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NEW ADVANCES IN VOLUMETRIC T-SPLINE CONSTRUCTION FOR ISOGEOMETRIC ANALYSIS

Yongjie Jessica Zhang

Department of Mechanical Engineering,
Carnegie Mellon University, Pittsburgh, PA 15213, USA
jessicaz@andrew.cmu.edu

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In this talk, we will discuss several new advances in volumetric T-spline construction for complex geometry, including feature alignment, trimming curve, conformal surface parameterization and handling extraordinary nodes using subdivision. Comprehensive schemes are described to construct rational trivariate solid T-splines from boundary triangulations. For arbitrary topology objects, Boolean operations and geometry skeleton can also be used to build feature-preserving polycubes. A polycube mapping is then used to build a one-to-one correspondence between the input triangulation and the polycube boundary. After that, we choose the deformed octree subdivision of the polycube as the initial T-mesh, and make it valid through pillowing, quality improvement and applying templates to handle extraordinary nodes. The parametric mapping method has been further extended to conformal solid T-spline construction with the input boundary spline representation preserved and trimming curves handled.

In the second part of this talk, I will present a new method termed Truncated Hierarchical Catmull-Clark Subdivision (THCCS), which generalizes truncated hierarchical B-splines to control grids of arbitrary topology and supports local refinement. THCCS basis functions satisfy partition of unity, are linearly independent, and are locally refinable. THCCS also preserves geometry during adaptive h-refinement and thus inherits the surface continuity of Catmull-Clark subdivision, namely C^2-continuous everywhere except at the local region surrounding extraordinary nodes, where the surface continuity is C^1. Adaptive isogeometric analysis is performed with THCCS basis functions on a benchmark problem with extraordinary nodes. Local refinement on complex surfaces is also studied to show potential wide applications of the proposed method.

REFERENCES

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