The 18th International Conference on Finite Elements in Flow Problems (FEF2015)
16-18 March 2015, Taipei, Taiwan

A STABILIZED CUT FINITE ELEMENT METHOD FOR THE CONVECTION PROBLEM ON A SURFACE

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Key words: *Embedded surface, tangential calculus, cut finite element method, error estimates, gradient jump stabilization*

We present a stabilized cut finite element method for the convection problem on a surface based on continuous piecewise linear approximation and gradient jump stabilization terms. The discrete piecewise linear surface cuts through a background mesh consisting of tetrahedra in an arbitrary way and the finite element space consists of piecewise linear continuous functions defined on the background mesh. The variational form involves integrals on the surface and the gradient jump stabilization term is defined on the full faces of the tetrahedra. The stabilization term serves two purposes: first the method is stabilized and secondly the resulting linear system of equations is algebraically stable. We establish stability results that are analogous to the standard meshed flat case and prove $h^{3/2}$ order convergence in the natural norm associated with the method and that the full gradient enjoys $h^{3/4}$ order of convergence in L^2. We also show bounds on the condition number of the stiffness matrix. Finally, we present numerical examples.

REFERENCES

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