A locally modified high order Finite Element Method for interface problems

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We consider the locally modified finite element method [1] for the Laplace equation with a discontinuous coefficient across an interface line, which is able to resolve weak discontinuities in interface problems. Our approach is based on a mixed triangular-quadrilateral mesh as in a fitted finite element method. If a patch of elements is cut by the interface, we start by dividing the patch into four quadrilaterals whose boundaries approximate the interface. Each quadrilateral is then split into two triangles. We show that all interior angles of the triangles are bounded by $117°$ independent of the position of the interface on an edge. We present some numerical examples to show optimal order of convergence for elliptic problems.

References:

[1] Stefan Frei and Thomas Richter, A locally modified parametric finite element method for interface problems

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