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Change Detection in Geo Cover Area through Satellite Images

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***Abstract*: Land use information is required for most of the studies as map updating, land use detection, cartography, city planning etc. For that reason, this project aimed to apply a methodology to detect and compare land use results acquired by classification of different satellite images with different resolutions. In our project we are basically displaying the changes in geo cover result in the particular area by using the satellite images. We consider the five field that are Barren land, Water, Forest, Agricultural and Urban area. We have used supervised and unsupervised classification technique to classify satellite image of that particular area but of different years. We have used maximum likelihood and parallel piped method in supervised and k-means method in unsupervised classification. We will compare two satellite images of same land but of different years then we got the result in cell count so we need to calculate it into Kilo meter and then shows the result of both the images in tabular form and shows the changes in separate column. We can further expand it to consider more number of categories and we can also consider for underground water sources.**

***Keywords*: Satellite Images, supervised classification, unsupervised classification.**

1. Introduction

Satellite images are rich and play a vital role in providing geographical information. Satellite and remote sensing images provides quantitative and qualitative information that reduces complexity of field work and study time [1]. Satellite image classification is a powerful technique to extract information from huge number of satellite images [2]. Satellite image classification is a process of grouping pixels into meaningful classes. It is a multi-step workflow. Satellite image classification can also be referred as extracting information from satellite images and studying urban and to determine various land uses in an area [3].

The rest of the paper is organized as follows. Section 2 gives need of the satellite image classification, section 3 illustrates various satellite image classification techniques, section 4 discusses few recent satellite image classification methods.

2. Need of satellite image classification

Satellite image classification plays a major role in extract and interpretation of valuable information from massive satellite images. Satellite image classification is required for:

- Spatial datamining
- Extract information for an application
- Thematic map creation
- Visual and digital satellite image interpretation
- Field surveys
- Effective decision making
- Disaster management

3. Satellite image techniques

There are several methods and techniques for satellite image classification. Fig. 1 shows hierarchy of satellite image classification methods. Satellite image classification methods can be broadly classified into three categories.

- Automated
- Manual
- Hybrid

A. Automated

Automated satellite image classification methods uses algorithms that applied systematically the entire satellite image to group pixels into meaningful categories. Majority of the classification methods fall under this category. Automated satellite image classification methods further classified into two categories 1) supervised 2) unsupervised classification methods.

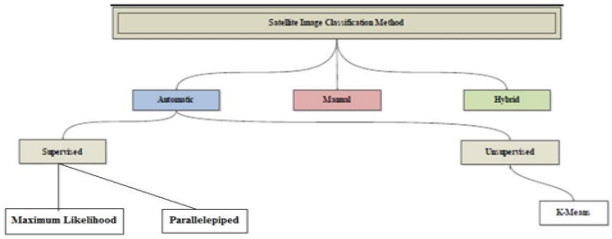

Fig. 1. Satellite image classifications methods hierarchy

B. Supervised

Supervised classification methods require input from an analyst. The input from analyst is known as training set. Training sample is the most important factor in the supervised satellite image classification methods. Accuracy of the methods highly depends on the samples taken for training.

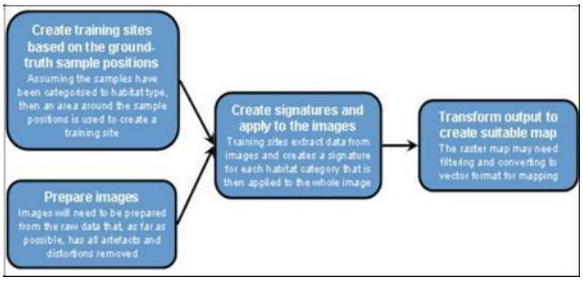

Fig. 2. Supervised satellite image classification process

Parallelepiped executes based on parallelepiped-shaped boxes for each class. Parallelepiped boundaries for each class are pre-determined. Pre-determined boundaries identifies checks pixels of test images and determine class of the pixel. Parallelepiped method is fast and easy to run, but overlap may produce false results [4].

Maximum likelihood method is a statistical supervised approach for recognizing the patterns. It allocates pixels to appropriate classes based on probability values of the pixels. Maximum likelihood is an efficient method to classify pixels of satellite image. But it is time consuming and insufficient ground truth data produces poor results [5].

C. Unsupervised

Unsupervised classification technique uses clustering mechanisms to group satellite image pixels into unlabelled classes/clusters. Later analyst assigns meaningful labels to the clusters and produces well classified satellite image. Most common unsupervised satellite image classification supports K-Means [6].

K-Means is a popular statistics and data mining technique. It partitions n observations into k clusters based on Euclidean mean value. Advantages with the K-Means technique are simple to process and fast execution. Limitation with this method is analyst should know priori number of classes [6].

4. Literature survey

We surveyed different research papers while studying the project domain. We reviewed the paper [7] which was related to our proposed system only difference is that it is shown the building development and we are doing it on land use in five categories which is specified above. In this study, we assessed the utility of fine-resolution satellite imagery for building extraction. It was strongly felt that fine resolution satellite imagery is very useful for building extraction. The accuracy assessment of the classification results clearly indicates this assumption. The accuracy assessment process is applied by using the boundaries of building areas which represents the reality. First the boundaries of buildings are converted to raster depending on the resolution of QuickBird and Ikonos images. Then the building pixel numbers at each classification result of each image are overlaid with this ground truth. And the percent of the truly classified building pixels are assessed and compared from it we are taking the concept of classification.

The paper [8] was about system in which it is an approach for in the planning stage of a land consolidation work Determination of present state of project area, Land works and classification processes, Formation of blocks (water management, drainage and road systems), Determination of stationary establishments can easily be done in the required precisions by using satellite images.

The paper [9] was about the classification methods which gives us an idea about the classification methods used for which purpose and give idea about the different satellite images. The various classifiers may be neural networks and SVM etc. Textures are extracted using haar wavelet transform or GLCM. Various researches done in this field shows that satellite images may be detected efficiently through different algorithm. These methods have some limitations like unable to detect the trees in dense forest through available LIDAR data and determination of edges is not clear. A method is useful for satellite image classification towards river image, residential image, forest image, agricultural and mountain using Gabor filter with the feature extraction. These features are texture, color and shape. These features may then be trained with the help of SVM training module and then classify the satellite image into five categories with the use of support vector machine (SVM) classifier.

5. Methodology

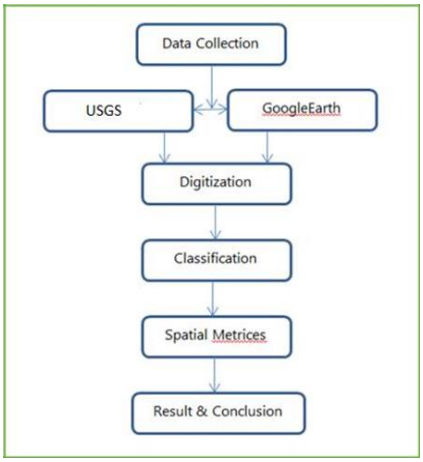

Fig. 3. Workflow

6. Results

Table 1
Change Detection in Km 2013-17

	2013	2017	Total Difference
Urban	6421.43	8893.54	2472.11
Agricultural	23778.80	17999.00	-5779.80
Water	519.47	392.37	-127.10
Forest	2517.99	3588.99	1070.99
Barren land	4127.61	6491.41	2363.80
Total	37365.31		

Table 2
Error detection 2013

	2013		
	Supervised	Unsupervised	Error Difference
Urban	4663.10	6421.43	**1758.34**
Agriculture	16113.29	23778.80	**7665.51**
Water	691.71	519.47	**172.24**
Forest	3134.20	2517.99	**616.21**
Barren land	12541.47	4127.61	**8413.86**

7. Conclusion

In the planning stage of a land consolidation work;

- Determination of present state of project area.
- Land works and classification processes. •Formation of blocks (Urban, Agriculture, Water, Forest, Barren land).

We have showed the change detection in aspect of five categories in kilometers of that particular area, Table 1. In Table 2, we have also showed the error difference between supervised and unsupervised after classifying the satellite images of particular area.

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