**Detection of Marine Debris Using Hyperspectral Imaging**

Ko H.W.1, Seo W.W.2, Lim P.C.3 and Rhee S.A.4\*

1Image Eng. Research Centre: Assistant Research Engineer, 3DLabs Co. Ltd, Republic of Korea

2Image Eng. Research Centre: Research Engineer, 3DLabs Co. Ltd, Republic of Korea

3Image Eng. Research Centre: Research Engineer, 3DLabs Co. Ltd, Republic of Korea

4\*Image Eng. Research Centre: Managing Director, 3DLabs Co. Ltd, Republic of Korea

\*ahmkun@3dlabs.co.kr

***ABSTRACT***

Marine debris can cause significant problems, including the destruction of marine ecosystems. In coastal areas, debris can be found in hard-to-access regions like cliffs. For this reason, recent research has increasingly turned to unmanned aerial vehicles (UAVs) for monitoring. Previous studies have explored detecting marine debris using frame cameras, but their success is limited by the range of wavelengths they can detect. In this study, we propose using a hyperspectral camera to observe coastal areas and improve the detection of marine debris. The process of detecting marine debris involves four main steps. First, we establish a hyperspectral sensor model equation. This allows us to transform image points into ground points by analyzing the geometry between the hyperspectral sensor and the UAV. Second, we perform hyperspectral image mosaicking. Since UAVs have a narrow observation swath and operate at low altitudes to detect debris, we need to create a single mosaic image from multiple hyperspectral images. Third, we classify the spectral characteristics of objects in the mosaic image to identify potential marine debris. Based on this methodology, we conducted marine debris detection in the coastal areas of Incheon, South Korea. We found that marine debris in Incheon took various forms, including plastics, nets, and metals. We used the mosaic images to categorize the spectral characteristics of these debris types. Additionally, we created a database to classify non-debris objects like beach sand and sea water, which helps improve classification accuracy. In future research, the spectral characteristics database from this study is expected to be used as a training dataset for deep learning techniques to automate marine debris detection.

**Keywords:** Marine debris, UAV, Hyperspectral image, Sensor model, Mosaic image