Zhang, Mei; Tang, Bo; Li, Hongjun; Hao, Wenxiu; Gong, Haitian
Simulation of the far-field radiation damping for half-plane problem by time domain boundary element method. (Chinese. English summary) [Zbl 07403698]

Summary: The radiation damping is of great significance in practical engineering such as blasting excavation of rock foundation pit, slope stability, structural seismic and structure-ground dynamic interaction. In order to simulate the far-field radiation damping of the half-plane problem, a new kind of element, adaptive semi-infinite boundary element, is proposed in the time domain based on the theory of the time domain boundary element method (TD-BEM) and the propagation characteristics of stress wave in elastic medium, which is specially used for discrete far-field semi-infinite boundary. The outer node of the element is always in front of the stress wave, which ensures that the calculation field can exactly contain the influence range of the stress wave in any case, so as to simulate the far-field radiation damping. Finally, two elastic half-plane examples under far-field and near-field dynamic loading respectively are used for verification, and the results are compared with those of the finite element method (FEM) and the original TD-BEM. The results show that the semi-infinite radiation condition is satisfied and far-field radiation damping can be simulated well by the TD-BEM adopted by the adaptive semi-infinite boundary element, and a higher accuracy can be obtained than the original TD-BEM under the almost same time cost.

MSC:
74S15 Boundary element methods applied to problems in solid mechanics
65M38 Boundary element methods for initial value and initial-boundary value problems involving PDEs

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radiation damping; adaptive semi-infinite boundary element; half-plane problem; stress wave

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