Concordia University

ARTIFACT

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Insight and future development:

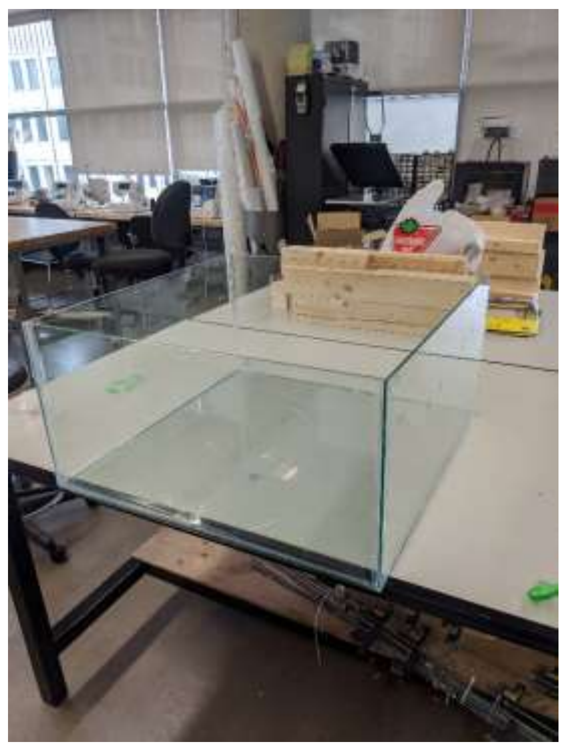
The project consisted of creating an installation allowing users to control and move water using their breathing and humming. The installation has meditative purposes. Participants are allowed to enter a space where they can view themselves and their actions from a different perspective. Water is the main material used in the installation. It is a material that has incredible freedom of movement that propagates through space and ripples through time. Participants are thus allowed to explore that freedom. Additionally, water has been symbolically associated to life. The water tank acts thus as a mirror to the participant, hinting to how they're allowed a freedom of movement and a freedom of action as well. Since movement of the water is actioned by the participant's breathing and humming, it allows the participant to focus on those, which strengthens the meditative experience. Breathing and producing noise are a human's first sign of liveliness, which in turn is the source and fuel of their action. The installation is thus a visual reminder of those. It is inspired of the concept of cymatics, the study of visual representation of sound and vibration. Water has also been symbolically associated with the concept of portals from reality to reality. By entering the dark room in which the installation will be in, participants enter a new microcosm. Since lights will be shining on the surface of the water, reflections of the light will fill the room. Since the entire environment is influenced by the actions of the water and the actions of the participant, the later is allowed to detach themselves from their everyday world and focus on themselves. If desired, a participant may want to bring another one into the space and both can influence the movement of the water. Being social beings, a relationship between users has a strong impact on their respective course of action. An element of play is thus also introduced.

Communicating the concept above has been proven difficult. Though the idea is clear in my mind, making it explicit to other users required further exploration. Additionally, the crafted experience has no progression or storytelling. Thus, supplemental functionalities should be implemented. For example, the lights in the room could be very dim when one first enters it. One then begins their interaction with the tank by creating waves, once the waves have high enough and a certain threshold water movement is achieved, the lights may turn on and start projecting the caustics. In this manner, the experience has an end goal. Another problematic was the use of the mask. Discussing my idea with classmates, many pointed out that the mask conveys concepts of toxicity and disease, which is undesirable for the experience. Additionally, by testing out the mask, I found myself running out of breath quite quickly. Thus, it would be preferable for the microphone and pressure sensor that were embedded in the mask to be used in a different manner. For example, they could be put inside a small container that one holds in their hand and can bring up to their mouth to either blow or hum into it. This way, the user can interact with the installation at their leisure, instead of being obliged to attach a foreign object to their face. The sensors can also be attached to the tank itself. If the user desires to interact with the tank, the natural behavior would be to approach it, and thus be detected by the sensors.

Apart from conceptual improvements, some technical ones could be implemented as well. The placement of the motor and its connection to the paddle can be changed as to hide the motor out of sight. Hiding the motor will improve the illusion that the paddle movement is controlled by ones breathing, rather than by a motor that turns on and off. The LED strip used to illuminate the tank was not capable of producing caustic patterns onto the walls and ceiling. It has been found that one strong light source, resembling the flashlight of a cellphone, was much more successful at the task. Using those types of light sources would be therefore preferable. The pressure sensor used in the mask required quite heavy breathing to detect a significant change. This could be tedious to the user. Perhaps, combining the use of the pressure sensor with the humidity sensor and temperature sensor to detect breathing would lower that threshold. Next, the tank was made square, but a more organic shape would have been preferred since it needs to mirror the user. The tank could possibly be more circular or rounded. Finally, the transducer used was not capable of creating enough movement to displace the water. The solution would be either to use a bigger transducer or to perhaps user subwoofers. Another idea could be to submerge vaporizers into the water. This would not only create ripples in the water, but can also create vapor, a material allowing another level of interactivity since it can be moved with one’s breath or hands.

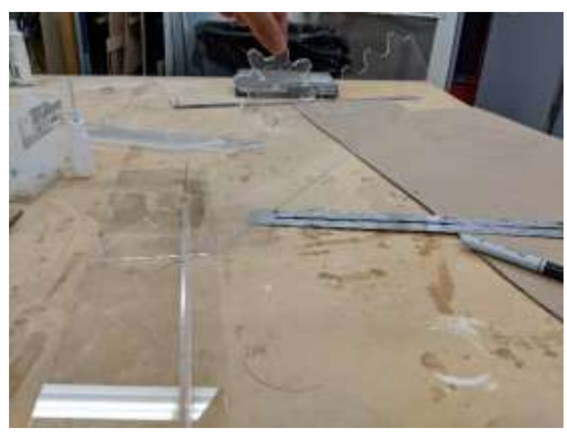
Research process

The body of the water tank was needed to be made with organic or natural materials as to better mirror the live being using it. Additionally, those materials would be reusable or biodegradable materials to minimize the installation's environmental footprint. Thus, glass was chosen for the container itself, and wood was chosen for the frame that will support it. With research, I've discovered that there are two types of commonly used glass: tempered and untampered. Only untampered glass can be cut to size. Calling glass cutting companies confirmed so as well. Though different sources of glass were explored, the one used was found on *Kijiji*, a small-ads website. This not only meant that the glass used in this project is repurposed, but it also brought the costs down. The drawback is that very limited dimensions were offered. Fabricating an octagonal or hexagonal glass tank meant that either I needed to find a hexagonal piece of tempered glass, either I needed to find an untampered square piece big enough to cut into a hexagon. Neither of those options came up. Thus, I decided to keep the tank square. The first piece of glass bought was a tempered square of 24 inches wide and tall, which became the bottom of the tank. Additional two pieces of untampered glass of 48 inches by 12 inches each were bought and cut in half to make four 24*12inch pieces which will serve as side walls. To bind the pieces together, silicon was considered. Ideally, the silicon to be used would have been one that is safe for aquariums, since the tank could be repurposed to make one. However, finding aquarium-safe glass-binding compounds proved to be difficult. Thus, silicon designed for kitchens and baths was used. To assemble the tank, an online video tutorial by *The King of DIY* was followed[1].



[1] "HOW TO: Build A Glass Aquarium TUTORIAL." *Youtube*, Youtube, 11 May 2012, https://www.youtube.com/watch?v=HSKIT2OLOYQ.

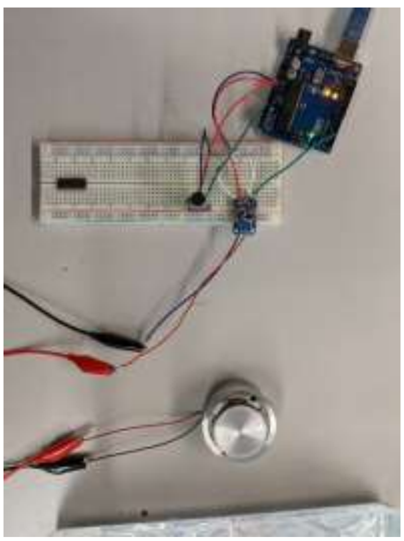
There are multiple sources of wood that were considered, such as the Concordia University Center for Creative Reuse. The wood pieces needed to be strong enough to support the weight of both the glass and the water that will be in it. The wood that suited the project the best was found at a hardware store. It consisted of pine wood pre-cut into 4 by 4 inch by 8 feet beams. The wood was untreated and soft. Cutting it and staining it into my desired color was thus much easier. Following the directions of the technicians of Concordia's Fabrication Shop, the pine wood was cut with either a hand saw or a table saw. Indentations that fit the corners of the glass tank were carved out with a chisel and mallet. Multiple ways of assembling the frame were thought of. It needed to be robust enough to support multiple gallons of water. Once a configuration was chosen, different techniques of attaching the pieces were explored. Attachment could be either done with dowels, nails or brackets. Brackets were the preferred choice since they would not split the pine wood as much as the other options. Wood glue was used to strengthen the structure.

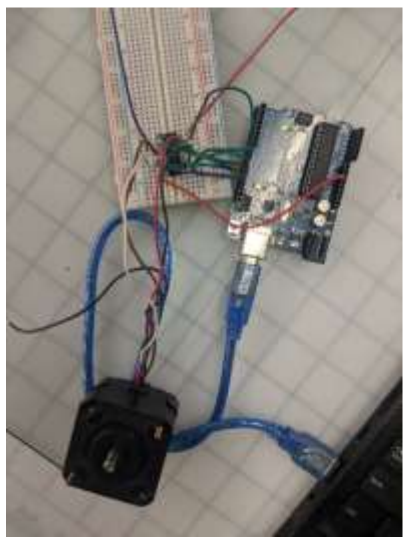


For the paddle that moved the water, plexiglass was chosen for its transparency, since it needed to be unnoticeable by the user, and ease of use, since a rack and pinion mechanism needed to be cut out of it. The rack and pinion mechanism was first conceived on the *Woodgears*[2] website and then translated into Adobe Illustrator. The mechanism and paddle were cut with a laser cutter and assembled using methylene chloride, as per the directions of the technicians at Concordia's Digifab.

[2] Gear Generator. Woodgears, https://woodgears.ca/gear_cutting/template.html.

Different stepper motors were tested during the conception of the mid-fidelity prototype. The stepper motor needs to be able to lift a significant amount of plexiglass. The one used is a NEMA 23HS30 stepper motor, combined with a driver. The assembly between the motor and driver was done following the motor's datasheet[3] and online videos[4] [5]. The pressure sensor used was a BMP085, the wiring and quick start tutorial of which were found on *Sparkfun's* website[6]. Attempts at using a more recent generation of the BMP sensor were made, though not successful. Finally, a 12 volts strip of LEDs was acquired to be installed on the perimeter of the tank. The color chosen was Warm White, as to imitate sunlight and lead the installation towards more of a natural experience rather than a sterile one. The LEDs were of type 2835, less bright than those of type 5050, since the light was meant to remain low to maintain some darkness in the room.





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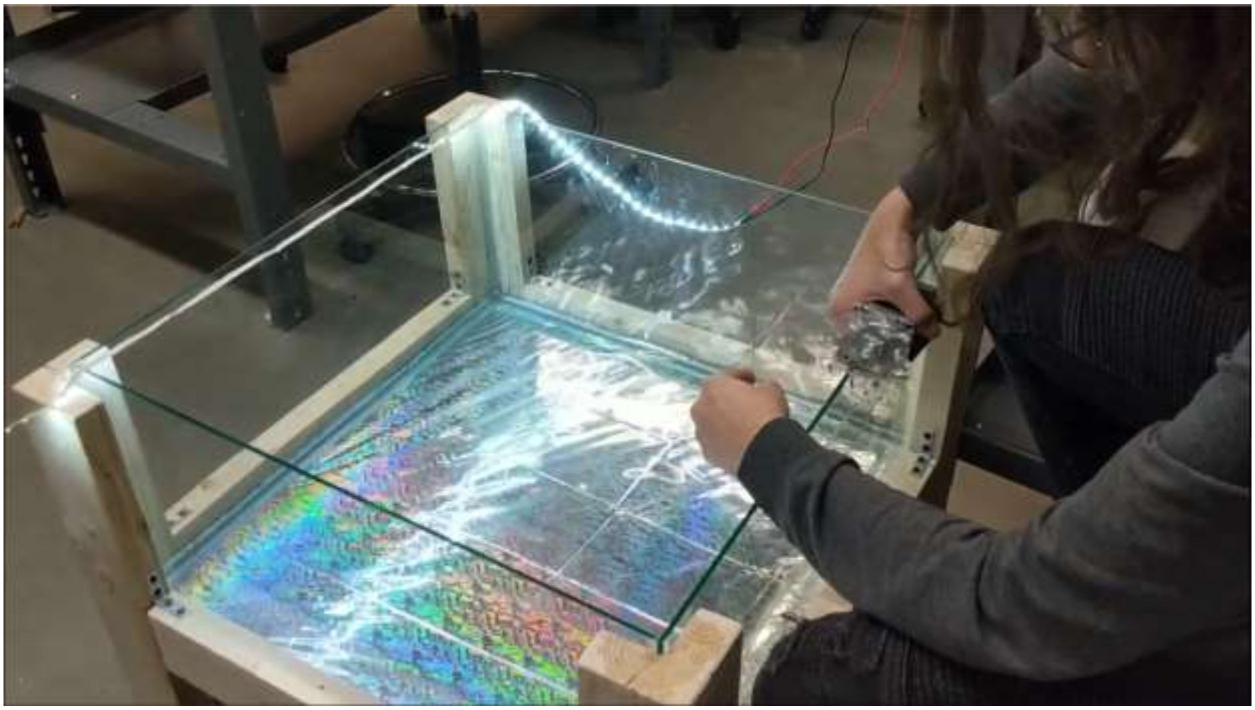
[3] "Stepper Motor 23HS30-2804s." *Oyostepper*, https://www.oyostepper.com/images/upload/File/23HS30-2804S.pdf.

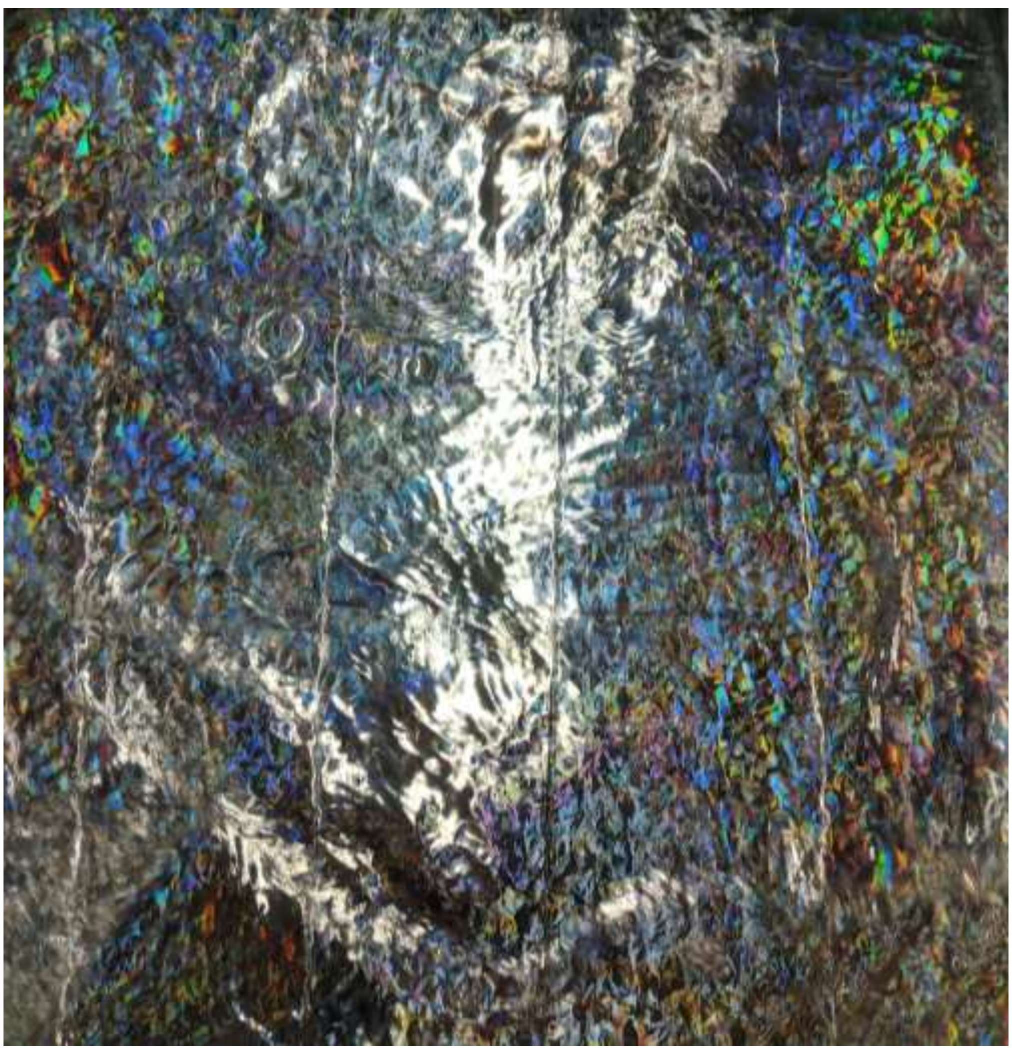
[4] "HY-DIV268N-5A Stepper Motor NEMA 23 with Arduino Mega ." *Youtube*, Youtube, 2 Nov. 2018, https://www.youtube.com/watch?v=PZbc-IgfDa8.

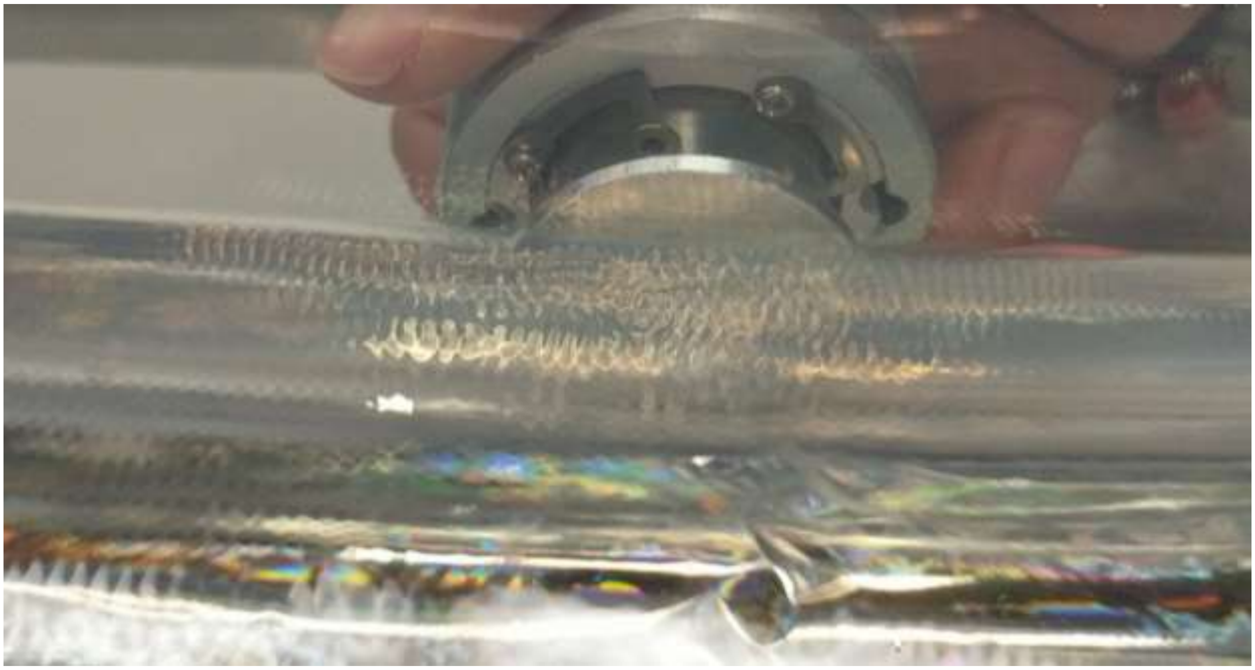
[5] "Big Stepper Motors with Arduino." *Youtube*, Youtube, 25 May 2019, https://www.youtube.com/watch?v=iY_4YOlpqyI.

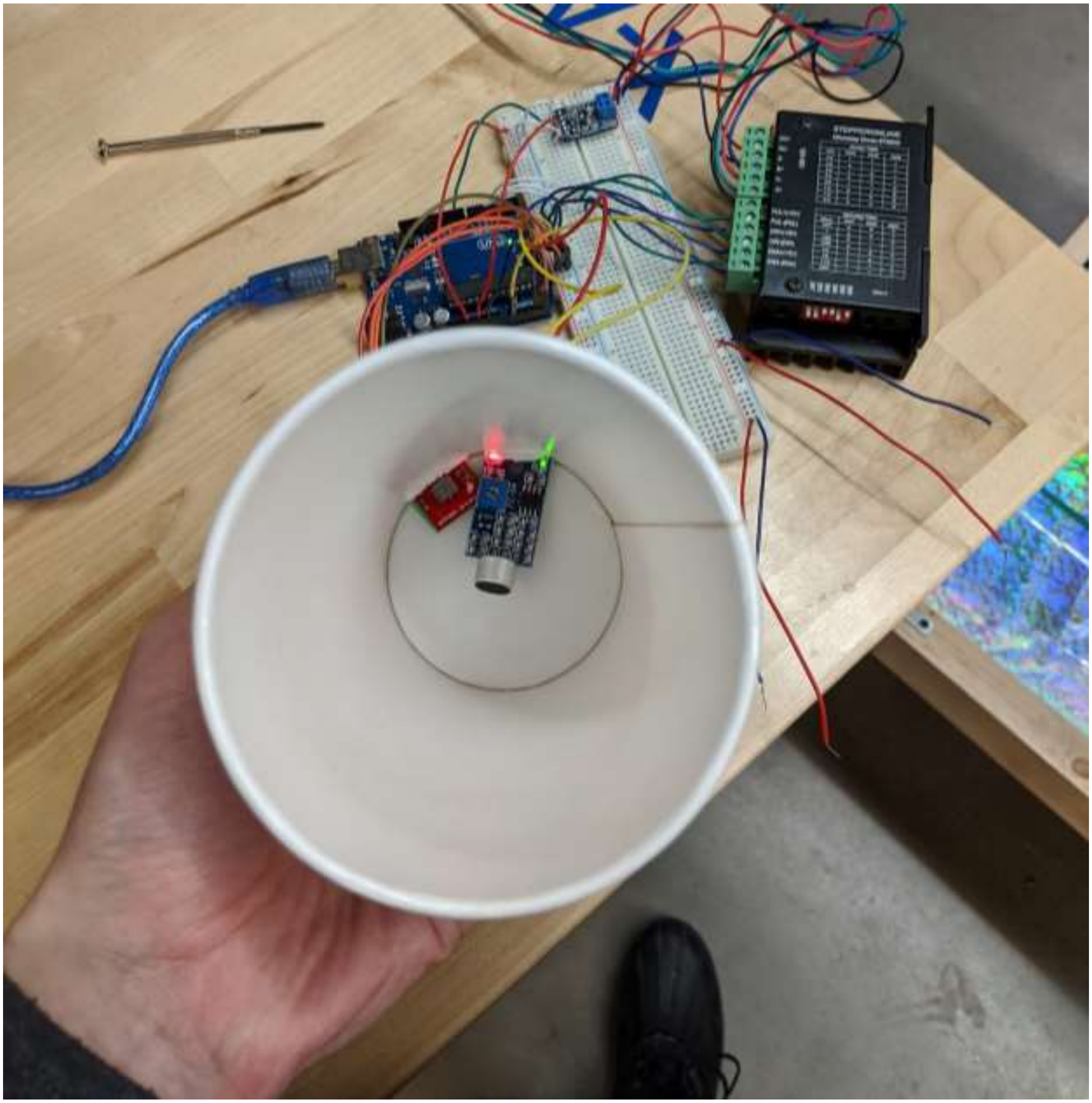
[6] "BMP085 Barometric Pressure Sensor Quickstart." *Sparkfun*, 21 Jan. 2011, https://www.sparkfun.com/tutorials/253.

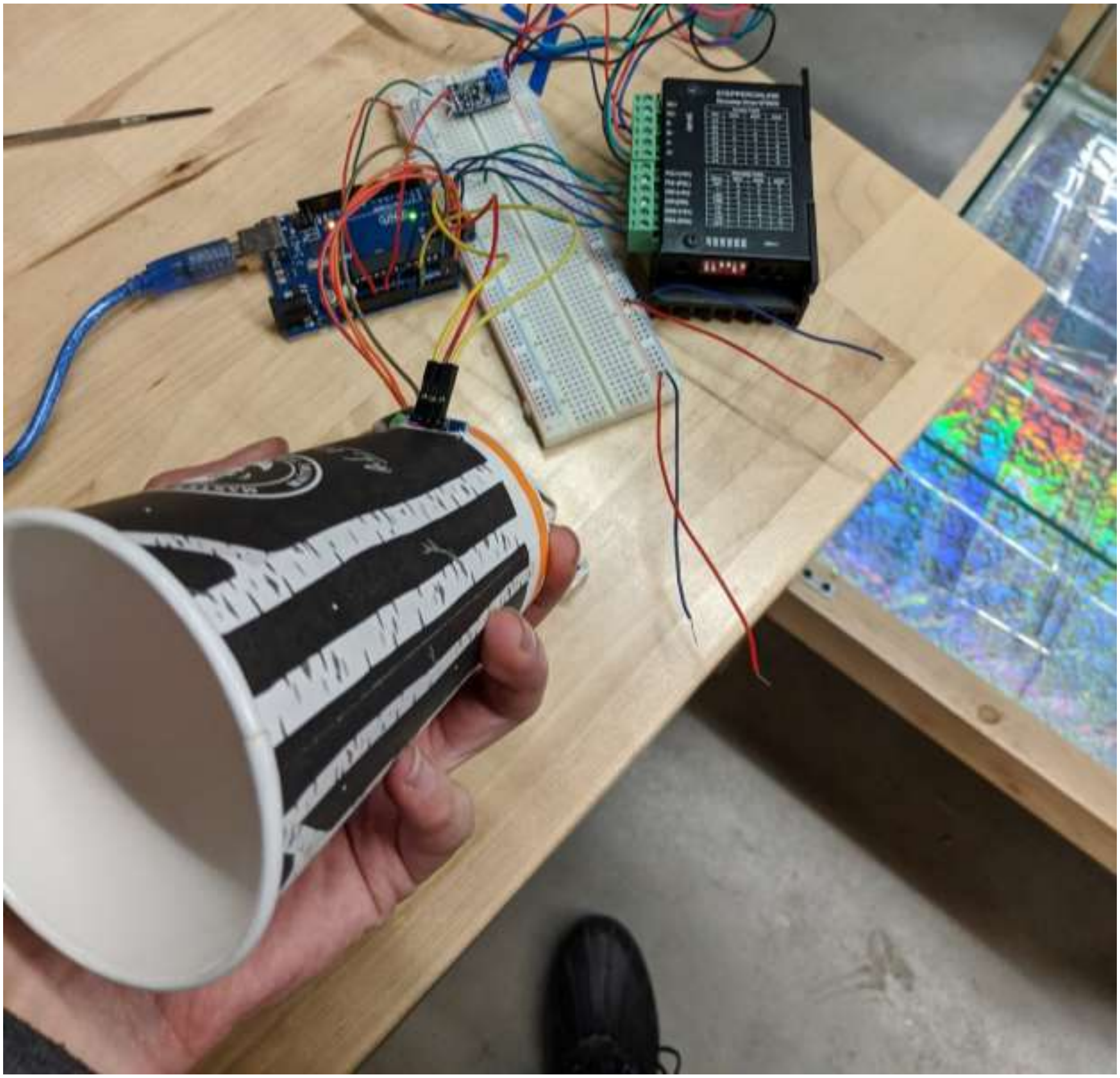
Photos of the final project

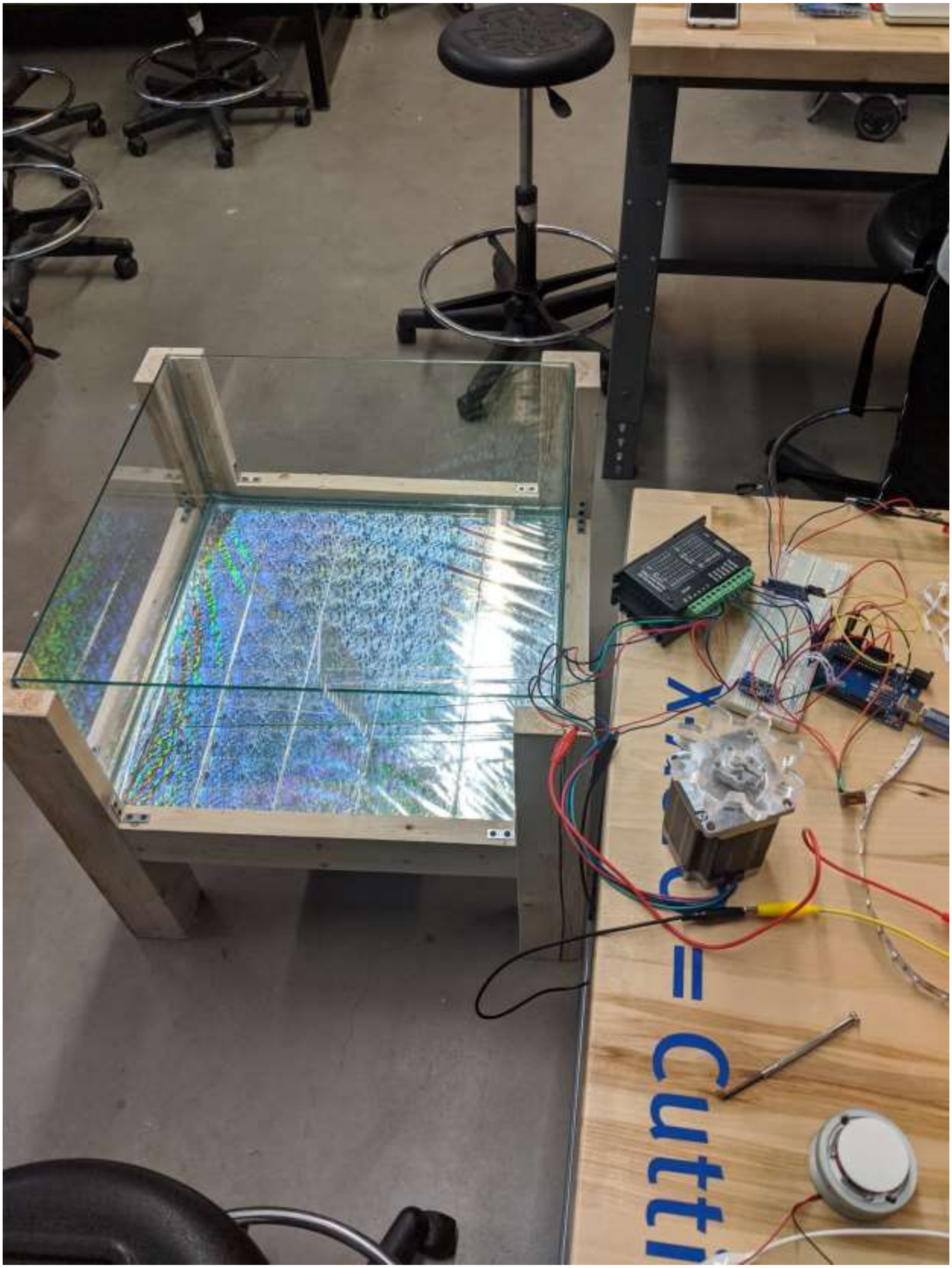












References

"Big Stepper Motors with Arduino." *Youtube*, Youtube, 25 May 2019, https://www.youtube.com/watch?v=iY_4YOlpqyI.

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