Asymmetric friction effects in surface interaction

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In this study, surface contact involving sections with symmetric and asymmetric friction (different magnitudes of friction are encountered when moving in opposite direction) is considered. The asymmetric friction phenomenon considered here is created when blocks of anisotropic material with symmetric axis inclined to the contact area moves in a constraint environment. Bafekrpour et al. (2015) have shown this arrangement can create high levels of asymmetric friction by coupling shear and normal forces. We consider a spring-blocks model of the type proposed by Burridge and Knopoff (1967): multiple blocks – some blocks with asymmetric friction property and others with symmetric friction property – connected by springs. Each of these blocks are connected by a spring to a driving block. Two types motion for the driving block are considered: moving at constant velocity and constant velocity with an oscillation. Parametric analysis has been conducted to compare the difference in dynamics when comparing surface interaction involving only symmetric friction blocks to different combinations of asymmetric and symmetric friction blocks. We show that threshold for instability/motion can be controlled by the proportion of asymmetric friction section present in the system and the magnitude of friction involved in the asymmetric friction section. The characteristic of the system’s motion is also shown to be affected by the arrangement asymmetric and symmetric friction sections.
