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A HIGHER-ORDER CONFORMAL DECOMPOSITION FEM FOR NURBS-BASED GEOMETRIES

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We show how to construct a higher-order variant of the FEM that combines the advantages of both classical FEM with those of embedded domain methods and can take NURBS as description of the domain boundary. The domain of interest is embedded into a background mesh where at each node the distance to the boundary is computed, thereby converting the boundary geometry into an implicit description via level-sets. Given this level-set information, background elements intersected by the boundary are automatically decomposed into sub-elements conforming to the given boundary. It is shown in [1, 2] that this decomposition yields higher-order accuracy in the geometry representation and, later, in the FEM approximation. Consequently, a conforming finite element mesh of Lagrangian elements is automatically obtained following the idea of the conformal decomposition FEM (CDFEM) [3].

This contribution focuses on the construction of level-set data from NURBS geometries for an efficient decomposition. It also shows an easy way to avoid ill-shaped sub-elements, points out the importance of properly considering points of reduced continuity along the boundary and demonstrates how a local geometry-adaptive refinement can be employed to handle complex geometries.

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