

Development of lunar rock collector for SELENE-2: Optimized shape design of endeffector

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To investigate the origin and evolution of solid planets including the Moon and the Earth, it has extreme importance to gather lunar rocks and analyze them. Landing on the Moon for in situ rock analysis is under study by JAXA, and there is a plan to be equipped with an experimental device (SIP, Science Instrument Package) that anatomize samples. In this study, we optimized a shape design of endeffector for sample collection with the lunar lander.

The lander aiming at landing on the Moon is examined as a successor of SELENE (SELEnological and ENgineering Explorer) that plans to be launched in this summer. SIP processes the rock samples gathered by a robot arm attached to a rover or a lander to clean and analyze rock surface. Clarifying characteristics of local geology of crater's central peaks, mafic areas in South Pole Aitken basin, or polar areas provides vital information to understand the origin of the Moon.

Targeted samples for our purpose include rocks in several cm size or soils of regolith. Generally the lunar surface is covered with regolith and it is known that samples are sprinkled throughout the Moon. Rocks are expected to have irregular shapes. So, requirement for the endeffector to attach at the tip of the robot arm is to gather these irregular rocks as well as sandy regolith. And we intend to perform high resolution macro spectral imaging and X-ray analysis. For such observation, mechanism should be also considered to brush and grind the surface of samples.

For the shape of endeffector, a few patterns have been examined. They are a pickup method by the nail like a rake or by fingers, selectively gathering a rock from all over regolith. We made test models and tested it to evaluate performance of these methods. In addition, We examined most optimized design of the shapes.