Locally Refined T-splines

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ABSTRACT

In isogeometric analysis (IGA), NURBS basis functions from the computer aided design model are directly employed in the computational model. The approximation error from the geometry description is alleviated, compared to the standard finite element method. However, due to the tensor product structure of NURBS, local mesh refinement is not possible. For this reason, adaptive splines have been proposed to achieve a local refinement.

Ideally, IGA should be enhanced with local adaptive mesh refinement while the exact geometry representation is preserved. Various local refinement strategies have been developed recently, including locally refined B-splines and NURBS [1, 2]. Locally Refined B-splines (LR B-splines) were introduced by Dokken et al. [1] and further studied by Bressan and Johannessen et al. [2]. The basic idea of LR B-splines is to locally enrich the basis function space by replacing coarse grid B-splines with fine grid ones. This normally breaks the tensor-product structure of B-splines.

In this contribution, we extend LR B-splines to Locally Refined T-splines (LR T-splines). With an LR T-splines, the geometry can be represented more flexible. The properties of LR T-splines are investigated, e.g. the nested nature, the linear independence and the partition of unity property. The Bézier extraction framework will be extended to the implementation of LR T-splines. It conforms ideally to the element-wise point of view in existing finite element codes, which is an attracting aspect of LR T-splines.

REFERENCES

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