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A MICROSTRUCTURE-BASED MULTISURFACE FAILURE CRITERION AND ITS APPLICATION TO WOODEN BOARDS WITH KNOTS

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As a natural composite, the failure behavior of wood highly depends on structural features on several lower length scales. Thus, an approach for the prediction of failure mechanisms of wood has been proposed [1, 2], leading to a better description of mechanical processes in wood and, thus, to an improved performance of wood-based products in service. The combination of failure surfaces inducing plastic behavior and of crack initiation surfaces within a single failure criterion leads to a powerful tool for the description of complex failure mechanisms in various timber engineering applications.

By implementing this new failure criterion into previous developments of a numerical simulation tool for wooden boards [3, 4], which enables the mathematical description of fiber deviations in the vicinity of virtually reconstructed knots, realistic simulations of complex failure mechanisms of not only single wooden boards and their use in timber connections but also of more complex wood-based products, like Glulam and CLT elements, are rendered possible. Furthermore, the simulation tool can now be used in the development of new wood composites, by making the material wood more predictable and, thus, more interesting for engineering applications.

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