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10/30/23

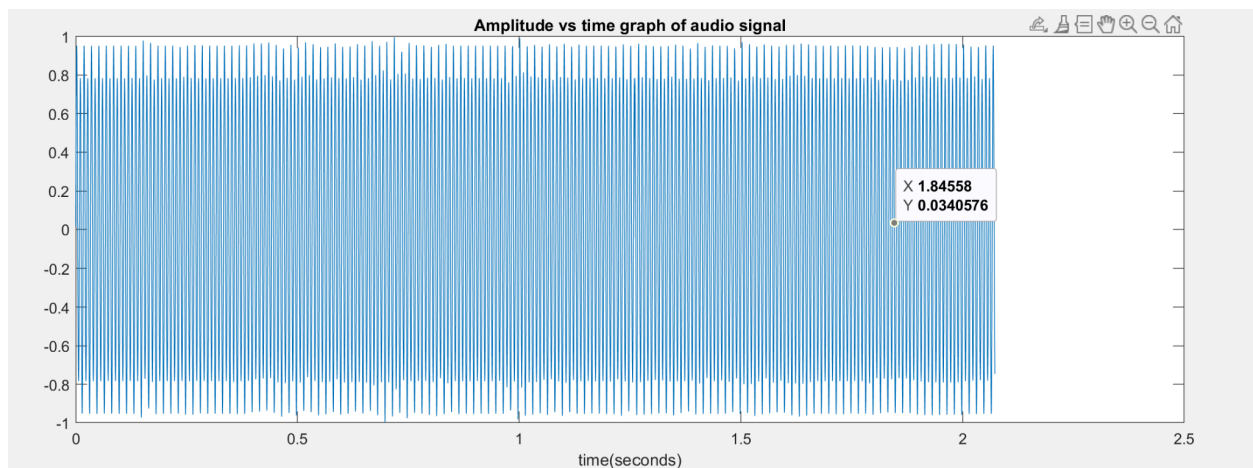
EE 400

Project 1 - Removing 60 Hz Mains Hum

Introduction:

The objective of this project is to implement a filter by using convolution to diminish the sound of a 60Hz frequency that is distorting the audio sample. A provided audio file and text file were used in the program MATLAB to perform all the operations necessary for filtering.

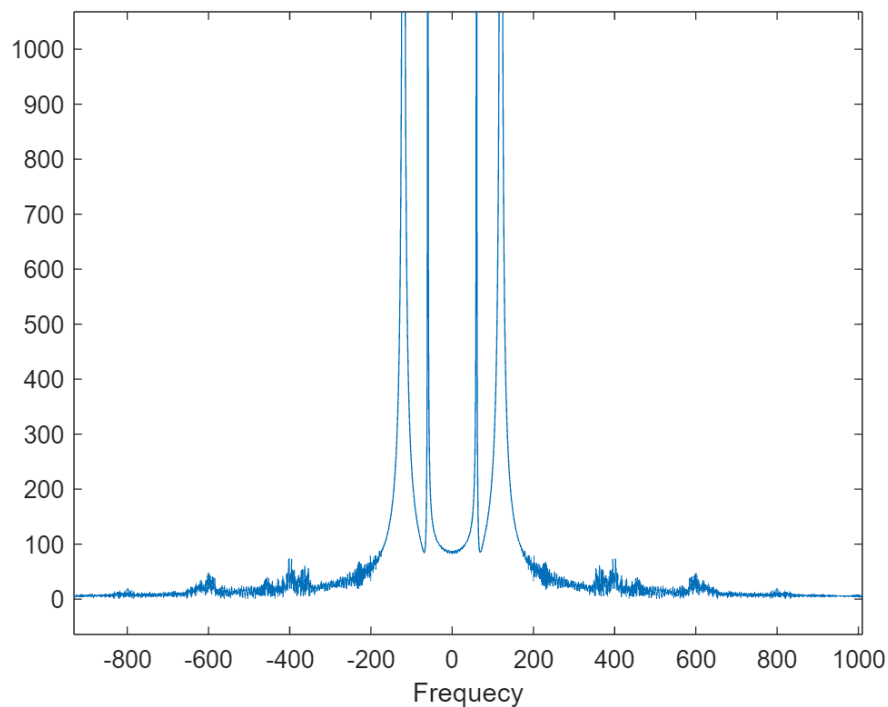
The program begins with a function that reads the audio sample and assigns the amplitudes of the signal to y , the sample rate which is built in to the file is assigned to fs and is to be 44100Hz (the sampling rate of a compact disk)



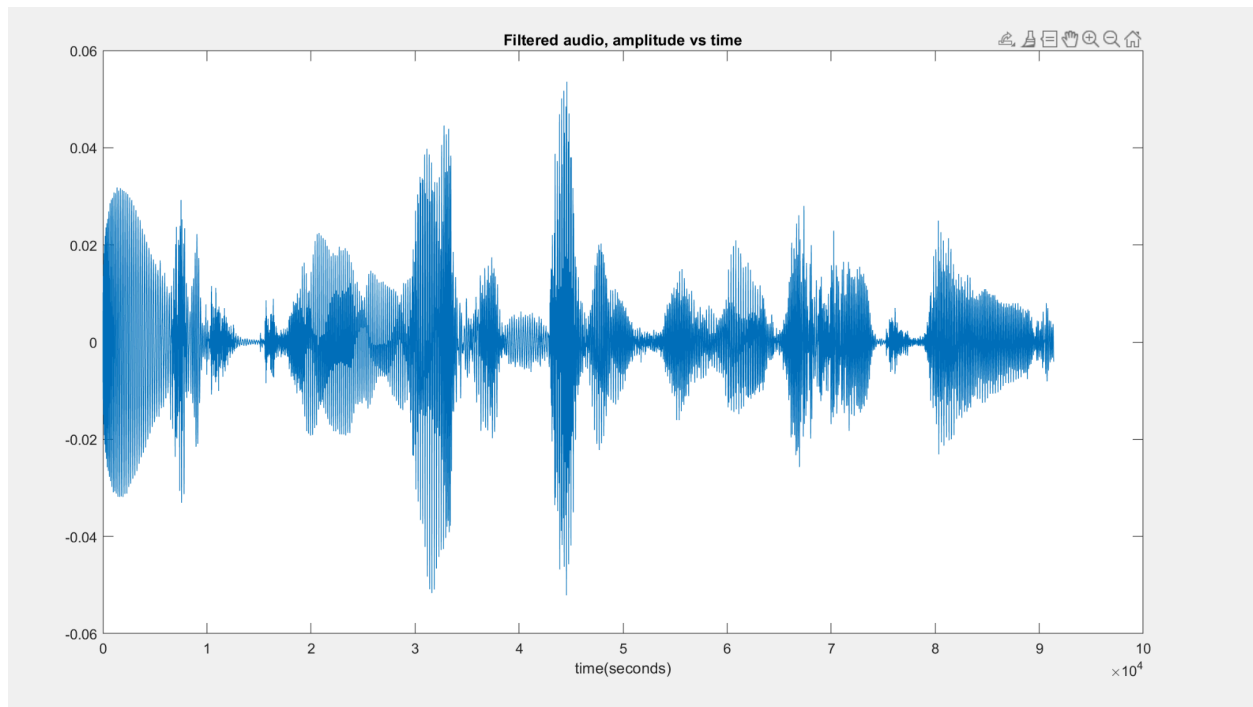
This plot shows the audio signal on an amplitude vs time graph.

The program then reads from the provided text file, the text file contains values that correspond to the frequency response of a band stop filter that was created in LTspice. The data is then interpolated to add a higher precision to the frequency response. After finding the derivative of the frequency response, it can be convoluted with the audio signal to perform filtering.

After the filtering process, the audio signal was better but there was still a noticeably large hum that was louder than the speaker. Performing a fourier transform, it can be observed to have a large amplitude frequency signal around $\sim 150\text{Hz}$.



After applying a high-pass filtering circuit with a cutoff frequency of 200Hz, the audio signal was audibly clean and the hum was removed.



Conclusion:

This project was extremely engaging and it encouraged me to make me think about the problem that needed to be solved. Being unsatisfied with the outcome of the provided code, I sought to delve further using the knowledge I have acquired in the class to create a program that perfects the filtering process. Although my final filtered result did not involve me applying convolution for filtering, I accomplished fully cleaning the audio sample of any hum.