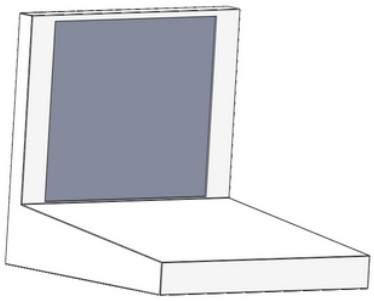
STEP 5 - BUILDING THE PROTOTYPE

For the prototype, we wanted to design a support that would allow us to hold the computer screen (we used a touch screen computer that could be folded 360 degrees) with the robot program incorporated, while at the same time having the robot controls all in the same object, imitating a bit the old videogame machines. That is why the support consists of two parts: the carcass and the part of the commands. For the first part, we used a 4mm thick MDF board to build it. This would not only have a specific space to place the screen, but also to store the different components needed to operate the robot.

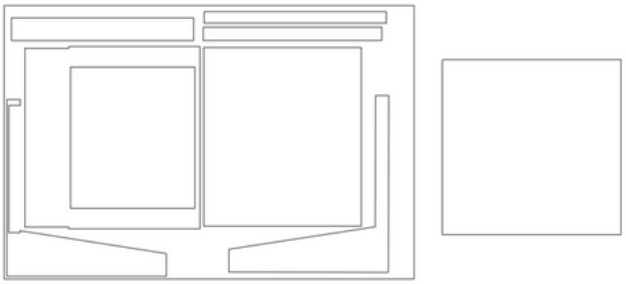
1

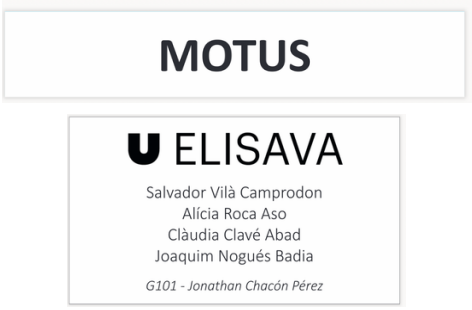
First, we made an initial sketch based on the components we were going to use in order to know the space we needed in total. From here, we detailed the measurements using a 3D model made with SolidWorks software, to adjust the proportions and dimensions of the box.



2

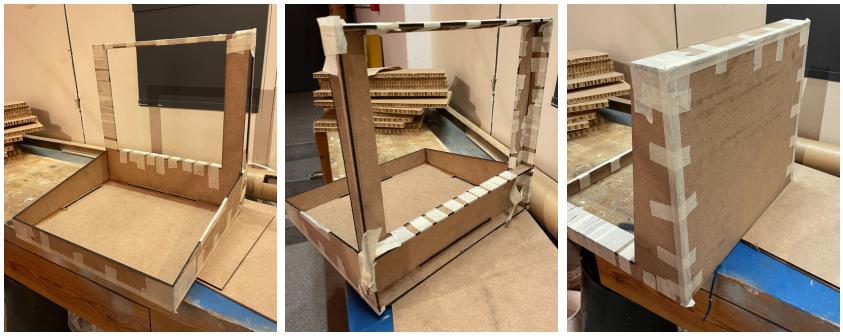
Once we have validated the 3D, we draw in AutoCad the parts we will need to build the box. Then, we placed them in the dimensions of the MDF board and cut them with the laser. To do this, we have tried to optimize the space between pieces as much as possible to avoid wasting wood. We have also cut a piece with the name of the robotic arm (Motus) laser engraved and a small card with the names of the team members.





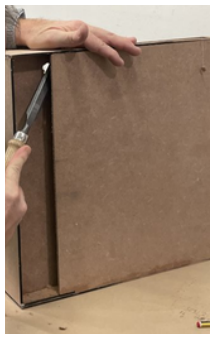
3

Once cut, we check with masking tape that everything fits and then proceed to join all the pieces with white glue. It is important to note that the design of the structure has left an opening in the back to pass the two power cables.



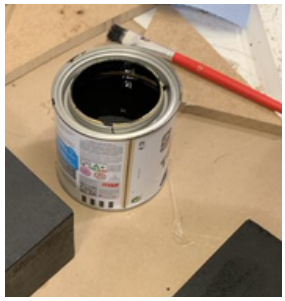
4

Let the glue dry for at least 24 hours and remove all the masking tape that was used to join it. We clean the glue residue and rub the edges to round them. We have also glued some strips at the base of the structure to hold the interactive panel.



5

We paint a first layer with black paint and after 24 hours we apply the second layer with a paint roller and brush.

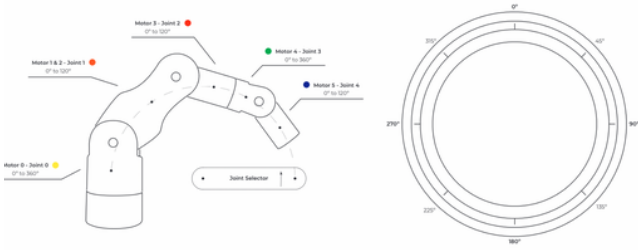


6

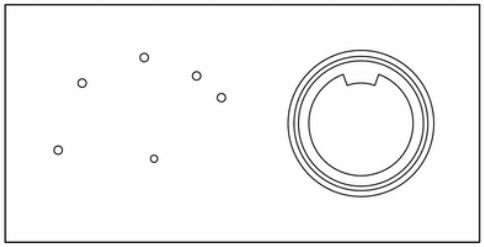
Our design allows the interactive panel to be placed on top of the structure without the need for screws or glue, since it is already in place and can be disassembled. To finish the structure we place the laser engraved card with the names of the group members. The structure is now ready and the next step is to build the interactive panel and the electronics.

7

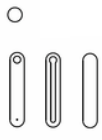
To design the interactive panel in 2D, the first step was to take an image of the Motus robot and use Illustrator software to draw its outline. To laser cut it, this drawing was transferred to the Autocad program. Then, the rest of the panel was designed. This consists of 4 aligned layers of MDF: in the external one there is the drawing of the robot, the circular hole for the paint with the engraved angles, 5 small holes to stick the pins, the names of each arm of the robot and how many degrees they can rotate, 5 circular holes of 4mm to put the diffusers of the leds and 1 circular hole to pass the axis of the selector arm; in the second layer there are 5 circular holes of 3mm to hold the diffusers of the leds and the continuation of all the holes of the external layer; the third and fourth layers are the same as the second.



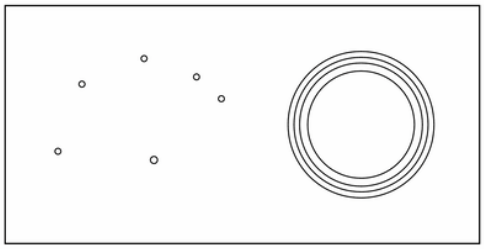
External layer



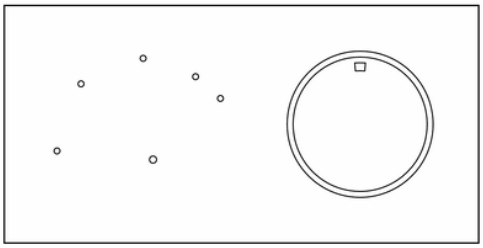
Second layer



Selector arm



Third layer



Fourth layer

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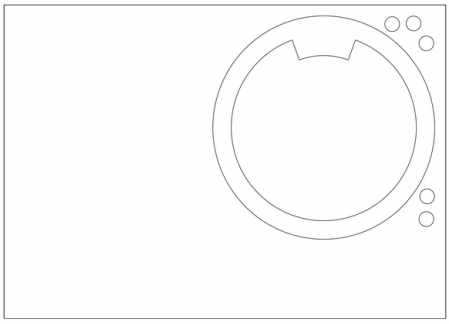
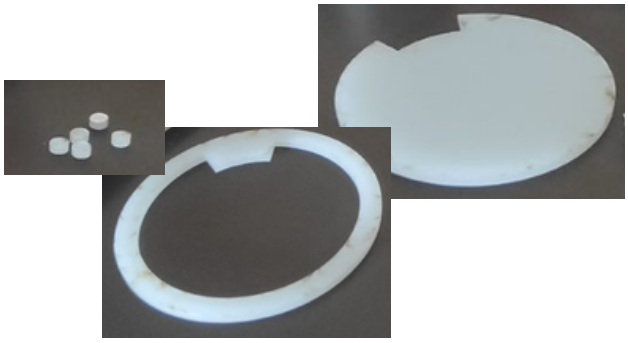
Once the four panels were laser cut and engraved, they were glued one on top of the other with white glue.

9

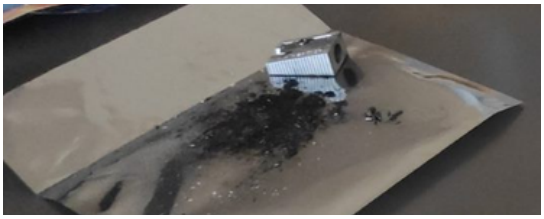
The last part to be laser cut are the led diffusers (4mm diameter circles) and the led circle diffuser (a circle 2mm wider than the led circle, where we will put the paint) with the internal hole. The material selected is methacrylate and specifically with a translucent finish to act as a diffuser.





10

The next step was to make the electrically conductive paint by mixing 4 drops of water, 1/4 pencil (crushed graphite with the pencil sharpener) and black acrylic paint (3 drops).

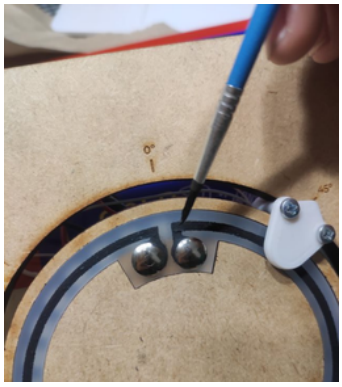


11

To paint a circle of paint accurately we laser cut the shape of the circle in vinyl which is adhesive. To paint the circle we hooked the vinyl on the methacrylate, let it dry for 2 hours, made a second layer, let it dry again and unhooked it.

12

Then, making two holes with a drill, we stick the two pins into the ends of the paint circle (the circle should not be closed, as there should be more potential at one end than at the other). Then we paint a line from the circle to the pins with the same paint as the circle.

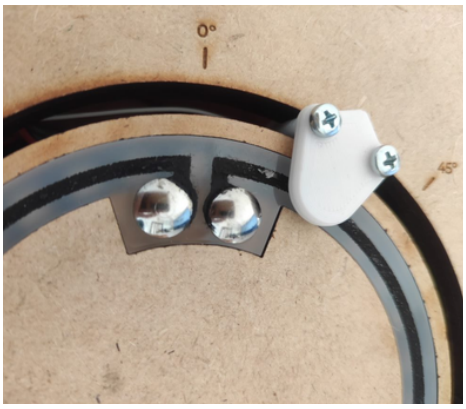


13

Then, we superglue the methacrylate diffusers to the outer panel (the 5 LEDs and the circle).

14

The next step was to design and print the 3D part that will move the pin through the circle, i.e. the wire that will feel the difference in potential. It is important that it is made of a non-conductive material such as plastic, so that it does not transmit current when touched. The design has been made with Solidworks and once printed, the drawing pin has been added at the bottom and a wire has been soldered to it. The piece is formed by two parts joined with two screws to be able to disassemble it.



15

Next, the 5 pins that go on top of the drawing of each arm of the robot were nailed. The panel was finished, now we proceeded to install the electronics.