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Return to the Moon (02)
Goals and Status of Future Lunar Missions (2)

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MOBILITY PERFORMANCE CHARACTERIZATION OF A LUNAR ANALOGUE ROVER

Abstract

The mobility performance of planetary rovers is an essential consideration in the success of surface exploration missions. The performance of the Apollo LRV allowed Astronauts to explore a larger area of the harsh lunar surface, return more regolith samples, and conduct more scientific experiments than they could have on foot. More recently, the importance in the role of the mobility subsystem was demonstrated with Spirit's inability to traverse a very soft patch of Martian terrain - which proved to be the beginning of the end of the rover's mission life.

The performance criteria for such rovers were first outlined during the Apollo era to aid in the rover design and selection process. Since the Lunar landings of the 1960's and 70's, however, the mission objectives and therefore performance requirements on surface exploration vehicles have evolved considerably. Vehicles will travel further on the lunar surface, explore permanently shadowed craters, and perform a variety of tasks such as transporting sensitive payloads, excavating regolith, and allowing for both unmanned and manned operation. To assess the feasibility of the next generation of lunar rovers in completing the aforementioned activities, the mobility performance of the rovers must be known.

In an effort to quantify the performance of novel lunar rover prototypes, the Neptec Rover Team (NRT) has undertaken extensive mobility testing in lunar analogue terrains. This work presents the results of the mobility performance of the NRT's multi-purpose lunar rover. The performance criteria quantified in this work can be broadly classified into trafficability, terrainability, manoeuvrability, and reliability. Trafficability is defined here as the ability to traverse terrain without loss of traction, as well as the ability to perform work (such as pulling, pushing, or excavating); manoeuvrability quantifies the ability to navigate efficiently through an environment; terrainability assesses the vehicles ability to negotiate terrain irregularities while maintaining stability and isolating the vehicle chassis and payload from the vehicle-terrain dynamics; while reliability ensure the rover performs and maintain its required functions in routine and unexpected circumstances for a specified life cycle. The results compare path-to-flight technologies which present viable designs for future lunar rovers to successfully complete exploratory missions.