

Study of acoustic metamaterials using the fast multipole boundary element method

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Abstract

In this talk, we report some preliminary results of modeling acoustic metamaterials using the boundary element method (BEM). Specifically, we have applied the 2-D and 3-D BEM for solving acoustic wave problems to model phononic crystal structures to detect the band gap phenomenon. We assumed that arrays of rigid and long cylinders are placed in the acoustic medium and impinged upon by an incident wave. The sound fields on the other side of the arrays are computed at different frequencies using both the 2-D and 3-D BEM programs that are accelerated by the fast multipole methods. The results show clearly the band gaps for the models used which are also consistent with the data reported in the literature. This preliminary study shows the potential of using the fast multipole BEM in the research on acoustic metamaterials. Some related computational issues in using the BEM will be discussed during this talk.

Keywords: Acoustics, Metamaterials, Fast Multipole Method, Boundary Element Method