Paper ID: 70864
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IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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FINITE ELEMENT SIMULATIONS OF THE WHEELS OF THE RASHID LUNAR ROVER

Abstract

Lunar Rovers which are robotic vehicles that travel on extra-terrestrial surfaces doing heavy scientific duties and experiments. The design and analysis of wheels for a lunar rover are significantly different than what is considered for applications on Earth. The main reason has to do with the lunar environment and its' surface, which is covered by a deep layer of fine regolith. Therefore, researchers have followed different design methodologies to obtain optimum wheel designs that suit the lunar environment, especially with the chances of the vehicle entrapment into the soil and traction control failure. Mohammed Bin Rashid Space Centre (MBRSC) has been developing the Rashid lunar rover, the first of its kind to be developed in the United Arab Emirates, which is expected to be deployed on the surface of the moon in as early as 2023. In this study, the finite element method was used to study the effect of the different wheel and grousers geometrical parameters on the wheel performance while traveling on the lunar surface. In addition, the wheel-soil interaction is investigated to validate the ability of the wheel to withstand the vehicle loading and the soil pressure. The obtained results show that the wheel is expected to perform well according to the mission objectives at the specified velocity and the intended slip ratio.