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CART-360

Owly Progress Report

For the prototype progress report, I have only been able to create a medium-fidelity prototype. Although I would have liked to have presented a high-fidelity prototype, I was unable to due to shipping issues with one of the pieces required to help produce the sounds. As of now, the 3D model of Owly has successfully been printed and the pixel jewel is programmed to light up when a user touches the capacitive sensor attached (see figure 1)

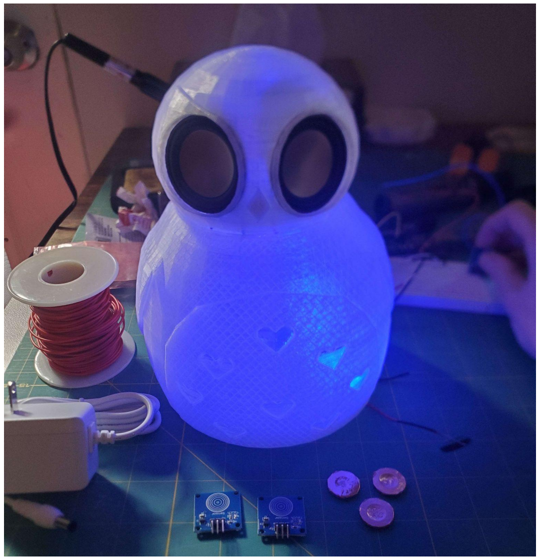

Figure 1. Medium Fidelity prototype with remaining components excluding Arduino FX sound board and 2x2W AMPS.

3D Printing

I purposely designed Owly to be a simple model that would be considered friendly for children and also to simplify the printing process. I have only ever printed simple smaller models, and Owly was my first time experimenting with modeling something on a larger scale that is also hollow.
On paper, I originally planned to model Owly with the dimensions of 25cm(L)x20cm(W)x20cm(H). However, once viewing the overall shape and adjusting the model shape to my preference, the overall dimension became 16.5(L)x14cm(W)x19(H). I also had to make sure that the eyes were the exact size of the speakers for a snug fit, as well as the copper extensions of the capacitive sensors (see figure 2). Initially, I aimed to model Owly as one whole piece. During the first print, it became evident that this was not ideal because the neck part of the structure was too thin causing the head to fall off mid-print. Due to it breaking, I was able to notice some issues with my model. I believe that because I used a series of cylinder booleans to create the eye holes, the program Ultimaker had a hard time recognizing certain faces and vertices, resulting in uneven rims (see figure 3). This became an opportunity to re-model the head and use sphere booleans to produce a better structure model for printing. On the other hand, the body portion printed smoothly for the most part. Some areas of the body, like a few of the hearts, are not as clean as I would have liked.

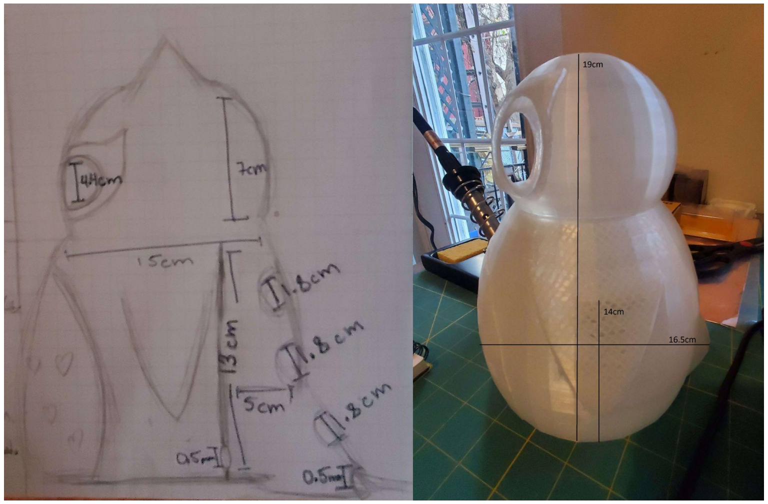

Figure 1. Left: sketched design and measurements. Right: final form and measurements.

I also designed a base for the bottom of Owly. This base has a wall that will be used to hide the breadboard and all of the components. This idea won't work as well as I thought because I decided to go with a frosty PLA for printing. When experimenting with flashlights, I found that the shadows of the components would be too visible, making Owly slightly terrifying. Instead, I will remodel the base so that it elevates Owly and will act as a compartment on its own. This way, there will be few wires that will be apparent when the artifact is lit up.

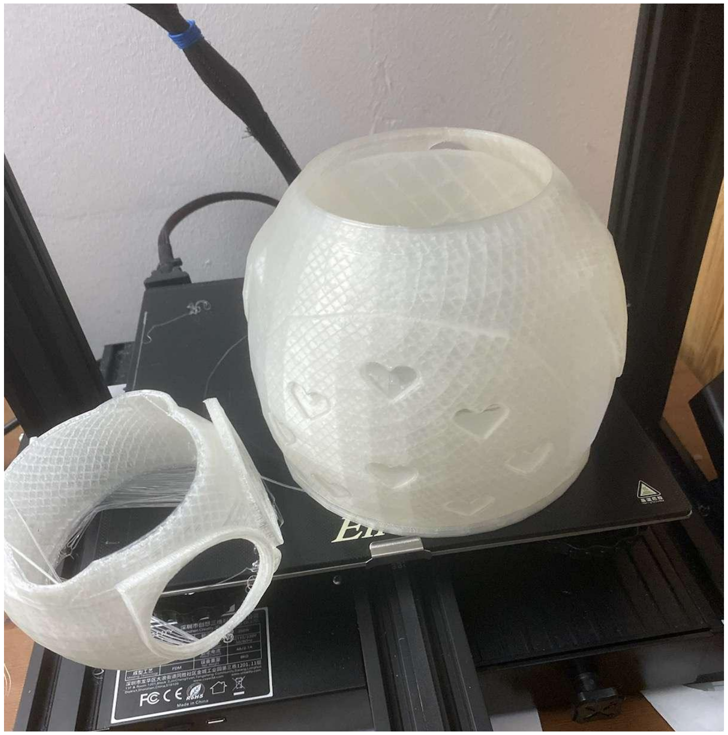

Figure 2. The Head snapped off mid-print due to bad placements of faces within the model.

The total time it took to model, print, reconstruct, and re-print again, took a total time of 20 hours. I successfully printed Owly as a shape that would appear cute and friendly to a child. However, due to the infill density of 30, the cubic infill patterns are very apparent when lit up with light. Some children may find it creepy rather than cute due to this.

Lighting up Owly

In order to bring light to my artifact, I decided to use a pixel jewel that is activated using a capacitive sensor. Before using the pixel jewel, I wanted to test the capacitive sensor to see how it functions. With trial and error, I managed to create a code that used the capacitive sensor as a switch for an LED. When the user touches the capacitive sensor, the LED turns on. When the user touches the capacitive sensor a second time, the LED turns off. With this, I felt confident that it would be easy to change the LED for the pixel jewel. I soon learned that this was not the case and that my code would not be able to be applicable.

Once soldering wires to my pixel jewel and incorporating it into my breadboard along with the capacitive sensor, I installed the pixel jewel library and ran a test with the library's sample code called "simple". I then rearranged my initial code to incorporate the pixel jewel library and made some arrangements such as changing NUMPIXELS 16 to NUMPIXELS 7. I also changed the pixel jewel RGB from pixels.Color (0, 128, 0), which is green, to pixels.Color (0, 0, 255), which is blue (see figure 4). The color blue will afford the user light therapy as blue is known to trigger the human brain to produce more melatonin, helping the user to ease into their sleep cycle. I then added functions that would use the capacitive sensor to light up the pixel jewel. When the capacitive sensor is high, meaning the user's finger is touching, the pixel jewel will glow blue. When the user removes their finger, the capacitive sensor will be low and the pixel jewel will stop glowing.

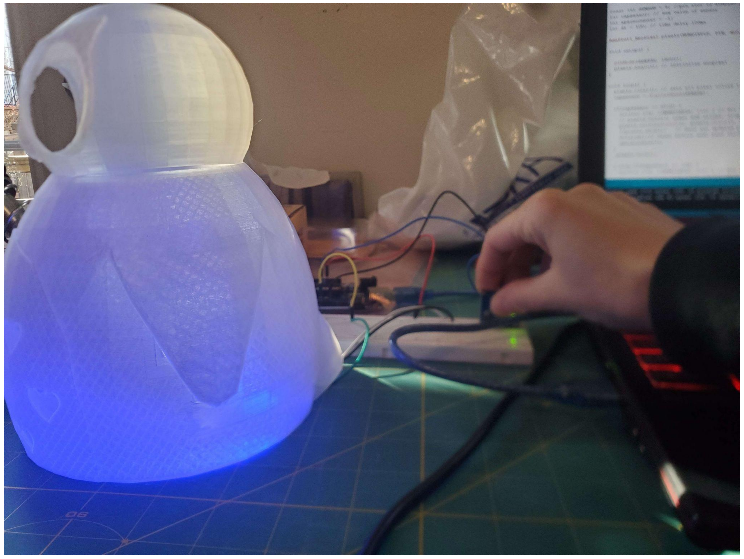

Figure 4. When touching the capacitive sensor, the pixel jewel lights up.

However, I want the capacitive sensor to act as a "switch". When the user first touches the sensor, the pixel jewel will light up and remain on despite the user removing their finger. When the user touches the sensor a second time, the pixel jewel will turn off. Separately, using only the capacitive sensor and Arduino's monitor, I was able to program it so that it recognizes the first tap of the finger as "on" and the second tap of the finger as "off". This required using a space counter and a delay time. All that is left is to incorporate the space counter into my primary code.

Pink Noise and Lullaby FX

Currently, I do not have this part of the artifact functioning. I am still waiting to receive my Adafruit audio FX sound board and 2x2W amps through the mail. These components will play an important role in affording the user with sound therapy. The lullaby is intended to be used as a tool to set up the initial atmosphere for the room, signifying that it is time to get ready for sleep. The pink noise will be the actual sound therapy, as pink noise has been proven to aid distressed sleepers. The pink noise frequency imitates the sounds of water rushing, or trees bristling, and thus can transform a space into a more relaxed environment.

Copper Sensors

All three functions of Owly, both sounds, and light, are activated by capacitive sensors.
Due to the nature of a capacitive sensor and its shape, I cannot simply just place it on the back of Owly. In order to make the sensors more user-friendly, I created extensions. The extensions are three metal washers that are wrapped in copper foil with an extended wire that will be soldered to each individual capacitive sensor (see figure 5). When designing the 3D model of the artifact, I left three holes on its back for the placement of these copper sensors. When the user touches the copper sensor, it will still be able to conduct electricity and carry the signals to the original capacitive sensors.

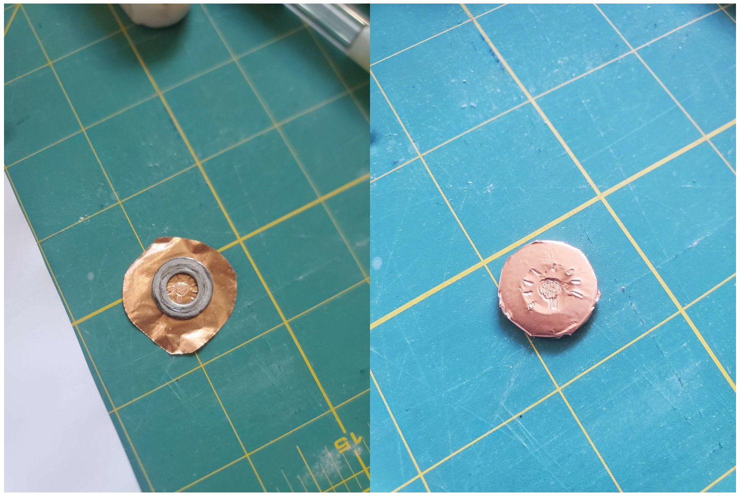

Figure 5. Left: washer shown before wrapped in copper. Right: final product with a logo of its functionality (light).

Conclusion

Due to the fact that my artifact is still in the low-fidelity stages, it is hard to say whether my initial intentions have been met. So far, it is safe to say that it has been meant somewhat, as I have successfully designed, modeled, and 3D printed the artifact shape. The only thing that did not go as planned with the 3D printing was how much the infill pattern would appear when the artifact is lit up. I was worried that if I use an opaque PLA filament, then the light would not be as bright, thus I decided to go with a semi-transparent PLA. The apparent cubic infill pattern does add more characteristics to the artifact when it is glowing, however, it could also appear eerie from a child's point of view. In terms of functions, I only have Owly's light source which is semi-functional. Currently, the pixel jewel can only be activated when the user keeps their finger on the corresponding capacitive sensor. All that is left for the pixel jewel to be what I want it to be, is to fix my code so that the capacitive sensor will act as an on-and-off touch button. Overall, with what I have produced so far, it seems that my artifact is following its initial intention as a sleep aid night light.