A DPG METHOD FOR THE QUAD-DIV PROBLEM

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ABSTRACT

The Quad-Div problem is related to the Quad-Curl problem in two dimensions. This kind of problems arise in several engineering and science problems, such as magneto-hydrodynamics, linear elasticity and inverse scattering theory [1].

In this talk we discuss the *Discontinous Petrov-Galerkin method with optimal test functions* (DPG method) [2] for the quad-div problem in a bounded Lipschitz polyhedral domain. The DPG method is a minimum residual method and is automatically stable. We develop an ultraweak formulation of a second-order reformulation. We prove its well-possedness in two and three dimensions. Then we construct a Fortin operator for $H(\nabla\mathrm{div})$ space and employ the DPG methodology that yields a quasi-optimal convergent numerical squeme. Finally, we show numerical experiments that confirms our theoretical results.

References

[1] Führer, T., Herrera, P. and Heuer, N., *DPG Methods for a Fourth-Order div Problem*, Comput. Methods Appl. Math. 22(3) (2022), pp. 545-562.

[2] Demkowicz, L.F. and Gopalakrishnan J., *A Class of Discontinuous Petrov-Galerkin Methods. Part II: Optimal Test Functions*, Numer. Methods Partial Differential Eq. 27 (2011), pp. 70-105.

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