovered years ago from an old desktop
20	white LEDs	recovered from an outdoor Christmas chain now unusable
a few meters	electrical wire	recovered from an old network cable whose connectors had broken
8	screws	various and unknown origins
some	PLA filament of various colors	residual of purchases made over the years
Non recycled/recovered Material		
	PLA	to print the base and the pieces of the lamp that are not visible from the outside (led holders)
some	DUPONT	male and female connectors to make the connections between the LEDs, the potentiometers, the switch and the Arduino
1	USB cable	to connect Arduino to the PC for programming and then to a power source for normal lamp operation
Others		
1	Welder & tin	everything has been soldered with tin including DUPONT connectors (I don't have the crimping tool)
1	PC	Needed to download the program to Arduino UNO
	Hot glue	to glue potentiometers and switch to the base
	Super glue	to glue the various parts of the lamp

The Design

Not being an expert designer I used Tinkercad to make the various parts of the lamp, below a brief description for each piece designed

Lamp Shade
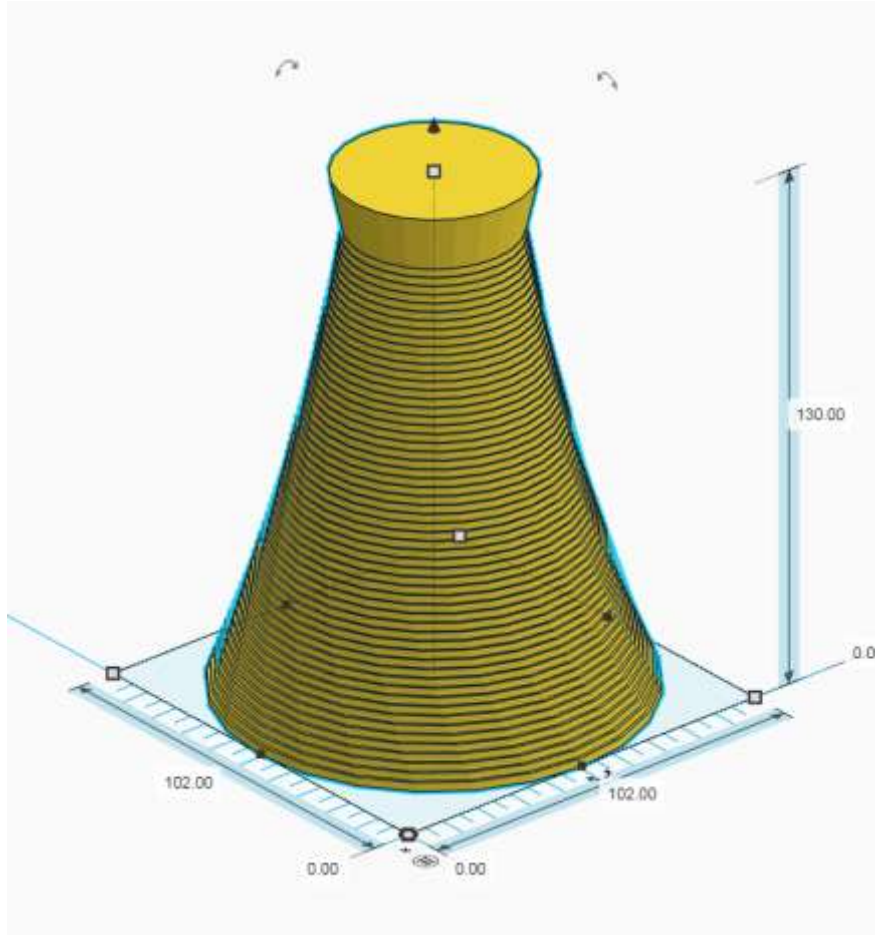
The solid id made up by 65 polygons of 24 sides 2mm high, superimposed and rotated 16 degrees with respect to the previous one, at the top, to connect with the rest of the lamp I positioned a cone, always with 24 sides.

It is not empty inside, for this reason, to print it, it will be necessary to set the slicer software appropriately. I use Cura and to print I used these settings:

2 bottom layers (for transparency);

0 top layers;

0% Infill (this will make your solid hollow);

3 perimeters (maybe 4 is better, but it will increase the printing time);

Lamp Stem
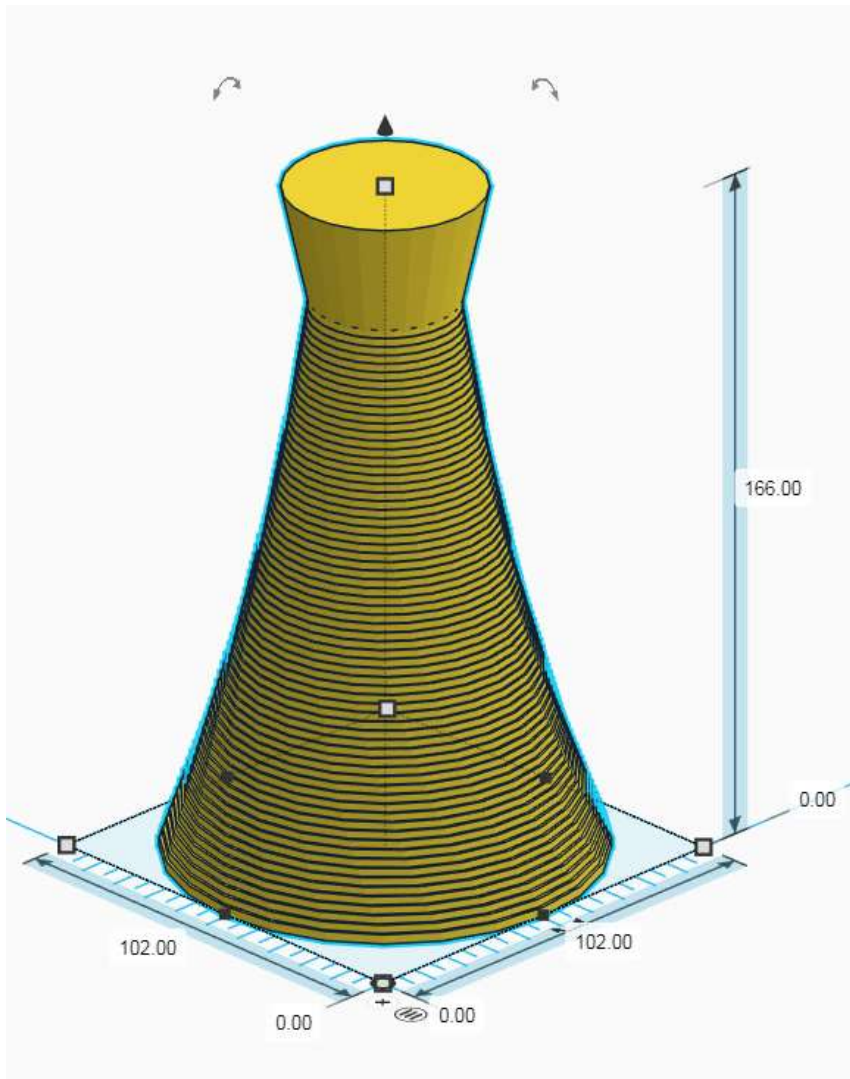
Same principle used to design the lampshade, but higher to respect the dimensions imposed by the competition.

I also used the same settings as for the shade for printing, with the following exception.

0 bottom layers;

Also note that the rotation of the polygons has been done in the same direction for both the shade and the stem in order to obtain an opposite wave effect between the two parts of the lamp since the shade will be mounted in the opposite way as it was designed and printed.

Led holders
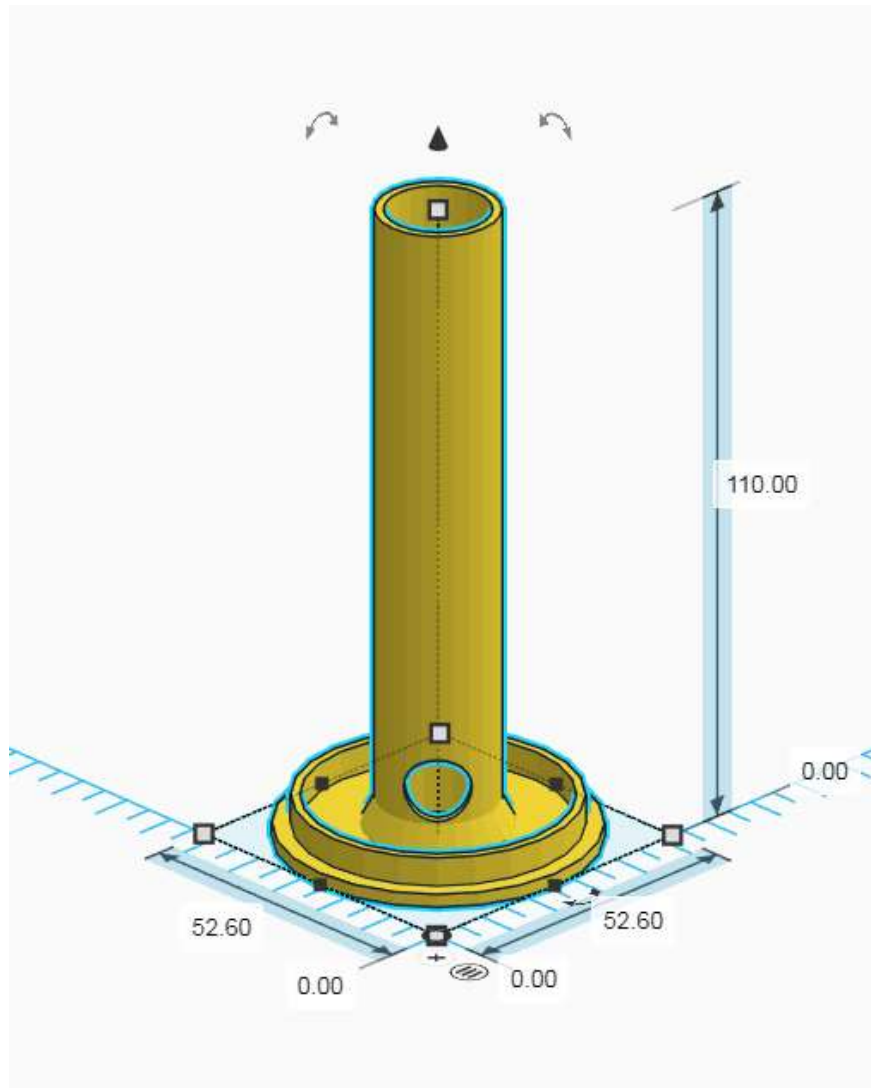
Also in this case, despite being almost completely hidden, the led holders have been designed with 24-sided polygons in order to be able to join with the shade and stem. You need to print two of them.

There are no particular settings for printing, since they don't have to be robust I chose to print them with 25% infill.

If you intend to print the Electromaker lamp these parts should not be printed, in their place the led holder that you find included in the kit should be printed.

Lamp Base
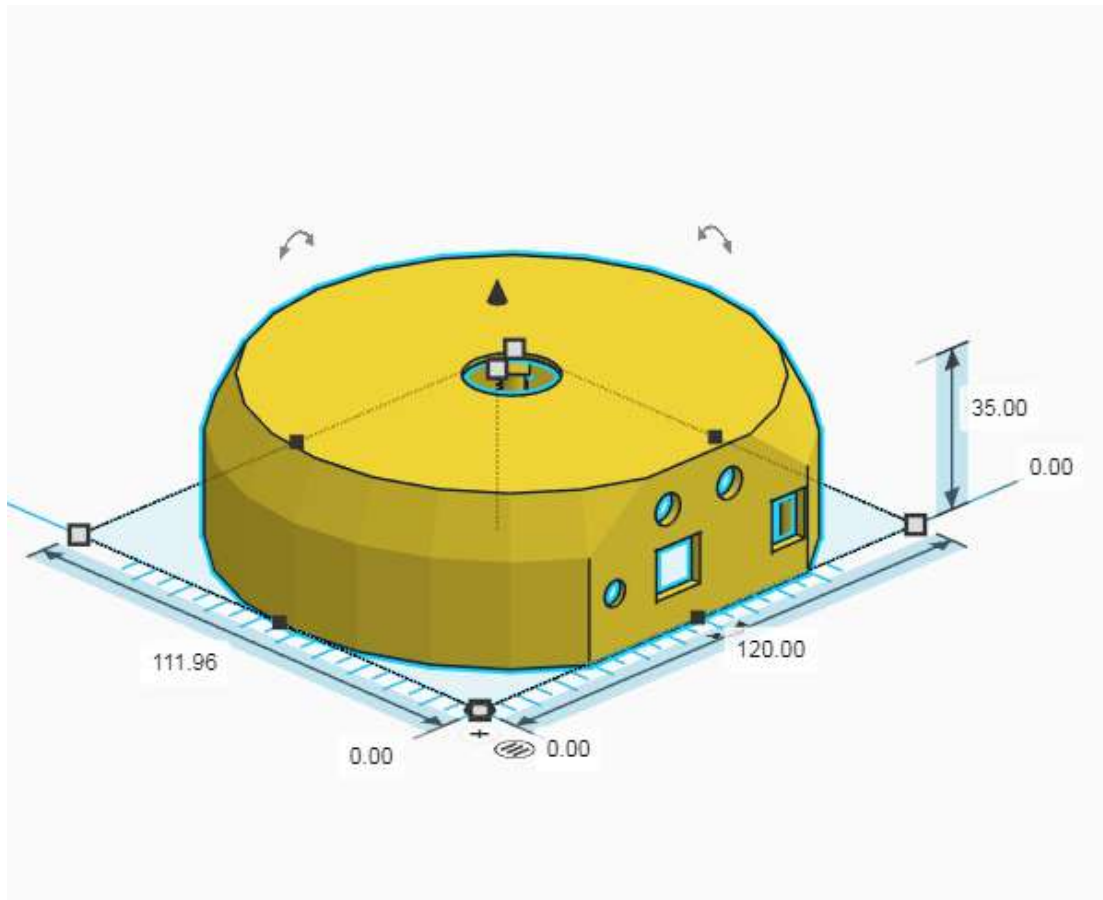
Again the 24-sided polygons theme, I had to redesign the base in order to install the Arduino UNO which is much more cumbersome than the Arduino Nano, In the back I made the holes to install the two potentiometers, the switch and the holes for the Arduino power outlets.

Print at 100% infill.

If you intend to print the Electromaker lamp these parts should not be printed, I have redesigned the standard base with the 24 polygons theme.
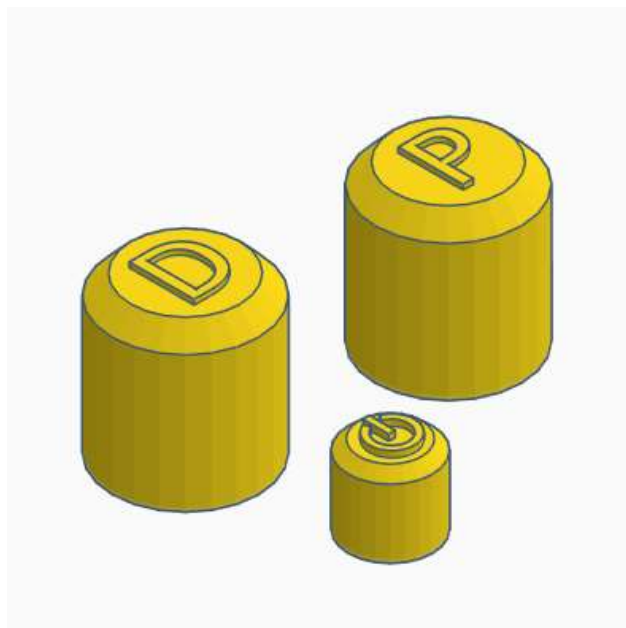
Lamp base Cover
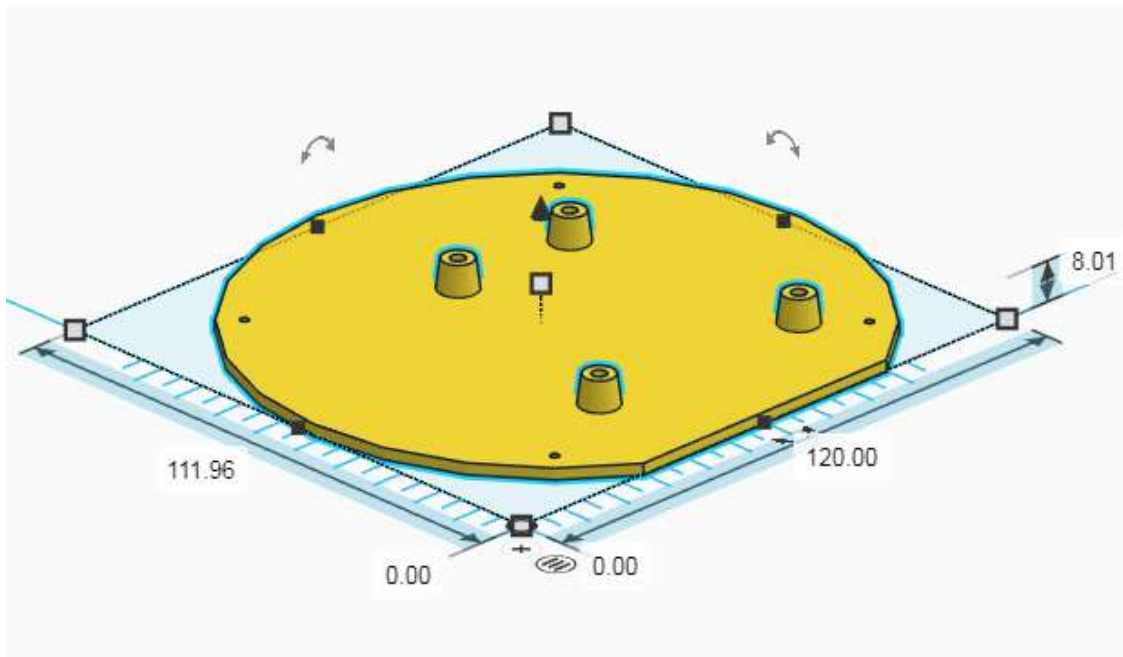
Unlike the standard lamp, this cover does not pop inside the base, in fact it is the same size. There are supports to be able to screw the Arduino UNO.

Print at 25% infill to minimize printing times.

If you intend to print the Electromaker lamp these parts should not be printed, I have redesigned the standard cover with the 24 polygons theme.

Potentiometer and switch cover

These are the three covers for the potentiometers and the switch, they are small parts so for printing I suggest 100% infill and 0.1 layer height.

Standard lamp base and cover
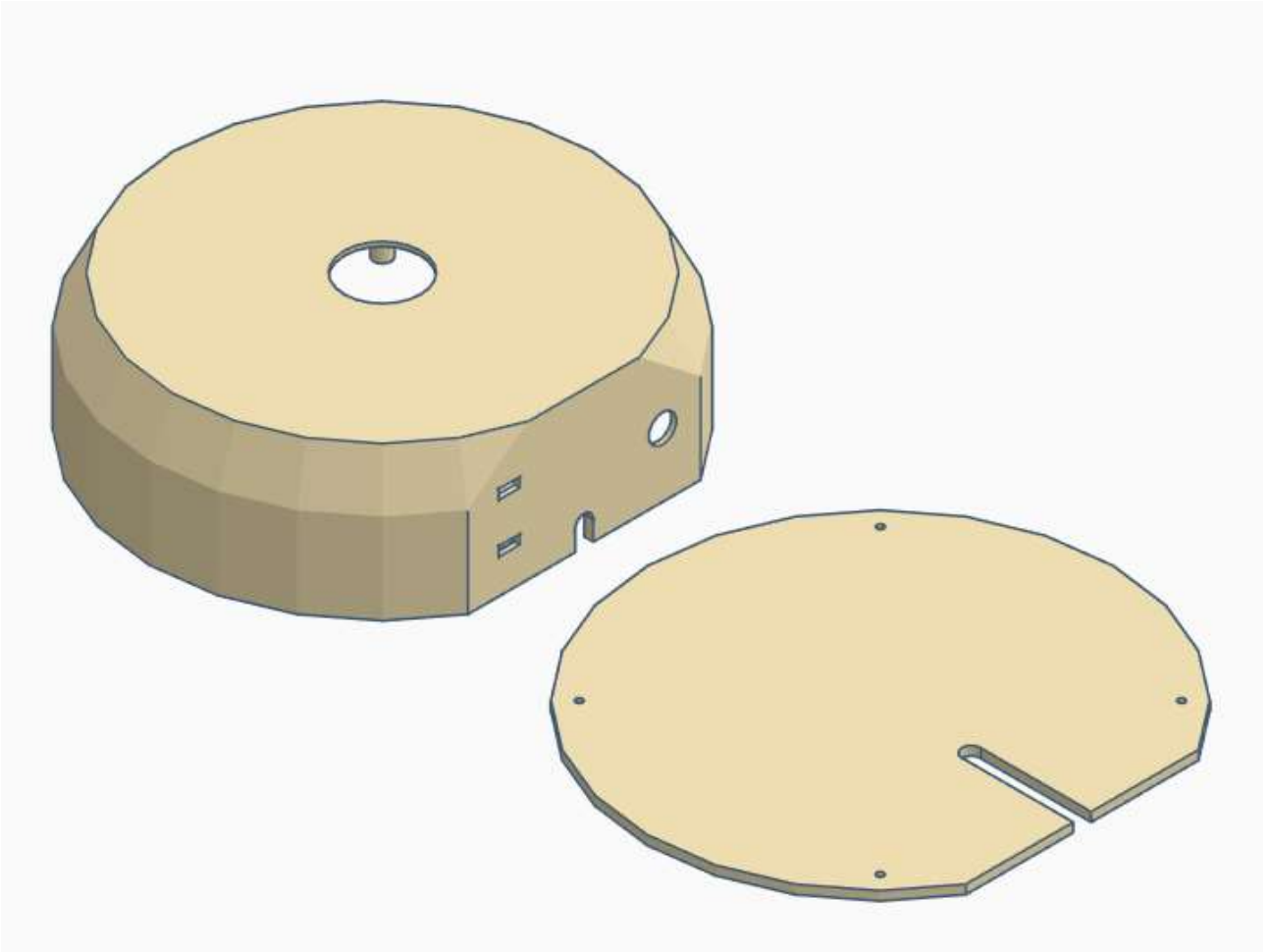
I have also redesigned these two parts in case you want to print the Electromaker lamp using the stem and the shade I designed; they are basically like those adapted for my lamp only with the holes of the base of the Electromaker lamp kit.

3D Printing

Below a series of photographs of some of the printed pieces.


Led Holder and Base
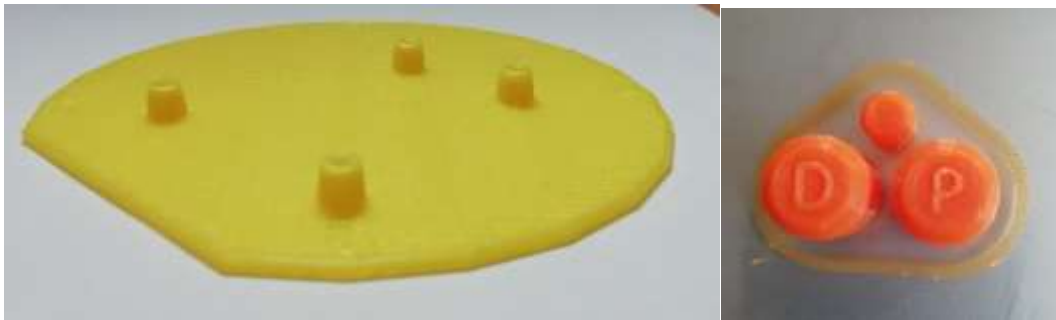
Base cover and potentiometer and switch cover

Lamp Shade

| Filename	Cura printing time (estimated)
lamp-stem.stl	PI3_lamp-stem 🖉 102.0 x 102.0 x 166.0 mm **02h 15min** 15.56m / ~ 52g
lamp-shade.stl	PI3_lamp-shade 🖉 102.0 x 102.0 x 130.0 mm **01h 57min** 13.50m / ~ 45g
lamp-base.stl	PI3_lamp-base 🖉 120.0 x 112.0 x 35.0 mm **02h 37min** 10.13m / ~ 34g
lamp-base-cover.stl	PI3_lamp-base-cover 🖉 120.0 x 112.0 x 8.0 mm **01h 26min** 6.84m / ~ 23g
lamp-led-holder.stl (2 pieces)	PI3_lamp-led-holder 🖉 107.9 x 54.5 x 110.0 mm **02h 53min** 9.66m / ~ 32g
lamp-switch-potentiometers-cover.stl	PI3_lamp-switch-potentiometers-cover 🖉 26.1 x 19.6 x 12.4 mm **00h 19min** 0.84m / ~ 3g

Assembly

Led chains
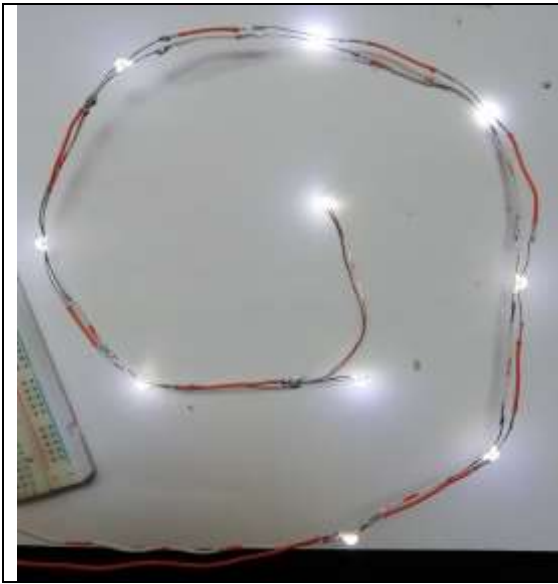
solder the LEDs in parallel to obtain a chain like the one in the figure on the left, leave at least 20 cm of wire at the end of the chain to allow connection to the Arduino pins, two of them must be created.

I only had 20 LEDs so I used 10 for each chain, obviously you can add as many as you want, the more you install the more light the lamp will do.
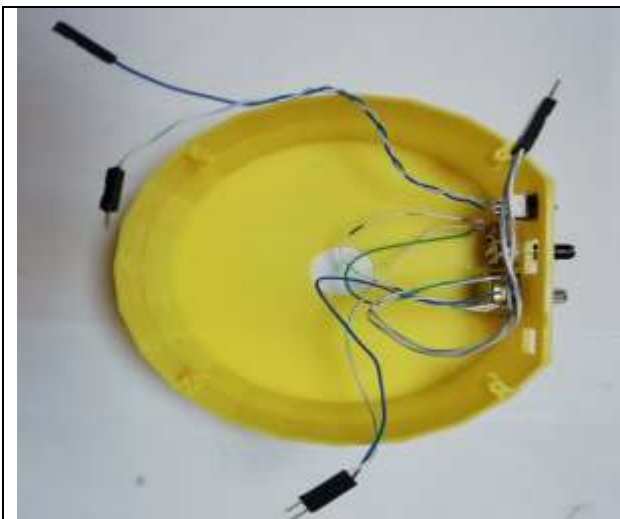
To connect the chains to the Arduino I used 3 male DUPONT connectors, led chains may have the anode or the cathode in common.

Base cover
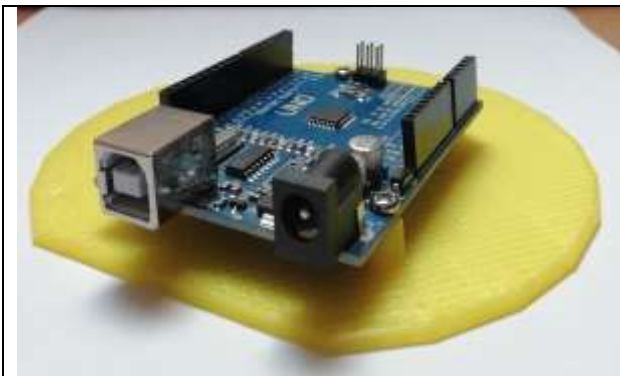
Screw the Arduino UNO to the base cover with 4 of the 8 screws.

Lamp base

solder the wires to the potentiometers and to the switch, and all of them with hot glue to the base. The potentiometers have three pins, the first and the third will have to be connected to the power supply and to the ground, it is better to connect them in parallel so as to bring only 4 wires to the Arduino.
To connect the pins to the Arduino I used DUPONT connectors, male for the 4 wires of the potentiometers, a male and a female for the switch as one of the two wires will connect to the LED chains.

Led holders
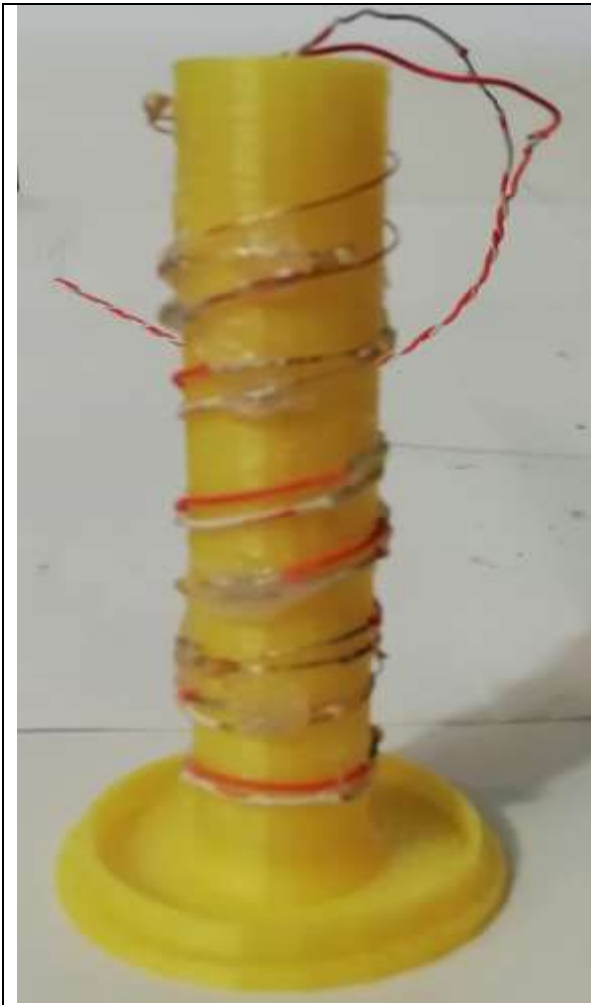
Twist the LED chain to the support and glue it with hot glue (I also tried other types of glue with bad results)

What you see in the picture is what will be inserted in the stem of the lamp, in fact the wires come out from above because this will have to be mounted upside down.

The other must be installed with the wires that come out of the bottom and then inserted in the second support.

the figure above shows the final assembly of the two holders, note the connection wires that both come out of the same side.
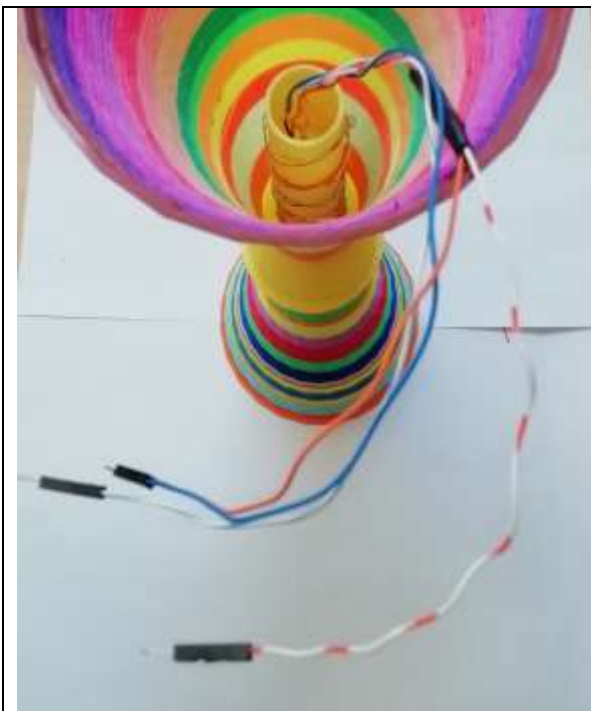

it is not yet time to assemble everything, I have inserted this photo here just to let you notice how the two supports and the wires of the LED chains must be installed

The blue and orange wire are the two cathodes/anodes of the LED chains connected together and soldered to a male DUPONT connector, these two wires will then be connected to the female DUPONT connector previously soldered to one of the two terminals of the switch. The other two wires will instead be connected to the Arduino pins.

Before moving on to final assembly, it must be checked that everything works

Testing

Refer to this schematic to assemble the various electronic parts. the complete drawing is included in the archive attached to the project, it was created with Fritzing.
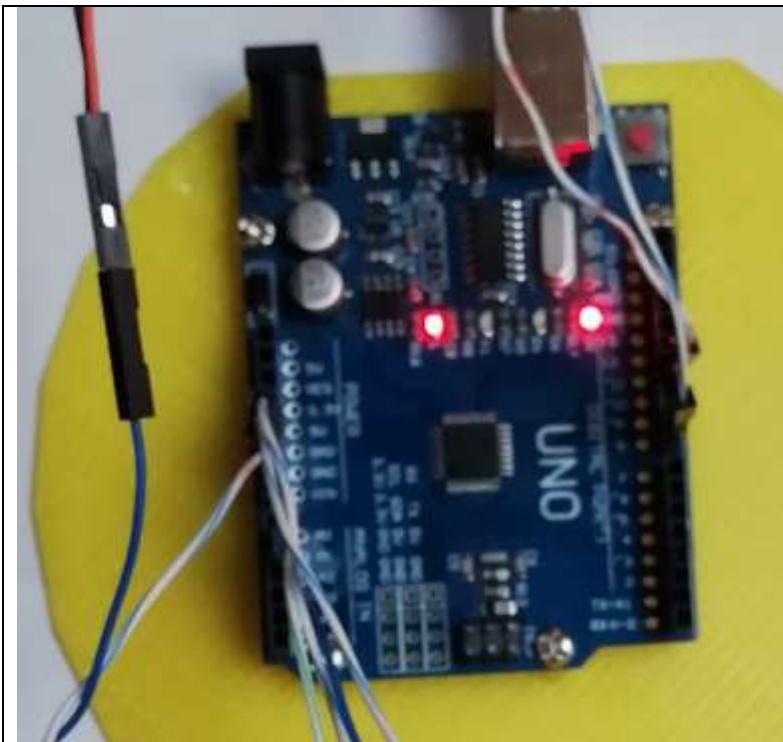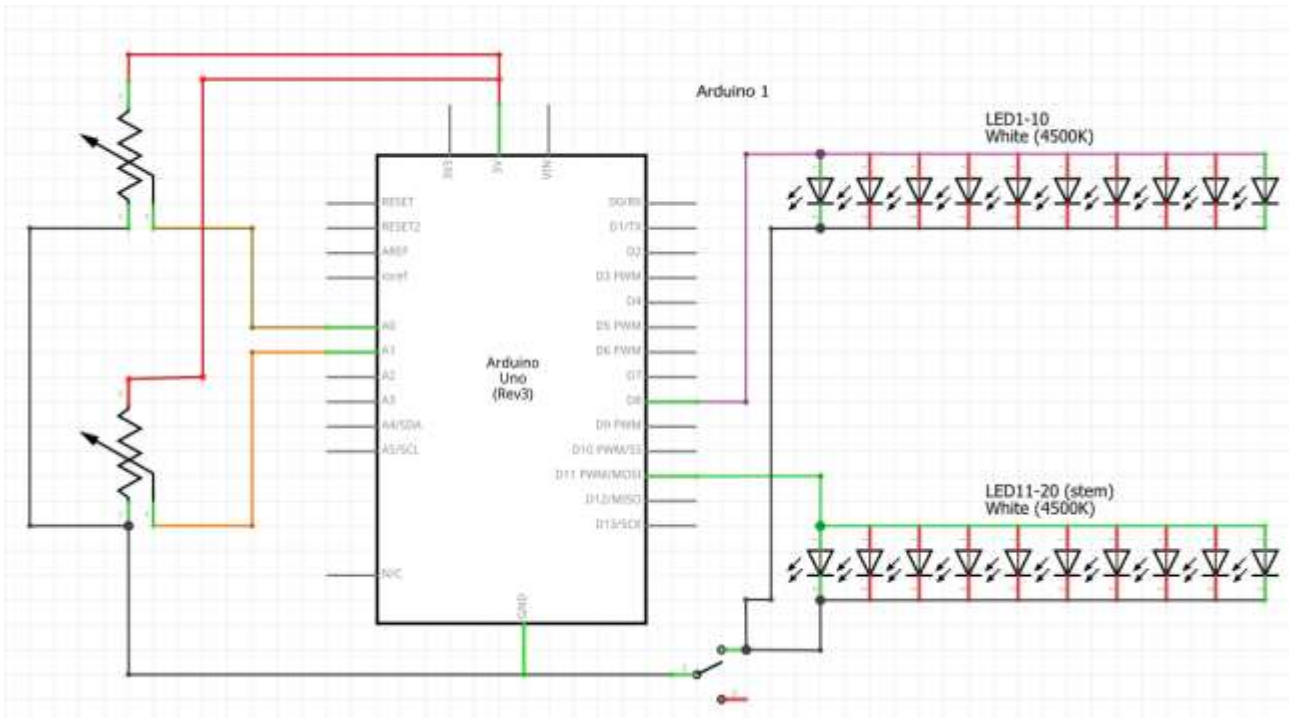

|	
	Connect the wire of the LED chain that will go into the lamp to Arduino's digital pin number 11. Connect the wire of the LED chain that will go into the lamp shade to Arduino's digital pin number 8. Connect the remaining wire of the LED chains to the wire with the female connector which is connected to the switch. Connect the remaining switch wire to one of the Arduino GND pins. Connect the two external terminals of the potentiometers one to the Arduino pin + 5v, the other to the Arduino GND pin.
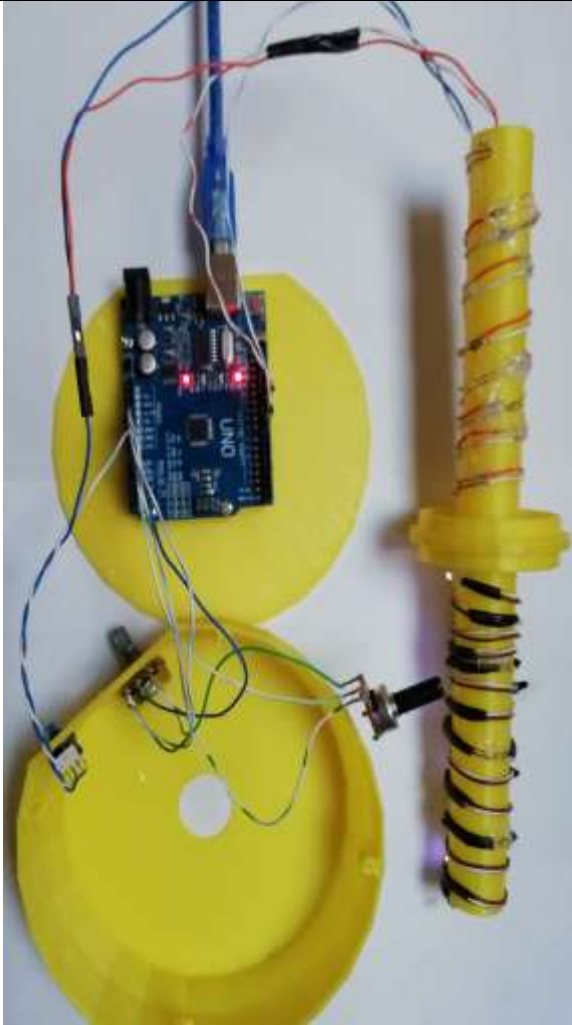
Connect Arduino to the PC and activate the Arduino IDE, open the sketch, which you find in the attached project file, compile it in to check that everything is OK and load it on the Arduino.
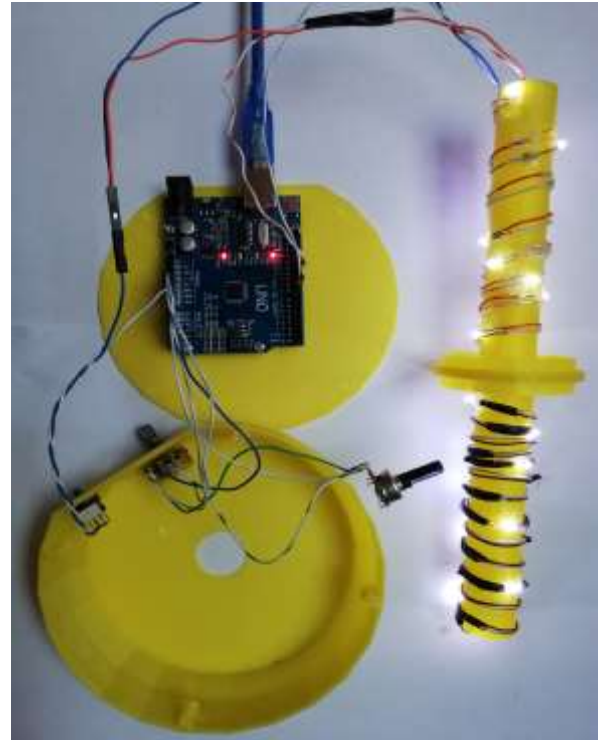
If everything works both chains of LEDs should light up. Not immediately though, first make sure that the switch is closed and then turn the potentiometers, they could be in the completely off position.

Once it is verified that the circuit does its duty, it is time to assemble the lamp.

Final assembling

First glue the two LED holders, be careful to match the sides of the polygons.

Then glue the holders to the shade, also in this case pay attention to the sides of the polygons, also pay attention to the fact that the wires of the LED chains (and consequently the holders) are mounted correctly, the figure on the left may help you.
Then glue the stem to the shade paying attention, again, to the sides of the polygons
The picture below is the final result.

Then glue the base to the lamp paying attention to the wires that will have to be inserted in the central hole.
Once the glue is dry you can connect the wires to Arduino as you have already done in the test phase.
Insert the base cover in the base and screw it with the remaining 4 screws.

At last glue the potentiometer and switch covers.

This is the final result