

24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
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JapanREAL TIME DETECTION SYSTEM FOR MDA WITH HYPERSPECTRAL CAMERA MOUNTED
SMALL SATELLITES**Abstract**

Real Time Detection System for MDA is that government agencies put those cameras in small satellites and use them for MDA (Maritime Domain Awareness). Hyperspectral Images are now used in the field of agriculture, cosmetics, and space exploring. Behind this fact, there is a result of efforts to contrive miniaturization and decrease in costs. This paper describes low-cost and small hyperspectral camera (HSC) under development and a method of utilizing it. MDA is required for national defense and disaster prevention especially in Japan. We assume early detection of unidentified floating objects to find out disguised fishing ships and submarines. For the analysis, there is one of the famous anomaly detections called Reed-Xiaoli Detector (RXD). The preliminary experiment had done with a small helicopter instead of a satellite. Consequently, all objects including a person who put on a life jacket, a ship, and a buoy are recognized. In regards to HSC, it was successful to invent a small-size and light hyperspectral camera which is loadable in a small satellite. In addition to that, the imaging performance satisfied the requirement as the mission equipment. MDHU makes it possible to process the large-volume data like hyperspectral data in the satellite. In MDHU, hyperspectral data is collected by the Backside Irradiation-type CMOS Image Sensor and transferred rapidly by FPGA and memorized into SSD at last. Then, the data is sent to the onboard computer (OBC) of the satellite by Space Wire/RMAP and downlinked into a ground station by laser communication. The experiment of the laser communication was successful when the distance between the transmitter and the receiver was 15km. Furthermore, total dose experiments of the CMOS sensor, SH2, and SSD were performed in Komazawa branch of Tokyo Metropolitan Industrial Technology Research Institute. As the result of the total dose experiment, there was no sign of deterioration of the CMOS sensor at 22.5krad (corresponds to 7.5 years in polar orbit). On the other hand, there is concern that SSD and FPGA may be out of order because of the current destruction by the dose effect in 7.1 years and in 8.4years respectively. The SH2 and the SSD are durable enough to fly through space. Thus, by employing 10 or more this satellites, Japan can perform MDA for Japanese territorial sea in real time.