

Exact Vibration Analysis of Laminated Piezoelectric Plates through Strong SaS Formulation

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ABSTRACT

This paper focuses on implementation of the sampling surfaces (SaS) method [1] for the 3D vibration analysis of laminated piezoelectric plates. The SaS formulation is based on choosing inside the layers the arbitrary number of SaS parallel to the middle surface in order to introduce the displacements and electric potentials of these surfaces as basic plate variables [2]. Such choice of unknowns permits the presentation of the piezoelectric plate formulation in a very compact form. The feature of the proposed approach is that all SaS are located inside the layers at Chebyshev polynomial nodes that improves the convergence of the SaS method significantly. The use of outer surfaces and interfaces is avoided that makes possible to minimize uniformly the error due to Lagrange interpolation [3]. Therefore, the strong SaS formulation based on direct integration of the equilibrium equations of piezoelectricity can be applied efficiently to the obtaining of exact solutions for laminated piezoelectric plates, which asymptotically approach the 3D solutions of piezoelectricity as the number of SaS tends to infinity.

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