UAV-based approach to extract topographic and as-built information by utilising the OBIA technique

ABSTRACT

In this study, the capability of Unmanned Aerial Vehicle (UAV) optical data to provide reliable topographic and as-built information was tested using the eBee Sensefly UAV system. The Object-based Image Analysis (OBIA) technique was used to extract important geospatial information for mapping. The robust Taguchi method was adopted to optimise the segmentation process. Feature space optimisation method was used to obtain the best features for image classification utilising different supervised OBIA classifiers, such as K-nearest neighbour (KNN), normal Bayes (NB), decision tree (DT), random forest (RF) and support vector machine (SVM). Results showed that SVM obtained the highest percentage of overall accuracy, followed by RF, NB, DT and KNN at 97.20%, 95.80%, 93.14%, 86.01% and 77.62%, respectively. The McNemar test was implemented to analyse the significance of the classifier results. The as-built information showed that dimensional accuracy was less than 1 metre compared with ground survey measurement. We conclude that the combination of UAV and OBIA provides a rapid and efficient approach for map updating. This technique could replace the current procedure that utilises piloted aircraft and satellite images for data acquisition and reduce the time for digitising each feature that represents land cover for urban mapping.

Keyword: UAV; Land cover; Topography map; As-built; OBIA; Segmentation