

# Assignment-4

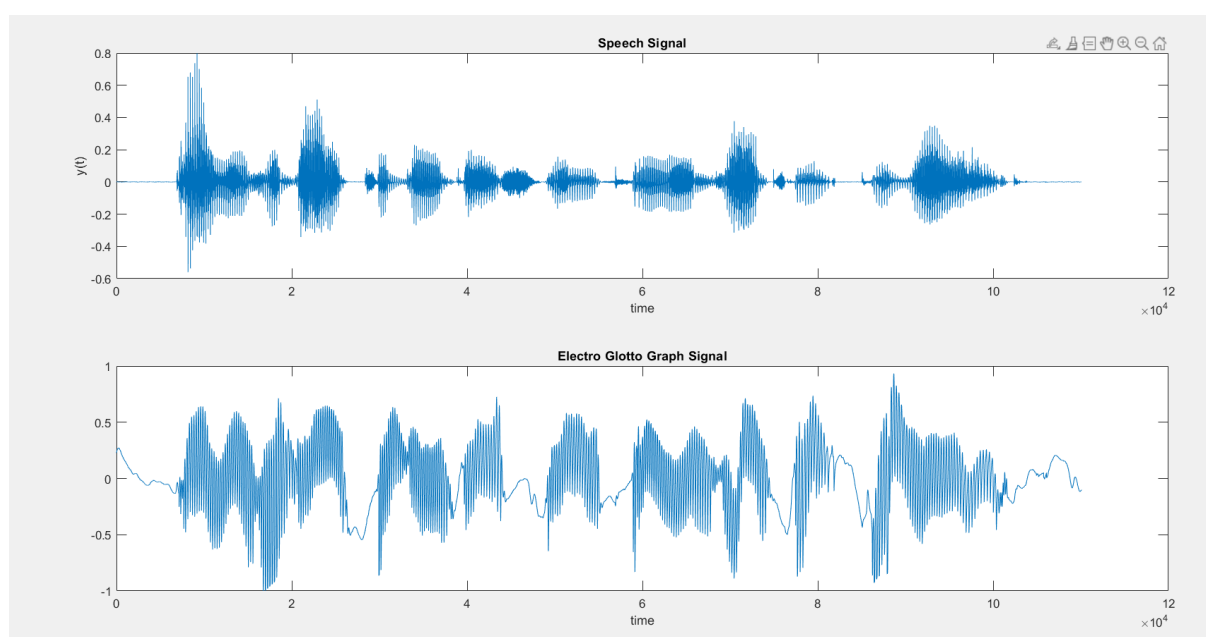
Speech Signal Processing

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*Q1. Calculate Epochs using ZFF approach.*

- In ZFF method, speech signal is passed through the cascade of two ideal zero frequency resonators.
- The output of the Zero frequency resonator (ZFR) is an exponentially increasing or decreasing function of time.
- The trend in the output of ZFR is removed by performing the mean-subtraction operation with window length equal to the average pitch period of the speech utterance.
- The resulting signal is called zero frequency filtered signal.
- The positive zero crossings of the zero frequency filtered signal are known as epochs.

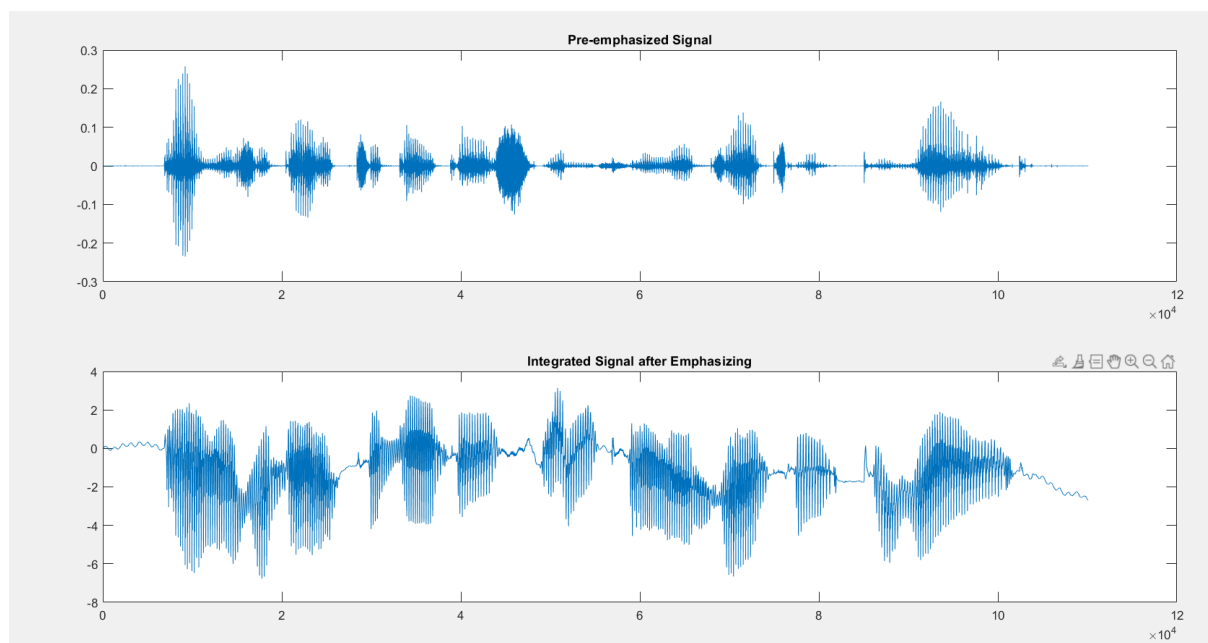
*[Cited by **Epoch detection from emotional speech signal using zero time windowing**]*

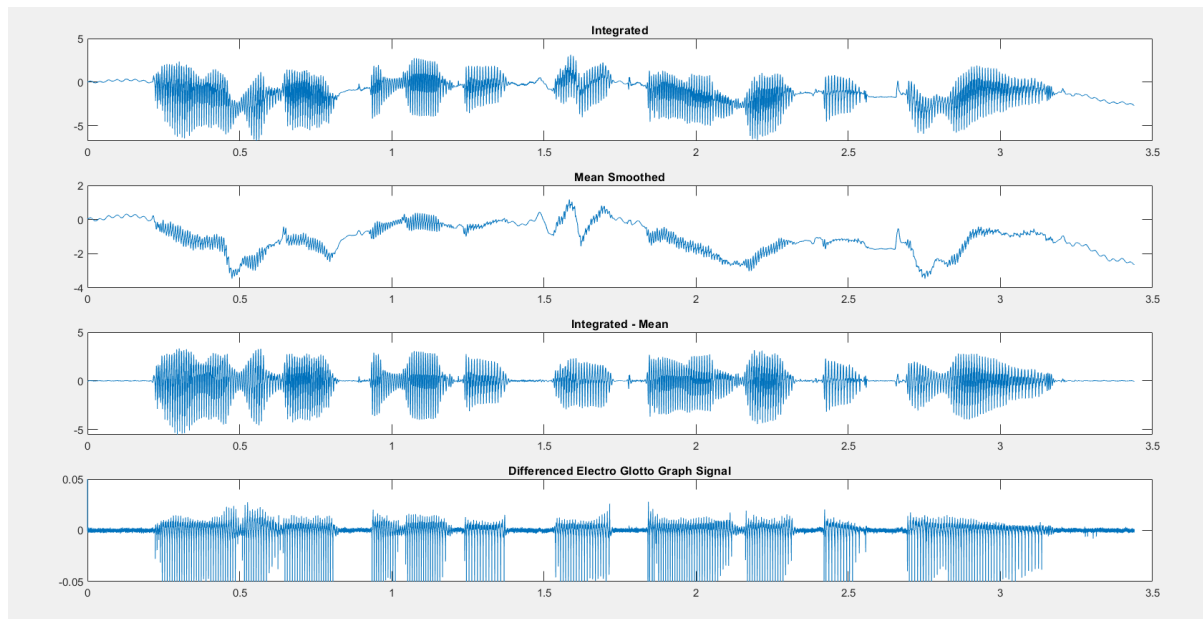


- Electro Glotto Graph signal represents the Epochs of the speech signal.

*Q2. Find LP Residual for a wave file of your choice and apply MFCC on it. Write your observations.*

- Using the same speech signal as used in question 1.
- Pre-emphasis refers to a system process which is designed to increase (within a frequency band) the magnitude of some (usually higher) frequencies with respect to the magnitude of other lower frequencies.
- This helps in improving the SNR.





*Q3. Calculate 7 prosody features for 4 wave files of same sentence spoken by different Native speakers(Mother tongue). Comment on variations in each feature.*

- Prosodic features are the aspects of speech that deal with the auditory qualities of sound instead of phonemes.
  - Volume: loudness or softness of sounds, used to show emotions
  - Projection: strength in speaking or singing where the voice is used loudly and clearly, technique used to command respect and attention.
  - Pitch: highness or lowness of a tone
  - Stress: degree of force with which a syllable or word is pronounced.
  - Intonation: variation of spoken pitch, used to express emotion, and for emphasizing something.
  - Juncture: a pause or slight delay in a continuous flow of speech. (/: slight pause; //: longer pause; #)
  - Rhythm: language's characteristic rhythm