

ADVANCED BEAMFORMING TECHNIQUES IN VEHICLE ACOUSTICS

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ABSTRACT

A problem for the classic beamforming approach is a reverberant environment. The algorithm is based on the evaluation of phase relations between the array microphones. In a highly reverberant environment e.g. a vehicle cabin, the phase relations are distorted by the reflections. With the use of measured transfer functions between the array microphones and the points of interest in the cabin the accuracy of the results can be enhanced.

Coherence filtering techniques allow for the detection of mirror sources. Here, the coherence between an additional sensor placed as reference close to the main source is used to filter the array signals increasing the overall dynamic of the acoustic source mapping.

Recent advantages in computer technologies allow for a real time processing of the microphone array data resulting in an online visualization of the sound sources. Computer vision technologies based on multiple video cameras detect the three dimensional distribution of the potential sound sources increasing again the accuracy of the evaluation.

The paper describes these techniques in comparison to standard techniques like Principal Component Analysis and MUSIC and shows application examples in vehicle acoustics.