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An Analytical Model for Wedge-Shaped Acoustic Arrays

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Abstract

This work presents the derivation of a 3D sound field model for the pressure field radiated from loudspeaker arrays in acoustic wedge spaces. These wedge arrays are described by their normal velocity profile at a given boundary. Using this model, a suitable beamforming technique with two different beam patterns is derived based on a mode-matching approach. The model is then used to study the beamforming performance as a function of frequency and distance from the array by analysing the Arc Radial Functions introduced in this work. The theory is tested on the basis of simulation results for different wedges and validated through holographic measurements made with a hemi-cylindrical array. It is found that for a large distance, a far-field approximation of the model can be used to drive the array, whereas for a short distance, the general model must be applied to yield accurate results.

Keywords: wedge space, wedge array, inverse problem, arc radial function,

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