Anisotropic Adaptive Mesh Method With Fully Implicit Interfaces

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An implicit boundary representation, coupled with anisotropic mesh adaptation provides a very flexible way to perform complex simulations involving complex interface geometries, moving or evolving boundary. In contrast, body fitted mesh add too much constraints to be well suited for optimization of complex shape.
In this presentation we present a possible way to insert the discretization error of the interfaces in the a posteriori error estimate. The error estimate is made of contributions coming from the under resolved scales of the Navier-Stokes solver and their traces on the boundary, scaled by the discretization error of the boundary itself. The implicit representation of the boundary is given by a distance field and the global process required only being able to calculate the distance to the interface when the geometry is known, or to solve adaptively a re-distancing equation when not. The error estimate provides a unique metric field controlled by a number of mesh nodes (CPU cost) driving optimally the mesh both on the discretization error from the solver and the boundary representation error. It is expected to simplify the global mesh adaptation procedure when the geometry is unknown or parametrized for optimization

References

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