CprE 492

**Date**: 02/23/18 – 03/09/18

**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

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**Weekly Summary:**

We ordered a new tube amplifier to get consistent, controlled data from an amplifier without a stereo. We developed a new test to gather the data relating to the time dependence of the tube amplifier. Data was extracted from the new test and a known nonlinear function. Matlab modelling continued to try to model the tube amplifier and the known nonlinear function to practice. Future work will all be put into modelling the tube amplifier

**Past Two Weeks Accomplishments:**

Electronic Amplifier – Tom, Ben, Virginia

- Designed electronic amplifier with calculatable nonlinear gain for developing the base of our nonlinear (mathematical) model

Data Acquisition – Tom, Ben, Dan

- Performed the first round of measurements for our new, tube amplifier. Data collected included transient data for distorted and non-distorted responses based on the magnitude of the input voltage
- Designed "steady-state" frequency sweep test to obtain transfer characteristics at a variety of input frequencies. In this context, I use the term "steady-state" to reflect the fact that I allow the vacuum tubes time to reach their operating temperature before any data is captured. While the transfer characteristic is certainly dependent on power consumed by the tubes (Power ~> heat), it is simply good practice to isolate variables during a data capture such as this. This week, our data represents the systems dependence on input frequency. Once this relationship is properly modeled, data coupling in the power dependence of the system (i.e. recording while the tubes warm up) can be used to modify this initial model.
- Conducted "steady-state" frequency sweep test to obtain transfer characteristics at a variety of input frequencies (test described above). Data captured on

oscilloscope, and .csv files of transient and transfer characteristic plots were saved for modeling. For the future, non-steady-state tests, data will once again be collected on the recorder to allow for longer transient captures (i.e. window on oscilloscope may fail to capture warming-up behavior at an adequate resolution, due to having to zoom out for longer transients, and compress the waveform).

Modelling – Dan, Virginia, Garrett

- Did modeling research and looked into different ways to express our transfer characteristic as a function of time vs amplitude. This graph is nonlinear, and it is difficult to find a linear representation for it.
- Started to try different modelling techniques such as least squared regression on different types of functions to correspond vin to vout.

**Pending Issues:**

Tube Model – Everyone

- Build a tube amplifier model in Matlab. The model is a function that should be able to map a vin to corresponding vout. The first model does not need to be perfect but needs to get to a working location to optimize and perfect the model.

**Individual Contributions:**

| Team Member | Contribution | Weekly Hours | Total Hours |
|---|---|---|---|
| Ben Reichert | Electronic Amplifier & Data Acquisition | 9 | 36 |
| Tom Kimler | Electronic Amplifier & Data Acquisition | 11 | 41 |
| Garrett Mayer | Modelling | 10 | 39 |
| Dan Kroese | Modelling & Data Acquistion | 4 | 24 |
| Virginia Boy | Modelling & Data Acquisition | 4 | 25 |

**Comments:**

N/A

**Plan for Next Two Weeks:**

Tube Model – Everyone

- Build a tube amplifier model in Matlab. The model is a function that should be able to map a vin to corresponding vout. The first model does not need to be perfect but needs to get to a working location to optimize and perfect the model.

**Summary with Advisors:**

Only met briefly to talk about an experiment to extract the time dependency of the tube amplifier circuit. It is simply taking vin and vout over a extending period of time and comparing the relationship over time.