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A Rapid Stress Retrieval Approach for Long-Fiber Angle-Ply Laminates Using the RBF Kansa Method

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Building on the work presented in [1], this study extends a fast stress retrieval method to long-fiber angle-ply laminates subjected to constant bending and torque moments. The fiber/matrix interface stress state is efficiently estimated using global deformation data obtained from a finite element analysis performed on a coarse model, potentially employing a homogenized material. Radial basis functions (RBF) are utilized to bridge the macroscale and microscale, enabling the extraction of appropriate boundary conditions at the representative volume element (RVE) level. A collocation-based Kansa method, also leveraging RBF, is then applied to a carefully selected set of points to determine the local stress distribution. The accuracy of the proposed approach is assessed by comparing its results with high-fidelity FEM sub-modeling.

[1] Chiappa, A., Groth, C., & Biancolini, M. E. (2023). A two-scale RBF meshless method for the interface stress retrieval in simply bended and torqued long-fibres laminates. Composite Structures, 306, 116600.

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