Anisotropic *Hp*-adaptive Discontinuous Galerkin Solution of Stationary and Non-stationary Problems With Applications in Fluid Dynamics

Vit Dolejsi
Charles University Prague
dolejsi@karlin.mff.cuni.cz

Abstract

We develop a *hp*-anisotropic mesh adaptation technique, which can be simply employed for the numerical solution of partial differential equations with the aid of a discontinuous Galerkin method. This method is based on piecewise polynomial but discontinuous approximation and it simply deals with anisotropic (thin and long) elements and with different polynomial approximation degrees on different elements. The presented algorithm generates quite general anisotropic triangular grids and the corresponding polynomial approximation degrees.

This adaptive technique is based on the following ingredients:

- the size of the generated elements is given by some a posteriori error estimates as residual based estimates, dual weighted residual estimates, ...,
- the shape of the anisotropic triangles follows from the minimization of the interpolation error in the suitable (semi-)norm,
- the polynomial approximation degree is chosen from several candidates in order to minimize the total number of degrees of freedom.

This approach is supported by a set of numerical experiments withe applications for steady as well as unsteady fluid dynamics problems.

References

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