Reducing Audio Bandwidth with an FFT-based Low-Pass Filter

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***Abstract*—The abstract goes here.**

I. Introduction

The transmission of audio signals through radio frequency is bandwidth-limited, which is why the FCC regulates transmissions so closely. Keeping the frequency higher saves bandwidth, and the goal is to trim the frequencies without impacting the quality of what the human ear perceives.

A. Objective

Our objective is to design and demonstrate an FFT-based low-pass filter to reduce bandwidth of a recorded audio signal for the purposes of AM Radio transmission.

II. Methods

We collected data, designed a low pass filter, pushed the signal through the filter, and then evaluated the resulting signal.

A. Data

We collected an audio signal by recording the song 'Flight of the Bumblebee' at the full frequency spectrum that a compact disc (CD) is recorded at, which is 44.1 kHz. The human ear does not even hear this full spectrum. This means that there are potential bandwidth 'savings' for transmission! This collected audio recording is referred to as the 'raw signal.'

B. Filter Design

Beat Navy. Test.

C. Nyquist-Shannon Sampling Theorem

When recording audio signals, one has to set a sampling frequency (or a frequency for recording the signal). There are several reasons why we set a sampling frequency:

1) Data storage conservation,
2) Bandwith conservation,
3) Power conservation.

III. Evaluation of Filtered Signal

We reduced the raw signal from 44.1 kHz to () kHz, with no perceived quality degradation to the three judges.

IV. Conclusion

The conclusion goes here.

References

[1] *GNU Radio*, https://www.gnuradio.org/.
[2] Baxley, R., Henshaw, A., Nowlan, S., & Trewhitt, E. *Software-Defined Radio with GNU Radio: Theory and Application, Georgia Tech Professional Education course notes.* (2017)