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DRIVING ITERATIVE DOMAIN DECOMPOSITION SOLVER BY OBJECTIVE OF ACCURACY ON QUANTITY OF INTEREST

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Virtual testing aims at being massively adopted by industrialists thanks to the developpement of computational mechanics. It requires methods to deal with large problems (millions of degrees of freedom) and tools to estimate and warrant the quality of numerical simulations. Non-overlapping domain decomposition methods [1,2,3] are classical strategies to solve large systems in parallel and the error in constitutive relation [4] leads to efficient estimators of the distance between the FE solution and the exact solution.

In a recent work [5], we proposed a fully parallel a posteriori error estimator that enables the separation of the discretization error from the algebraic error (due to the use of an iterative solver). This separation avoids over-resolution and offers the possibility of an auto-adapted computational strategy based on an objective of quality. The stopping criterion of the iterative solver is defined with a reference to the discretization and the error map provided by the estimator is used to process adaptative remeshing.

In this talk, we present the extension to goal-oriented error estimation. We show that the reference and adjoint problems can be solved simultaneously thanks to block-Krylov techniques [6]. We describe a method based on [7] to build kinematically and statically admissible fields for both reference and adjoint problems, necessary to evaluate the error in constitutive relation. Therefore, we obtain a fully parallel error estimator for both problems and we are able to evaluate the local and global error at each iteration. Finally, we demonstrate that classical bounds on quantities of interest [8] can be rewritten in order to separate the sources of error. That separation enables to drive the iterative solver by an objective of accuracy on the quantity of interest.

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