A hybrid difference method and postprocessing

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ABSTRACT

In this talk, we consider a hybrid difference method (HDM) which was introduced and analyzed by Jeon-Park-Shin (Comput. Methods Appl. Math., 2017) for the second-order elliptic problems. This method can be viewed as a finite difference version of hybrid discontinuous Galerkin methods (Jeon-Park, SIAM J. Numer. Anal., 2010). The HDM is a locally conservative method and it allows high-order approximations. Also, the method has great reduction in global degrees of freedom and its convergence is proved in the discrete energy norm. Since a few node points in each element are not used, the approximation value is evaluated on the axis parallel lines constructed by the node points of the HDM in $\mathbb{R}^d$ $(d = 2, 3)$. In the present work, the error estimate is analyzed by introducing a projection operator to obtain the optimal rate of convergence. Also, the HDM is developed and generalized to be a conforming method by introducing a postprocessing. Numerical results are presented to show the performance of the proposed method, which support our theoretical findings.

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