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CONTACT FORMULATIONS CONSIDERING ROTATIONAL DEGREES OF FREEDOM OF STRUCTURAL ELEMENTS

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Contact between bodies is a classical subject in computational mechanics. There are many geometric approaches to describe contact, ex.: line to line, line to surface, surface to surface. Sometimes the surface/line modeled on bodies that present contact does not match the actual contact surface/line. This can occur frequently in shell/beam contacts [1], in which the mid surface or the axis line are commonly used. To remedy that issue it is common to use surface offsets in order to adjust such a difference. The problem is that usually when enforcing the offset, one generates moment of friction forces, which is usually not taken into account properly in the contact contribution equation or, if considered, not always the kinematics conjugated with that effect, that is, rotation, is treated properly. This can be an issue in rolling problem simulation, which requires inclusion of rotation information to calculate friction contribution. When the offset is small this effect may be non-important, however, when enforcing contact between structural elements, such as beams or shells, the offset considered due to cross section radius of a beam or a shell thickness can lead to important effects of moment of friction forces. This work shows an approach to model contact together with structural elements, such as shells or beams, including in the tangential gap function the moment of friction and, furthermore, including a more complex kinematics including rolling effects and subsequent changes in contact points in the tangential gap function. The approach was already applied to beam to surface contact in [2], successfully. Now, it is being developed to different geometries, such as beam to beam and beam to non-flat surface contacts.

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