

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

- Record the sounds of any one short vowel sound, long vowel sound and a diphthong (Also, record the two sounds present in the diphthong).
- Plot the time domain waveform, magnitude spectrum and the spectrogram for each of the above sounds.
- 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

- 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.
- Plot the time domain waveform, the magnitude spectrum and the spectrogram for each of the above sounds.
- 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

- 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)**