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Author: Dr. Dongseok Ryu
Korea, Republic of, sayryu@kaeri.re.kr

Dr. Wonseo Lee
Korea, Republic of, wonseo@kaeri.re.kr
Dr. Jongwon Park
Korea, Republic of, jwpark@kaeri.re.kr
Dr. Hocheol Shin
Korea, Republic of, smarthc@kaeri.re.kr

# PRELIMINARY DESIGN OF A COMPACT MOBILE WHEEL BUCKET AND TETHER SYSTEM FOR LUNAR SOIL SAMPLING

**Abstract**

As the importance of a long term residence on moon has emerged for preparing a moon-to-mars plan, ISRU(In-Situ Resource Utilization) is necessary to extract water and oxygen from the soil. Thus, the lunar soil mining system for ISRU has been extensively studied. Along with global trends of lunar exploration, various payloads for lunar soil sampling have also been proposed and discussed.

This paper proposes a conceptual design of a compact mobile wheel bucket and tether system to be mounted on a body of a lunar lander. Many soil sampling devices have been designed to attach on a rover because usually sampling distance is limited to a few feet. When installing a soil sampling device on the main body of the lander, it is necessary to consider how to overcome the sampling distance. In particular, if the purpose of soil sampling is the ISRU, the sampling distance should be several tens of feet or more because reverse propulsion during landing would change the properties of regolith in the vicinity of the lander. Therefore, the proposed concept of a compact mobile wheel bucket is designed to be connected by tether extending the sampling distance, unlike a typical scooping system. The tether contributes to enlarge the access distance. In order to reach the desired location, the compact mobile wheel bucket lands and travels on the lunar surface, where as the tether is connected for safe returning of the compact mobile wheel bucket back to the lander. A symetric structure of the compact mobile wheel bucket guarantees stable movement even if it is overturned. The compact mobile wheelbucket can change the heading direction with skid steering. A pan-tilt camera mounted on the lander is utilized to monitor and control the heading direction. The tether simply pulls the compact mobile wheel bucket to retrieve it in the event of a problem (e.g., getting stuck between rocks or moving in an undesirable direction).

The proposed system has the advantages of long access distance and light weight. Integration of the development model and functional verification using simulant are in progress.