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C Vibration Analysis of a Beam on Elastic Foundation with Elastically Restrained Ends Using Spectral Element Method

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Abstract : In this study, a spectral element method is employed to predict the free vibration of a Euler-Bernoulli beam resting on a Winkler foundation with elastically restrained ends. The formulation of the dynamic stiffness matrix has been established by solving the differential equation of motion, which was transformed to frequency domain. Non-dimensional natural frequencies and shape modes are obtained by solving the partial differential equations, numerically. Numerical comparisons and examples are performed to show the effectiveness of the SEM and to investigate the effects of various parameters, such as the springs at the boundaries and the elastic foundation parameter on the vibration frequencies. The obtained results demonstrate that the present method can also be applied to solve the more general problem of the dynamic analysis of structures with higher order precision.

Keywords : elastically supported Euler-Bernoulli beam, free-vibration, spectral element method, Winkler foundation
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