ON HYBRID AND MIXED FINITE ELEMENT METHODS FOR STOKES AND DARCY FLOWS

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ABSTRACT

Accuracy and local conservation are attractive characteristics of mixed finite element methods for second order elliptic problems. Stable mixed methods are normally constructed based on pairs of finite element spaces satisfying the inf-sup conditions in the reference element. Usually, stability and approximation properties of these pairs of finite element spaces are robust to affine isomorphism, but not necessarily to more general mappings. For example, it is well known that RT and BDM mixed formulations loose their optimal rates of convergence when applied to general meshes of quadrilateral or hexahedral elements.

Recently, attempts have been made to develop more robust finite element methods. The natural connection between DG formulations and hybrid methods have been successfully exploited to derive new finite element methods with improved stability and reduced computational cost but still preserving the robustness and flexibility of DG methods.

In this talk we make some remarks on stability and approximation properties of the classical mixed finite element methods (RT and BDM) on distorted quadrilateral meshes and present, as alternatives, stabilized hybrid and mixed formulations for Stokes and Darcy flow problems.

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