Iterative Solver for Solving Large-Scale Frictional Contact Problems

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Abstract : Since the precise formulation of the elastic part is irrelevant for the description of the algorithm, we shall consider a generic case. In practice, however, we will have to deal with a non linear material (for instance a Mooney-Rivlin model). We are interested in solving a finite element approximation of the problem, leading to large-scale non linear discrete problems and, after linearization, to large linear systems and ultimately to calculations needing iterative methods. This also implies that penalty method, and therefore augmented Lagrangian method, are to be banned because of their negative effect on the condition number of the underlying discrete systems and thus on the convergence of iterative methods. This is in rupture to the mainstream of methods for contact in which augmented Lagrangian is the principal tool. We shall first present the problem and its discretization; this will lead us to describe a general solution algorithm relying on a preconditioner for saddle-point problems which we shall describe in some detail as it is not entirely standard. We will propose an iterative approach for solving three-dimensional frictional contact problems between elastic bodies, including contact with a rigid body, contact between two or more bodies and also self-contact.

Keywords : frictional contact, three-dimensional, large-scale, iterative method
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