Combining BEM-FEM and CQ Techniques for Wave Propagation Simulation

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Abstract:

In this work, we introduce a non-overlapping Boundary and Finite Element Method (BEM-FEM in what follows) approach to simulating wave propagation in unbounded and heterogeneous media via Multistep Convolution Quadrature (CQ) techniques. Initially proposed in [3], the CQ approach to our problem reduces the evolution problem into a sequence of stationary wave problems, with complex wave-numbers, in the full plane/space. We show how these problems can be solved efficiently in parallel using the BEM-FEM method, as introduced in [2]. This method exploits the strengths of both algorithms in space discretization: the FEM's flexibility in dealing with heterogeneities and the BEM's fast convergence for smooth solutions and the natural handling of the behavior at infinity

Furthermore, we present numerical experiments to demonstrate the effectiveness of our algorithm.

References:

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