Deep Speech Processing (DSP) Assigment: 4

Short Term Time Domain Processing of Speech

Jan 2025

Instructions

- When uploading to Google Classroom, compress your files into a ZIP archive. Name the ZIP file as `SRN_Name.zip`

- All students are required to submit their assignments before coming for evaluation

- From now on, there is no need to upload a separate report. Instead, include your observations directly within the IPython notebook. For each experiment, create a text cell to write your observations. Additionally, embed audio files directly into the notebook.

- During evaluation, you will present the concepts using the IPython notebook exclusively.

- Any deviation from the guidelines may not be considered during evaluation.

- For all the questions in Basics section, ensure that both the time-domain representation and the magnitude spectrum plots are included in your Ipython notebook.

- If any doubts, please mail to `kishorks@iitdh.ac.in`

Short term energy [Q1]

Suggested Reading:
Concepts: Framing, Frame size, Frame step/Frame shift/Hop size
`https://shabda.readthedocs.io/en/latest/references/AudioBasics.html`

- Record audio with fs=16KHz, 16bit.
- Write a Python program for computing short term energy

- Frame size = [30msec, 50msec, 100msec, 200msec], Frame shift = Frame size/2
- Use Rectangular window and Hamming window while framing
- Time domain plot of audio
- Plot short term energy v/s time for all frame size, both rect and hamming window.
- Record your observation.

Short term ZCR [Q2]

Repeat the above experiment by computing short term Zero crossing rate (ZCR). Record observation with different frame size and window type.

Short term Auto correlation [Q3]

- Select 30msec of voiced segment [example: vowels,/aa/] from previously recorded audio.
- plot time domain and Autocorrelation of selected speeech segment
- Select 30msec of unvoiced segment [example: Fricatives,/sh/] from previously recorded audio.
- plot time domain and Autocorrelation of selected speeech segment
- Record your observation

Utils

- lab1: `https://colab.research.google.com/drive/1nX20djsBuHpdy29TNpbDCXc_6TCzyMlo?usp=sharing`
- lab3: `https://colab.research.google.com/drive/1yDGsctDdYIyCzTv2hJPCsRkzFJB9aOO-?usp=sharing`
- For recording audio, use wavsurfer or Audacity