Data Collection Memo for Lab 6

Names: Yang Zhang, Zhang Wen & Yuan-Ti Ho

Date: October 10, 2016

Section: 01

# Part 1: From the Fourier Series to the Fourier Transform

1. Provide the screen captures that include the frequency domain for the periodic signal by itself and when multiplied by the pulse signal at each of the frequencies 500Hz, 250Hz, 125Hz, and 62.5Hz.

|  |  |
| --- | --- |
| Periodic signal with T0=1ms../../../Volumes/USB%20DISK/te | When multiplied by pulse at 500Hz../../../Volumes/USB%20DISK/te |
| When multiplied by pulse at 250Hz../../../Volumes/USB%20DISK/te | When multiplied by pulse at 125Hz../../../Volumes/USB%20DISK/te |
| When multiplied by pulse at 62.5Hz../../../Volumes/USB%20DISK/te |  |

1. Using the tables, find the Fourier transform of the single triangle that you saw when the pulse signal was at 62.5Hz.

X = tirg(t/0.5); 🡺 X(w) = (1/2)\*sinc^2(w/4Pi)

Y(w)=(2Pi/T0)

Plug in X(w):

Y(w)=(Pi/32m)

1. Sketch an outline of the spikes that appear in the power spectrum in each of your scope captures. What shape is this outline?

It is a sinc^2 function.

1. Explain why the sound from the speaker had a lower pitch as you decreased the frequency of the pulse signal.

As the frequency of the pulse signal decrease, the Fourier transform gets closer to sinc^2, which has more low frequency component, so the pitch is lower.

# Parts 2 and 3: Looking at Speech Signals

It is strongly advised that you create ALL of your plots in lab. Before you leave the lab, you MUST have the instructor verify at least one magnitude plot and one spectrogram plot.

1. Provide the MATLAB plots of the signals with respect to time and the corresponding magnitude and phase as shown in Figure 2.

|  |  |
| --- | --- |
| Phonetic “s” sound time and FFT figure | Phonetic “a” sound time and FFT figure |
| Phonetic “v” sound time and FFT figure | Whole word “save” time and FFT figure |

1. Provide the MATLAB plots of the signals with respect to time and the corresponding spectrogram as shown in Figure 3.

|  |  |
| --- | --- |
| Phonetic “s” sound time and spectrogram figure | Phonetic “a” sound time and spectrogram figure |
| Phonetic “v” sound time and spectrogram plot | Whole word “save” time and spectrogram figure |

1. Why does the Magnitude of the FFT for the “a” and “v” sounds have clear peaks, while the “s” sound does not?

‘a’ sound and ‘v’ sound have a pretty big amplitude. We can clearly see the peak.

1. How is the information in the Magnitude plot of the whole word “save” different from the information in the spectrogram for the word “save”?

The scale for the whole word Is larger.

1. Indicate on the spectrogram for the whole word “save” at which times each of the phonetics is being said.

Annotated on the graphs

1. Given the bandwidths of the AMR-WB and AMR-NB codecs that you found in your prelab, what parts of your speech signal would be rejected by each of these codecs.

For AMR-WB, it will reject all the frequencies other than 50 to 7000 Hz

For AMR-NB, it will reject all the frequencies other than 300 to 3400 Hz