ECE 480 Design Project
Assignment 1

Matlab Operations on Wave Files

Objective:

During this first design project assignment, you will be exposed to some of the fundamental concepts of using Matlab to process wave files. This will prepare you to use the digital signal processing techniques that are required for your final project. You will develop the input/output procedures that will be used in the final design project.

Deliverables:

- The report should include all relevant graphs integrated with the text.
- Make sure to explicitly label all axes and title all graphs (time is in msec).
- Comment your Matlab code so that it is obvious what process you are using.
- Include all Matlab code as either a referenced appendix or integrated into the report.
- Number all of your pages.

Design Project Assignment 1 Procedures:

Record and save the phrase *"We were away"*. Say it drawn out enough so that the vowel /IY/ in *"We"* and diphthong /eI/ in *"aw<u>ay</u>"* have a significant duration. Use Sound Recorder with the following properties:

Format	= Pulse Code Modulation
Sampling Rate	= 22,050 Hz
Bits per Sample	= 16
Recording Mode	= Mono.

1) Open the file in Matlab. Create a labeled plot of the signal versus samples. How many samples are in this signal?

2) Create a labeled plot of the signal versus time. What is the duration of this signal?

3) Alter the signal so that its new sample rate is 11,025 Hz. How many samples are in this signal?

4) Explain why a sampling rate of 11,025 Hz is still acceptable for this signal. For what type of sounds or signals might this sampling rate not be appropriate?

5) Edit the signal and remove any background-noise, pause, silence, or clicks BEFORE and AFTER the signal. Include a labeled plot of the edited signal versus samples. How many samples are in this signal?

6) Save the edited 11,025 Hz signal to a new wave file. Play the signal back and compare the sound quality of the 11,025 HZ wave file to the original 220,050 Hz wave file. Explain what attributes have changed and how well you can perceive the differences with your ears.

7) From the 11,025 Hz *"We were away"* wave file, extract the utterance /IY/ from *"We"*. Plot the utterance versus samples. How many samples are in this signal?

8) Zoom in on the /IY/ utterance. Does the signal look quasi-periodic? Plot two 'periods' of the signal. What is the approximate duration of one period in samples and in seconds? What frequency does this correspond to?

9) From the 11,025 Hz *"We were away"* wave file, extract the utterance /eI/ from *"away"*. Plot the utterance versus samples. How many samples are in this signal?

10) Zoom in on the /eI/ utterance. Does the signal look quasi-periodic? Plot four 'periods' of the signal. What is the approximate duration of one period in samples and in seconds? What frequency does this correspond to?

11) Resample the original 22,050 Hz *"We were away"* wave file in Matlab using <u>8 bits</u>. Compare the sound quality of the 8-bit signal to that of the 16-bit quality. Explain what attributes have changed and how much you can perceive the differences with your ears.