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Frictional contact and wear along virtual interfaces

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Wear is a complex interfacial phenomenon resulting from relative motion between contacting bodies, and manifests itself in material removal. Accurate representation of contact tractions while accounting for the continuously evolving geometrical changes due to wear, poses numerical challenges. The commonly encountered complexities with the numerical treatment of wear include: remeshing procedures to capture the geometrical changes and field remapping of history variables. An approach mitigating these complexities is elaborated in this work.

Here we extend the existing method of embedded interfaces for tying problems to treat frictional contact and wear problem in 2D [1]. Combining this method with the surface-to-surface contact formulation, results in a simplified numerical framework to treat contact problems along virtual interfaces [2, 3]. An energy-based wear law is used to determine the progression (wear depth) of these virtual interfaces in the bulk; no remeshing is needed. In addition to handling surface evolution, this computational scheme ensures accurate representation of surface tractions, which is essential for wear simulation.

The method's performance in terms of convergence and accuracy will be presented. Applications of the method to the disk-blade fretting problem will be discussed.

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