SUMMARY

UGC MINOR RESEARCH PROJECT

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Introduction:

Remote Sensing is a technology currently undergoing tremendous advances both intechnique and its applicability in different thematic disciplines. The term"remotese nsing" in its broadest sense merely means "reconnaissance at a distance" and also can be descr ibed as, "the practice of deriving information about theearth's land and water surfaces using i mages acquired from an overhead perspective,usingelectromagnetic radiation in one or more regions of the electromagneticspectrum, reflected or emitted from the earth's surface".

This study focuses on the classification method for extraction of land cover information from remotely sensed images in central part of Maharashtra, with a specific emphasis on the built up and other areas.

Importance of the Study:

Remote sensing is applied in several different areas viz. agriculture, forestry, landuse studies, urabn sprawl, geology, environment, costal zone management, snow and glacier, disaster monitoring and mitigation, infrastructure development etc.

The main role in remote sensing is, of the image whtich the satellites acquire for various parts of earth at repetitive period. The data is acquired at the satellite and transmitted to the ground station for further processing and analysis. Is by which objects on satellite imagery can be identified within the given range of wave length by a set of charactristics known as spectral signature.

There are many approaches to classify remotely sensed images. Broadly, the methods are categorized into unsupervised and supervised. Unsupervised classification, proceeds with minimal interaction with theanalysis and searches for natural groups of pixels present within the image. Supervised classification on other hand, proceeds by considerable interaction with the analyst, who must guide the classification by identifying certain training sites representing each category on the image. The supervised classification involves three basic stages. Such as,

i) Training stage, ii) Classification stage, iii) Accuracy assessment stage

Remotely sensed image analysis is a challenging task. One popular and commonly used approach to image analysis is digital image classification. The purpose of image classification is to label the pixels in the image with meaningful information of the real word . Through classification of digital remote sensing image, thematic maps bearing the information such as the land cover type, vegetation type etc. can be obtained. Typical method of classification of remote sensing imagery has been pixel based. Normally, multispectral data are used to perform the classification and, indeed the spectral pattern present within the data for each pixel is used as the numerical basis for categorization that is different feature types with different combination.

The main aim of the present work is to classify and compare the pixel based and object based image classification techniques for land use / land cover classification using IRS – P 6 LISS – IV high resolution data in parts of Maharashtra. This work achieved by-

- Land use / Land cover (level II) classification using pixel based unsupervised and supervised classification techniques.
- Land use / Land cover (level III) classification using object based classification method.
- Comparison of Pixel based and Object based techniques through results of accuracy assessment.

Pixel based and objects oriented image analysis approaches have been performed by classifying the remote sensing image of LISS- IV. The accuracy of the classification result using these two approaches has been assessed by creating the error matrix using the same test area as reference data. Comparisons of the results of the accuracy assessment are showed that object oriented image analysis attains higher overall accuracy and higher land cover class accuracy for most of the classified land cover class. In eCognition classified image objects are not only assigned to one class or not but also get a detailed list with the membership values of each of the class contained in the class hierarchy.

Classification:

The ERDAS software was used to perform unsupervised classification. The initial input for the number of classes was kept as 10 classes and then extended up to 20 and 30 classes. Then classes were merged fitting to the devised classification scheme, but none of these proved to give considerable results. Usually the unsupervised method of classification is followed when the ancillary information is not at hand. Here unsupervised classification with 20 classes gave overall accuracy of 60% which is not satisfactory.

In supervised classification, the image analyst supervises the pixel categorization process by specifying to the computer algorithm, numerical descriptors of the various land cover types present in an image. Training samples that describe the typical spectral pattern of the LU/LC classes are defined pixel in the image are compared numerically to the training samples and are labeled to the LC/LC class that has similar characteristics.

Minimum distance to mean classifier gave the overall accuracy of 66% and Kappa statistics is 1.63, for LU/LC classification. Minimum distance to mean classifiers are based on the Euclidean distance between candidate pixel and the class mean. The minimum distance calculated often validates to be incorrect and misclassifies the image. In this classification mixing of two classes has occurred, such as settlement and barren land because of same DN values.

Mahalanobis classification technique presented the accuracy of 79% and kappa statistics is 0.77 which was advantageous over unsupervised classification. This process for the classification has the advantage of accuracy, directness, and simplicity. But there are some disadvantages which are obvious. Spectral regions for informational categories may intersect. Training data may underestimate actual ranges of classification and leave large areas in feature space and on the image unassigned to informational categories. Pixels near the edges of class boundaries may

belong to other classes. If the training that does not encompass the complete range of values encountered in the image, large areas of the image remain unclassified. Further, MXL classification proved to be more appreciable.

The MXL classifier takes variability of classes into account by using the covariance matrix of the signature. The MXL algorithms gave overall accuracy of 83% and Kappa Statistics is 0.81. In comparison with other algorithms, MXL showed best results. In case of class wise accuracy of MXL, Water body deep (User Accuracy = 100%), Water body medium (87%), Waterbody Shallow (88%), Sugarcane (100%), Other Crops (86%), Fallow land Current (80%), Fallow land permanent (100%), Land with Scrub (50%), Land without Scrub (95%), Vegetation (100%), Settlement (61%), and River (70%), is achieved.

The assumption at the beginning was that object based techniques would give better results compare to pixel based techniques. This assumption was based on the fact that objects based techniques can be effectively implemented for high spatial resolution image data. Also few studies have shown that pixel based techniques may not be appropriate for high resolution image data as it is easy to treat features as object rather than as pixel. Moreover with object based techniques, the object's properties such as shape, size, orientation, direction etc. can be considered for classification which is not possible with pixels. The result of object based classification is presented in following paragraph.

The object based classification for the LISS- IV image gave an overall accuracy of 71% and kappa coefficient ins0.68. in case of class wise accuracy, 82% user accuracy has been achieved for water body deep, 95% for water body medium, 79% for water body shallow, sugarcane 100%, other crops 100%, Fallow land Current 93%, Fallow land Permanent 66%, Land with Scrub 85%, Land without scrub 100%, vegetation 53%, settlement 42%, River 52%.

Achievements:

Based on above observation, it can be stated that pixel based classifiers such as Mahanalobis and MXL have given better results than object based classifier for LISS- IV image data. It can be concluded that Pixel based techniques may be more suitable than object based techniques particularly for classification of LISS- IV image data.

Contribution to the Society:

The results presented here are specific to the high resolution imagery such as LISS-IV image and may or may not be applicable to other spatial resolution image data. Also the ground truth sites were not sufficient to cover entire range of classes.

And the use of software for this analysis therefore had limitation in terms of its functionality.