Theremin Light Controller

Inner Light Journeys

Project funded by NCIDEA™
In collaboration with:
WCU Corp. for Entrepreneurship and Innovation

Western Carolina University

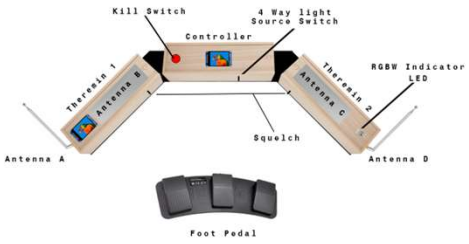
PROBLEM STATEMENT

- Allow the user to control several parameters of a meditation light using fluid hand motions and precise control
- Give the user multiple ways to control a live light meditation session.
- Original idea included 2 theremins (4 antennae), but this had multiple issues.
- New design is a system using 1 antenna and 1 contact slider.
- Theremin and slider each controlling 1 variable.

#	Requirement
1	Microcontroller w/Bluetooth communication
2	4 controllable variables
3	3 binary switches
4	At least one Theremin
5	Size of a wine box
6	Contact slider
7	LCD screen

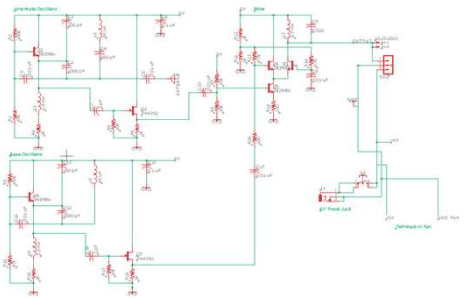
CONCEPTS

- Initially the team's goal was to build a two theremin system, however this would introduce several complications.
- The first design was to use a 555 timer to create an oscillation signal but the response proved to be inadequate.
- The final concept is a single theremin system including an antenna and a slider that will each control one variable, plus 3 foot pedals.

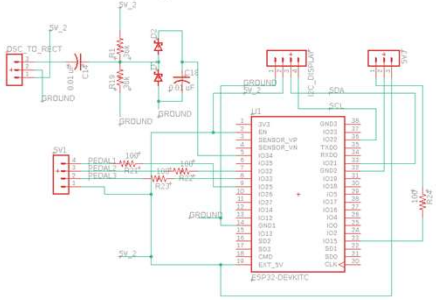


FINAL DESIGN

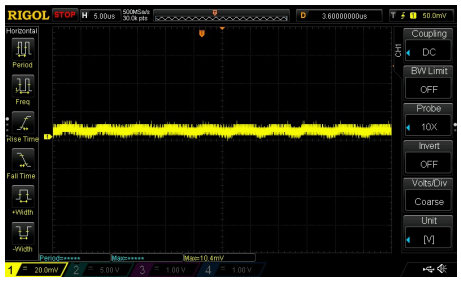
The final design revolves around a dual oscillator theremin. This design incorporated a base and amplitude oscillator, and a signal mixer. The mixer outputs a signal based on the amplitude difference of the two oscillators, which is controlled by an antenna connected to the amplitude oscillator. This allows the user to change the amplitude of the signal by moving their hand closer to the antenna (decrease) and further away (increase). This signal is then converted into a DC waveform by a full wave rectifier and then fed into the microcontroller to be converted into an integer and sent to the user's laptop via Bluetooth. The user can also store a value from the theremin with a foot pedal and change a secondary integer value with a slider potentiometer. This system allows for fluid control of two mappable variables during a light meditation session.



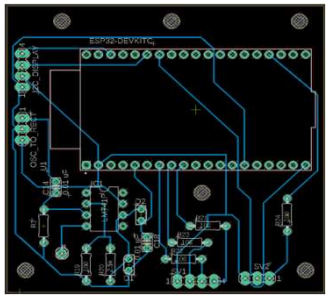
Dual Oscillator Theremin Circuit



Microcontroller PCB

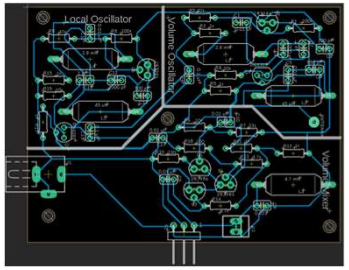


Oscilloscope Screenshot after Rectifier



Microcontroller PCB

Oscilloscope Screenshot of Theremin Output



Dual Oscillator Theremin PCB

RESULTS

```
liveSlider = 4095, Live Antenna = 913, stored = 912
liveSlider = 4095, Live Antenna = 918, stored = 912
liveSlider = 2759, Live Antenna = 912, stored = 912
liveSlider = 2755, Live Antenna = 915, stored = 912
liveSlider = 2759, Live Antenna = 913, stored = 912
liveSlider = 2754, Live Antenna = 728, stored = 912
liveSlider = 2753, Live Antenna = 862, stored = 855
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liveSlider = 2750, Live Antenna = 913, stored = 855
liveSlider = 2751, Live Antenna = 912, stored = 855
liveSlider = 2750, Live Antenna = 913, stored = 855
liveSlider = 2768, Live Antenna = 912, stored = 855
liveSlider = 2750, Live Antenna = 912, stored = 855
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Serial monitor output data of slider, live and stored antenna

SUMMARY

Team 04 successfully designed and built a working prototype that allows the user to control two variables, and store 1 variable within the allotted time for Capstone projects.

FUTURE WORK

- Adding an I2C display using the integrated I2C pin connections on the microcontroller PCB and coding.
- Improving the response of the antenna by experimenting with different antenna shapes/configurations.
- Assigning values to the two unused pedals by modifying the code to suit the application.

TEAM 04

- Adam Pope – Electrical Engineering
- Stefan LeClair – Electrical Engineering
- Mae Biller – Electrical and Computer Engineering Technology

- Sponsor: Chris Neumann – Owner of Inner Light Journeys LLC
- Mentor: Dr. Bill Yang – Professor of Electrical Engineering