ISOGEOMETRIC SPLINE FORESTS

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In this talk we present isogeometric spline forests. An isogeometric spline forest is a hierarchical spline representation capable of representing surfaces or volumes of arbitrarily complex geometry and topological genus. Spline forests can accomodate arbitrary degree and smoothness in the underlying hierarchical basis as well as non-uniform knot interval configurations. Spline forests can be viewed as a generalization of both analysis-suitable T-splines and hierarchical B-splines. We describe adaptive h-, p-, and k-refinement and coarsening algorithms for isogeometric spline forests and develop a Bézier extraction framework which provides a simple and efficient single level finite element description of the complex multi-level, unstructured hierarchical spline basis.

We demonstrate the potential of spline forests as a basis for analysis in the context of several demanding benchmark problems where fully integrated adaptivity (coupled refinement and coarsening) is demonstrated. In all cases, the adaptive process remains local (even in the case of moving fronts) and preserves exact geometry at the coarsest level of the discretization. The accuracy and robustness of the approach is demonstrated in all cases.