Energetic BEM-FEM coupling for the numerical solution of the damped wave equation

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Abstract. Time-dependent problems modeled by hyperbolic partial differential equations (PDEs) can be reformulated in terms of boundary integral equations (BIEs) and solved via the boundary element method (BEM). In this context, the analysis of damping phenomena that occur in many physics and engineering problems is of particular interest. Starting from a recently developed energetic space-time weak formulation for the coupling of BIEs and PDEs related to wave propagation problems [1, 2, 3], we consider here an extension for the damped wave equation in layered media. A coupling algorithm is presented, which allows a flexible use of FEM and BEM as local discretization techniques. Stability and convergence have been proved by energy arguments. These properties are crucial in guaranteeing accurate solutions for simulations on large time intervals. Several numerical results on 1D model problems, confirming theoretical results, are presented and discussed.

Keywords: damped wave equation, BEM, FEM, layered media
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References

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