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BLENDED B-SPLINE CONSTRUCTION ON UNSTRUCTURED QUADRILATERAL AND HEXAHEDRAL MESHES WITH OPTIMAL CONVERGENCE RATES IN ISOGEOMETRIC ANALYSIS

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We present a novel blended B-spline method to construct bicubic/tricubic splines over unstructured quadrilateral and hexahedral meshes for isogeometric analysis. C^1 and (truncated) C^2 B-spline functions are used in regular elements, whereas C^0 and (truncated) C^1 B-spline functions are adopted in boundary elements and interior irregular elements around extraordinary edges/vertices. The truncation mechanism is employed for a seamless transition from irregular to regular elements. The resulting regularity of the blended construction is C^2-continuous everywhere except C^0-continuous around extraordinary edges and C^1-continuous across the interface between irregular and regular elements. The blended B-spline construction yields consistent parameterization during refinement and exhibits optimal convergence rates. Spline functions in the blended construction form a non-negative partition of unity, are linearly independent, and support Bézier extraction such that the construction can be used in existing finite element frameworks. Several examples provide numerical evidence of optimal convergence rates.