

Suitably graded THB-spline refinement and coarsening: Algorithms and applications

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ABSTRACT

The hierarchical spline model is an adaptive spline technology that enables the possibility to properly deal with local problems. Based on the multi-level concept of hierarchical splines, truncated hierarchical B-splines (THB-splines) were introduced as an effective tool to perform hierarchical refinement while reducing the interactions between different levels in the spline hierarchy [3]. The truncated basis has been successfully applied in different problems related to computer aided design and isogeometric analysis. While several papers investigated refinement schemes for hierarchical isogeometric methods in the last years, see e.g., [1] for a recent overview on adaptive methods with THB-splines, only very recently, few authors also focused on the study of suitable and effective mesh coarsening [4, 5].

In this talk, we present a complete set of algorithms to perform adaptive refinement and coarsening with THB-splines defined on certain suitably graded hierarchical meshes indicated as admissible meshes. We apply the proposed algorithms to linear heat transfer problems with localized moving heat source, as simplified models for additive manufacturing applications [2]. The numerical examples show that THB-spline admissible solutions deliver effective discretizations. In addition, they also confirm that our algorithms strongly improve computational efficiency.

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