A Painless Automatic Goal-Oriented *hp*-Adaptive Strategy for Elliptic Problems

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ABSTRACT

Despite the existence of several *hp*-adaptive algorithms in the literature (e.g. [1]), very few are used in industrial context due to their high implementational complexity, computational cost, or both.

This occurs mainly as a result of two limitations associated with the use of *hp*-adaptive methods: (1) the data structures needed to support *hp*-refined meshes are often complex, and (2) the design of a robust automatic *hp*-adaptive strategy is challenging.

To overcome limitation (1), we adopt the multi-level approach of D'Angela et al. [2]. This method handles hanging nodes via a multilevel technique with massive use of Dirichlet nodes.

Our main contribution in this work is intended to overcome limitation (2) by introducing a novel automatic *hp*-adaptive strategy. Derived from an energy-based *unrefinement* approach developed in [3], in here we extend it to the case of goal-oriented adaptivity.

Given an arbitrary grid, the algorithm detects those unknowns that contribute least to an upper bound of the error representation of the quantity of interest, and remove them. Once a sufficient level of unrefinement is achieved, a global h, p, or any other type of refinements can be performed.

We tested and analyzed our algorithm on one-dimensional (1D) and two-dimensional (2D) benchmark cases. In this presentation, we shall illustrate the main advantages and limitations of the proposed goal-oriented *hp*-adapted method.

REFERENCES

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