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Contact Dynamics Models for Spacecraft-Regolith Interactions[1]
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Granular mechanics simulations are currently used in the planetary science community in order to understand the evolution of asteroids, which are believed to be self-gravitating conglomerates of boulders and smaller grains. These simulations are typically done with Hard-Sphere or Soft-Sphere Discrete Element Method (DEM) codes. However, asteroids are increasingly being considered as exploration targets for the future spacecraft. Due to the very low gravity on the surface of these bodies (in some cases, six orders of magnitude less than Earth's gravity), it is not reasonable to design sample collection devices or mobility systems for future spacecraft based solely on Earth-based experimentation. However, there are limitations to using DEM codes for dense granular systems. Thus, we are creating a Contact Dynamics model to aid in the design of future spacecraft. In addition to its necessity for the design of spacecraft for asteroid exploration, granular mechanics simulations will also reduce the cost and risk of designing future mobility and sample collection systems for spacecraft heading to the Moon and Mars. We will present the current status of our Contact Dynamics code for monodisperse, spherical grains.

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