ECE 2312

Project 2

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GitHub Link

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Table of Contents

Table of Figures

Question 1

Using the sin function, produce a sine tone at a frequency of 5000 Hz using the sampling rate Fs employed for the recording of your speech files in Project 1. Make sure the time duration of sine tone is equal to that of your previously recorded speech file : "The quick brown fox jumps over the lazy dog."

- Play your sine tone using the **sound** function and comment on what you hear.
- Save the resulting sine tone to a WAV file using the filename "team[[yourteamnumber]]-sinetone.wav" and include in your submission to CANVAS.
- Plot the spectrogram of the sine tone to include in your report.

Using MATLAB when I played the sine tone, I heard a high-pitch sound. It resembles the deafening sound often associated with concussion or a stun.

Spectrogram: This is the spectrogram of sine tone generated using MATLAB.

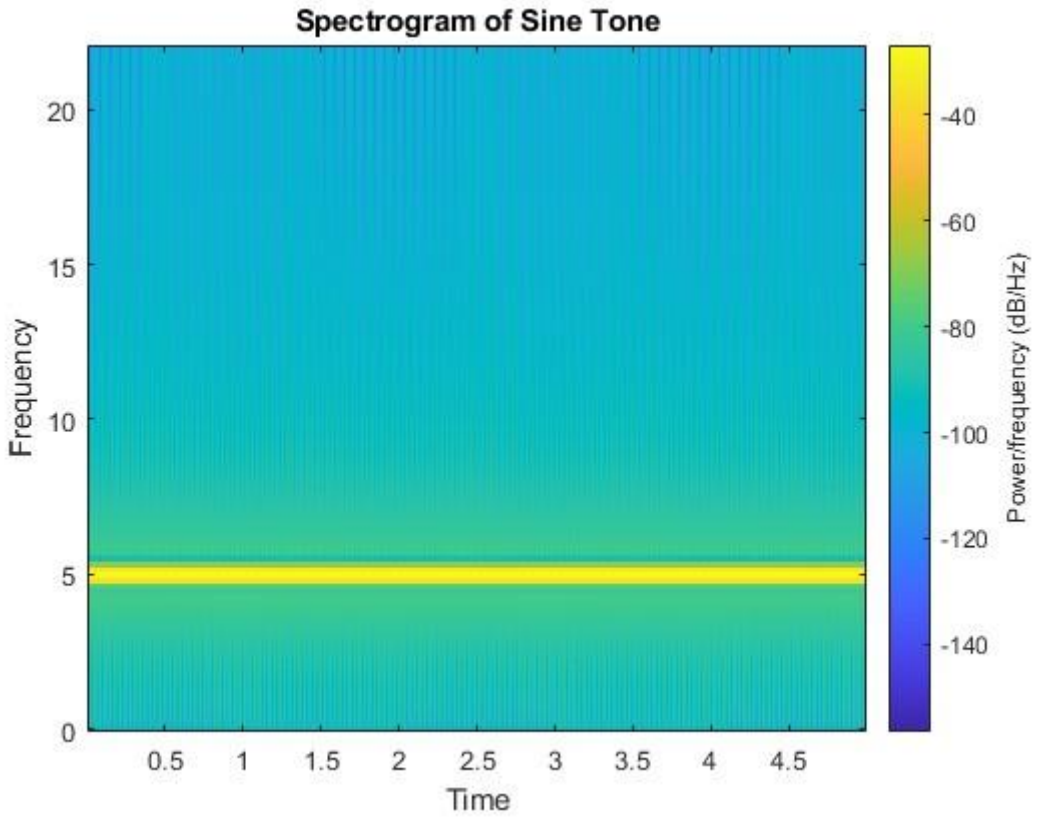

Figure 1 - Spectrogram of Sine Tone

Question 2

Using the sine function, produce a chirp signal based on a sine tone with a frequency that varies linearly from 0 Hz to 8000 Hz across the entire time duration of the signal. Please use a sampling rate Fs that was employed for the recording of your speech files in Project 1. Make sure the time duration of chirp signal is equal to that of your previously recorded speech file: "The quick brown fox jumps over the lazy dog."

- Play your sine tone using the **sound** function and comment on what you hear.
- Save the resulting sine tone to a WAV file using the filename "team[[yourteamnumber]]-sinetone.wav" and include in your submission to CANVAS.
- Plot the spectrogram of the sine tone to include in your report.

Using MATLAB when I played the chirp signal. I heard a linear sound which started from low frequency or Low pitch sound and gradually increased to a high frequency sound.

Spectrogram: This is the spectrogram of chirp signal generated using MATLAB.

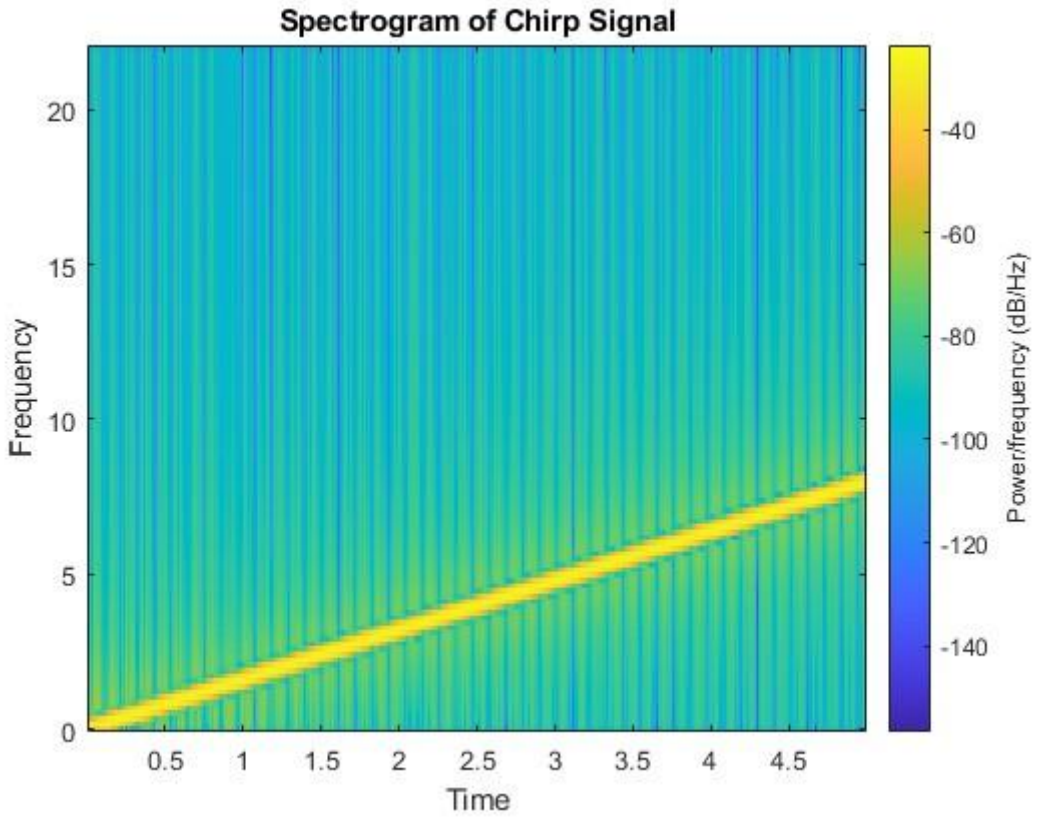

Figure 2 - Spectrogram of Chirp Signal

Question 3

Using the sin function, produce an approximate rendition of this same sine tone pattern from CETK within the 0 Hz – 8000 Hz frequency range. Please use a sampling rate Fs that was employed for the recording of your speech files in Project 1.

- Play your rendition of this sine tone pattern using the sound function and comment on what you hear.
- Save the resulting sine tone pattern to a WAV file using the filename "team[[yourteamnumber]]-cetk.wav" and include in your submission to CANVAS .
- Plot the spectrogram of the sine tone pattern to include in your report.

I was able to create a pattern which is similar to CETK however it has a higher pitch.

Spectrogram: This is the spectrogram of CETK Sine Tone generated using MATLAB.

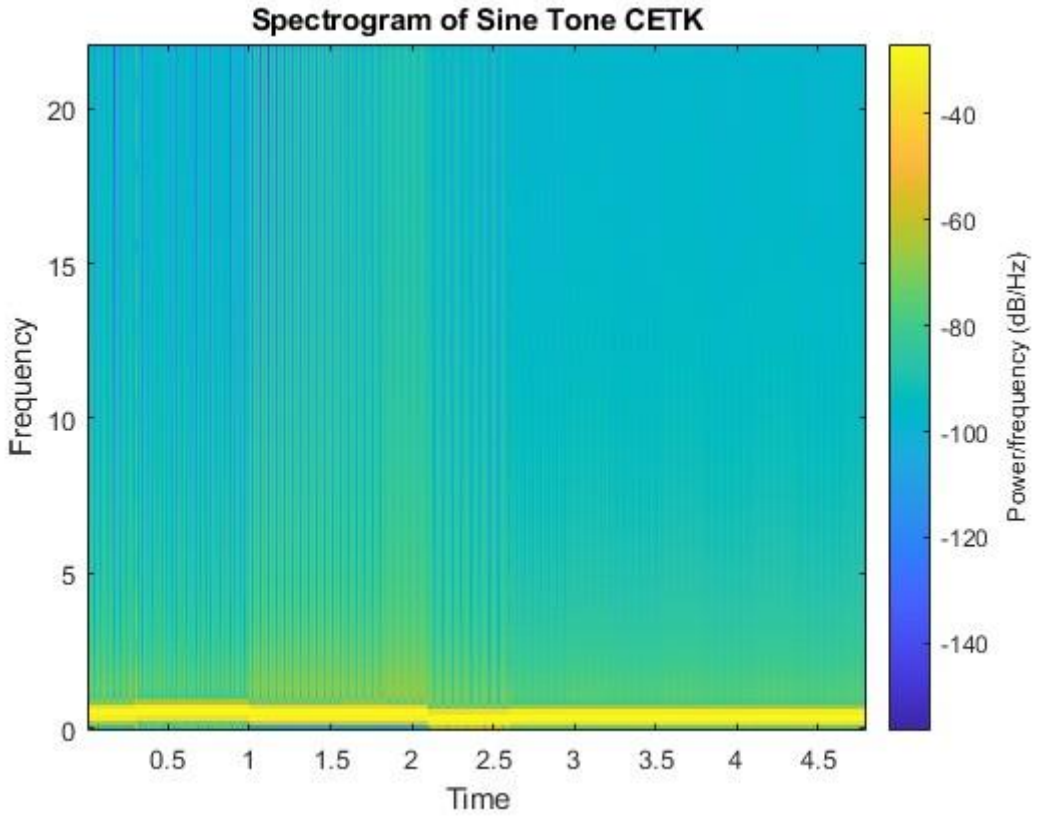

Figure 3 - Spectrogram of CETK Sine Tone

Question 4

Load the previously recorded speech file from Project 1, namely, "The quick brown fox jumps over the lazy dog," and add the 5000 Hz sine tone to it. Note that both signals should be the same lengths and should both be row vectors or column vectors.

- Play the resulting signal using the sound function and comment on what you hear.
- Save the resulting signal to a WAV file using the filename "team[[yourteamnumber]]-speechchirp.wav" and include in your submission to CANVAS.
- Plot the spectrogram of the resulting signal to include in your report.

When I heard the resulting sound, the recorded sound was heard at a lower volume than before, and I could hear the High Frequency Sine Tone.

Spectrogram: This is the spectrogram of SpeechChirp generated using MATLAB.

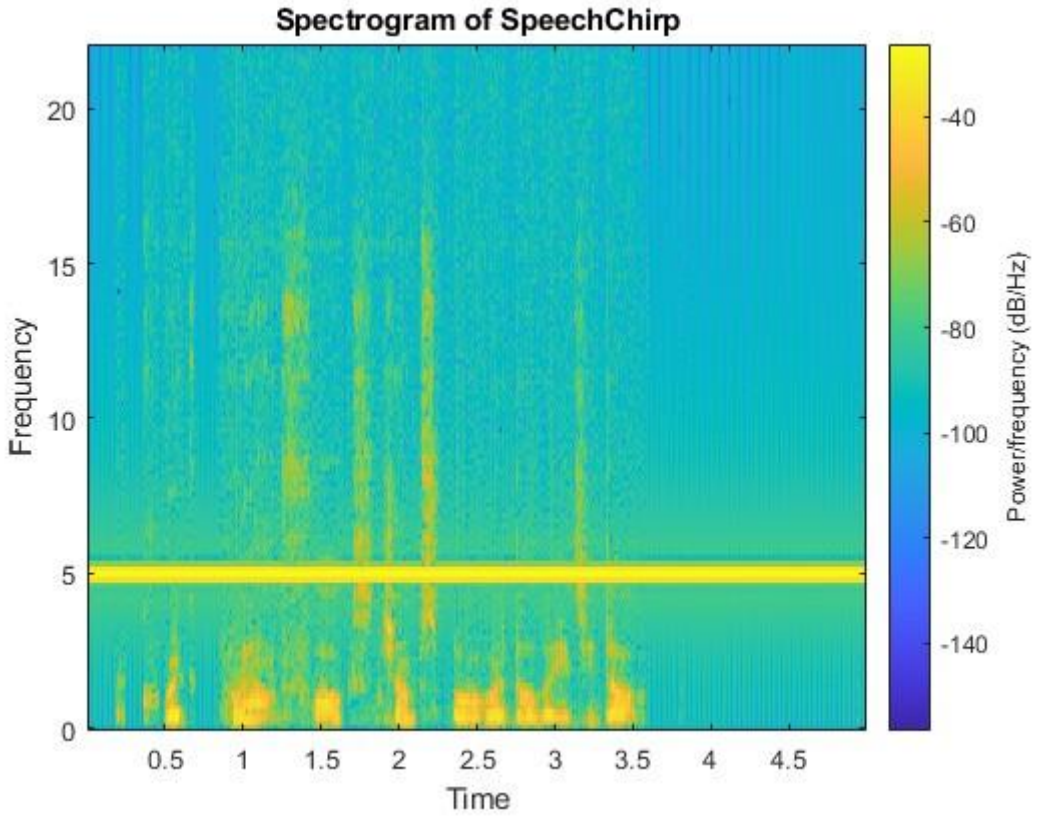

Figure 4 - Spectrogram of SpeechChirp

Question 5

Given the combined speech and sine tone signal from the previous section, design a lowpass filter with a cut-off frequency of 4000 Hz and apply it to this signal.

- Play the resulting signal using the sound function and comment on what you hear.
- Save the resulting signal to a WAV file using the filename "team[[yourteamnumber]]-filteredspeechsine.wav" and include in your submission to CANVAS.
- Plot the spectrogram of the resulting signal to include in your report.

Here, the sine tone is very noticeably quieter when compared to unfiltered signal.

Spectrogram: This is the spectrogram of Filtered Speech Sine generated using MATLAB.

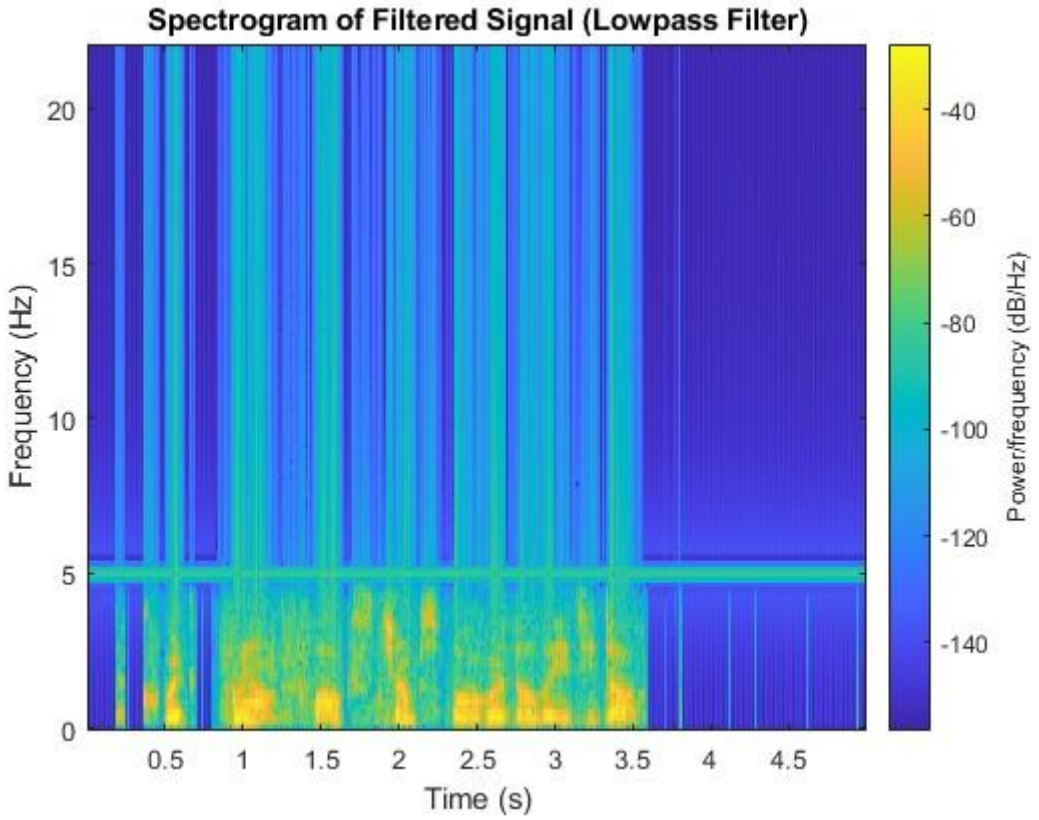

Figure 5 - Spectrogram of Filtered Signal (Lowpass Filter)

Question 6

Create a stereo audio signal, with the left audio channel consisting of the previously recorded speech file, “The quick brown fox jumps over the lazy dog,” while the right audio channel contains the same speech signal with the 5000 Hz sine tone added to it.

- Play the resulting stereo signal using the sound function and comment on what you hear. It is recommended to listen this signal using headphones.
- Save the resulting stereo signal to a WAV file using the filename "team[[yourteamnumber]]-stereospeechsine.wav" and include in your submission to CANVAS.
- Plot the spectrograms for each audio channel of the stereo signal and include them side-by-side in your report.

Here, I can clearly hear the sine tone from the right side of my headphones while the left side has the previously recorded speech.

Spectrogram: This is the spectrogram of Stereo Speech (Left Channel) generated using MATLAB.

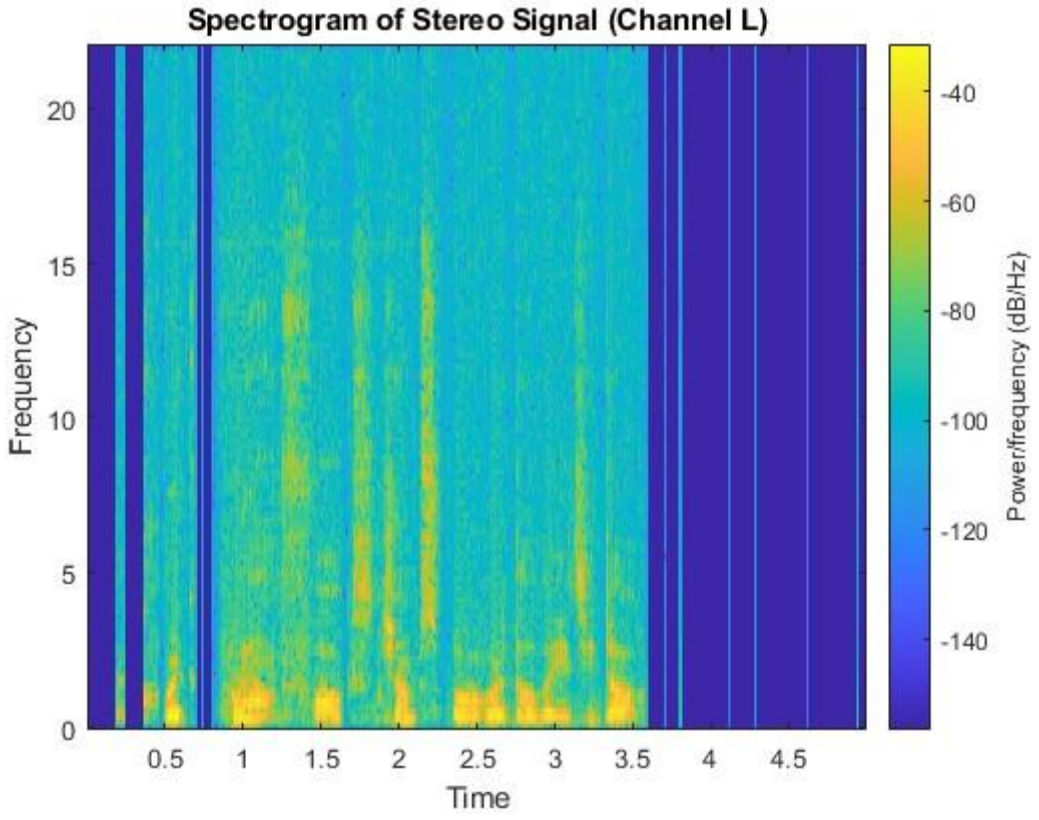

Figure 6 - Spectrogram of Stereo Signal: Left Channel

Spectrogram: This is the spectrogram of Stereo Speech (Right Channel) generated using MATLAB.

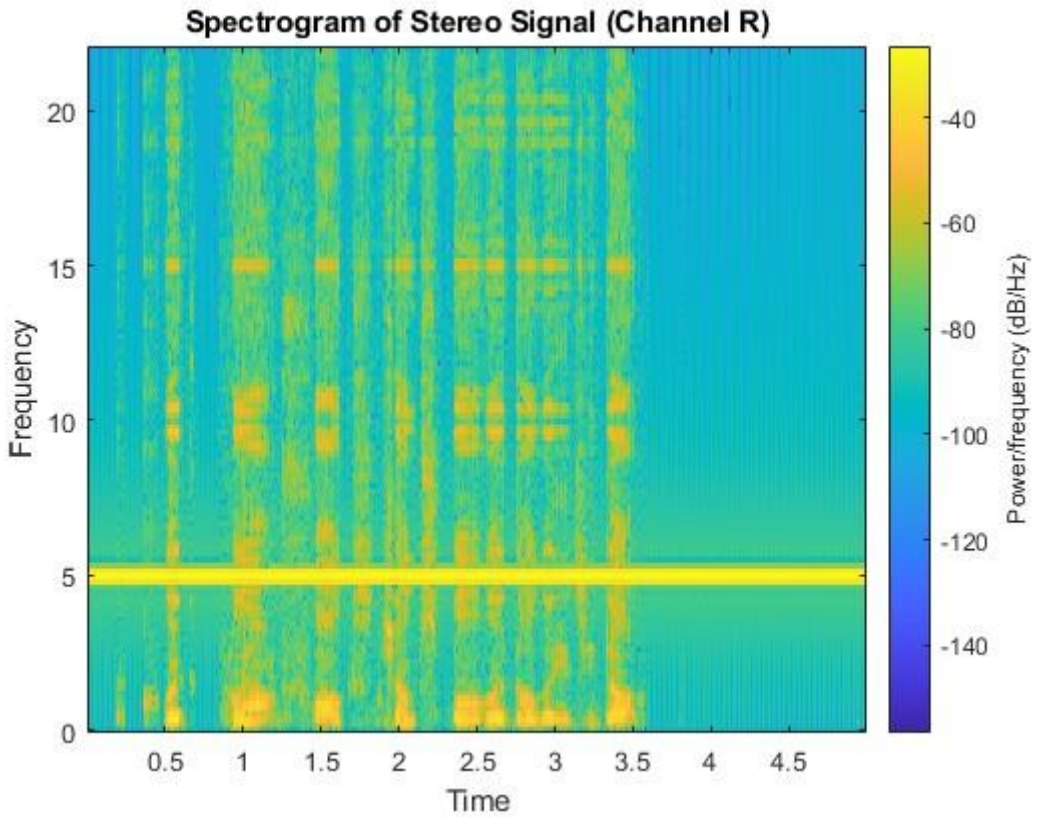

Figure 7 - Spectrogram of Stereo Signal: Right Channel