ABSTRACT

Most of the speech communication applications viz. telephony, hands-free communication, voice recording, automatic speech recognition, interactive voice response system, human-machine interfaces, etc. that require at least one microphone, desired speech signal is usually contaminated by background noise and reverberation. As a result, the speech signal has to be "cleaned" with digital signal processing tools before it is played out, transmitted, or stored. An attempt has been made here to explain the requirements and scope of improvements in the field of speech enhancement and its real time embedded implementation.

Several single channel speech enhancement and detection strategies are suggested in the past which are surveyed here; out of which the popular ones have been simulated and compared. But still they are offering some hindrances i.e. underperformance at low SNRs ($\leq$5dB) and in real world noisy and reverberant environments. Hence, the objective is to modify or combine single channel speech enhancement and detection algorithms having appreciable noise suppression characteristic in the low SNR range for various real world additive noises such as airport, car, restaurant, train, station etc. as well as in reverberant environments.

Considering the improvisations required in overcoming the flaw of traditional methods; efforts have been made to develop a new hybrid algorithm, which outperforms in adverse conditions. The hybrid algorithm interactively combines MMSESTSA approach and RASTA approach. It has been simulated and evaluated on the objective and subjective scale. The evaluation has been carried out as per IEEE recommendation and ITU guidelines. The outcomes of the method are well appreciable as compared to the other methods.

Finally, the hybrid algorithm is tried for the real time and embedded implementations. The real time implementation is done on PC using SIMULINK from Mathworks and embedded implementation is done on TMS320C6713 DSP from Texas Instruments using DSP Starter kit-DSK 6713 from Spectrum Digital Incorporation. The SIMULINK, Real Time Workshop and Target Support Package TC6 toolboxes from Mathworks and Code Composer Studio version 3.3 from Texas Instruments are used as development tools. The profile report of both the implementations are generated and compared. Final comment is made after comparison of profile results.