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A PRIORI-BASED MESH ADAPTATION FOR VISCOUS COMPRESSIBLE FLOWS

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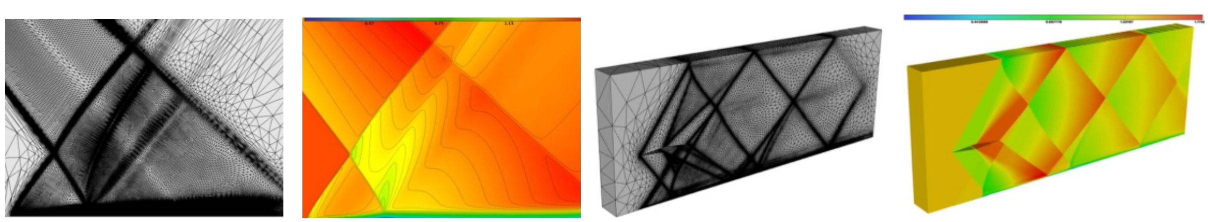
Most viscous flows cannot be computed without an adapted mesh. After decades of aerodynamical simulation, the engineer has accumulated an impressive sum of know-how for adapting such meshes by e.g. equipping obstacles with mesh boundary layers. Performing an as good job with automated mesh adaptation is not so trivial. In order to take into account the necessary mitigation of approximation error, mesh adaptation methods can rely on the adjoint-based goal-oriented methodology, using error estimates and adjoint states, [1].
The proposed communication will address the derivation of these estimates by using as guide the $k-$exactness principle, which says that $u_h = u$ if $\Pi_h u - u = 0$. In the case of the Poisson problem, the estimate writes

$$\int \sum_1^d \left[\frac{\partial}{\partial x_i}(u-\Pi_h u)\frac{\partial}{\partial x_i}\Pi_h\varphi\right] \mathrm{d}\Omega \preceq K_d \int_\Omega \max_{ij}\left|\frac{\partial\varphi}{\partial x_i x_j}\right| |u-\Pi_h u|\, d\Omega \;+\; \text{Boundary Terms}$$

In the case of the Navier-Stokes equations for a compressible fluid, a similar analysis has to be applied to each of the viscous/thermal terms of the system. This analysis and a collection of 2D and 3D applications with new mesh generators [2] will be presented during the talk.



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