Surface Contact Model for Comets and Asteroids

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A contact force model was developed for use in touch and go (TAG) surface sampling simulations on small celestial bodies such as comets and asteroids. In TAG scenarios, a spacecraft descending toward the surface of a small body comes into contact with the surface for a short duration of time, collects material samples with a sampler device, and then ascends to leave the surface. The surface contact required 6-DOF (degrees of freedom) dynamics models due to coupling of the attitude and translation dynamics during the contact.

The model described here is for contact scenarios that utilize a rotating brush wheel sampler (BWS) to collect surface material. The model includes stiffness and damping of the surface material during BWS vertical motion, lateral friction from the BWS dragging across the surface, and lateral shear from the rotating BWS scooping the surface material.

This model is useful for any mission to asteroids or comets that incorporates surface sampling operations.

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