Crystal Glow

An Interactive Discovery

Before Crystal Glow

Before settling on a project, I went through several weeks of idea brainstorming. With the broadness of this assignment, I struggled to choose a specific concept. Starting out ambitious, I had numerous ideas, including:

1. A vase that brightens up depending on the weight of the content

2. A collar for deaf animals that changes the light installed in front of a room, so their humans can easily locate them, as the animal themselves are unable to hear calls

3. A lighting device that indicates the movements in a room (ex. someone entering a room) so that people who are hearing -impaired know if there's people behind them

4. A more developed version of idea 3: a set of bracelets that vibrate depending on the surroundings of someone who is hearing-impaired. Serves as footsteps. Most people who are hearing-impaired have little to no perception of the action behind them

With some research, I found that these ideas were not totally beginners level. I wanted to be able to complete this assignment successfully, and these projects were not compatible with my skillset, which has yet to be determined at this point.

Final Concept

At the end of the day, I had to narrow down on a specific project. I ended up doing the crystal shaped lamp that changed colours depending on its angle.
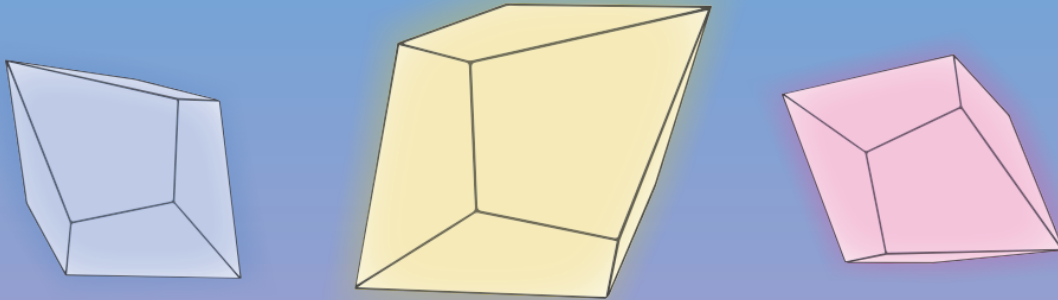
Crystals

Crystals take on an unique geometric form. I knew that I would be able to manipulate the shape of the crystal freely, which means I could work around the arduino, and not the other way around.

Light

Light is a powerful agent to work with. It requires minimal manipulation, and it can easily create a variation of atmospheres. Lights also work well with crystals thematically. With this assignment, I could easily use the arduino to make a soft glow.

Brainstorming

My intial idea was to embed various force or touch sensors on the sides of the crystal to trigger a Neopixel to smoothly transition between colours. I thought I could assign different angle values to different RGB percentages to make it work.

However, I encountered numerous conflicts. Here are some of the key issues:

1. Casting a silicone crystal shape would be time-consuming. The objective of this assignment is to get the arduino working- not build the prototype body
2. Embedding sensors into the silicone crystal would be very difficult
3. Neopixels are not available at Lee's electronic at this time and ordering it would mean that I might have to delay my process
4. The sensors will be relatively visible, which might not be visually appealing
5. Using sensors means that I can trigger the colours with my hands when I touch it

Inspiration
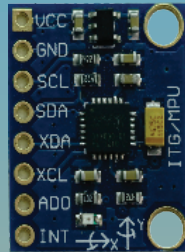
 While most people have not started their assignment, Evan Craig, from the S002 class has already half-completed his project. He used a gyroscope to create unique sounds. It turned out to be a fascinating sound exploration piece. After explaining my concept to him, he suggested that I too, try the gyro. He gave me one of his extra MPU-6050 to work with.
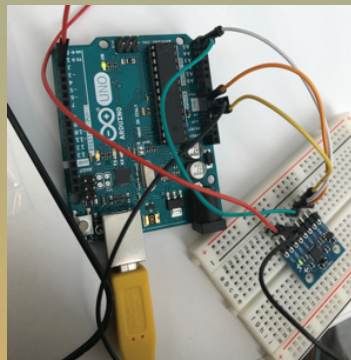
Evan suggested that I test out the gyroscope to make sure it's functioning properly. This step is one way of preventing time wastage. It was also an encouraging sight to see that the project is on its way. I used a Serial.println ( ) to monitor the numbers and angles.

Coding Process

Evidently, the coding part was going to be absolutely terrifying. The internet was the best place to find salvation. I found many of my answers with the help of many talented coders. It was hard to piece everything together. Frankly, I've blended multiple codes that were shared online to complete my assignment. For example, I found this if else statements for calling the LEDs. I was trying to trigger the lights even when the breadboard is completely upside down. I tweaked some of the numbers and added some variables to make it more accurate and sensitive.

```
void flashLEDsSimple(int x, int y, int z)
{
    if (y > 0) {
        analogWrite(rightLed, y*4);
        analogWrite(leftLed, 0);
    } else {
        analogWrite(leftLed, y*4*-1);
        analogWrite(rightLed, 0);
    }
    if (z > 0) {
        analogWrite(bottomLed, z*4);
        analogWrite(frontLed, 0);
    } else {
        analogWrite(frontLed, z*4*-1);
        analogWrite(bottomLed, 0);
    }
}
```

```
void flashLEDsSimple(int x, int y, int z)
{
    if (y > 0) {
        analogWrite(rightLed, y);
        analogWrite(leftLed, 0);
    } else {
        analogWrite(leftLed, y);
        analogWrite(rightLed, 0);
    }
    if (z > 0) {
        analogWrite(bottomLed, z);
        analogWrite(frontLed, 0);
    } else {
        analogWrite(frontLed, z);
        analogWrite(bottomLed, 0);
    }

    if (x > 0) {
        analogWrite(bottomLed, x);
        analogWrite(frontLed, 0);
    } else {
        analogWrite(frontLed, x);
        analogWrite(bottomLed, 0);
    }
    if (y < 0) {
        analogWrite(rightLed, y);
        analogWrite(leftLed, 0);
    } else {
        analogWrite(leftLed, y);
        analogWrite(rightLed, 0);
    }
    if (z < 0) {
        analogWrite(bottomLed, z);
        analogWrite(frontLed, 0);
    } else {
        analogWrite(frontLed, z);
        analogWrite(bottomLed, 0);
    }
}
```

There were a lot of elements in various codes that I didn't quite understand, so I'm certain that most of my code is redundant. Miraculously, the code works.

Assembly

The assembly was pretty difficult. It was stressful not knowing whether or not the wires were in the right spot. It's also important to focus to ensure that all the connections are made correctly. I'm still in the process of understanding the complex logisitics of building circuits. Forefront. io provided a helpful article for Arduino beginners. This helped me figure out how to start.

http://forefront.io/a/beginners-guide-to-arduino/

Also, with all the loose jumper cables everywhere, the LEDs were getting covered. I replaced the regular male to male jumper cables with solid core jumper wires.
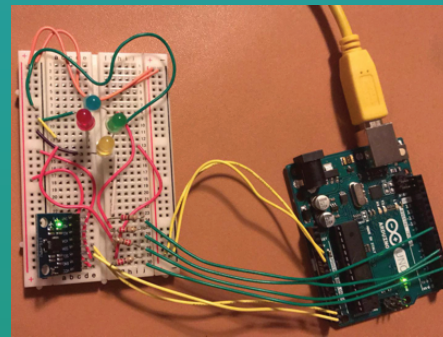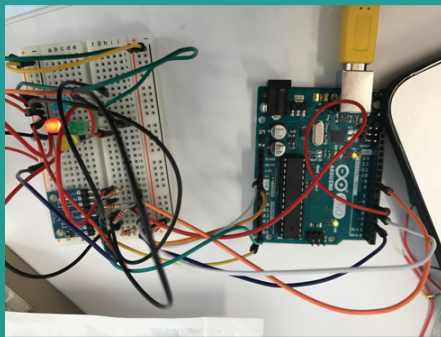
This way, everything is more secured, and tight into the breadboard. It also looks a lot cleaner. It was less possible to accidentally unplug the loose wires.

Going Wireless

While it is totally functional being plugged into the computer, I thought that it would look much nicer, disconnected. Putting in the 9V battery snap, took a matter of seconds, and it worked perfectly.
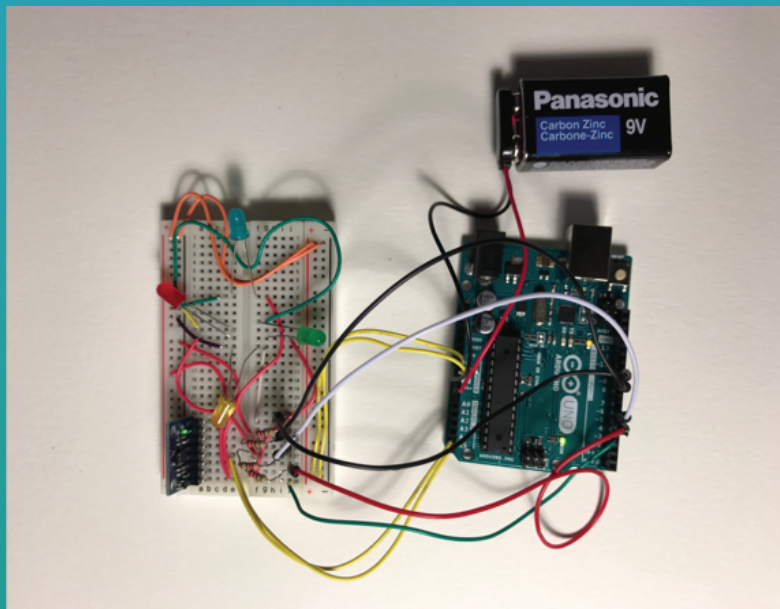
It's very satisfying to see that is finally put together. I changed the coloured LEDs a couple times, to make the colour combination as pleasant as possible. I was hoping to find some different, brighter LEDs.

Soldering Process

While everything was working, the MPU-6050, was not well embedded into the breadboard. The connection between the male pin strip and the gyroscope was very floppy. I used this video and some of Brenna, Bobby and Haig's knowledge to solder the two components together.

https://www.youtube.com/watch?v=2xAPTJkrap8

It's very satisfying to see that is finally put together. I changed the coloured LEDs a couple times, to make the colour combination as pleasant as possible. I was hoping to find some different, brighter LEDs.

Trial & Error

Much like creating any project, there will be some trouble-shooting required. In this video, you can see that my entire Arduino is flashing. This happens when there is a bad connection.

https://youtu.be/RNA4d5_ll74

Final Arduino Results

When everything is working normally, it works like so:

https://youtu.be/ucj-6ER00vg

Sometimes, the green one is really hard to trigger. In the code, all the values and numbers are the same and are equivalent to one another. I believe it might be some faulty analysis with the gyroscope. That is my bird chirping in the back.

Prototyping Brainstorming

The process of making the body of the lamp was interesting. At first, I was less inclined to complete to portion of this assignment, as I rather focus on the functionality of it. But with much contemplation and advice from Thomas and Morten, I decided to see what I can formulate for the appearance of the Crystal Glow.

My options were rather limited, due to some tightness of time. Ideally, I would sculpt the shape of the crystal, out of some hard material (most likely self-drying clay), and create a cast using the vacuum forming machine, that I have been eager to try. Then, I would put a silicone mixture in the cast and go from there.

Not only am I on a pretty strict schedule, I also did not know exactly how to do all those procedures, and it was far too much discovery for me in the span of 1.5 weeks. I immediately looked for other ways of creating my prototype. My Facebook feed is littered with DIY videos. While some of them are absolute trash, I did find one that was quite helpful.

https://www.youtube.com/watch?v=uJWL68bbzEw

Clearly, their target audience are pre-teens. Either way, it was fairly inspiring.

Prototype

The process started out with some polyhedron paper folding. This link includes a gigantic index of printables for geometric 3D shapes.

http://www.korthalsaltes.com/visual_index.php

I decided to fold a couple, to see which one best suits the fitting of the Arduino. I ended up choosing the one in the middle, which I thought had a very unique shape. It looks like it's not even, but actually, all the sides are completely identical. This one is called the square trapezohedron.

Prototyping the Shape

Using the knowledge that I've acquired from the DIY video, I was able to make plastic leather. Luckily, I bought a gigantic pack of gluestick from a fabric store called Parisina in Puerto Vallarta for the small price of $8 (In comparison to Canada, this was a total steal). I ended up using a little over 1/5 of the bag. I ironed the glue flat, using an iron and baking paper.

After I ha all 9 pieces ready to go, I manually glued everything together. I tried my absolute best to make the sides as smooth as possible.

This is the part where I started to realize how my initial plan to cast everything, would make the body look much cleaner.

The Real Crystal Glow

The Arduino fit inside the prototype wonderfully. However, I struggled to create a door and a mechanism to make the Arduino stay in place as I rotate the lamp around. I ended up having to hold it. Here is the video of how it looks:

https://youtu.be/aP2AfCBtaAc

The dispersed light from the frosted quality of gluesticks, makes a nice glow. It could be better, however.

Proof of Concept

Theoretically I wanted it to have a smoother body and glow transition. Here is a rendered video I made to illustrate that concept.

https://youtu.be/sr_qJL-GQGI

The Crystal Glow is meant to be a lighting device that takes on an unique shape and has the ability to change the mood of an entire room with only a simple shift in orientation. It is not meant to save the world, it's just a delightful, fun and beautiful item for the home.

Improvements

The Crystal Glow has not reached its full potential. There is still so much room for improvement.

1. Smooth transition between colours- It would obviously look much more calming and elegant if the colours of the glow transitioned in a more soft and discrete manner. This could be achieved with modifications of the code and a Neopixel

2. Smoothness of the silicone body- If I had completed the project using my initial prototype process, it would have looked a million times cleaner

3. Better "door" system- If I could figure out a way to take the arduino in and out of the crystal, it would be more functional.

Learning Outcomes

This project required a lot of patience, and I often got physically frustrated; this does not do anything for the project. I should try harder to keep it together.

The internet is very useful. I found that the web was very essential in helping coders all over the world solve their problems.

There are a million projects I can do and a million ways to execute them. Possibilities are endless.