Paper ID: 32475
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SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations (IP)

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SEMI-ACTIVELY CONTROLLED LANDING LEGS FOR A SPACECRAFT

Abstract

Most of lunar or planetary landers have landing legs to reduce shock at the touchdown. They are usually made by passive elements that use aluminum honeycomb structure. When the spacecraft has horizontal velocity or lands on inclined surface, however, reaction force from legs causes rotational moment and the spacecraft might tumble down. The spacecraft should be designed to have lower center of gravity in order to prevent turnover. To avoid turn over and optimize elasticity and damping parameter of landing legs, we had proposed actively controlled landing legs. Since full-actively controlled legs which use high speed and high torque motors require large mass, large power and complexity, semi-actively controlled landing legs are considered. That is, only damping coefficient is controlled following states of the spacecraft. As a result of our study, damping coefficient should be switched to low or high depending on the sign of angular velocity of the spacecraft and shrinking speed of each landing leg. In the presentation, summary of our study is shown. The control scheme of the landing legs are introduced from theoretical consideration. Effectiveness of the proposed scheme is validated with numerical simulations and scale model experiments.