

Speech Signal Assignment-3

Name:Ajay Ray

Roll:20211020321

1.

a.The *universal background model* (UBM) is an effective framework widely used in speaker recognition, enabling them to differentiate between target speakers and unknown speakers by comparing the likelihood of speech features against a background distribution.

b.In LP analysis the current sample is predicted as a linear combination of past p samples where p is the order of prediction. It is shown in below equation.

$$\hat{s}(n) = - \sum_{k=1}^p a_k \cdot s(n-k) \quad (1)$$

Now the LP residual is the prediction error $e(n)$ obtained as the difference between the predicted speech sample $\hat{s}(n)$ and the current sample $s(n)$.

c.The spectral subtraction method is a simple and effective method of noise reduction. In this method, an average signal spectrum and average noise spectrum are estimated in parts of the recording and subtracted from each other, so that average signal-to-noise ratio (SNR) is improved.

d.Mel Filter bank: It's a set of filters that are spaced according to the Mel scale, which is a perceptual scale of human hearing. These are applied to the spectrum of an audio signal to emphasize certain frequency bands that are more relevant for human auditory perception.

e. cepstrum: Cepstrum is a mathematical representation obtained by taking the inverse Fourier transform of the logarithm of the spectrum of a signal.