A posteriori error estimate for fictitious domain and Nitsche’s method applied to contact problems in elasticity

Mathieu FABRE\textsuperscript{1}, Jérome POUSIN\textsuperscript{2} and Yves RENARD\textsuperscript{3}

\textsuperscript{1}INSA-Lyon, ICJ UMR5208, Villeurbanne, France. mathieu.fabre@insa-lyon.fr
\textsuperscript{2}INSA-Lyon, ICJ UMR5208, Villeurbanne, France. jerome.pousin@insa-lyon.fr
\textsuperscript{3}INSA-Lyon, ICJ UMR5208, Villeurbanne, France. yves.renard@insa-lyon.fr

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\textbf{ABSTRACT}

The aim of this work is to present a residual-based \textit{a posteriori} error estimator on the approximation of unilateral contact problems between two elastic bodies in a fictitious domain framework. The Dirichlet and contact boundary conditions are taken into account with a Nitsche type method.

In the present work, we consider the unilateral contact in the small deformation between two elastic bodies with nonzero initial gap, a potential contact zone and Dirichlet and Neumann boundary conditions. This work is based on a generalization to the case of two elastic bodies and a fictitious domain approach analyzed in [1]. To obtain an optimal \textit{a priori} error estimate, a stabilized fictitious domain method is necessary. This stabilization is inspired by an extended finite element method [2]. \textit{A posteriori} error estimator based on residual approach for contact problem is proposed [3] and adapted for Nitsche’s method and fictitious domain approach.

Some theoretical results are presented: the consistency of the discrete method, existence and uniqueness results. As far as we know, the optimal \textit{a priori} error estimate and \textit{a posteriori} error estimator for a contact problem with a fictitious domain approach and Nitsche’s method is a new result. Finally, the method is validated using Hertz contact in two dimensional as the test problem (\textit{c.f.} Figure 1).

\textbf{REFERENCES}

