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The Rashid rover: to guide the way for the next generation lunar missions and solar system exploration

Sara Almaeeni¹, Sebastian Els², and Hamad Almarzooqi³

¹Mohammed Bin Rashid Space Centre, United Arab Emirates (sara.almaeeni@mbrsc.ae)

²Mohammed Bin Rashid Space Centre, United Arab Emirates (sebastian.els@mbrsc.ae)

³Mohammed Bin Rashid Space Centre, United Arab Emirates (hamad.almarzooqi@mbrsc.ae)

The United Arab Emirates has announced its first space mission to the moon by 2024. The Emirates Lunar Mission (ELM) consists of a micro rover, named Rashid, has a main objective of traversing the mid-latitude landing site and obtaining high resolution images of the lunar surface. Such an objective necessitates careful designs of the architecture and the different systems involved to ensure smooth integration and proper operation.

The rover weigh around 10Kg and has 4 wheels that are designed to climb slopes of 20 degrees and rocks of maximum height of 10cm. Also, it is equipped with 2 wide field cameras that will be used for navigation and to increase the environmental awareness while the operator drives the rover remotely. Moreover, the rover is powered by the solar panels which are mounted in a certain angle to maximize the collecting of the solar energy. After the collection and battery charging, various regulated voltages are distributed to all subsystems.

The Rashid rover is designed with two communications channels. The primary communications channel is the main channel used during the mission and allows for high speed bandwidth and low power consumption (on the rover). The secondary communications channel uses more power and is slower, but is not dependent on the lander and is therefore used as a backup as well as the lunar night recovery phase.

Despite being a small rover and its prime goal being a technology demonstrator, Rashid's scientific instrument suite is substantial. The science instruments will provide data of the lunar surface environment allowing to investigate a vast variety of topics like geology of the Moon, lunar surface alteration mechanisms, Interaction of the soil with the solar wind and material suitability for future lunar missions. In this paper, the ELM mission, the rover subsystems as well as the science instruments are described in details.