CprE 492

Date: 01/27/18 – 02/09/18

Team: 39

Title: Sound Effect Devices for Musicians

Advisers: Dr.Chen & Dr.Geiger

Team:
Tom Kimler – Team Lead
Virginia Boy – Power Lead
Ben Reichert – Test Lead
Dan Kroese – Embedded Lead
Garrett Mayer – Software Lead

Weekly Summary:

Our team has decided to pursue a new way to collect and analyze data from the tube amplifier. The data is now going to be taken at single frequencies over time. The idea is to analyze the transfer function of the tube amplifier over time. From the data, we should see the relationship of Vi/Vout at a range of frequencies and see if the range is dependent on time/system temperature. Accomplishments of the weeks was buying a new basic tube amplifier to avoid using a team member's. Initial data was taken from the new experiment with little success because of equipment difficulties. We expect emulator designs should be up and running in the next few weeks.

Past Two Weeks Accomplishments:

FFT Demo Code – Dan

- Implemented demo code using FFTW3 to take FFT of input array. Meant to prepare code used in future emulators

Data Retrieval – Ben, Tom

- Spent hours trying to run new experiment to gather transfer function of tube amplifier with oscilloscope
- Drivers for oscilloscope are not working and need to find way to get uncompressed data from the recorder
- Revolved around attempting to resolve this driver issue, to no avail
- Ddapted the test to utilize the DMM instead of the oscilloscope for data collection. While the DMM samples at a much lower rate, we were still able to collect meaningful transfer characteristic curves of the tubes in their warm up phase.

Data Analysis – Ben, Tom

- Initial Analysis of transfer function. It is clear there is a warmup time associated with tube amplifiers, but need better data acquisition device to determine properties under a second's length
- Collected Bode plots of the system, providing a baseline metric for the frequency response of the system

MATLAB Scripts & Functions – Garrett, Tom, Virginia

- Created more functions to analyze data in the transfer domain sense
- Created additional script to analyze the data of transfer function
- Continued to work on MATLAB scripts that will benefit our data processing capability

MP3 Compression Research – Garrett

- Read up on the compression formula to learn what kinds of information is being lost within the algorithm. The algorithm removes data that is inaudible because of other frequencies
- It is not ideal to analysis mp3 data because it is non-deterministic on what frequencies are being compressed.
- We should use the complete raw data

Test Bench Solution– Ben

- Researched and began to implement "Audacity" as our new data collection interface, Signal Express lacks the appropriate divers for oscilloscope sampling, and our previous data interface (GarageBand)lacks the low level control needed over data collection(user-defined sample resolution, sample rate.). As Audacity allows for lossless data collection, its seems that this will be our primary interface for transfer characteristic recording from this point forward.

Tube Amplifier Research – Tom, Virginia

- Researched possible options for purchasing a vacuum tube amplifier that is not coupled with features that possibly cloud the true response of the vacuum tube (e.g. tone-shaping filters, built-in post effects etc.). The one challenge is whether or not we should take the risk of buying a kit that we would have to assemble ourselves in order to truly achieve a "tube only" amplifier.

Research on Filter Theory – Virginia

- Research and design on filter theory in amplifiers

Pending Issues:

Uncompressed Data Retrieval – Ben, Dan

- Use Audacity to interface with our recorder to get full raw data

Individual Contributions:

Team Member	Contribution	Weekly Hours	Total Hours
Ben Reichert	Data Acquisition, Data Analysis, Test Bench	12	20
Tom Kimler	Data Acquisition, Data Analysis, Tube Amplifier Research, MATLAB scripts	11	23
Garrett Mayer	MATLAB Scripts & Functions MP3 Compression Research	9	20
Dan Kroese	Wrote C code that calculates fft of input array	5	12
Virginia Boy	MATLAB scripts, Tube Amplifier Research, Filter Theory Research	9	14

Comments:

No comments for this week.

Plan for Next Two Weeks:

Setup New Tube Amplifier – Tom, Ben

- Learn how to use new tube amplifier with test bench

MATLAB Transfer Analysis – Garrett

- Create more tools and scripts to automatically analyze data from the new experiment

Arduino Temperature Circuit – Dan

- Create simple Arduino circuit to directly measure the temperature of the tube amplifier

Acquire Data – Tom, Ben

- Extract data from new experiments

Analyze Data – Virginia

- Analyze data from new experiments

Initial Emulator Implementations – Virginia, Tom, Dan

- Create individual first try emulators based on known data analysis

Summary with Advisors:

We developed new experiments to extract frequency and time dependency characteristics from the tube amplifier. We have been approved to buy a tube amplifier that has no speaker to allow easier and cleaner data retrieval.