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Multibody Dynamics with Unilateral Constraints: Computational Modeling of Soft Contact and Dry Friction

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Abstract: We consider a system of rigid bodies subjected to unilateral constraints with soft contact and dry friction. When the constraints are saturated, velocity jumps may occur and the dynamics is described in generalized coordinates by a second-order measure differential inclusion for the unknown configurations. Observing that the right velocity satisfies a minimization principle ([1, 2]), a time-stepping algorithm is proposed. It allows to construct a sequence of approximate trajectories, reproducing at the discrete level the main features of Coulomb's law.

References

[1] C.A. Coulomb, *Théorie des machines simples*, Bachelier, Paris, 1821.

[2] J.J. Moreau, *Unilateral contact and dry friction in finite freedom dynamics*, in Nonsmooth Mechanics and Applications (J. J. Moreau and P. D. Panagiotopoulos, eds.), C.I.S.M. courses and lectures 302, Springer, New York, 1988.