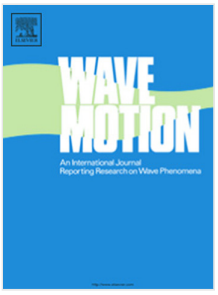

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A Numerical Study of Super-Resolution through Fast 3D Wideband Algorithm for Scattering in Highly-Heterogeneous Media

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Abstract

We present a wideband fast algorithm capable of accurately computing the full numerical solution of the problem of acoustic scattering of waves by multiple finite-sized bodies such as spherical scatterers in three dimensions. By full solution, we mean that no assumption (e.g. Rayleigh scattering, geometrical optics, weak scattering, Born single scattering, etc.) is necessary regarding the properties of the scatterers, their distribution or the background medium. The algorithm is also fast in the sense that it scales linearly with the number of unknowns. We use this algorithm to study the phenomenon of super-resolution in time-reversal refocusing in highly-scattering media recently observed experimentally [1], and provide numerical arguments towards the fact that such a phenomenon can be explained through a homogenization theory.

Key words: Fast multipole method, multiple scattering, waves in inhomogeneous media, super-resolution, homogenization.

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