A POSTERIORI ERROR ESTIMATORS FOR HB-SPLINE DISCRETIZATIONS

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Abstract. Local adaptivity in numerical methods for partial differential equations makes possible to solve real problems leading to a suitable approximation of the desired solution without exceeding the limits of available software. When considering isogemetric methods, from a theoretical point of view, the design of efficient and robust strategies for local refinement constitutes a challenging problem because the tensor product structure of splines is broken.

In this work, we consider hierarchical B-spline (HB-spline) spaces [2] in order to discretize linear second order elliptic equations. A posteriori error estimations and adaptive strategies in this framework are interesting and useful points to analyze. The first theoretical results on these topics are given in [1], where simple residual element based error estimators are used.

Now, we define error estimators associated to the HB-spline basis functions, instead of active cells. We select functions with large error estimators, and remove them from the space by refining some of the active cells in their supports. In this context, we discuss about theoretical and practical aspects of an adaptive loop of the form

$$\text{SOLVE} \quad \rightarrow \quad \text{ESTIMATE} \quad \rightarrow \quad \text{MARK} \quad \rightarrow \quad \text{REFINE},$$

and in particular we present several numerical examples that show the performance of such algorithm.

Keywords: isogemetric analysis, hierarchical splines, local refinement, a posteriori error estimators

References

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