A posteriori error estimates for the Mimetic Finite Difference approximation of the diffusion problem

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Abstract

The main characteristic of the Mimetic Finite Difference (MFD) method, when compared to a more standard finite element approach, is that the basis functions related to the discrete degrees of freedom are not explicitly defined. As a consequence, the operators and other quantities appearing in the problem must be approximated by discrete counterparts that satisfy finite dimensional analogs of some fundamental property. This approach allows for a greater flexibility of the mesh and the possibility to *mimic* intrinsic properties of the differential problem under study. In particular, general polyhedral (or polygonal in 2 dimensions) meshes, even with non convex and non matching elements, can be adopted.

This flexibility makes the MFD method a very appealing ground for the application of mesh adaptivity. In the present talk we focus on the MFD scheme for the diffusion problem and derive local a posteriori error estimates for the method. The error estimator is shown to be both reliable and efficient with respect to an energy type norm involving a post-processed pressure [1]. Finally, the error indicator is combined with a simple adaptive process and a set of numerical tests is presented [2].

Keywords: Mimetic Finite Differences, diffusion problem, a posteriori error estimation.

References

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