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Numerical Aspects in Multibody Dynamics with Frictional Contacts

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ABSTRACT

Friction exists in any actual multibody mechanical system when contacting surfaces have relative motion. This is a highly nonlinear phenomenon, which can be undesirable due to energy dissipation, thermal and wear effects, among other phenomena. These cases require a rigorous evaluation of friction forces in order to obtain an accurate systems' response. The pure dry sliding friction, stick-slip effect, viscous friction, Stribeck effect, frictional lag, are some of the main phenomena associated with friction, which are discussed in this work. Coulomb's law states that friction force is proportional to the normal force and opposes to relative motion [1]. Broadly, friction force models can be divided into two main groups, namely the static friction models and the dynamic friction models. The former group mainly describes the steady-state behavior of the relation friction force/relative velocity, while the latter allows capturing more properties by using extra state variables. These models differ mostly on the modeled friction effects, implementation complexity and computational efficiency. The latter may have a fundamental role since the modeling of contact problems is by itself very inefficient, therefore, the friction modeling must not compromise the whole simulation of the mechanical system [2]. This work aims at analyzing the role of several friction force models in the dynamic response of multibody system. From the results, it is possible to conclude that both the choice of the friction force model and friction parameters involved can significantly affect the dynamic response of mechanical systems with friction.

REFERENCES

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