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Small lunar-lander “SLIM” for the pinpoint landing technology demonstration

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Small experimental spacecraft "SLIM" (Small Lander for Investigating Moon) is proposed by ISAS/JAXA to demonstrate precise "pinpoint" landing technology on a celestial body with gravity. Since modern spacecraft provided high resolution image data on the Moon surface, such as fruits of SELENE or LRO spacecraft, now the place of interest on the Moon comes to be "exactly that point", not "somewhere on the Moon". Marius Hill's Hall (MHH), which is one of the candidates of SLIM landing target, is an interesting vertical hall, for example. Pinpoint-landing technologies with 100m-order accuracy is desired to carry out scientific exploration on such specific target, although the conventional lunar landing accuracy was typically km-orders.
To enable 100m-order navigation accuracy for pinpoint landing, novel technologies have been researched and developed by SLIM working group members. Practical crater detection and recognition algorithms were proposed for image based guidance system, which can be implemented on an existing space qualified FGPA device. Novel landing radar system was newly developed, and was evaluated with bread board model in field flight test. Detection and avoidance of harmful obstacles around the landing area based on the camera image were also researched. Numbers of these researches have been carried out in ISAS, JAXA or many universities, and the SLIM project has been proposed to demonstrate these novel technologies with actual lunar landing.
We proposed SLIM to be launched by Epsilon rocket, and so the weight resources are very severe. Based on our current design, dry mass of the spacecraft is about 130kg in weight. To realize a lunar lander in this restricted weight, innovative technologies are studied, such as efficient ceramic thruster, aluminum foam based landing gear system, ultra-lightweight solar sheet, and so on. Many of these technologies will be surely useful for future exploration projects including Mars missions.
SLIM was proposed for the next ISAS/JAXA small scientific mission using Epsilon rocket, and was just selected as a finalist in Jan., 2015. The details of the mission sequence, spacecraft design, and demonstrated technologies with SLIM will be introduced in this paper, with the latest status information on the project.