

A counterexample for finite element projectors

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In one space dimension, L_2 -orthogonal projectors onto spline spaces are known to be *uniformly* bounded as operators in L_∞ or C , independently of the choice of the partition. After results by Ciesielski and de Boor for low-degree splines obtained about 40 years ago, this was recently established in full generality by Shadrin [1].

In higher dimensions, things are "easier". It was folklore since the 70ies that uniform L_∞ bounds for L_2 -orthogonal projectors onto multivariate spline spaces are not to be expected. However, even for the simplest case of linear C^0 finite element spaces over triangulations of polygonal domains, concrete proof was not given in the literature. In [2], we provided such an example. It shows that in the 2D case the L_∞ norm may grow at least linearly with the number of triangles in the partition (certainly, these "bad" triangulations cannot satisfy the minimum angle condition uniformly in the number of triangles). A matching upper bound has not yet been proved.

REFERENCES

- [1] A. Shadrin, *The L_∞ -norm of the L_2 -spline projector is bounded independently of the knot sequence: a proof of de Boor's conjecture*, Acta Math. **187** (2001), 59–137.
- [2] P. Oswald, *A counterexample concerning the L_2 -projector onto linear spline spaces*, Math. Comp. **77** (2008), 221–226.