CLASSIFICATION OF LAND USE LAND COVER CHANGE DETECTION USING REMOTELY SENSED DATA

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ABSTRACT

Image classification is perhaps the most important part of digital image analysis. With supervised classification, the information classes of interest like land cover type image. These are called "training sites". The image processing software system is then used to develop a statistical characterization of the reflectance for each information class. This stage is often called " Signature analysis" .

Unsupervised classification is a method which examines a large number of unknown pixels and divides into a number of classes based on natural groupings present in the image values. Unsupervised classification is becoming increasingly popular in agencies involved in long term GIS database maintenance. The reason is that there are now systems that use clustering procedures that are extremely fast and require little in the nature of operational parameters. Thus it is becoming possible to train GIS analysis with only a general familiarity with remote sensing to undertake classification that meet typical map accuracy standards. With suitable ground truth accuracy assessment procedures , this tool can provide a remarkably rapid means of producing quality land cover data on a continuing basis.

The profusion information of the earth surface offered by the high resolution satellite images for remote sensing applications. Using change detection methodologies to extract the target changes in the areas from high resolution images and rapidly updates geodatabase information processing.

However, the traditional method of change detection are not suitable for high resolution remote sensing images. To overcome the limitations of traditional pixel-level change detection of high resolution remote sensing images, based on georeferencing and analysis method, this paper presents a **clean** way of multi-scale amalgamation for the high resolution remote sensing images change detection. Experiment shows that this method has a stronger advantage than the traditional pixel-level method of high resolution remote sensing image change detection.

Keywords: *Image classification, training sites, satellite images, Unsupervised classification ,change detection, Remote sensing images*.

1. Introduction

Remote sensing, GIS, and spatial analysis played a central role in providing elements for discussion. A variety of change detection methods have been developed now a days. Some of the most common methods are (i). image deferencing (2). Principal component analysis, (3). Post-classification comparison, (4). Change vector analysis (5). Thematic change analysis.

Within this paper, findings are presented with emphasis on settlement landscapes, reserves, buffers around roads, and property lots. These new sources of high spatial resolution image will increase the amount of information attainable on land cover[2].

** The analytical strategy, units of analysis and level of detail for collection and integration of data;[10].

** Remote sensing module : data definition and processing techniques for extraction of information related to LULC in a multi – scalar and multi temporal basis;

** Statistical module: numeric analysis of data through descriptive and inferential statistics;

** GIS module: manipulation of spatial databases generated by the previous modules ;

** Analysis and Synthesis module: integration of spatial and numeric data to answer the research question.

Multi temporal analysis: The development of effective methodologies for the analysis of multi temporal data of the most important and challenging issues that the remote sensing community will face in the forthcoming years. Its importance and timeliness are directly related to the ever-increasing quantity of multi-temporal data provided by the numerous remote sensing satellites that orbit our planet. The synergistic use of multi temporal remote sensing data and advanced analysis methodologies results in the possibility of solving complex problems related to the monitoring of the earth's surface and atmosphere at different scales.

However, the advances in the methodologies for the analysis of multi temporal data have been significantly under-illuminated with respect to other remote sensing data analysis topics[10].

Significance is that the data can be acquired by our eyes and the energy can be analyzed. But satellites are capable of collecting data beyond the visible band also. This will help us to analyze the new things which are not possible in visible band[3].

Fig 1. Deforestration and the Land View after deforesting

A small example may be considered . When was the lat time a sparrow spotted from the balcony? Once they were everywhere. However, in the last few decades, the sparrow population has reduced by nearly half. Lack of nesting and breeding sites (deforestation of native trees and nurturing of exotic trees and manicured lawns in their place), pollution, presence of mobile towers, lack of insect food and use of unhealthy pesticides are some of the important reasons for the sparrow's decline.

2.Study area

GENERAL INFORMATION
Area: 23.5-sq-km
Population: 7,04,514 (1991 Census)
Latitude N: 10° 10' and 11° 30'
Longitude: E 76° 40' and 77° 30'
Altitude: 43.2 m
Clothing: Light Cottons
Language Spoken: Tamil, English, Telugu and Malayalam
Climate: Tropical
Temperature Range (deg C):
Summer: Max 39.4ºC, Min 23.3ºC
Winter: Max 32.8ºC, Min 20.7ºC
Rainfall: 92.2 mm

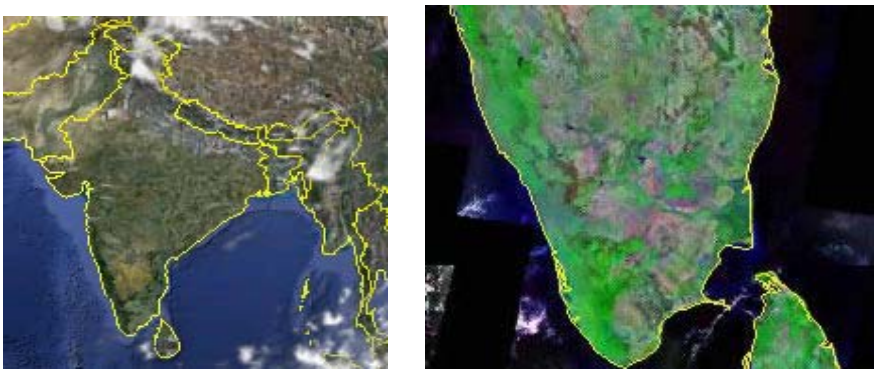


Fig 2. The LANDSAT imagery of India and Tamilnadu

3.Methodology

Normally, the process includes edge detection techniques, image acquisition, image enhancement, segmentation classification, data modeling etc.

1.Image acquisition

Numerous electromagnetic and some ultra sonic sensing devices frequently are arranged in an array format. CCD sensors are used in digital cameras and other light sensing instruments [8].

1.1. Preprocessing

Preprocessing function involve those operations that are normally requires prior to the main data analysis and extraction of information , and are generally grouped as radiometric or geometric corrections. Radiometric correction includes correcting the data for sensor irregularities and unwanted sensor or atmospheric noise and converting the data so they accurately represent the reflected or emitted radiation measured by the sensor.

Geometric correction includes correcting for geometric distortions due to sensor-Earth geometry variations, and conversion of the data to real world coordinates (e.g latitude and longitude) on earth's surface.

To correct distorted or degraded image data to create a more faithful representation of the original scene, image rectification and restoration process is necked which is always termed as preprocessing.

Edge detection

An edge is a set of connected pixels that his on the boundary between two regions, Edge detection is performed on the image by the construction of edge detection operators like sobel edge detection, laplacian edge operator etc. For a continuous image f(x,y), where x and y are the row and column coordinates respectively, consider 2D derivatives $\delta yf(x,y)$ and $\delta xf(x,y)$. Two functions can be expressed :

1. Gradient magnitude

$$| \Delta f(x,y) | = \sqrt{ (\partial_x f(x,y))^2 + (\partial_y f(x,y))^2}$$

2. Gradient orientation

$$\angle \Delta f(x,y) = \text{ArcTan} (\partial_y f(x,y) / \partial_x f(x,y))$$

Local maxima of the gradient magnitude identify edges in f(x,y). The first derivative achieves a maximum and the second derivative is zero. For this reason, an alternative edge detection strategy is to locate zeros of the second derivatives of f(x,y) [2].

Fig 3. Edge detection sample o/p

2.Image segmentation technique

Image segmentation is the partition and pick-up of the homogeneous regions of image. In the results of segmentation, the consistancy of gray the smoothing of boundary and the connectivity are fulfilled. The classical method of segmentation is the spatial cleaning based on the measurement space[1].

The goal of image segmentation is to cluster pixels into silent image regions, i.e regions corresponding to individual surfaces, objects or natural parts of objects.

Image segmentation is crucial processing procedure for the classifications and feature extraction of high resolution remote sensing image[5]. The segmentation result is able to sway the effect of subsequent processing. At present the main image segmentation methods are

1. Thresh-hole based

2. Edge-band

3. Region-based

The edge-based segmentation is taken into account which is namely grounded on discontinuity of gray-level in imagery. The image is segmented by the edge of the different homogenous areas[4].

Adopting this method, the accuracy of edge positioning is high whereas the consecutive edge composed of a serial of unique pixels cannot produced, so a sequent process including bulky the detected edge points should he requisite.

4.Clustering technique

There are numerous clustering algorithms that can be used to determine the natural spectral groupings present in a data set. One common form of clustering, called the “k-means” approach accepts from the analyst the no. of clusters to be located in the data[6].

The algorithms then arbitrarily “seeds” or locates that number of clusters centers in the multidimensional measurement space[8]. Each pixel in the image is then assigned to the cluster whose arbitrary mean vector is closet.

5. Unsupervised classification

Image classification and analysis operations are used to digitally identify and classify pixels in the data. Classification is usually performed on multi-channel data sets and this process assigns each pixel in an image to a particular class or theme based on the statistical characteristics of the pixel brightness values. There are variety of approaches taken to perform digital classification.

The family of classifiers involves algorithms that examine etc unknown pixels in an image and aggregate them into a number of classes based on the natural groupings or clusters present in the image values.

Supervised classification procedures require a human analyst to provide training areas, which form a group of pixels with known class label, so as to assemble groups of similar pixels into correct classes .

An unsupervised classification divides all pixels within an image into corresponding class pixel by pixel.

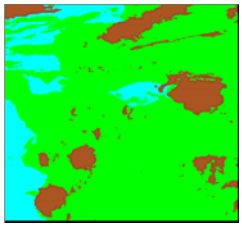
The classification algorithm is designed to automatically said dense regions within the n-dimensional hyper spectral data cloud[7]. The algorithm is based on the well-known observation that spectra of large, distinct land covers tend to cluster around a mean spectrum.

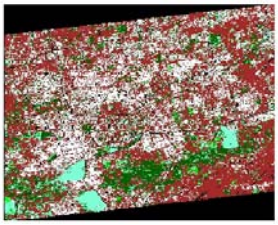
This is the basis for unsupervised classification parcel on cluster analysis[2]. The pixel density around the mean spectrum depends on the spectral variability of the land cover and the areas extent of the land cover.

Screen shots

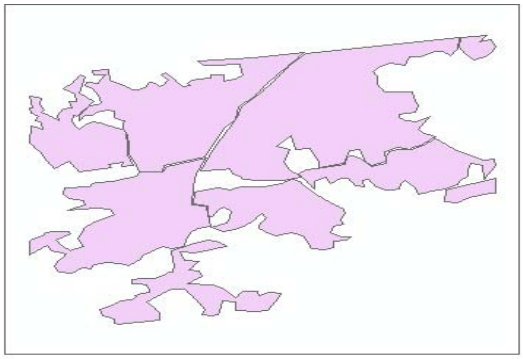
a)

b)





c)



d)

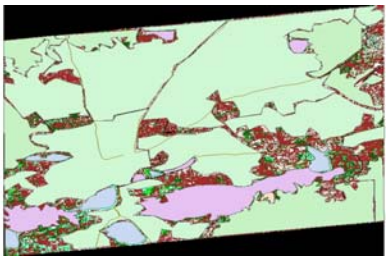


Fig (a) – (d) Various Screen shots of Coimbatore city after classification

6. Conclusion
Sample data

Category	Hectares	Land Use
1	135	Water
2	210	Aquatic Vegetation
3	90	Urban/Edge
4	190	Grassland
5	169	Bare Soil
6	270	Forest
-	1064	Total

The remote sensing data have been analyzed to fixed the land cover classification of our city, and to know how the use of land changes according to time and also performed the temporal analysis to analyze[3] all these things, the unsupervised classification method is used.This is very fast and useful analysis method. It is widely used for the crops[10] classification in the world and this classification method is used for land cover and land use because vegetation components are important in the images[9].The basic axis is also to preserve the greenery of the city for the healthy environment.

Findings

* Found that More agriculture lands are converted into Residential areas. Which reduces the vegetation growth.

* Found that Industrial areas are also increased so that pollution rate increases.

* Found that great reduction in the number of trees due to deforestation. So rain fall is reduced.

* Found that due the above reasons the earth – warm rate in highly increased which tends to the global warming.

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