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Dynamic Analysis of Gradient Elastic Solids by BEM

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A boundary element methodology is presented for the frequency domain elastodynanic analysis of three-dimensional solids characterized by a linear elastic material behavior coupled with microstructural effects taken into account with the aid of a simple gradient elastic theory. Both time harmonic and transient problems are considered. A variational statement is used to determine the equation of motion as well as all the possible classical and non-classical boundary conditions. The gradient frequency domain elastodynanic fundamental solution is explicitly derived. In addition to a boundary integral representation for the displacement, a boundary integral representation for its normal derivative is also necessary for the formulation of the problem. For the transient case the problem is solved with the aid of the fast Fourier transform algorithm. Two numerical examples serve to illustrate the method, demonstrate its accuracy and assess the gradient effect on the response.

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