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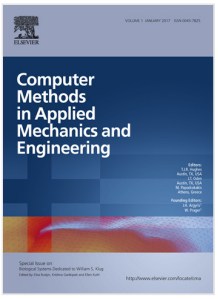

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Isogeometric analysis of composite beams with arbitrary cross-section using dimensional reduction method

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Abstract

A novel isogeometric-based cross-sectional analysis of composite beams with arbitrary cross-section geometry and a one-dimensional composite beam model is presented via the concept of dimensional reduction method. In dimensional reduction method, three-dimensional beam problem is decomposed into a two-dimensional beam cross-sectional analysis and a one-dimensional beam problem. To achieve this goal, warping displacements should be computed by solving a cross-sectional eigenvalue problem. The cross-sectional analysis is accomplished by spline basis functions to describe unknown warping fields as well as beam cross-section geometry in an isogeometric framework. The present method benefits from the exact geometric definition of beam cross-section, greatly simplifying mesh refinement and better convergence in contrast to classical finite element method. The proposed beam cross-sectional analysis is applied to a variety of beam cross-section configurations with isotropic and anisotropic materials, which show good correlation with the available results in the literature.

Keywords

Dimensional reduction, beam cross-sectional analysis, composite beam, Isogeometric analysis

1. Introduction

The accurate analysis of composite beams has attracted significant attention in the literature. Composite beam-like structures are widely used in advanced engineering fields. Composite beam models are used in the analysis of

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