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Embedded shell finite elements: Solid-shell interaction, surface locking, and application to image-based bio-structures

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We couple a shell mesh on the surface of an embedded solid domain to its unfitted volumetric mesh.

The variationally consistent formulation depends only on displacement variables.

Its stabilization term triggers surface locking due to a polynomial mismatch between shell and solid elements.

Reduced quadrature of the stabilization term mitigates surface locking.

We present two use cases: patient-specific stress prediction in a vertebra and local rind buckling in a plant structure.

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