DYNAMIC FRICTION MODELING FOR JOINTED STRUCTURES

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Interface friction plays an important role in stiffness, durability, and dynamic characteristics of jointed structures. Dynamic modeling of friction connections presents a variety of challenges because joint behaviors are described on temporal and spatial scales much smaller than those of the rest of the structure. As a result, computational approaches to dynamic frictional contact attempt to resolve these length and time scales without sacrificing overall model fidelity and computational efficiency. This presentation is broken into three parts, each focusing on a different aspect of this difficult problem. First, we will discuss the broad class of dynamic friction models available, focusing mostly on the variety of low-order approximations typical of frictional contact analyses. A survey of the literature [1] reveals that we now have a large number of dynamic friction modeling options, but that our choice of friction model must be tuned to the goals of the simulation. Second, we will describe our reduced-order modeling efforts using a particular class of discrete models based upon parallel arrangements of Iwan-type elements. We consider convergence of structural response, convergence of interface kinematic states, energy dissipation scaling, and computational efficiency of the models. Third, we will briefly interpret our numerical results in the context of experiments carried out on a prototype joint in our lab. Hysteresis loops and the energy dissipation scaling in the small-slip regime are examined using the discrete models for correlation with experimental results. While a great deal of progress has been reported in the literature in recent years, dynamic friction and joint modeling remains an important and difficult research area.

References

[1] E. J. Berger, "Friction Modeling for Dynamic System Simulation," *Applied Mechanics Reviews*, v. 55, n. 6, p. 535-577, 2002.