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A Set-Valued Force Law For Spatial Coulomb–Contensou Friction

Remco I. Leine, Christoph Glocker

Institute of Mechanical Systems, ETH Zentrum, Zurich, Switzerland

The aim of this paper is to develop a contact law for combined spatial Coulomb friction and normal friction torque (drilling friction) as a function of sliding velocity and spin. We will call this extended contact law the Coulomb-Contensou friction law. The Contensou phenomenon occurs for instance in an electric polishing machine with turning brushes used to clean floors. The machine is hard to move when the brushes are non-rotating (Coulomb friction) but the machine can easily be pushed over the floor with rotating brushes (Contensou phenomenon). The Coulomb-Contensou friction law shows a continuous behaviour for non-zero sliding velocity and spin and a set-valued behaviour for zero sliding velocity and spin (stick). The theory and numerical methods are applied to the Tippe-Top. The analysis and numerical results on the Tippe-Top illustrate the importance of Coulomb-Contensou friction for the dynamics of systems with friction.

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