# Land Use And Land Cover Analysis -A Review

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**Abstract -** *A thorough study of the natural science describing the geography and topography of our planet reveals a serious damage to our land cover due to various events and activities of the mankind. Global warming which is the greatest threat to our planet causes grave damages to our water bodies. This gives the need to analyze the land use and land cover of our planet. This paper presents a review on how the analysis is done to estimate the total land use and land cover using various techniques like supervised, unsupervised and hybrid classification, digitization etc. It also provides adequate information on software packages like GIS, ERDAS IMAGINE etc.*

**Key Words:** Land use/ Land cover, classification, GIS, SAM, SAR

## 1.INTRODUCTION

The global need for urban development and efficient use of land for human habitation as well as for agricultural use, is the sound and thorough information about the land cover which has been used or lies barren. The necessity to estimate the changes due to global warming has reached its limit. As we run with the breakneck speed on the information superhighway and mark our achievements in the field of technology, one cannot under-estimate the fact that the quality of land cover is degrading day by day. Thus, this gives the need to classify the land cover using various techniques such as different kinds of classifications and digitization. Past studies have used the techniques of supervised and unsupervised classifications; but, the results obtained were unsatisfactory as these techniques could not distinguish between barren land and harvested land, shadows and water bodies. After further research Hybrid classification techniques were used and the results obtained were satisfactory and had high range of accuracy [1].

## 2. ANALYZING METHODS

Geographical Information Systems (GIS)

It is an open source (QGIS) software package, a kind of system which does not stockpile an image/s but, it is a database which stores the information of particular image with its regional information so that, the image can be created using the database. In other words, GIS is for creation of a map rather than storing a map. It uses two kinds of inputs vector and raster form. Vector form of input is used for analogue maps where the points, lines and borders are defined and accordingly the map is plotted and raster form of input is used when plotting each pixel of the map using its grid and cell information [2].

Hybrid classification technique

As in [1], this technique used ERDAS IMAGINE software, wherein the AOI (Area Of Interest) was exported and the area was classified into different classes using Normalized Different Vegetation Index used to distinguish thick forest, thin forest and eroded forest, Region growing method used to discriminate water bodies and Bitmap adjustments for settlement areas.

When performed using GIS approach, neighbourhood and overlay techniques are used to provide satisfactory results.

Supervised Classification

Supervised classification is mainly based on Maximum Likelihood, it usually provides unacceptable results as roads in the settlement areas are classified as barren agricultural land as their radiometric responses resemble each other [1].

Spectral Angle Mapper (SAM) Algorithm

This algorithm can be used with hyper-spectral images which are based on the spectral information of each pixel of that image. The pixels having the same properties are clubbed together to form one classification on the basis of a reference vector, which is then compared with the spectral angle of each pixel to distinguish between different areas [3]. It is based on supervised classification. The benefit of using SAM is that the vector i.e. the direction of the spectrum of the pixels are used instead of the length which makes this technique unaffected by changes in illumination or light [3].
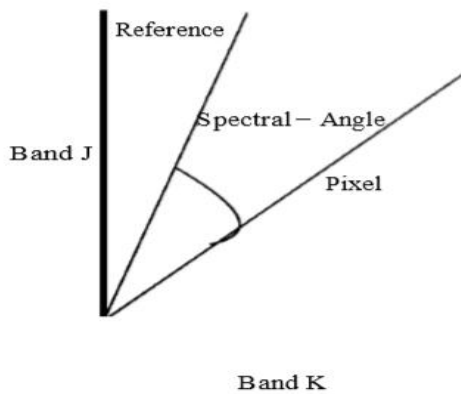
**Figure 1. Representation of reference angle [3]**

Unsupervised Classification

Unsupervised classification required prior separation of the unplowed agricultural land and rock fragments. Then the classification was performed which required human intervention for visual rendering of the different areas [1].

Synthetic Aperture Radar (SAR) + Satellite Imagery

It is believed that SAR provides good quality of images which when combined with the satellite images give appropriate results which can be used for Land Use and Cover classification. This technique also uses a fusion of different classifiers like neural networks, decision tree, k-nearest neighbours, quadratic discriminant classifier. The overall accuracy obtained is high due to the use of different fusion operators [5].
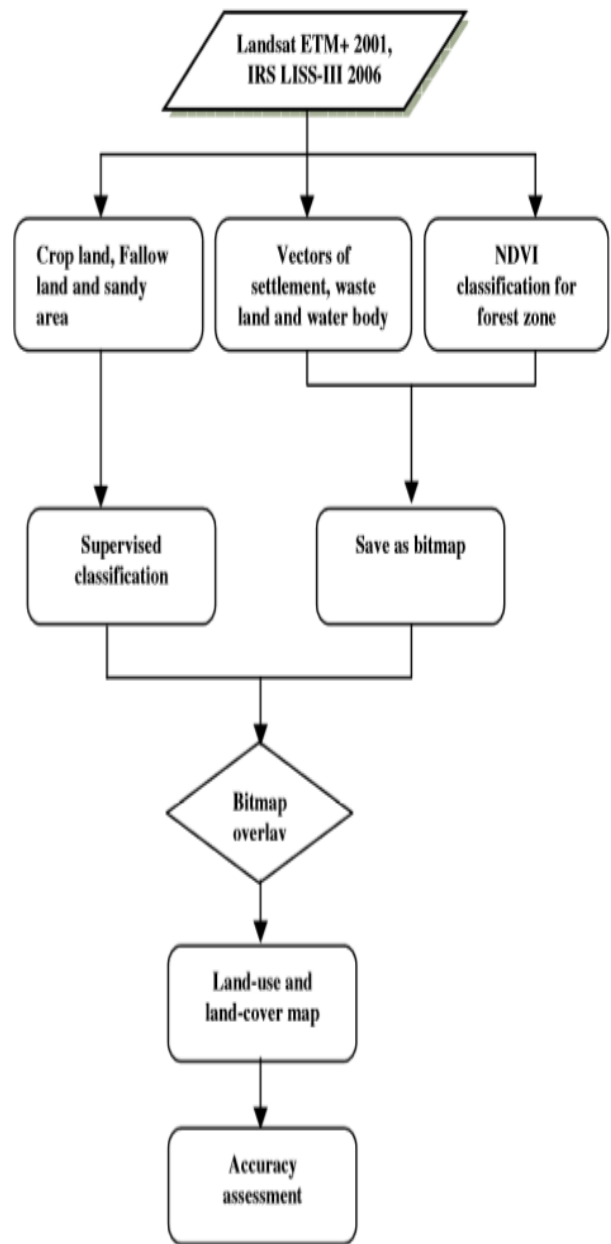


**Figure 2. Methodology chart [1]**

The above chart gives the methodology in which supervised classification is used [1], the accuracy obtained is fairly good. Different types of land covers like crop land, fallow land, sandy area; waste land, water body and forest zone are distinguished using various techniques and then the classification is done.

## 3. ANALYSIS OF THE LITERATURE REVIEW

| Reference Number | Technique of classification | Area & application |
|---|---|---|
| 1 | Hybrid classification | Avoidance of spectral confusion |
| 3 | Spectral angle mapper | Hyperspectral images |
| 4 | Polygon partitioning algorithm | Built 3D models of urban areas |
| 5 | Classifier fusion methods: minimum, max., mean, median | Feature generation, speckle noise reduction of Images from aperture radar (urban area) |
| 6 | Topology preserving maps using virtual co-ordinates and wireless sensor networks | Improving Maps and graphs |
| 7 | Unique colour combination of the optical spectral band | Detection of burnt forest |
| 8 | COSMO-Skymed data retrieval algorithm and snow cover maps | Distinguishing wet snow and dry snow |
| 11 | Maximum likelihood | Hyperspectral image analysis |

## 4. CONCLUSIONS

It can be concluded that, although there exists numerous classification techniques which can be used to estimate Land use/ Land Cover; Hybrid classification when used provides better accuracy as compared to other techniques. Also when two techniques are fused together with several classification operators provide improved results.

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