Splines on unstructured quadrilateral meshes: an isogeometric pipeline for design and analysis

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Modeling geometries of arbitrary topologies using quadrilaterals leads, in general, to unstructured meshes containing extraordinary points. Construction of smooth splines over such meshes is of considerable interest within the field of isogeometric analysis, and a myriad of approaches have been recently explored that focus on the design and analysis of such geometries.

In this talk we present a novel spline framework for design and analysis, admitting the use of unstructured quadrilateral meshes [1]. Acknowledging the differing requirements posed by design (e.g., the convenience of an intuitive control net) and analysis (e.g., good approximation behavior), we propose the construction of a separate, smooth spline space for each while ensuring isogeometric compatibility. An ingredient of our approach is the use of singular parameterizations at extraordinary vertices. We demonstrate the versatility of the approach with several applications in design and analysis. The constructed spline spaces show optimal approximation behavior, and seem to be well behaved even at the singularities [2].

Joint work with: Deepesh Toshniwal and Thomas J. R. Hughes (ICES, University of Texas at Austin)

References

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