Get Lit!

Introduction

Our goal for this lab was to get LEDs to flash or light up to the sound/beat of music. The materials we needed were two arduinos, a breadboard, LEDs, a sound source, a container for everything, and wires. We first started with the code for the Arduino to correspond with the music. Our plan was to use the Arduino shield to pick up the music from a phone or other audio source. The code then deciphered the beats from the music and sent out an output to make the LEDs light up. We broke down the project into a systems level diagram. Also add more specifics stemming from the overall goal.

Procedure

1. Gather parts
   a. LEDs
   b. 2 Arduino Unos
   c. Arduino Uno Shield attachment
   d. Wire
   e. Optional auxiliary chord and splitter
   f. Container
2. Edit doppler lab code to run two arduinos together.
3. Edit code to allow LEDs to light up at certain amplitudes.

4. Solder LEDs in groups of 2 or 3, connect the positive and negatives of each strip to ground pin and input of the arduino.

Body

In order to begin this project, we collaborated on different project ideas in order to find something that we were all interested in until we finally came across this LED light display that plays to the sound of music. Although we did not have a lot of prior knowledge about the different programs used in arduino, we decided to use this project as an opportunity to learn more about this language and discover more of the projects associated with both the shield and the arduino library. We began our project by researching the code needed for this project and we decided that we could mimic the code from the doppler lab previous this semester. This code used the shield and the arduino to recognize sound through the microphone and create a graph of the amplitude versus frequency. Once we guaranteed that this code recognized the correct sound, we began to work with the code for the LEDs. We used MATLAB to program the LEDs to light up at various times using if statements relating to the amplitude of the sound from the doppler graph. Because this graph, which is pictured below, relates the size of the amplitude with how loud the music or sound is, we decided to program the LEDs off of this relation. We programmed the LEDs to light up at different levels of amplitudes so when we played a song into the shield, the LEDs would turn on and off at different times. Furthermore as a result of lighting the LEDs based on amplitude, we were able to choose any song to play for our project because every song has varying pitches. Once these codes were completed, we connected the two libraries and ran into several problems when doing so. We ultimately learned that we needed to create two separate objects for the two arduinos and we needed to upload the

arduinos at separate times in order for the code to be uploaded to the correct arduino. To finalize the project, we created the display of LEDs that lit up to the amplitude of different songs. We soldered LEDs together in strands in order to create more of a light display and we used four different colors of LEDs. While soldering the LEDS, however, we began to realize that we needed to look more into how much voltage was required for each LED in a string because the strips we created continuously failed to light up. In order to fix this issue we tested different combinations of LEDs in a strand to find the max voltage the strand would respond to. Because the arduino only outputs 5 volts, we knew that our strands could not surpass this limit. Therefore, we concluded that 2 LEDs per strand was sufficient for the output voltage because the LEDs were still bright enough and they did not reach the limit of 5 volts. We used some of the ideas from the below schematic when we soldered the LEDs together and we adjusted the schematic accordingly for our project.
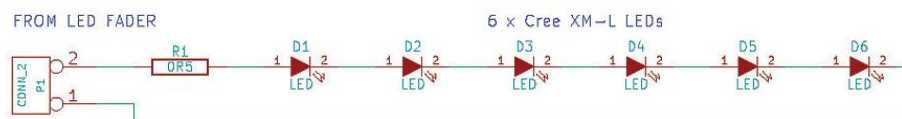

Because we had a power source from the arduino, we only needed to solder the LEDs so that each negative end would be connected to a positive end of the LED. Once we finished soldering the LEDs, we were able to test the final product and conclude that everything worked properly and the project was complete.

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We had gotten the original idea of this project off of a YouTube video that used LEDs, a transistor, and batteries. After seeing the video, we thought that we could do better, and instead of using a transistor, we could use our own code with the help of Arduinos to be the brains of the project. So we gathered our materials of 9 LEDs, wire, 2 Arduinos, one having a shield attachment, a headphones splitter, (so that two objects could be plugged in, but only needs to occupy one auxiliary port) and a container to hold it all. With such modifications, we had ran into some problems. The first problem we encountered is if we would be able to run two Arduinos together at once. As explained earlier, we ultimately had solved this problem of running two arduinos by creating a new object in the MATLAB code.
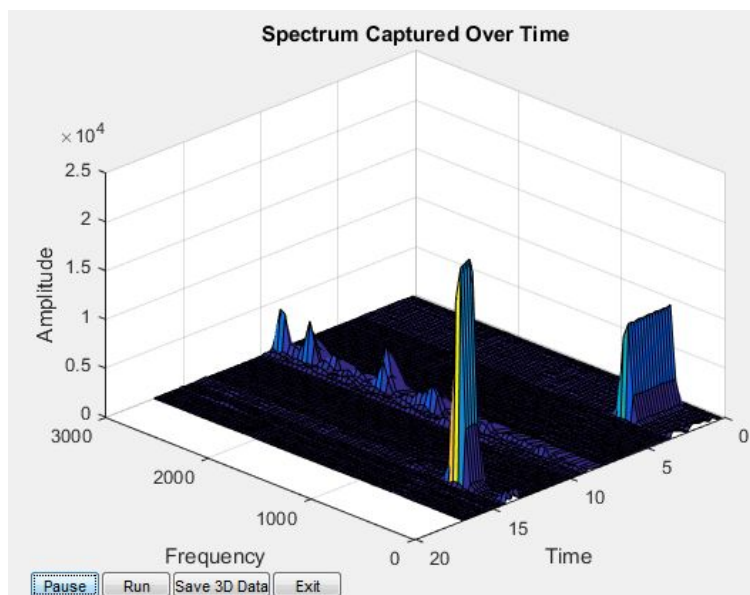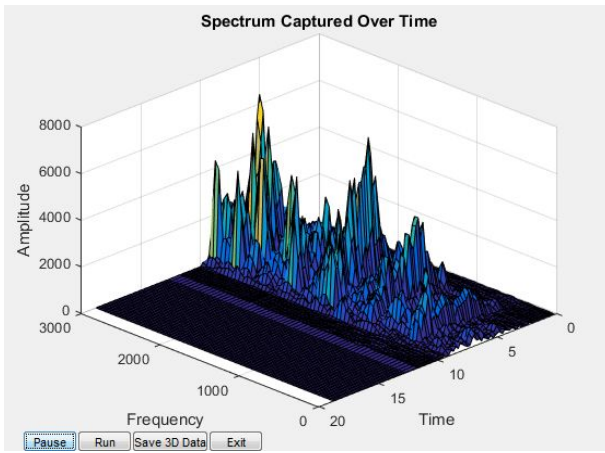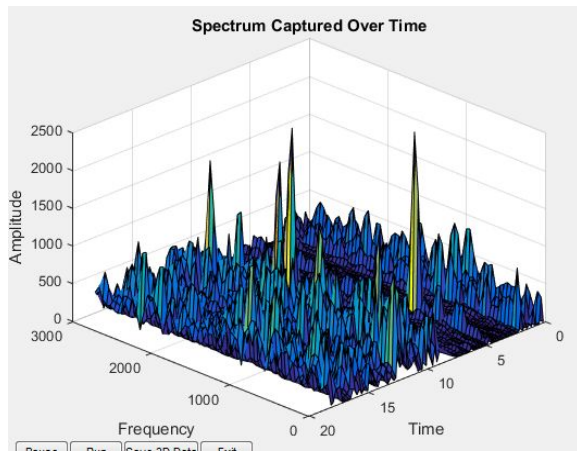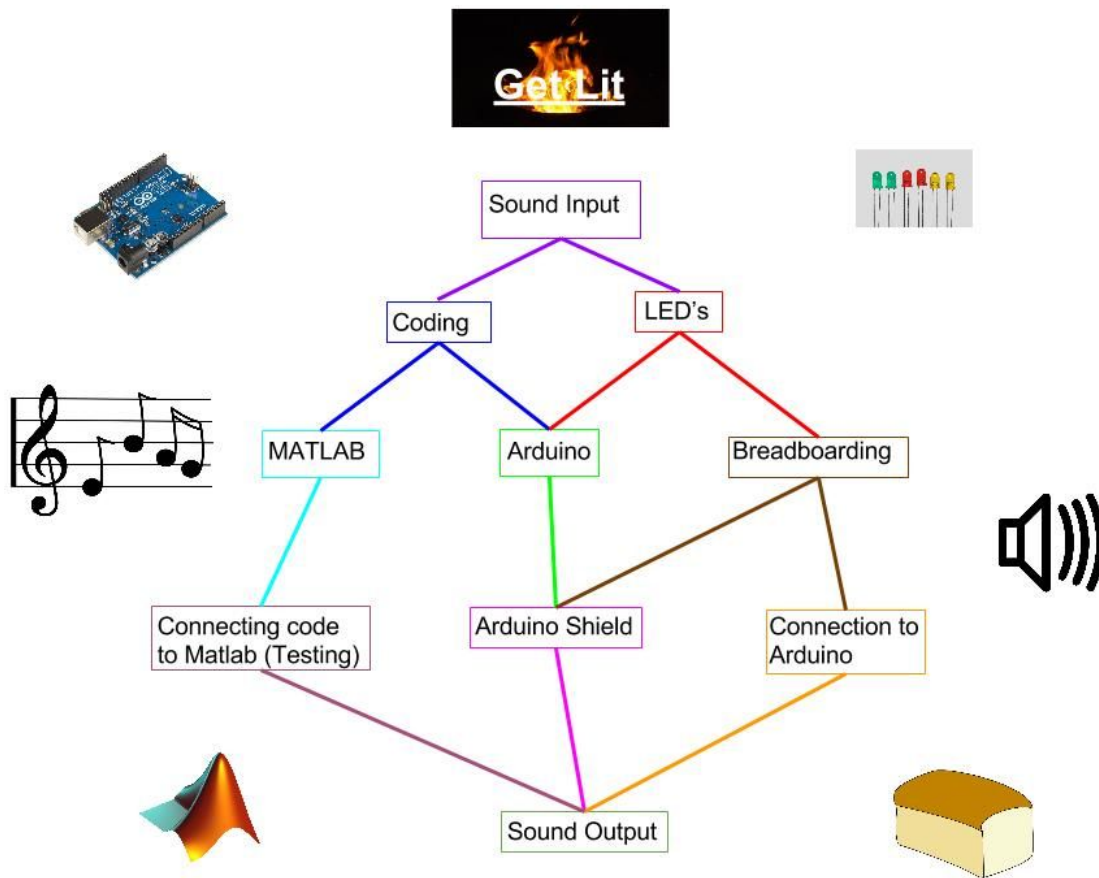
Conclusion

Overall, this lab was an opportunity to work with several different skills we will utilize often in our futures. We were able to apply various skills to solve a particular problem. After all, that was the objective of the class. We were able to analyze a problem and used skills we had previously developed to create a solution. In this case we were came up with an idea that created a LED display that was synced with music. The most gratifying part of the project was that we were able to overcome some major obstacles. The major obstacle was that the arduino can only have

one object per port. This was by far the most difficult part of the project. For a while we were not

sure if the project was going to work. Thankfully, in the end the project worked flawlessly. We

even found ways to further improvise, such as using a series of aux cords to play the music

through a speaker. This also gave us a signal with less noise. We were all glad to see ourselves

possess the creativity to improvise on things that we already had to create something new and

useful. Upon completion of the project we had successfully exercised our engineering abilities.

References

https://www.youtube.com/watch?v=PVOuKaMMnM8&list=PLtZ1WtnfAMwOoy1SB8OQSok1hxBxXHehp&index=8

http://www.instructables.com/id/How-to-Make-LEDs-Flash-to-Music-with-an-Arduino/step3/Program-your-Arduino/

http://paulorenato.com/index.php/85