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A POSTERIORI ERROR ESTIMATES FOR A NEUMANN-NEUMANN DOMAIN DECOMPOSITION ALGORITHM APPLIED TO CONTACT PROBLEMS

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Abstract. Contact problems are frequent in structural analysis. They are characterized by inequality constraints such as non-interpenetration conditions, sign condition on the normal constraints, and an active contact, an area that is a priori unknown. Several approaches exist for solving the non linear equations issued from the finite element discretization of frictionless contact problems. In this work, we consider a natural Neuman-Neumann domain decomposition algorithm, in which each iterative step consists of a Dirichlet problem for the one body, a contact problem for the other one and two Neumann problems to coordinate contact stresses. Two main approximation errors are introduced by this algorithm: a discretization error due to the finite element method (FEM) and an algebraic error due to the Neuman-Neuman domain decomposition algorithm (NNDD).

The objective of this paper is to present an a posteriori global error estimator for a frictionless contact problem, solved by a NNDD algorithm and two errors indicators which allow to estimate the part of the error due to the spatial discretization and the part of the error due to the domain decomposition algorithm. We show how to extend the error measure in the constitutive relation developed by the authors for contact problems solved by a Neumann-Dirichlet domain decomposition algorithm and how to modify the construction of the admissible fields. The proposed errors estimators and indicators are studied on several 2D-examples and the behavior of the NNDD algorithm is compared with the behavior of a Neumann-Dirchlet domain decomposition algorithm