ACOUSTICS2008/2919
Estimation of acoustic directivity from microphone array measurements using parametric models

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In this paper, we are interested in recovering the far-field acoustic pattern of a directive source from signals recorded in the near-field by an array of microphones with a reduced spatial extent.
This question is particularly relevant in small test facilities where far-field acoustic measurements can not be carried out. A two-step approach is suggested. Firstly, the characteristics of sources are estimated from near-field measurements. Secondly, these characteristics are used to estimate the far-field radiation pattern.
The main difficulty of this problem mainly resides in the first step. Due to the reduced spatial extent of the array, much information is lost about source characteristics, which mathematically leads to solve an ill-posed inverse problem. Our approach consists in using a parametric model based on physical assumptions, which has the virtue of regularizing the estimation problem.
The suggested method is firstly evaluated with simulations, and then applied to experimental data recorded during aeroacoustic tests with a subsonic jet in an anechoic wind tunnel. It is shown that comparison between far-field measurements and estimated far-field pattern are in good agreement.