An accurate equilibrium-based approach to recover stresses in elastic solid composite structures via isogeometric analysis

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**ABSTRACT**

This work focuses on an accurate equilibrium-based stress recovery procedure \cite{1, 2} for elastic laminated composites which relies on high-regularity properties of Isogeometric Analysis (IgA). Using only one element through the thickness and a layer-by-layer integration rule or a homogenized approach, the 3D solid isogeometric modeling grants an inexpensive and accurate approximation of the in-plane response of the composite. In order to obtain also an accurate stress state through the thickness, this solution is then post-processed by means of direct integration of the equilibrium equations in strong form. However, in the case of laminated curved geometries, stresses referred to the global reference system, cannot be longer associated to in-plane and out-of-plane components. Therefore we introduce a local description at every point of the structure for which the out-of-plane through-the-thickness stress is going to be recovered, to locally apply the post-processing technique. This grants that no additional coupled terms appear in the equilibrium, allowing for a direct reconstruction without the need to further iterate to resolve the balance of linear momentum equation. The proposed post-processing technique requires the shape functions to be highly continuous, which is fully granted by IgA properties. Several numerical results, in the context of both IgA-Collocation and IgA-Galerkin methods, show the good performance of this approach particularly for composite stacks with a large number of layers.

**REFERENCES**
