ENTEROMORPHA PROLIFRA AERIAL REMOTE SENSING MONITORING USING ARRAY CAMERA

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Abstract:

Enteromorpha prolifra, a kind of green algae, grows every year in the south sea of China and also can be found in most sea areas all over the world. But in 2009, it broke in a large-scale and became a disaster mainly distributed in the yellow sea of China near the Olympic sailing city Qingdao. [1] Enteromorpha prolifra used to be food or flavor in Fujian province, and never bring on environmental pollution even today. This was the first time that Enteromorpha prolifra became a disaster just because of the large scale. So, the remote sensing research of Enteromorpha prolifra disaster also was the first time. [2]

We used an Array Color Camera to monitor the distribution of Enteromorpha prolifra in order to guide the salvage work. Aerial remote sensing was used to get the distribution information every day during July to August 2008. In this paper, there are 5 parts of work: 1) we analyzed the spectrums of Enteromorpha prolifra with ground based measuring; 2) analyzed the ground objects' spectrums in the array aerial images and fixed a distribution retrieval method; 3) fixed a fast processing flow of aerial remote sensing images; 4) validated by field survey and compared with the satellite monitoring results; 5) monitored the disaster situation every day and analyzed the evolution rules.

The first problem is to know optical properties of Enteromorpha prolifra. We measured the spectrum with a spectrometer. With the spectral curve, it is easy to find Enteromorpha prolifra has the same reflectance property with land surface vegetation. At the green band, there is a reflectance peak because of the chlorophyll. After 0.7um, the reflectance rises

rapidly.

The second problem is to find the distinctive feature of Enteromorpha Prolifra which made it easy to be extracted. There are three kinds of object in the aerial images. Sun glitter was the main noise to recognize Enteromorpha prolifra. Sun glitter is produced by Fresnel reflection caused by the mirror reflection on the ocean water surface [3] [4]. In the remote sensing images, sun glitter's DN distributed widely and mixed with Enteromorpha prolifra. So, it is very important but not easy to eliminate it as a noise. There are only three bands in the color images. Considering the spectrum properties, we designed a decision tree to extract Enteromorpha prolifra and eliminate the sun glitter noise.

The third problem is aerial array image preprocessing before extraction. The objective of image preprocessing is to get the orthoimage with the help of POS (Position and Orientation System) data. The preprocessing flow includes interior orientation, exterior orientation, orthophoto correction, image mosaic, Low-pass filter. After preprocessing, the whole distribution information can be extracted.

After extraction, we validated the monitoring results and compared the aerial and satellite monitoring results. The validation results were preferably well.

Based on the long-term monitoring, our work not only serviced the Olympic sailing very well, we also concluded a fast monitoring method with aerial array camera and analyzed the evolution of the Enteromorpha prolifra burst as a disaster the first time.

Key Words: Enteromorpha prolifra, Aerial Remote Sensing, Array Camera, POS

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