

Bending Analysis for Piezoelectric Composites using Scaled Boundary Finite-Element Method

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The recent high demand for advanced structures has elevated the attention to piezoelectric composites due to their superior properties and customisability to those of conventional materials. Their increasing usage has emphasised the significance in reliably predicting their behaviour in early design stages. This paper presents an accurate and efficient technique to analyse piezoelectric composites. It is built upon the scaled boundary finite-element method, which is a semi-analytical procedure with only boundary discretisation of the problem domain. The proposed technique is developed without introducing any kinematic and electrostatic assumptions. The solutions in the transverse direction are expressed analytically as matrix exponential functions. The numerical locking issue, hence, does not arise. The proposed technique is able to describe high-order through-thickness solutions accurately. The good agreement with results from the literature and those from converged FEA highlights the performance of the proposed technique.

Keywords: Scaled Boundary Finite Element Method, Plate analysis, Piezoelectric composite, Smart structures