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Isogeometric analysis of functionally graded plates using a refined plate theory

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Abstract

We present in this paper a simple and effective approach that incorporates isogeometric finite element analysis (IGA) with a refined plate theory (RPT) for static, free vibration and buckling analysis of functionally graded material (FGM) plates. A new inverse tangent distributed function through the plate thickness is proposed. The RPT enables us to describe the non-linear distribution of shear stresses through the plate thickness without any requirement of shear correction factors (SCF). IGA utilizes basis functions namely B-splines or non-uniform rational B-splines (NURBS) which reach easily the smoothness of any arbitrary order. It hence satisfies the C^1 requirement of the RPT model. The present method approximates the displacement field of four degrees of freedom per each control point and retains the computational efficiency while ensuring the high accuracy in solution.

Keywords: A. Plates; B. Buckling; B. Vibration; C. Computational modeling; FGM

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