High-order anisotropic metric-based mesh adaptation

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ABSTRACT

Nowadays, there have been an increasing interest for high-order numerical methods, such as discontinuous Galerkin or spectral differences methods. In order to be efficient, these requires high-order representation of the solution, as well as high order approximation of the geometrical domain. If the mesh is not well adapted, or if the geometry is linearly approximated, high-order methods may not converge with high-order rate, or even not converge at all (see for instance [1]). For linear finite elements, the topic has been largely investigated and there exist several mesh adaptation methods to deal with this issue, among them the metric based adaptation methods (see [2, 5, 6, 7]). In this presentation, one introduces an extension of these methods to the case of high-order interpolated solutions. It is well known that the high-order interpolation error is governed by the high-order differential of the solution [3]. In the linear case, this leads to the Hessian based methods, in which the adaptation metric field derives from the Hessian matrix of the solution (see for instance [6, 7]). In this presentation, one shows how to extend the Hessian based methods to the case of high-order interpolated solutions, through the use of the log-simplex method. It is based on the approximation of the high-order differential of the solution by a continuous metric field, which we obtain by reducing the optimisation problem into a sequence of linear ones, in a logarithm metric space [4].

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