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CUT ISOGEOMETRIC METHODS WITH BASIS REMOVAL

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A cut isogeometric method is a fictitious domain method where the boundary of the domain is allowed to cut through the background mesh in an arbitrary fashion and high regularity approximation spaces can be used. In particular, we consider a cut isogeometric method for a second order elliptic model problem which utilize B-spline approximation spaces of maximum regularity. In order to stabilize the method on the cut boundary we remove basis functions which have small intersection with the physical domain. We determine criteria on the intersection which guarantee that the order of convergence in the energy norm is not affected by the removal.

The higher order regularity of the B-spline basis functions leads to improved bounds compared to standard Lagrange basis functions. In W^1_∞-norm we note the extreme case where removal of Lagrange basis functions is not even possible without loosing convergence order.

While the basis removal does give a significant improvement of stiffness matrix condition numbers our criteria alone does not yield the optimal scaling of $O(h^{-2})$ as is the case for conforming finite element methods. We therefore also evaluate the combination of basis removal and preconditioning techniques.

REFERENCES

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