Analysis-Suitable Hybrid Non-Uniform Subdivision Surfaces with Optimal Convergence Rates

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ABSTRACT

This paper presents an improved version of hybrid non-uniform subdivision surfaces [1], called *analysis-suitable hybrid non-uniform subdivision* (ASHNUS), to achieve optimal convergence rates in isogeometric analysis, where we introduce a single parameter to control the rate of change of irregular regions. From the geometric point of view, ASHNUS retains comparable shape quality as the previous work [1] when using non-uniform knot intervals around extraordinary points. As a merit of subdivision schemes, ASHNUS is refinable in the sense that its geometric mapping stays invariant during refinement. Moreover, we prove that an ASHNUS surface is C^2-continuous everywhere except around extraordinary points, where it is G^1-continuous. From the analysis point of view, ASHNUS basis functions form a non-negative partition of unity, are globally linearly independent, and as a result of refinability, their corresponding spline spaces are nested. We further numerically demonstrate that ASHNUS can achieve optimal convergence rates with non-uniform knot intervals around extraordinary points.

REFERENCES

[1] Li, X. and Wei, X. and Zhang, Y.J. Isogeometric analysis based on hybrid non-uniform recursive subdivision with improved convergence rate. *Computer Methods in Applied Mechanics and Engineering.* (2018) Submitted.