

PROCEEDINGS

Discrete Ritz Method

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ABSTRACT

Ritz method runs into difficulties when dealing with complex geometry domain due to the difficulty of constructing a global trial function to approximate structural deformation and the complexity of integration. In this paper, a novel numerical approach, discrete Ritz method (DRM), is proposed for the free vibration analysis of arbitrarily shaped plates with arbitrary cutouts. Legendre polynomials are adopted to generate the admissible function. DRM transforms the complex geometry domain into a system of rectangular domain with variable stiffness. Standard energy functionals and computation procedures are established for arbitrarily shaped plates. Then, in terms of Gauss-Legendre quadrature, integration over a complex geometry domain can be numerically simulated by discretizing the rectangular domain using Gauss points, and putting the thickness and stiffness of the Gauss points within the cutouts to be zero. With sufficient Gauss points, the innovative integration strategy can provide high precision integration results, and hence resolve the eigenvalue problem for free vibration of arbitrarily shaped plates with arbitrary cutouts. Numerical examples considering plates with various shapes, cutouts, aspect ratios, and boundary conditions are demonstrated to show the precision and stability of DRM, and results are compared with other available numerical, analytical, and experimental results existing in the literature.

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