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LUNAR PAYLOAD DEPLOYMENT AND COMMUNICATION FOR EFFECTIVE SURFACE EXPLORATION OF THE MOON

Abstract

Following the ideas presented in "Designing a Robotic Delivery System for Lunar Surface Exploration" at IAC 2024, which described a mission that involves the delivery of remote observatory payloads on the lunar surface using a central mother rover, this paper elaborates on the same mission concept with a focus on studying its communication aspect. The mission concept dealt with a network of distributed payloads across various locations on the lunar surface. This paper surveys the different kinds of geological backdrops available on the moon's surface and environment to choose potential sites to deliver such an observatory payload. In order to maximize the quality and trends in the observed data, locations with variations in their surface and environmental properties will be studied and considered. Along with this, there will also be a consideration for unique features of the lunar geology of the surface, which might provide interesting insights into the conditions on the moon.

Further, the communication method between each payload and the mother rover will be studied aiming to ensure uninterrupted data transfer between each individual payload and the mother rover. This will be shaped by the mission needs to optimize data bandwidth, link budget, and latency in the links, in addition to power consumption considerations, which are effectively constrained by the payload characteristics as well as the physical locations of the payloads themselves. This integrated approach not only enhances payload management to achieve maximum scientific data but also lays the groundwork for the development of sustainable and scalable lunar missions, which in turn would support the long-term exploration and infrastructure development of the Moon.