EE-414 Speech Processing Lab
Lab-5
07/02/2021

AIM

- To study different sound units present in majority of Indian languages.
- To understand the production mechanism of each sound unit.
- To learn the time domain and frequency domain characteristics of different sound units.

PROBLEM STATEMENT

Note: Use 16 kHz and 16 bits/sample as the sampling frequency and the bit resolution respectively for recording all the speech signals.

A. Short vowels, Long vowels and Diphthongs
    a. Record the sounds of any one short vowel sound, long vowel sound and a diphthong (Also, record the two sounds present in the diphthong).
    b. Plot the time domain waveform, magnitude spectrum and the spectrogram for each of the above sounds.
    c. Inspect each of the above plots and write your observations comparing them.

B. Stop Consonants

POA	MOA			
	UVUA	UVA	VUA	VA
Velar	k	k^h	g	g^h
Aveolar	T	T^h	D	D^h
Dental	t	t^h	d	d^h
Bilabial	p	p^h	b	b^h

    a. Pick up any one of the POA(Position of Articulation) types and record the sounds present in the respective row for all the MOA(Manner of Articulation) types.
    b. Plot the time domain waveform, the magnitude spectrum and the spectrogram for each of the above sounds.
    c. Inspect the above plots and describe the various sub phonetic events that take place, their relative duration and how they vary across different kinds of MOA.

C. Nasals
    a. Record the sounds of any two nasal sounds and plot their time domain waveform, the magnitude spectrum and the spectrogram.

    b. Inspect the above plots and write your observations. Also, comment on how they compare to vowel sounds..

D. Semi-Vowels
    a. Record the sounds of any two semi-vowels and plot their time domain waveform, the magnitude spectrum and the spectrogram.
    b. Inspect the above plots and write your observations. Comment on how these vary from the vowel sounds.

E. Fricatives
    a. Pick up any two fricatives having different positions of constrictions. Record these sounds and plot the time-domain waveform, the magnitude spectrum and the spectrogram.
    b. Inspect the above plots and write your observations.

F. Affricates
    a. Record any one affricate sound and plot the time domain waveform, the magnitude spectrum and the spectrogram.
    b. Inspect the plots and write down your observations.

SUBMISSION (Please note there are two phases of submission for this lab)

- **Phase-I - Problems A-B (Only submission of the problems A-B, no Demo)**
- **Phase - II - Problems C-F (Submission of the problems C-F and Combined Demo for problems A-F)**

- Submit a single pdf/zip 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 **(Including production mechanism of the sound unit and its properties, eg: periodicity, energy, etc)** 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

- **Phase-I : 5:00 PM 14/02/2021 (Only submission A-B, no Demo)**
- **Phase-II : 5:00 PM 21/02/2021 (Submission C-F, Complete Demo for Problems A-F)**