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https://github.com/margaretbsavvas/CART360

Owly: Sleep Aid Buddy

Abstract

This report is a descriptive process of how the artifact Owly has came to be. Owly was initially designed to be used a sleep aid tool for parents with stubborn children. It is a night light uses both light and sound therapy to help the child fall asleep. Owly was constructed through 3D printing and simple wiring. The final prototype of the artifact is faulty due to capacitive sensors being too sensitive.

Design Narrative

The idea to create an artifact such as Owly, came from the idea of young children who often have problems falling asleep. The artifact was created with the intention to help both child and parent by providing light and sound therapy that would create a more relaxing and sleep inducing environment. The artifact has three buttons that trigger the light and sound through the use of capacitive sensors.

The first button triggers a blue light which would fill the child's room. The ganglion cells in the human eyes are used to collect information from our visual surroundings. The part of our brain that produces hormones, the hypothalamus, will receive the information from the ganglion cells through chemical signals and thus produce hormones according to what our eyes see. The color blue is a color that is not stimulating to the human eye, so when blue is seen the hypothalamus will produce more melatonin, a hormone that helps put us to sleep[1].

The second and third button will trigger two different sounds. The first sound is the classical lullaby "*Hush Little baby*", and is meant to encourage the child to begin getting ready for bed. This would aid the parent from having to constantly chase after their child to tell them that it is time for bed. Ideally, the child would build the habit to recognize the lullaby as a sign for bed time. The second sound will be a subtle pink noise frequency. Pink noise has been proven to help with restlessness because it replicates sounds of nature such as waterfalls, waves, or leaves rustling. It creates a relaxed environment and has been scientifically proven to help with sleep[2].

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[1] Nazish, Noma. "The Best (and Worst) Bedroom Colors for Sleep, According to Experts." Forbes. Forbes Magazine, September 29, 2022. https://www.forbes.com/sites/nomanazish/2022/09/27/the-best-and-worst-bedroom-colors-for-sleep-according-to-experts/?sh=487690e26355.

[2] "Can Pink Noise Help You Sleep?" Cleveland Clinic. Cleveland Clinic, April 28, 2022. https://health.clevelandclinic.org/why-pink-noise-might-just-help-you-get-a-better-nights-sleep/.

The artifact Owly will build an emotional connection with the child as it comes in a friendly 3D owl shape that is painted with blue and yellow colors. When the artifact is in use, it will activate three of the five human sense. The first sense is touch, to activate the artifact, the second is sight as owly emits a calming blue light to help melatonin production, and the third is hearing as the user will have the choice to play a lullaby or pink noise.

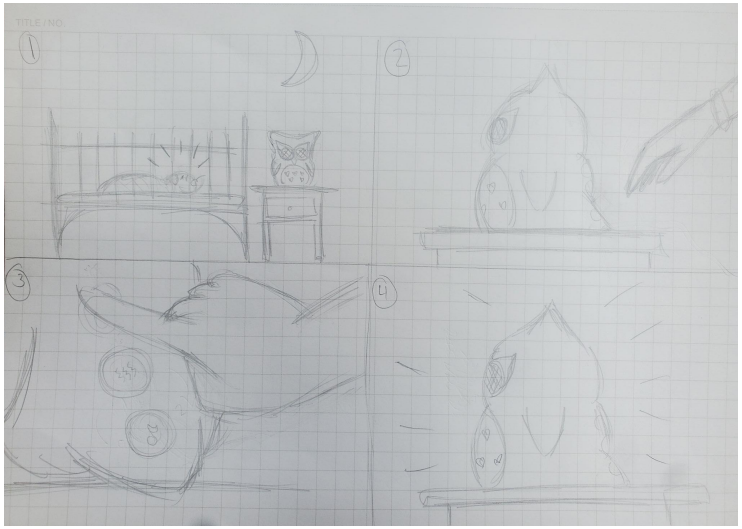

Figure 1. Segment from original storyboard demonstrating the functionality of Owly.

Prototype Process

In order to create the shape of owly, I decided to create a 3D model that would be 3D printed. This way I was guaranteed to achieve a fun animal like figure. The total time it took to achieve the final 3D printed model was over 50 hours. A good 20 hours of this time was dedicated to the actual designing of the model. The software that I used was Blender and unfortunately Blender is not the most ideal when it come to creating 3D models. However, it was the modelling software that I was most comfortable with. The initial mesh that I created in Blender was actually scrapped because the neck area of the owl was too thin and fell off mid-print (see figure 2).

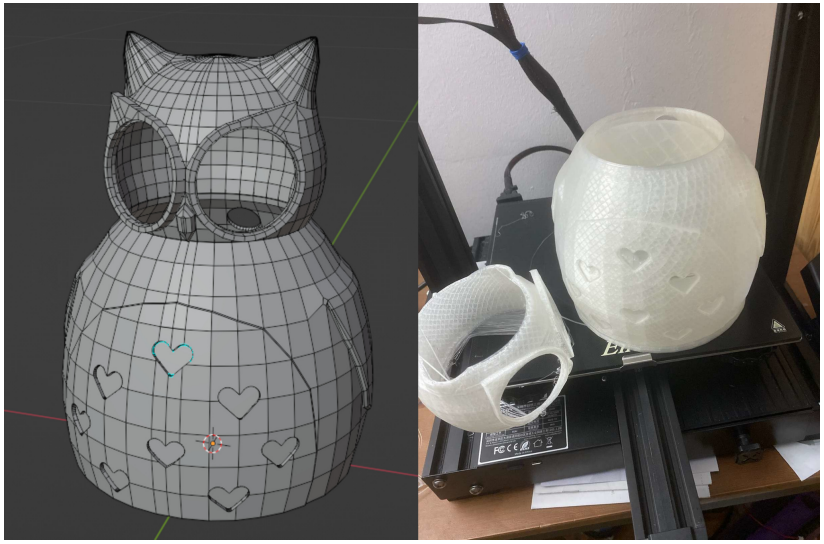

Figure 2. First prototype of Owly model and 3D print result.

In the end, it was a good thing that this printing failed because I realized that the design for the first prototype was faulty. The pointed ears were not constructed in a way that would allow the light to shine through. Keeping in mind that the joint between the body and head would potentially fall off again and that the head design was not ideal, I went ahead and redesigned the head piece. I also kept the head and body pieces separate for easier printing. I then just simply super glued the two together (see figures 3).

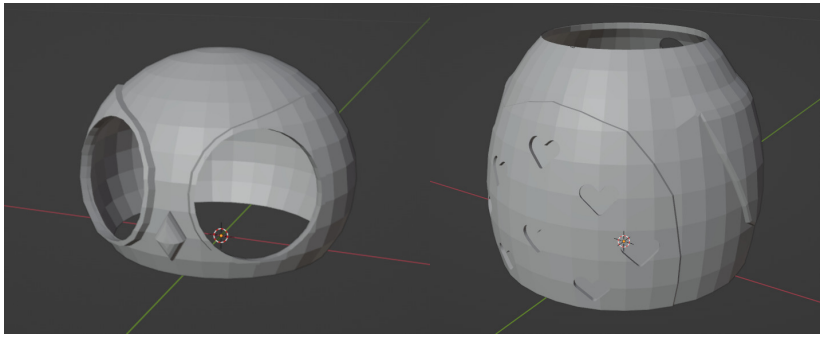

Figure 3. Second prototype of Owly Model

When designing the body of Owly I had to take into consideration how I would implement the speakers and capacitive sensors for the buttons. I decided to keep the eyes hollow, and make them the exact measurements of each speaker. On the back of the body I left three holes. These holes were meant to hold the three copper extensions of the capacitive sensors (see figure 4).

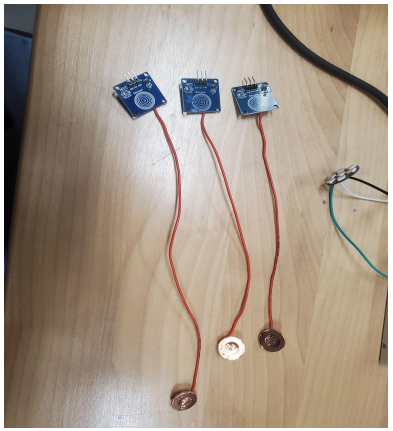

Figure 4. Capacitive Sensor extensions.

For the lighting of Owly, two pixel jewels were used. Both placed inside the body, glued to either side of the base cover's hole. This was to ensure that when both pixel jewels were lit up, that the wires would become invisible to the human eye due to light shining from all sides. The pixel jewels were connected to an output on the arduino and then had an input that was connected to the corresponding capacitive sensor. Using the Adafruit NeoPixel Library, I programmed the pixel jewels to the color blue. I then programmed the corresponding capacitive sensor, using a boolean, to be used as a trigger to switch the pixel jewel on and off with a simple touch.

For the sounds, and Adafruit audio FX sound board and 2x2W amps were used. I plugged the sound board microcontroller into my computer and uploaded the lullaby as T00 and the pink noise as T01. Now the sounds were saved on trigger 1 and trigger 2 of the sound board. In order to have the

capacitive sensors work as triggers on the sound board, I was not able to directly connect them to the microcontroller. To have the desired affect I wanted I had to connect the capacitive sensor as inputs into the arduino and then connect the two trigger sounds from the sound board as outputs to the arduino (see figure 5). Unfortunately, I learned that with the Adafruit audio FX sounds board, it was not possible to have a sound play on loop. So rather than having the pink noise play on a loop with the option to switch it off, it only plays once until the user presses the button again.

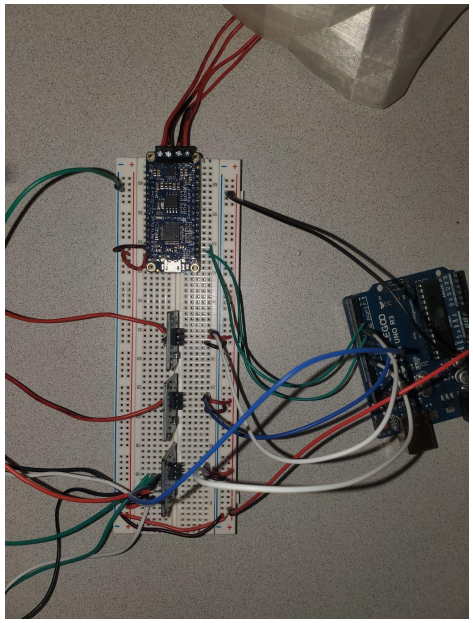

Figure 5. Final wiring of capacitive sensors connected to neo pixels (green wires on left) and to sound triggers (green wires on the right) on the audio FX soundboard.

To conceal the sound board and all of the wire as much as possible, I 3D modelled and printed a base for the artifact. This base was hollow and measured exactly to the size of the breadboard for a snug fit (see figure 6). Finally I decided to add more color to the artifact by coloring the eye holes blue and yellow, as well as coloring the belly blue to match both the light and the color of the base. I also added some blue to its wings to emphasize their shape and painted the beak yellow. I then added some feathers on the eyebrows for fun.

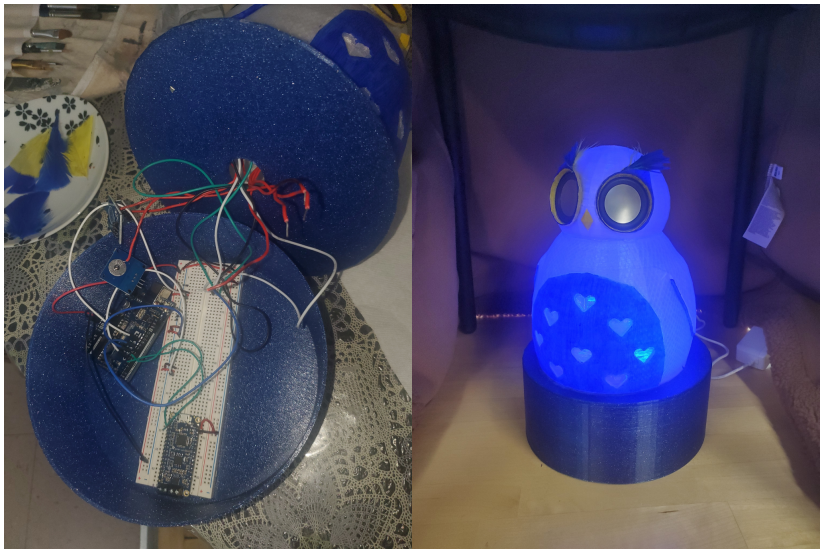

Figure 6. Left side is mid-assembly of feeding wires and placing them in the base. Left side is final artifact.

Final Artifact and Observations

The final artifact of Owly (see figure 6) is very close to the desired result that I initially wanted. The aesthetics were spot on, but the functionality became a little faulty. I completely forgot to isolate the wires that were connected to each capacitive sensor. The wires of the capacitive sensors continuously triggered because they were touching each other inside the artifact. There were moments, when keeping the artifact very still, that I was able to have it functioning as I wanted but it took a lot of patience to wait for these exact moments.

I also realized that with Adafruit's audio FX soundboard, it was impossible to program the sounds on a loop, meaning each sound could only be played once and the copper extension would have to be pressed a second time if a user would like to hear it again. This defeated the purpose of the pink noise as the sound file was only one minute long, meaning the user would have to roll over in bed to replay the sound. A second observation about adafruit's audio FX soundboard is that the volume could not be adjusted other than directly triggered the volume pins on the microcontroller itself. This aspect was not only disappointing but also frustrating because adafruit's audio FX soundboard is also faulty. I was only able to connect the microcontroller to my computer once to upload the files, but afterwards my computer was no longer able to recognize the microcontroller. After some research, I discovered that many buyers of the product encountered the exact same issue meaning that the product was just faulty to begin with.

In the future if I were to improve Owly, I would return the Adafruit's audio FX soundboard for a new one. I would make sure to edit the audio files to a volume level that is preferred before uploading them. Otherwise, I would find another means of playing audio that would allow me to program the sound to play on a loop. I would also take apart Owly and wrap the capacitive sensor extension wires in electrical tape, to ensure that they were isolated and not as sensitive to touch anymore. Lastly, I would like to incorporate more kinetic movement to bring Owly to life. Either through adding little microvibration motors to the eyebrows or a larger motor that would allow the neck to turn as if it were a real owl.

Bibliography

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