ABSTRACT

New developments in Active Noise Cancellation have given birth to commercial products such as noise canceling headphones and low engine sound airplane cabin and cockpit. These products rely on adaptive filter to eliminate the noise by generating anti noise of original noise. Likewise these strategy can be applied to voice to cancel unwanted speech in open air. In some cases the speech must be preserved for speaker to communicate and canceled in surrounding environment for unwanted listeners.

Active Noise Cancellation (ANC) is an efficient way to attenuate noise that is very difficult and expensive to control using passive measures because of the long acoustic wavelength corresponding to low frequency noise involved. These long wavelengths make it necessary to use large headsets and heavy enclosure for noise control. Acoustic noise problems becomes more evident as increased number of large industrial equipments such as engines, blowers, fans, transformers, compressors and turbines are used.

ANC involves an electro acoustic or electromechanical system that cancels the primary (unwanted) noise based on the principle of superposition. A secondary source (commonly a loudspeaker derived by a control algorithm) creates an anti noise of equal amplitude and opposite phase that combines with the primary noise, and results in the cancellation of both the noises. However, ANC systems are ideally suited for use in the low frequency range. Although higher frequency ANC systems have been built, a number of technical difficulties, both structural/acoustic and electronic limit their efficiency. At higher frequency, passive system generally becomes more cost effective.

The thesis will present design of the Integrated ANC system that will consists of Adaptive feedback filter using Filtered-xLMS to attenuate the near-end periodic noise based on error microphone, an adaptive filter which functions as an adaptive noise canceller to enhance near-end speech before sending it to far end. The secondary path needs to be estimated and used in the updating process of the FxLMS algorithm, Estimation of secondary path is usually performed off-line followed by on-line modeling. Off-line modeling is carried out when a training signal is introduced into both the adaptive filter and the actual secondary path. On-line modeling of secondary path can also be performed after the off-line modeling has converged to the required error level. The received far-end speech replaces the training signal to continuously track the variation of Secondary path Transfer Function.

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