Boundary Element Methods in Dynamic Analysis

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Abstract
A review of boundary element methods for the numerical solution of dynamic problems of linear elasticity is presented. The integral formulation and the corresponding numerical solution of three- and two-dimensional elastodynamics from the direct boundary element method viewpoint and in both the frequency and time domains are described. The special case of the anti-plane motion governed by the scalar wave equation is also considered. In all the cases both harmonic and transient dynamic disturbances are taken into account. Special features of material behavior such as viscoelasticity, inhomogeneity, anisotropy, and poroelasticity are briefly discussed. Some other nonconventional boundary element methods as well as the hybrid scheme that results from the combination of boundary and finite elements are also reviewed. All these boundary element methodologies are applied to: soil-structure interaction problems that include the dynamic analysis of underground and above-ground structures, foundations, piles, and vibration isolation devices; problems of crack propagation and wave diffraction by cracks; and problems dealing with the dynamics of beams, plates, and shells. Finally, a brief assessment of the progress achieved so far in dynamic analysis is made and areas where further research is needed are identified.

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Topics: Boundary element methods, Dynamic analysis, Finite element analysis, Plates (structures), Vibration isolation, Crack propagation, Elastodynamics, Shells, Soil, Scalars