EE-414 Speech Processing Lab
Lab-4
31/01/2021

AIM

- To understand the time and frequency domain characteristics of **voiced and unvoiced speech**.
- To perform the voiced/unvoiced/silence classification of speech.

PROBLEM STATEMENT

A. Record the phrase "**Speech signal**" and plot the time waveform. Use 16kHz and 16 bits/sample as the sampling frequency and bit resolution respectively.
B. Examine "s", "ch", any one vowel, any one nasal from A as follows. Take one segment of 25 ms duration at the centre of the sound. Compute and plot the Autocorrelation function, and comment on the periodicity of the sounds. Compare the autocorrelation plots for various sounds and comment on how autocorrelation can be used for classifying the sounds as voiced and unvoiced.
C. Consider the 4 speech sounds mentioned in B and one silence segment. For each of these 5 audio segments, compute and plot **Short Term Zero-Crossing** rate and the **Short Term Energy** as a function of frame index for all the frames in the sound. Use 25 msec and 10msec as frame_size and frame_shift respectively. Comment on how you would use these time-domain features for classifying the sounds as voiced or unvoiced or silence.
D. Plot the magnitude spectrum (with magnitude in log scale) of the 4 speech sounds. Comment/explain how the visual inspection of the spectrum can be used to classify the sound as voiced or unvoiced.

SUBMISSION

- Submit a single pdf file, consisting of the following for each problem:
    - Theory
    - Procedure to carry out the experiment
    - Code (Matlab/Python)
    - Plots of the signal in the time domain and the magnitude spectrum.
    - Observations/Explanations wherever asked.

SUBMISSION FORMAT

- Submit a single pdf file, having the name as your roll number, Eg: **170010037.pdf** OR Submit a single zip with name as your roll number **(Eg:**

170010037.zip) containing the report and the codes. Note: Don’t create a zip of the files directly. Submit the zip of a folder containing the files.

DEADLINE: 5:00 PM 07/02/2021