Cyborg Sax Test Plan

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Hardware Setup:

Our hardware setup consists of four parts: the Teensy Microprocessor, a Teensy audio shield, an 8 X 8 RGB LED Matrix, and a powered speaker. The Teensy 3.6 microprocessor is used to control the visual LED matrix patterns. A micro-usb cable connects the Teensy to the laptop which will be used to code the Teensy for the LED matrix. A ⅛” aux cable is used to connect the audio shield line output to the input of the active speaker. Cables are connected from the Teensy/Audio Shield to the led matrix - these cables are +5V, ground - these two power the LEDs - and digital signal connection to control the pattern and intensity of the LEDs on the matrix.

What to perform for hardware tests:

When it comes to testing the hardware components, we will connect the Teensy micro-usb port to a laptop. After it has been connected, it will be programmed, and it will start running the software on the Teensy. The Teensy will start playing the WAV (song file) file on the SD card, and will perform an FFT algorithm on the song. Based on the outputs of the FFT, an algorithm will communicate with the Teensy to light up the LED lights according to the FFT values - simultaneously, the audio shield will perform digital to analog conversion and send the analog song signal to the speaker, which will be amplified through the internal amplifier of the speaker. This will then result in the LED lights lighting up in response to the audio signals coming from the SD card on the Teensy. As the audio gets played from the SD card to the speaker output, ideally the music should play and respond to the LED matrix lights for the entire duration of the song. The aim of the hardware test is to test the functionality of the LED matrix and the audio shield with the FFT code. Another goal of this hardware testing is to make sure each system (LED and Sound) runs simultaneously and in synchronous with one another.

Hardware Measurable Criteria:

1. Be able to read the data from the song that we put on the SD card in the Teensy, if we run the FFT software and can see the simulator output value n, then it proves that we can access data from the SD Card.
2. Be able to check whether the wires are connected properly with solder by making sure the lights on the LED light up.
3. Making sure the audio shield is working by making sure the sound can be outputted to the speaker.
4. Making sure all the LED lights light up with correspondence to the FFT code.
5. Making sure that there is connection from the USB cable to the Teensy to make sure there is a way to communicate to the microprocessor via the laptop and to power the microprocessor.

Software Setup:

* We need a functional PC (Windows/Mac) to run the Arduino Software
* We need a micro-USB cable to connect the laptop with the Teensy Microprocessor
* The program will run with the Arduino Software with the Teensy driver

Software Tests:

1. Visual Implementation
   1. LED should light up once the program starts running
   2. LED will turn to different colors based on the value of the FFT value we get from the simulator. For example, if the range of n is at 0.2 < n < 0.3, the first two LEDs in the given column should light up green; if the range is at n > 0.4, the same 2 LEDs will turn green, but the LED above the matrix will turn on and turn yellow.
2. FFT functional test
   1. Running through the arduino monitor, we can see the different FFT value n shown in the display, and it will refresh every .2 seconds.

Software Measurable criteria for success:

1. Program can be run properly
2. Every part is connected properly with the Teensy board (validated if LED matrices run as previously stated)
3. LED will turn to different colors based on the FFT value from the Arduino simulation.

What needs to be improved:

1. Work on the microphone attached to the Audio shield and do the real sound analysis afterwards.
2. Record a sound clip from the microphone and store it on the SD card in the Audio Shield, and run the FFT software to see if the LED will change color accordingly.
3. Change all wires from male-male to female-male.
4. Design a more advanced visual pattern on the LED