GOAL-ORIENTED hp-ADAPTIVE STRATEGY FOR THE DISCONTINUOUS GALERKIN METHOD

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Abstract. Error control of approximations is a crucial aspect in numerical resolution of partial differential equations. For engineer applications, a common practice is to control the error in quantities of interest related to the phenomenon, which can be represented by a functional applied to the solution. For the discontinuous Galerkin method for second and fourth order elliptic problems, as formulated in [3] and [4], our purpose is to consider an adaptive goal oriented process to control the error in quantities of interest with reduced number of degrees of freedom. As in [2], we analyse the performance of three kinds of *a posteriori goal-oriented* error indicators to guide adaptation. They are based on the dual problem associated to the target functional, and produce the same global error estimation. However, they have different local behaviours. In addition, we design an hp-criterion based on an estimation of the local smoothness of the solution based on the local decay of the error indicators, which is inspired by the ideas in [1]. The idea is to use p-adaptation where the solution is smooth, and h-adaptation for regions containing a singularity, restricting its influence to smaller elements as possible. In the experiments, we observe that the performance of the indicators may vary according to the treated problem or to the kind of tasks involved in the adaptive strategy (localization of elements with significant error or smoothness estimation). We propose the combination of different indicators in the same simulation, by exploring the better performance of each one, making the adaptivity even more advantageous. This fact shows the importance of having different tools to be used in the adaptive process.

Keywords: discontinuous Galerkin method, goal oriented error indicators, biharmonic equation, hp adaptivity.

Mathematics Subject Classifications (2000): 65N50, 65N30, 65N15.

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