A stress recovery approach for accurate elastic analysis of laminated composites via isogeometric collocation

Alessia Patton[†,*], John-Eric Dufour[‡], Pablo Antolin[§], Josef Kiendl[¶], Alessandro Reali[†]

[†] Department of Civil Engineering and Architecture - University of Pavia
Via Ferrata, 3, 27100 Pavia, Italy
E-mail: alessia.patton01@universitadipavia.it, alessandro.reali@unipv.it

[‡] Mechanical and Aerospace Engineering Department - University of Texas at Arlington
500 W 1st St, Arlington, TX 76010
E-mail: johneric.dufour@uta.edu

[§] Institute of Mathematics - École Polytechnique Fédérale de Lausanne
CH-1015 Lausanne, Switzerland
E-mail: pablo.antolin@epfl.ch

[¶]Department of Marine Technology - Norwegian University of Science and Technology
O. Nielsens veg 10, 7052 Trondheim, Norway
E-mail: josef.kiendl@ntnu.no

ABSTRACT

This work presents an isogeometric computational approach for stress determination of laminated composites, taking advantage of the accuracy and high-regularity properties of isogeometric analysis (IgA) [1] to build an accurate equilibrium-based stress recovery procedure [2]. Focusing on laminated plates, the proposed simulation strategy models the composite as a 3D solid via isogeometric computations using only one element through the thickness and a layer-wise integration rule or a homogenized approach. This guarantees an accurate approximation of the in-plane response. To recover also an accurate out-of-plane stress state, equilibrium is imposed in strong form as a post-processing correction step, which requires the shape functions to be highly continuous. This continuity demand is fully granted by isogeometric analysis properties, and results, in the context of both IgA-Collocation and IgA-Galerkin methods, show a very good performance of the proposed technique particularly for increasing values of length-to-thickness plate ratio and number of layers. Preliminary results that extend this procedure to the curved 3D case and to bivariate Kirchhoff plates will also be discussed.

REFERENCES

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