A PRECONDITIONED DOMAIN DECOMPOSITION ALGORITHM FOR CONTACT PROBLEM

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Abstract

The purpose of this work is to study for small strains, the quasistatic two-body contact problem without friction. The mechanical interation between the bodies is modeled, under the assumption of small displacement, by the bilateral or unilateral contact condition [1]. An algorithm is introduced to solve the resulting finite element system by a non-overlapping domain decomposition method. The global problem is transformed to a independent local problems posed in each bodie and a problem posed on the contact surface (the interface problem). The central aspect of this work is the adaptation of a preconditioner construction developed by B. Kiss at al., in [2] for non-overlapping decomposition domain method to the contact problem. The circulant matrix representations of the $H^{\frac{1}{2}}$ seminorm has been proved to be spectrally equivalent to the Schur Complement in [3]. The advantage of this preconditioner construction is, that its preconditioning property is optimal and this technique allows us to reduce the storage and the matrix-vector multiplication costs. Using this equivalence, the interface problem is transformed to an equivalent problem which is solved with adequate mathematical programming methods [4]. The developed algorithm is validated for two-dimensional and three-dimensional problems.

References

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