ABSTRACT

In most of the communication systems speech is transmittes in narrowband, containing frequencies from 300 Hz to 3400 Hz. Compared with normal speech which is generally contains a perceptually significant amount of energy up to 8 kHz, this speech has a muffled quality and reduced intelligibility, particularly noticeable in sounds such as /s/ and /f/ . Speech which has been bandlimited to 8 kHz is often coded for this reason, but this requires an increase in the bit rate.

Wideband reconstruction is a scheme that adds a synthesized highband signal to narrowband speech to produce a higher quality wideband speech signal. The synthesized highband signal is based entirely on information contained in the narrowband speech, and is thus achieved at zero increase in the bit rate from a coding perspective. Wideband reconstruction can function as a post-processor to any narrowband telephone receiver, or alternatively it can be combined with any narrowband speech coder to produce a very low bit rate wideband speech coder. Applications include higher quality mobile, teleconferencing, and internet telephony.

This final project aims to simulate the bandwidth extension system using spectral shifting method for highband excitation, which is used codebook and linear mapping to estimate the envelope of highband. The algorithm for wide band expansion proved to work, though certain unwanted artefacts were introduced in the reconstructed signal. Listening tests confirmed the presence of these unwanted artefacts. Objective and subjective tests demonstrate that wideband speech synthesized using these techniques have presentage in (numerical) 50 % of the respondences with SNR 5,13 dB. Optimum parameter used in this system goes to Euclidean distance with K=1 for KNN classification and correlation distance with 256 clusters for Kmean clustering. Computational time for spectral shifting 0.144 s, for spectral folding 0.138 s and codebook needs 164,2 s. Subjective measurement using DMOS for spectral shifting about 3.65 and for spectral folding 2. However further research and improvement to reach higher quality from this system for implementation are still needed.

Keywords : wideband reconstruction, narrowband, highband, codebook, spectral shifting.