

Supervised/Unsupervised Classification of Land cover using Remote Sensed Data

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Abstract

Remotely sensed images may be used to predict a wide range of properties at the surface of the Earth including both categorical and continuous properties. Batticaloa District which encompasses different land cover categories including water, barren land, agriculture and forest. This study achieves maximum likelihood supervised classification, Iso clustering unsupervised classification to an Sentinel 2 Data image, and compares the results of these three methods in Batticaloa District. Secondary data was utilized to this study and supervised classification and unsupervised classification methods were engaged in this study. The results of all classifications revealed that agriculture classes were the largest land cover classes in this area. The extent of water bodies was happened approximately equal in all classification process in this selected area. Barren land cover classes a major difference in all classification and forest area show major deviation in supervised and unsupervised classification. The water body's classes of resulting supervised classified image are generally acceptable even some water bodies came within the barren land categories. So, training sample polygon should be selected homogenous area in this process because of highly depending the accuracy of supervised classification by sample creator.

Key words: Land cover, supervised classification and unsupervised classification

1. Introduction

Land cover is a distinct concept applied to the classification of the earth's land surface. Land cover as the vegetational and artificial construction covering the land surface. The classification of land cover is the assignment of geographic areas to certain classes based upon similar characteristics of land cover. There are numerous uses and purposes for the classification of land cover. One of the main purposes of satellite remote sensing is to interpret the observed data and classify features. In addition to the approach of photo interpretation, quantitative analysis, which uses computer to label each pixel to particular spectral classes (called classification), is commonly used. Quantitative analysis can perform true multispectral analysis, make use of all the available brightness levels and obtain high quantitative accuracy. There are two broads of classification procedures: supervised classification and unsupervised classification.

The supervised classification is the essential tool used for extracting quantitative information from remotely sensed image data. Using this method, the analyst has available sufficient known pixels to generate

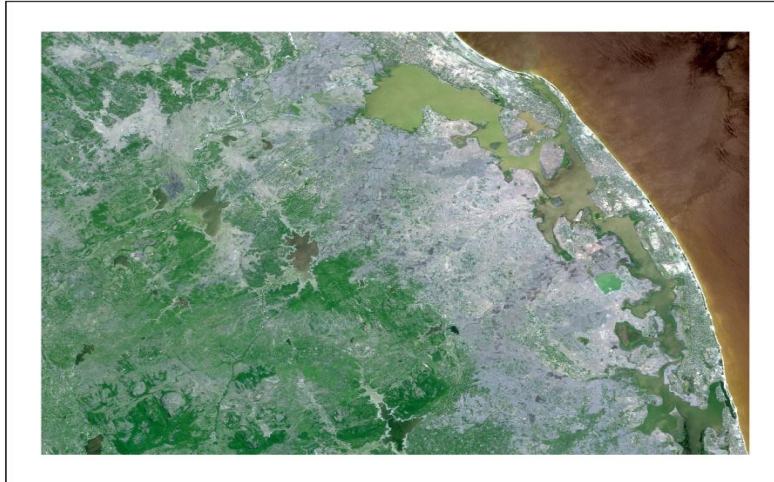
representative parameters for each class of interest. This step is called training. Once trained, the classifier is then used to attach labels to all the image pixels according to the trained parameters. The most commonly used supervised classification is maximum likelihood classification (MLC), which assumes that each spectral class can be described by a multivariate normal distribution. Another broad of classification is unsupervised classification. Unsupervised classification involves the separation of image pixels into natural groupings based upon similar spectral characteristics by means of a classification algorithm and the resultant assignment of those groupings to informational classes by the analyst. One of the most commonly used unsupervised classifications is the Iso clustering classifier. This method is based on labeling each pixel to unknown cluster centers and then moving from one cluster center to another in a way that the SSE measure of the preceding section is reduced data.

Digital image processing of satellite data provides tools for analyzing the image through different algorithms and mathematical indices. Features are based on reflectance characteristics, and indices have been devised to highlight the features of interest on the image. There are several indices for highlighting vegetation bearing areas on a remote sensing scene. This study performs maximum likelihood supervised classification, Iso clustering unsupervised classification to an Sentinel 2 Data image, and compares the results of these two methods.

2. Study area

The research area for the image classification for land cover analysis is about 2000km² of the Batticaloa District. The study area contains different land use categories such as Water, Barren land, Agriculture, Forest.

STUDY AREA



3. Data

The sentinel-2 is image used in this study. The satellite image was downloaded from Earth Explorer with spatial resolution of 10m, 20m & 60m, taken image is 2016.08.11. The digital image processing was carried out using Arc GIS 10.4.1 software for image processing, classification and analysis of the imagery. The processed images were geo-referenced using WGS84/UTM Zone 44 N projection system.

4. Methodology

1. Layer Stacking

Each multispectral band was combined into single image for enhanced visualization and interpretation using 'composite band' tool.

2. Clipping of image

50km width and 40km height area was chosen for research. This area outline is created using 'Fishnet' tool and area of interest was clipped.

3. Classification

4.1 supervised classification

In the supervised classification of an image, two training samples were collected for each Land cover classes Water, Forest, Barren land, Scrub land. And also, signature file was created. The Maximum Likelihood Classification algorithm was the chosen method for supervised classification. Then supervised classification image was obtained. That resulted image was enhanced by done reclassification, majority filtering and smooth polygon. in the attribute table of enhanced supervised classification layer,

area was calculated for each land cover classes in hectares.

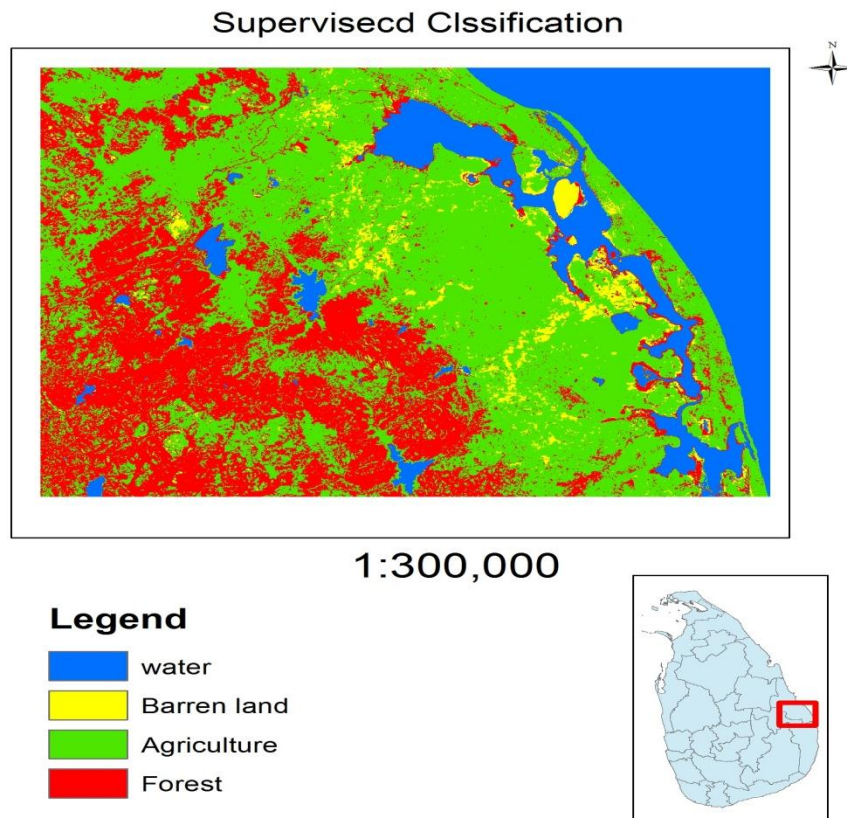
4.2 Unsupervised Classification

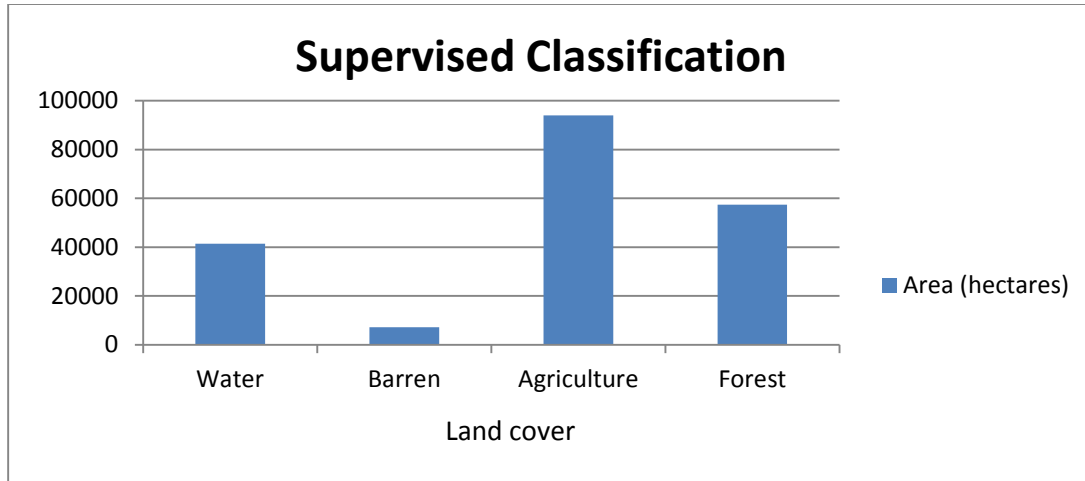
Unsupervised Classification Using the Iso Cluster algorithm, unsupervised classification with four categories of land cover classes. After that, resulted images was enhanced by done reclassification, majority filtering and smooth polygon. Each of land cover category area was calculated in that attribute table.

5. Result

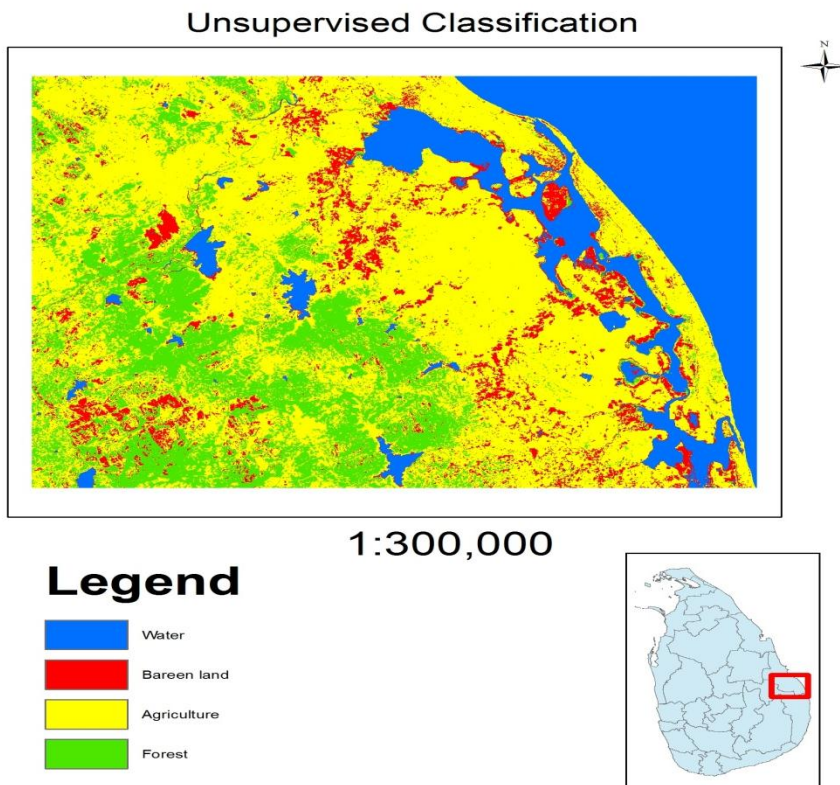
The satellite image classification done in three different approaches. The steps of each classification process are shown in methodology. The final output of classification technique consists in four different land cover area classes in all method.

5.1 supervised classification

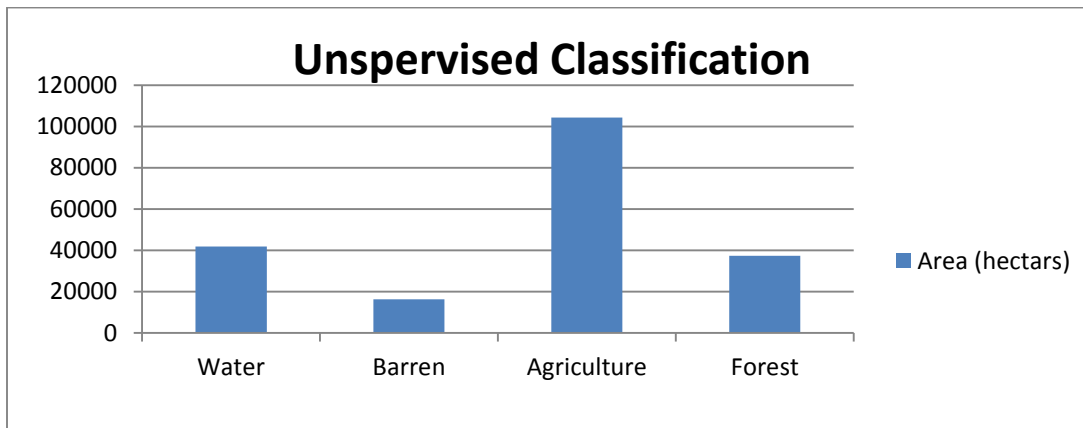




5.2 Unsupervised Classification



Land cover	Supervised Classification Area(Hectares)	Unsupervised Classification Area (Hectares)
Water	41431.7	41924.9
Barren land	7208.8	16357.8
Agriculture	93949.6	104389
Forest	57409.8	37328.6



The above table shows output results of each classification method with different land cover classes. Barren land land cover classes a major difference in both classification. Results of supervised classification was much similar than Unsupervised classification. Forest area show major deviation in supervised and unsupervised classification. Water area did not show significant change in Four types of classification.

6. Conclusions

There is a need to study whether satellite image classification methods performance

depends on acquired dataset for this study area. The ability to obtain cloud less sentinel 2 satellite scene was the largest limiting factor in this research. Landsat7 and Landsat 8 images are crowd by cloud. And also, which are 30 meters resolution images. But sentinel 2 images are 10-meter resolution and clear images. Therefore, sentinel image has been selected in this process.

When comparing the all classification maps, the results of all classifications showed that Agriculture classes were the largest land cover classes in this area. The extent of water bodies was happened approximately

equal in all classification process in this selected area. Barren land cover classes a major difference in all classification. Forest area show major deviation in supervised and unsupervised classification.

The supervised classification mainly depends on collecting training sample which may most effected by human in sample creation. The Water body's classes of resulting supervised classified image are generally acceptable even some water bodies came within the barren land categories. So, training sample polygon should be selected homogenous area in this process because of highly depending the accuracy of supervised classification by sample creator.

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