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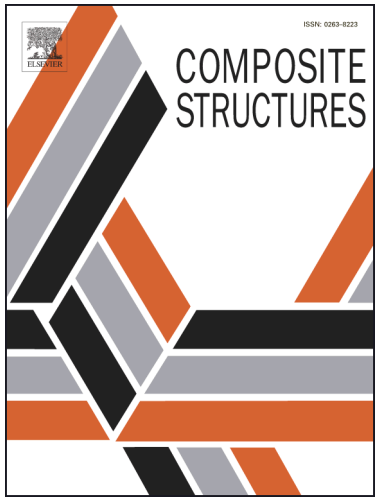

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Bending Analysis of Laminated Composite Plates Using Isogeometric Collocation Method

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Abstract

Isogeometric collocation has emerged as an efficient numerical technique for solving boundary value problems and is a potential alternative for Galerkin based Isogeometric methods. In this investigation, Isogeometric collocation has been proposed for the linear static bending analysis of laminated composite plates governed by Reissner-Mindlin theory. Three formulations are presented in this paper namely, standard primal formulation, mixed formulation and a locking-free primal formulation. The standard primal formulation adopts displacements and rotations as unknown field variables. Mixed formulation considers displacements, rotations and transverse shear forces as the unknown field variables. Locking-free primal formulation is a rotation-free formulation with displacements and transverse shear strains as the unknown field variables. Results for benchmark problems on bending of rectangular laminated composite plates are obtained and compared with the ones existing in the literature. The three formulations of Isogeometric collocation presented in this paper are assessed in terms of accuracy and the computational time required to assemble and solve the problem.

Keywords: Isogeometric collocation method, NURBS, Laminated composite plate, Sandwich plate, Reissner Mindlin plate theory, Shear locking

1. Introduction

Isogeometric analysis (IGA) is a relatively new family of numerical methods proposed by Hughes et al. [1] in 2005 aimed at integrating finite element analysis with Computer Aided Design (CAD). IGA methods in general adopt the same Non-uniform Rational B-Spline

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