Wave propagation involving solid-fluid interaction using a BEM/TBEM and MFS coupling formulation

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Abstract

This paper proposes a coupling formulation between the boundary element method (BEM) / the traction boundary element method (TBEM) and the method of fundamental solutions (MFS) for the transient analysis of elastic wave propagation involving solid-fluid interaction. The proposed formulation overcomes the specific limitations of each of these methods. The full domain of the original problem is divided into sub-domains, which are handled separately by the BEM/TBEM or the MFS. The coupling is enforced by imposing the required boundary conditions.

The accuracy, efficiency and stability of the proposed algorithms, which use different combinations of BEM/TBEM and MFS, are verified by comparing the solutions against reference solutions.

The potential of the proposed procedures is illustrated by simulating the propagation of elastic waves in the vicinity of a fluid-filled borehole, placed in a cracked elastic medium.

Keywords: wave propagation, TBEM/MFS coupling, BEM/MFS coupling, elastic inclusions, cracks, solid-fluid interaction.