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A STRESS-RECOVERY APPROACH FOR COST-EFFECTIVE ISOGEOMETRIC ANALYSIS OF COMPOSITE STRUCTURES

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This work focuses on the development of an isogeometric method for composite structures taking advantage of the accuracy and high-regularity properties of isogeometric analysis [1] to build a cost-effective stress recovery procedure [2]. The proposed simulation strategy consists of using 3D or shell isogeometric computations with a single element in the thickness and a layer-wise integration rule or an homogenized approach, granting an inexpensive and accurate approximation of the in-plane response. This solution is then post-processed in order to obtain also an accurate stress state through the thickness, based on the integration of the equilibrium equations in strong form. Such an approach allows to drastically reduce the number of degrees of freedom and, accordingly, the overall computational time as compared to standard layer-wise approaches where every layer corresponds to an element through the thickness. The post-processing operation is in fact very fast and its cost does not increase significantly with the number of degrees of freedom. Several numerical experiments are shown, revealing the very good accuracy-to-cost ratio of the method, which appears to be particularly effective on composite stacks with a large number of layers. The isogeometric collocation version of the approach is also discussed.

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