A SCALABLE DUAL–PRIMAL DOMAIN DECOMPOSITION METHOD FOR THE SOLUTION OF CONTACT PROBLEMS WITH FRICTION

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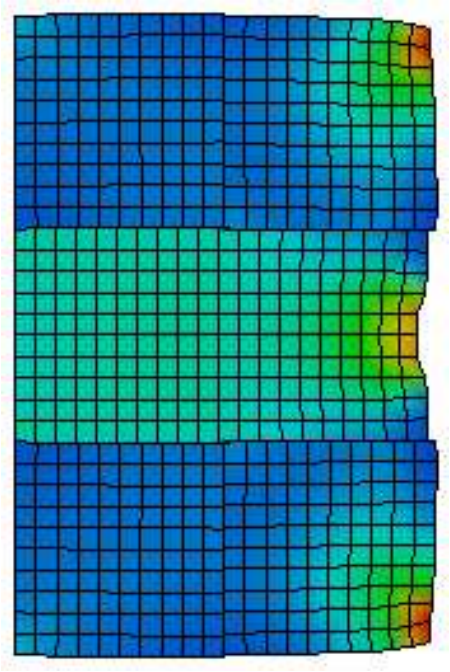
We present a domain decomposition method with Lagrange multipliers for solving iteratively contact problems with friction. This method, which is based on the dual–primal FETI method [1] and therefore is named the FETI–DP–C method, incorporates a coarse contact system that guides the iterative prediction of the active zone of contact. The treatment of the normal contact constraints is the same as in the FETI–C method [2]. The FETI–C approach is expanded to include friction. Solving the resulting *non-symmetric* projected system of equations requires modification of the PCPG algorithm used in FETI–C.

Domain decomposition methods like the dual–primal FETI method subdivide the computational domain into several subdomains and provide the connection between these domains through a set of constraint equations utilizing the Lagrange multiplier approach to enforce the constraints. This concept can be expanded naturally to include constraints originating from contact. To this end a set of potential contact constraints is defined from which the active contact constraints are selected within the main PCPG loop. Essentially, at each PCPG iteration, the contact requirements of non-penetration and positiveness of the contact pressure are checked and a change in the contact status is made whenever this is appropriate. Including friction into the problem will add the conditions that the frictional force cannot exceed a maximum value and that sliding needs to take place opposite to the direction of the frictional force. Expansion of the frictionless dual–primal FETI method to include friction causes non-symmetry in the PCPG solver. The standard PCPG algorithm is modified so that orthogonality of the residual with respect to previous search directions is not destroyed by the non-symmetry.



References

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