Audio Project Report

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Project Outline

The aim of this project is to learn digital audio fundamentals and how systems interact with audio. The project will begin as a way to convert sinusoidal audio waves into a .wav (WAVE) file format. By the end of its development time, the project should be able to process audio and playback audio. Furthermore, this audio processing and playback should be nontrivial such as Fourier transforms and combining audio waves. Ultimately, this project should have a user interface that allows a user to:

1. Create sinusoidal audio waves based on input parameters
2. Combine audio waves to create distinct audio wave forms
3. Edit current audio wave parameters
4. Remove current audio waves
5. Mix audio (LATE STAGE)
6. Save audio mixes as some kind of audio file
7. Realtime audio processing (input) (LATE STAGE)

Rough Ideas

When it comes to sinusoidal audio waves, the easiest representation would be to use the .wav (WAVE) file format. This would allow us to quickly create and play audio to test the project. I think allowing the user to save to multiple file formats would be beneficial, but it isn’t something I want to worry myself about currently.

When users create audio, simple waves are fine but when adding waves together the waves must be at the same sample rate. <https://stackoverflow.com/questions/19847601/how-do-i-combine-digital-audio>. We can also allow more than just sinusoidal waves. Square waves, triangle waves, and sawtooth waves are all possible.

I also want users who have combined audio waves (or even recorded audio) to see the individual waveforms of those audio waves (Fourier transform). By “see” I mean show the actual waveform in a way that Desmos or Audacity shows waveforms. They should be able to edit these individual and combined waves through amplitude and frequency shifting.

Users should be able to playback audio that is loaded within the window. Threads should be used to help mix that audio together (I am not sure yet and will have to do research on how all the audio should play at once).

Users should be able to mix the audio that is loaded within the window. Such options would be to cut and stitch audio “clips”, change amplitude of current audio, and change frequency of current audio.

User Controls:

* Toolbar – File (new, open, save), Edit (remove all, combine selected), View (zoom)
* Window Area – Each wave has its own partition in this window (combined waves could have a dropdown that shows the individual waves)
* Playback – Go back x seconds, play/pause, go forward x seconds, audio slider

References

<http://soundfile.sapp.org/doc/WaveFormat/>

<https://ptolemy.berkeley.edu/eecs20/week8/scale.html>

<https://onlinetonegenerator.com/>