

True and spurious eigensolutions of an elliptical plate by using the imaginary-part method of fundamental solutions

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In this paper, we employ the imaginary-part kernel of the fundamental solution to solve the true and spurious eigensolutions of an elliptical plate. The investigation is focused on the method by utilizing the imaginary-part kernel of the fundamental solution as the non-dimensional dynamic influence function. The method belongs to one kind of meshless methods. The coefficients of influence matrices can be easily determined. In order to illustrate the validity of numerical results to understand why spurious eigenvalues occur, we use the imaginary-part indirect boundary integral equation method (BIEM). The imaginary-part indirect BIEM is one kind of semi-analytical and meshless methods. To fully employ the elliptical geometry for an analytical study, the elliptic coordinates in companion with the Mathieu function are used. Owing to the appearance of spurious eigensolutions accompanied with true eigensolutions, singular value decomposition (SVD) updating techniques will be employed to extract true and spurious eigenvalues. Finally, the occurring mechanism of true and spurious eigensolutions of an elliptical plate will be analytically investigated. Also, the numerical results will be used to verify the validity of the proposed approach.

Keywords: imaginary-part kernel, SVD updating technique, NDIF method, elliptical plate, free vibration, imaginary-part indirect BIEM.