

**Lab # 4**

Name: \_\_\_\_\_

Reg #: \_\_\_\_\_

**Aim:**

Our task today is to use a basic algorithm to efficiently separate non-speech part from any speech signal. Speech separation is one of the basic steps involved in Speech detection.

**Task:**

We aim to write a MATLAB script that can be used for speech segmentation i.e. it separates the speech signals into speech and silent (noise inclusive) part. E.g. uttered speech is

AoA. My name is Sajid. Welcome to DSPs lab.
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The algorithm must be capable of extracting three separate portions from this speech signal based on substantial pause/break in speech.

AoA.	My name is Sajid.	Welcome to DSPs lab.
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A simple yet effective approach to achieve this task is by analyzing the envelope (approximation of signal energy) of the signal. The steps constituting the overall system involve pre-emphasis, envelop generation, de-noising (using a simple Low Pass Filter) and finally thresholding and selection of silent and speech parts.

**Pseudo-code:**

- Record/Read a speech signal involving silent part.
- For each sample
  - To effectively utilize the dynamic range of frequencies pre-emphasis the signal, using  $y[n] = x[n] - ax[n - 1]$ .
  - Calculate envelope of the signal and apply a low pass filter to discard noise in the signal. (**Low pass filter as difference equation**)
  - Check if its amplitude is less than threshold set for voice sample (**T\_hold = 0.25\*max(signal)**)
    - Increment a counter saves number of continuous samples having amplitude less than threshold
  - Otherwise
    - Check if the number of continuous samples less than threshold are significant enough or not (**for this a min half a second of silence is considered significant**)
      - Increment counter holding information of total parts in the speech signal
      - Save indexes of start and end of silent period identified
    - Otherwise
      - Reset the counter for continuous samples
- Play/Plot the identified speech portions separately