Automatic Detection of Illegal Waste Sites in UAS Orthoimages

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With the force of technological development and growing human population, it is important for the government to understand the rate of land use/land-cover change. Remotely sensed data has been popularly employed for land use monitoring, in order to avoid improper land use or illegal expansion. Over the past decade, medium-resolution satellite images have been exploited to find out where illegal waste disposal sites are in Taiwan. However, acquiring satellite imagery often takes long revisit time. In recent years, Unmanned Aircraft System (UAS) attached with a non-metric camera has become a popular platform for acquisition of aerial images. It is cost-effective for acquiring temporal images over large geographic areas. This study employed a sensfly Ebee drone to acquire aerial images for monitoring land use activity. An orthoimage can be generated using state-of-the-art Structure-from-Motion (SfM) photogrammetry. With the help of object detection technique in artificial intelligence, illegal activity can be rapidly identified in the orthoimages. The Tensorflow Object Detection API was applied. In this study, a faster region-based Convolutional Neural Network (R-CNN) with Resnet-101model was retrained for detecting the location of illegal waste. The results achieved a recall of 86.9% and a precision of 72.2%. This study demonstrated that it is possible for department of land monitoring to know the hot spot of illegal waste sites. Surveillance operations become active and effective. In the future, hard sampling mining method would be investigated to reduce false alarm cases. Also, a faster detection procedure, such as YOU ONLY LOOK ONCE (YOLO) v3 will be further assessed.

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