

Master 2014

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Speech Enhancement by a Beamformer Postfilter System in Non-Stationary Noise Environments.

ABSTRACT - Masterthesis

This thesis presents and compares several methods for multichannel noise reduction schemes in diffuse, stationary and non-stationary noise environments. A fixed beam former is one of various possible multichannel noise reduction methods. It is called fixed because it has fixed filter coefficients. We analyse delay & sum and super-directive beam formers as fixed beam former for this thesis.

The so called generalized sidelobe canceller is another kind of beam former which includes a delay & sum beam former and two more structures (a fixed and an adaptive filter) to cancel the sidelobes of the signal. It can achieve higher noise reduction than fixed beam formers. The robust generalized sidelobe canceller is another form of the generalized sidelobe canceller for which both of the sidelobe cancelling filters are adaptive.

Higher noise reduction and good quality of the desired speech component can be achieved if a beam former plus a post-filter system is used. In this thesis the Zelinski, Simmer, Subarray-approach and Psychoacoustic approach are used as post-filters. Zelinski and Simmer usually fail to handle correlated noise in the low frequency range while the subarray techniques use different subband approaches for different frequency ranges. A psychoacoustic approach exploits the auditory masking effect since complete removal of the noise is often neither necessary nor desirable.

From this thesis it will be clear that when the interference noise becomes non-stationary and diffuse, the fixed beam former and generalized sidelobe canceller are not sufficient enough to tackle the problem. The effect of non-stationary and diffuse noise field better reduce by beam former plus a postfilter system.