Fitting and Lofting with Patchwork B-splines

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Hierarchical B-splines are one of the major approaches for adaptive refinement in geometric modeling and isogeometric analysis. However, the available refinement strategies are limited due to the fact that the underlying spline spaces are required to form a nested sequence. In order to increase the flexibility of the construction while preserving the good mathematical properties of the hierarchical B-splines, we introduce the concept of Patchwork B-splines. They use more general systems of spline spaces, thereby admitting a wider range of refinement strategies. We construct a basis of the resulting spline space by suitably adapting Kraft's selection mechanism [1] and discuss how to obtain a non-negative partition of unity. Finally, we focus on two potential applications of the Patchwork B-splines to aircraft engine design in an industrial environment. First, we present experimental results for surface approximation and second, we discuss a lofting algorithm that interpolates several cross-sectional B-spline curves with a Patchwork B-spline surface.

Joint work with: Bert Jüttler.

References

 R. Kraft. Adaptive und linear unabhängige Multilevel B-Splines und ihre Anwendungen. PhD Thesis, Univ. Stuttgard, 1998.