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A TWO-SCALE LATIN-PGD FOR EFFICIENT FRICTIONAL CONTACT PROBLEM SOLVING

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Contact mechanics is a fundamental element governing an interaction boundary phenomenon of one or multiple bodies. Due to its non-linear and non-smooth behavior, the frictional contact constitutive law is difficult to handle. Within the linear elastic isotropic mechanical framework, we assume small displacements hypothesis and quasi-static evolution. We consider non-regularized laws for the contact behavior (Signorini's conditions and Coulomb's model). The finite element method is used to discretize the mechanical problem.

Industrial complex problems involving large contact zones may lead to prohibitive computational time. Unfortunately, classic incremental solvers (*e.g.* Newton-Raphson) for contact problems could defeat the deployment of model reduction techniques well-known for their efficiency to reduce computing time and memory usage [4, 6, 5].

Even if reduced basis methods seem to be inappropriate to non-smooth phenomenon like frictional contact, solutions of such problems show a great scale separability (both in space and in time). Thus, these solutions can be compressed into a small reduced number of vectors depicting different scales of the problem [1, 2].

We propose to tackle the contact problem with the non-linear and non-incremental two-scaled iterative LATIN (**L**arge **T**ime **In**crement) solver [3]. Then, unknowns are sought into a separated form (a time-space rank-one approximation) using a PGD strategy. The two-scale feature is dealt with a FAS-multigrid like algorithm. Thus, an efficient strategy is proposed combining the accelerating PGD method still keeping the strong physical meaning of the LATIN method. Moreover, a size control is proposed allowing an optimality mastering at each enriching stage of the growing PGD basis.

On academic cases, we show the efficiency of the proposed method. This new strategy requiring definitely less computational charge and memory usage may overtake full-order

LATIN solver for given levels of accuracy.

Ongoing investigations concerning multiparametric studies and multiscale properties will be alluded.

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