Isogeometric methods on trimmed geometries

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ABSTRACT

Trimming is one of the most fundamental tools in CAD environments, where complex geometries are built using boolean operations. At the same time it constitutes a source of difficulty in the interplay between the geometry and the numerical analysis of PDEs. When the superfluous parts of the physical object are cut away, its visualization changes, while its mathematical description does not. It turns out that we have to deal with elements unfitted with the boundary for which we prove that even the weak imposition of Dirichlet boundary conditions using Nitsche's method suffers from lack of stability. A minimal stabilization technique based on a modification of the variational formulation is presented in the context of the Laplace equation (see [1]). Optimal a priori error estimates are proven, and numerical examples confirming the theoretical results are provided. Then we generalize our novel method to the case of the union of multiple meshes, in the spirit of [3]. Finally, the extension to the case of the Stokes problem is discussed.

REFERENCES

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