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STRONG FORMULATION ISOGEOMETRIC ANALYSIS (SFIGA) FOR LAMINATED COMPOSITE ARBITRARILY SHAPED PLATES

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ABSTRACT. Engineering applications in conventional numerical modeling are investigated by domain decomposition techniques because, generally, structural components do not have a regular shape. The most common and versatile numerical approach, in this regard, is the Finite Element (FE) method, which uses low order polynomials and the variational formulation for the solution of the differential problem. In contrast with the classic approach, the present paper shows a strong form collocation method for solving laminated composite plates wherein discontinuities arise. Both approaches need mapping technique for converting arbitrarily shaped elements into the computational space. Since the present strong form technique can deal with variable order approximating polynomials within each element, advanced blending function mapping must be employed for treating any discontinuity and distortion effect using the smallest number of elements. The Differential Quadrature (DQ) method is utilized for solving the mathematical problem and isogeometric mapping is implemented for the nonlinear mapping of complex shapes. The present methodology belongs to the framework of Isogeometric Analysis (IGA), therefore this approach is termed Strong Formulation Isogeometric Analysis (SFIGA). Numerical applications show the accuracy, stability and reliability of the present methodology.

KEYWORDS: A. Layered structures, B. Vibration, C. Numerical analysis, C. Computational modelling, Strong Formulation Finite Element Method

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