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A NEW POWER MODELLING APPROACH FOR A SMALL ROVER MISSION TO THE LUNAR SURFACE

Abstract

Today, solar power systems are the main sources of energy used by lunar rovers. This technology has proven to be robust, reliable and space proven. However, the design of a power system for lunar rovers requires taking into consideration different environmental aspects. Due to the limited amount of resources available to small rovers, creating better resource management models becomes essential in future mission planning and rover design.

In this work, we present a power budget model tailored towards a lunar rover mission. A complete power model constitutes of three fundamental elements; consumption, generation and storage. Firstly, this particular model includes the power consumption of each subsystem at any given rover operation. Each operation is determined during the mission planning stage, and in order to meet mission objectives, the rover needs to execute multiple operations sequentially. Therefore, with the large number of possible operation combinations the number of different scenarios also increases, hence the importance of a scalable model. The second aspect of the model presents a power generation profile. This is mainly dependent on the rover's trajectory, time of the day, and solar panel orientation. The energy stored (for example, in a battery) can also be predetermined while tracking power generation and consumption. The proposed power budget model could serve as a powerful tool for future lunar missions.