sdmay19-11: MIDI Zeusaphone (Singing Tesla Coil)

Week Report 11
November 7 - November 14

Client
Joseph Zambreno

Advisor
Craig Rupp

Team Members
Gunnar Andrews — *Webmaster*
Leo Freier — *Interrupter and Micro Controller Lead*
Luke Heilman — *Technical Architect*
William Brandt — *Pulse Width Modulation Expert*
Greg Harmon — *Tesla Coil Construction Expert*
Jacob Feddersen — *Communications Specialist*

Summary of Progress this Report

- Prototype signal output circuit from Raspberry PI
- Continued working on hosting webpage to test code on the PI
- Finished scripts to run wave program

Past Week Accomplishments

- Prototype output circuit from Raspberry PI to combine two channels and output over fiber cable - Jacob
    - Raspberry PI must output each channel on a different pin
    - Circuit to combine the two signals
        - CMOS OR gate
            - Correctly combines signals, but cannot handle load on output
            - Tried amplifier on output, works but is overkill solution
            - Could drive a transistor switch for output
        - Wired OR gate with diodes
            - Cheaper, smaller, simpler to implement
            - Drive a transistor switch for output
- Created new Architecture plan - Luke Heilman
    - Updated block plan with new info
    - Included details about
        - WAP, webpage control
        - PWM on Pi, the wave combiner circuit
        - Fiber optic cable
- ANSI Standard Recommended practice for the measurement of hazardous Electromagnetic Fields - Greg Harmon & William Brandt
    - Provides recommendations regarding instrumentation and practice to measure EMF.
- Updated team webpage - Gunnar Andrews
    - Started cleaning up and updating the website for the end of the semester

    - This process will obviously continue in the coming weeks
- Hosting webpage on the Raspberry PI - Gunnar Andrews
    - Started creating a server that the PI will be able to host
    - This will be able to run backend scripts, which can be used to demo or test easier
- Scripts to run C code - Gunnar Andrews
    - Created scripts that will compile and run test code. This script can be hosted on a server and ran from HTML
- Finished scripts - Leo Freier
    - Tested the scripts and debugged a little bit to get them to work correctly. The scripts now run as expected, taking an argument which is the .mid file to play.
    - The one thing that might be bad practice is that the folder and file setup needs to be the same as how we have it now, but I'm not sure if scripts can handle searching for files and such.
- Tested multi-channel by alternating channels - Leo Freier
    - Got around to testing the multi-channel implementation, which I think will not be useful since Jake has developed another method that OneTesla uses. When I tested my solution, I did not notice the sound of multiple notes, but I didn't have to choose a channel to play at least.

Pending Issues

Nothing to report.

Plans for Upcoming Reporting Period

- Gunnar Andrews
    - Host website to run test code on PI
    - Update website for end of semester
    - Try to connected PI website to team website for demo purposes
    - Possibly building onetesla if it arrives
- Leo Freier
    - Work on building the OneTesla, assuming it arrives
    - Work on the hosted GUI with Gunnar
    - Work on interfacing with the Pi over a WAP
- Greg Harmon
    - Research the effects of EM waves on pacemakers and other life-supporting devices
        - Search for datasheets/manufacturer-provided data
    - Simulate the driver circuit
    - Look into construction of a faraday cage
        - Size, specific specs, material
- William Brandt
    - Construct tesla coil
- Jacob Feddersen
    - Finalize the Raspberry Pi output circuit and create diagrams for project plans
    - Add safety features to driver program
    - Clean up driver program branch to merge into master
- Luke Heilman
    - Try to get the test scripts for the virtual MIDI device to pass the auto-testing Git pipeline
        - Might be a wrong MIDI device being read

- Analyze the interrupter OneTesla schematic

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Gunnar Andrews	● Continued with scripts to run C code ● Made POC code to embed scripts into HTML so it can be hosted on the PI ● Updated website ● Worked with connecting team website to hosted website	6.5	59
Leo Freier	● Finished scripts for wave program ● Tested multi-channel implementation ● Looked into the WAP interface to the Pi	6	58
Luke Heilman	● Virtual keyboard testing ● Created new architecture plan	6	64.5
William Brandt	● research on control circuit design	6	55
Greg Harmon	● Read through parts of the IEEE Standard for Safety levels with EM fields. ● Read over the IEEE standard for measuring EM fields ● Refined tests for the tesla coil to ensure proper operation	6	64
Jacob Feddersen	● Build prototype output circuit ● Implement CMOS OR with amplifier and test characteristics	8	68.5

Gitlab Activity Summary

commit d0e7d141b32d0cb516d88c32bb4455abca1bae5b (HEAD -> documentation, origin/documentation)
Author: Luke Heilman <lheilman@iastate.edu>
Date: Wed Nov 14 10:43:26 2018 -0600

Add new project architecture