sdmay19-11: MIDI Zeusaphone (Singing Tesla Coil)

Week Report 15
January 31 - February 14

Client/Advisor

Joseph Zambreno

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

- First parts order received
- oneTesla completed and working
- Transmitter circuit from Raspberry Pi working properly
- Completed all base functionality with Web API, and troubleshooted socketing issues
- Keyboard functionality implemented into Web API/software

Past Period Accomplishments

- Ordered and received first parts shipment
    - Replacement parts for oneTesla
    - Transmitter circuit parts
    - Low voltage tesla coil circuit components (still designing bridge components)
- Fixed and tested oneTesla
    - Replaced fiber optic receiver - must have been damaged in soldering
    - Spark testing using fixed frequency mode
    - Songs tested using provided interrupter, playing MIDI files
- Fixed our own Raspberry Pi interrupter output
    - When two frequencies played at once, they had a chance of overlapping, driving the coil longer than it should
    - OneTesla interrupter output was analyzed, and seen that two pulses were never played within a certain time of each other
    - Circuit added to the transmitter using 555 timers that prevents two pulses from outputting within a certain time frame of each other
- Web API functionality finished
    - Dynamically filled list
    - Adding midi files
    - Keyboard input
    - Multi-client socketing
- Prototype and test antenna feedback circuit
    - Built the antenna feedback circuit on breadboard

- Used miniature, low power tesla coil to test feedback being received by the antenna

Pending Issues

Nothing to report

Plans for Upcoming Reporting Period

- Contact Lee Harker for ways to more easily wind/varnish the secondary coil
- Contact Mani Mina for Gaussmeter access
- Prototype the driver circuit and low power versions of the coil
- Iterate circuit designs and PCB layouts based on testing
- Start to layout final Web API design
- Finalize keyboard purchase
- Start looking into pitch bending on MIDI keyboard
- Continue researching alternative parts and list pros and cons.
- Finalize choices for bridge circuit parts

Individual Contributions

Team Member	Contribution	Reporting Period Hours	Total Hours
Gunnar Andrews	• Fully implemented functionality to upload midi files from the API • API now has a dynamically filled list of all available songs that are available to play • Added keyboard functionality to API (just need keyboard) • Helped tested OneTesla (videographer*) • Fixed socketing issues with the API and dual functionality	17	108
Leo Freier	• Helped with testing OneTesla • Helped build/test transmitter circuit • Helped diagnose and fix OneTesla problems running off of our Pi • Reviewed our current circuit designs	18	107
Luke Heilman	• Layed out diagrams of circuits for PCB designs • Testing the OneTesla • Tested OneTesla coil with the raspberry pi • Helped diagnose extra sparks from coil controlled by the pi • Troubleshot the 555 timer circuit designs to fix raspberry pi output	23.25	132.75
William Brandt	• Research bridge circuits ○ Most time spent on half bridge • Discussed alternative parts with Greg	16	95

	● On hand with initial testing of OneTesla		
Greg Harmon	● Purpose of components on Bridge ○ Pros and cons of parts ○ Find datasheets and SPICE files ● Research possible alternative parts ○ GaNFET, IGBT, Power MOSFET ○ Different values for Bridge Caps ○ Different constructions for primary coil	17	109
Jacob Feddersen	● Build and test modular circuit components ● Testing with the oneTesla ● Transmitter circuit refinement - fix overlapping waveforms ● Testing oneTesla coil with our transmitter software	20.25	162.75

Gitlab Activity Summary

None to report