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Advanced Source Localisation with Beamforming in Vehicle Acoustics

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Beamforming using microphone arrays is a common used technique for the localization of sound sources. The first applications were mainly aeroacoustic measurements in wind tunnels. Here the measurement object can not be measured in the very near field with e.g. a single microphone without producing excessive noise, whereas the array can be placed outside the airflow. A problem for beamforming 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. 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 detail and shows applications in vehicle acoustics.

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