

A comparative assessment between object and pixel-based classification approaches for land-use/land-cover mapping using Spot 5 imagery

Abstract

Land use/land cover (LULC) classification with high accuracy is necessary, especially in eco-environment research, urban planning, vegetation condition study and soil management. Over the last decade a number of classification algorithms have been developed for the analysis of remotely sensed data. The most notable algorithms are the object-oriented K-Nearest Neighbour (K-NN), Support Vector Machines (SVMs) and the Decision Trees (DTs) amongst many others. In this study, LULC types of Selangor area were analyzed on the basis of the classification results acquired using the pixel-based and object-based image analysis approaches. SPOT 5 satellite images with four spectral bands from 2003 and 2010 were used to carry out the image classification and ground truth data were collected from Google Earth and field trips. In pixel-based image analysis, a supervised classification was performed using the DT classifier. On the other hand, object-oriented (K-NN) image analysis was evaluated using standard nearest neighbour as classifier. Subsequently SVM object-based classification was performed. Five LULC categories were extracted and the results were compared between them. The overall classification accuracies for 2003 and 2010 showed that the object-oriented (K-NN) (90.5% and 91%) performed better results than the pixel-based DT (68.6% and 68.4%) and object-based SVM (80.6% and 78.15%). In general, the object-oriented (K-NN) performed better than both DTs and SVMs. The obtained LULC classification maps can be used to improve various applications such as change detection, urban design, environmental management and zoning.

Keyword: Image classification; Remote-sensing; Object-oriented; Support vector machine; Decision tree; GIS; Malaysia