

Change Detection Using Unsupervised Learning Algorithms for Delhi, India

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Abstract: We have analyzed effectiveness of three types of unsupervised learning techniques for change detection in water, vegetation and built-up land cover classes of a part of Delhi region in India. Total eight images of Landsat TM and ETM+ from year 1998 to 2011 were processed for doing change detection. Radiometric calibration of the data was done so as to reduce the noise due to differences in atmosphere, sensor calibration, and sun-angle at different dates. Three features were extracted : soil adjusted vegetation index (SAVI), modified normalized difference water index (MNDWI), and Builtup from normalized difference built-up index (NDBI), which were representing vegetation, water and urban land cover classes respectively. Clustering was done on these features using k-means, fuzzy-c-mean(FCM) and expectation-maximization(EM) algorithms which are partition based technique, fuzzy technique and probability based technique respectively. The cluster evaluation was then done using silhouette coefficient which takes into consideration both intra-cluster and inter-cluster distance between clusters. Quantitative values of the results are different from each other however they are following the almost the same pattern of increase or decrease in area of each land cover class. We found that in Delhi, India vegetation and water area have reduced whereas urban area have increased over a period of thirteen years.

keywords: change detection, unsupervised learning, silhouette coefficient