Land Use and Land Cover (LULC) Identification and Analysis Using Satellite Imagery

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ABSTRACT

GIS is a Spatial Information Science as well as a interdisciplinary subject. Today GIS can be widely implementing in several sectors because of its capabilities. GIS is gradually more accessible to planners and is now an important tool for urban planning in developed and developing countries alike. The infrastructural development in the urban areas growing faster, and to monitor this development is becoming critical issue in the government administration of different departments. The study of land use and land cover analysis will assist to urban and regional planners as well as all government bodies to develop several and proper policies of development. This will enrich the knowledge of planners regarding the geographical information in an easily understandable format.
Keywords : GIS, LULC, Supervised Classification, Clustering

I. INTRODUCTION

Geographic Information System (GIS) is a Spatial Information Science which is interdisciplinary subject. Today the GIS become the fastest growing sector of the computer science. GIS is becoming a multi-billion-dollar industry employing the hundreds of thousands of people worldwide. In general GIS provides facilities for data capture, data management, data manipulation and data analysis, and the presentation of reports or results in both graphical and statistic form[1].

The database management, mapping, and spatial analysis functions of GIS have been very useful in many areas of urban planning. There are different strategies for linking planning models with GIS. They range from loosely-coupled, to tightly coupled and fully-integrated architectures. Integration based on the loosely-coupled architecture involves importing and exporting data between GIS and planning models. Data are exported from a GIS and transferred to an external program for execution [2].

In this experiment we are going to identify the patterns of land use and land cover in urban and regional areas.

In addition to this the identified patterns of urban areas are analyzed and classified using different methods. Identification of land use and land cover areas is now a day's becoming very important task for making a policies regarding urbanization. Continuous growth of cities including large cities and small cities are also requires the proper planning for the effective management of all facilities [3, 4].
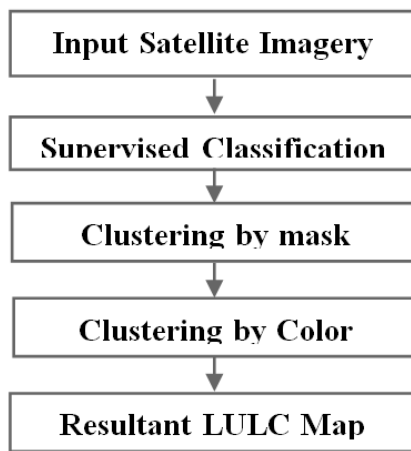
It is necessary to measure and monitor land use and land cover changes time to time by the respective monitoring authority of the government and the policy makers, for sustainable development of the area. Now a day there is requirement of Remote Sensing and Geographical Information System (GIS) experts for the development of land use and land cover planning in city.

STUDY AREA

The selected study area for the land use and land cover analysis is the Nanded taluka. Nanded taluka is the sub-district of Nanded district. Nanded taluka is selected because, it consist of Nanded city which will monitor by Nanded waghala municipal corporation as well as other

land use and land cover patterns can also be available for the analysis.

II. METHODS AND MATERIAL

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│   Input Satellite Imagery   │
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│   Supervised Classification │
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│     Clustering by mask      │
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              ▼
┌─────────────────────────────┐
│     Clustering by Color     │
└─────────────────────────────┘
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              ▼
┌─────────────────────────────┐
│     Resultant LULC Map      │
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Figure 1.1 Methodology for LULC analysis

Above is the methodology implemented for the land use land cover analysis:

➢ In this satellite imagery is provided as input to this methodology. Landsat imagery has been used for the land use and land cover analysis.
➢ Supervised classification has been implemented by using ArcGIS 10.2 desktop. In ArcGIS supervised classification is being performed and for more accuracy further clustering algorithm has been implemented in Matlab
➢ In the next of methodology, the clustering has been performed to identify the similar clusters and to provide the more accuracy. Clustering is performed using Matlab.
➢ After clustering resultant maps can easily explains the different land use and land cover and its area occupied.

The above Figure 1.1 will explains the steps of the methodology implement required to classify, segment, cluster, area computation and color computation for the analysis of LULC image. The above mentioned algorithm is implemented in MATLAB 10.0

The developed algorithm will displays the LULC images as well as also shows the land covered (area covered) by the different selected features in percentage. The algorithm is implemented on the color class cluster to extract the feature. Following are the resultant LULC images

generated through above output. The following figure shows the LULC map of Nanded taluka generated by above algorithm. The segmented LULC image created through ArcGIS is the as follows, showing different color class clusters. Here, by using supervised classification two satellite images are segmented of the year 2001 and 2009.
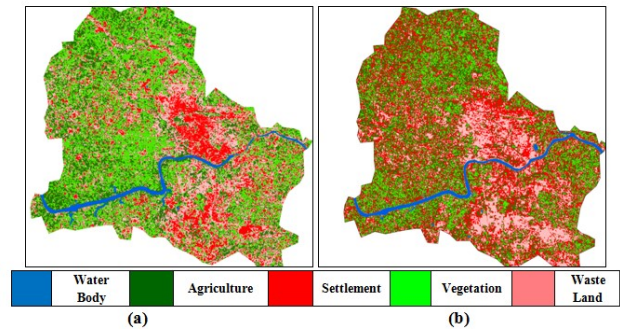

Figure 3.1 Segmented LULC images with their color class clusters.

III. RESULTS AND DISCUSSION

Following are the resultant mask class cluster images obtained through above algorithm implemented in Matlab 10.0., through this clustering we can identify the land use features and also able calculate its area.
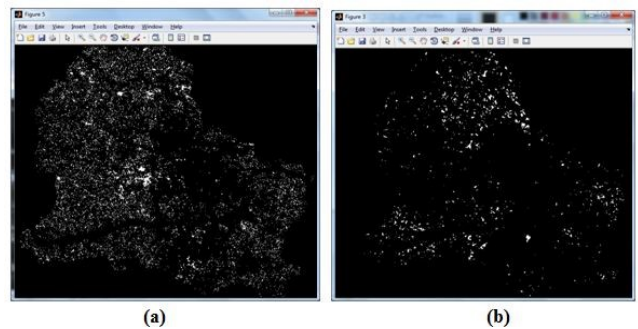
Figure 3.2 LULC cluster mask of agricultural in 2001 (a) and 2009 (b)
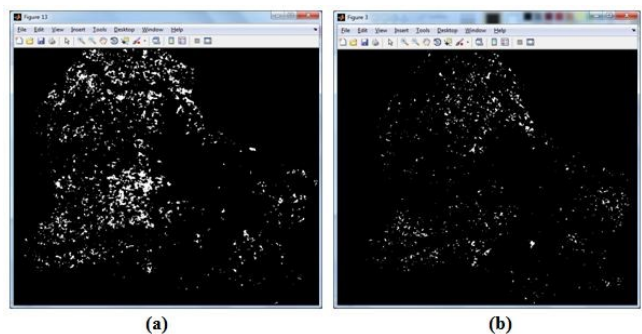
Figure 3.3 LULC cluster mask of vegetation in 2001(a) and 2009 (b)
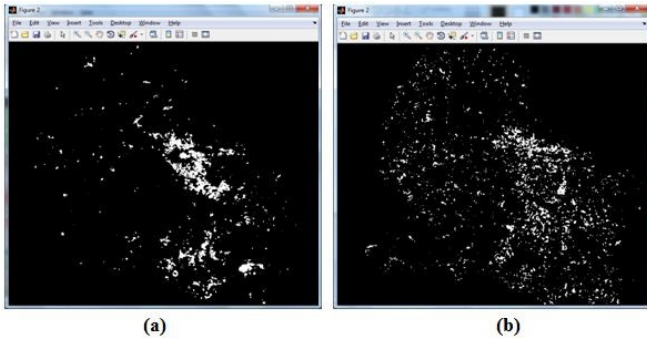
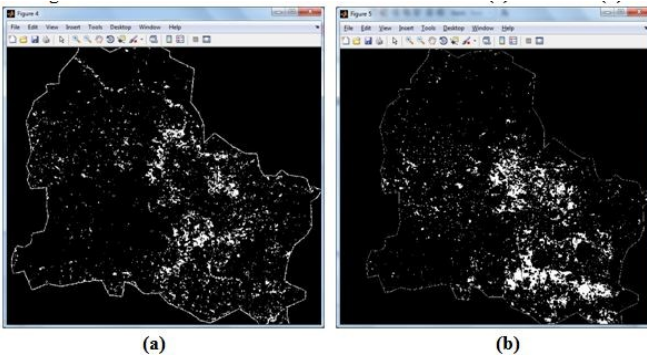Figure 3.4 LULC cluster mask of Settlement in 2001 (a) and   2009 (b)

Figure 3.5 LULC cluster mask of Waste Land in 2001 (a) and 2009 (b)

Through these output images generated through our algorithm are explain the land used and land covered by the respective geographic feature. Through this algorithm area covered by respective geographic feature is also be calculated and is shown in following table:

Sr. No	LULC Classification	Area Covered	
		Year - 2001	Year - 2009
1	Agricultural Land	103383	120452
2	Vegetation	130011	74537
3	Settlement	71403	143793
4	Waste Land	119800	86031

Table 3.1 Area covered calculated through LULC

IV. CONCLUSION

In this experiment comparison of two different satellite images of 2001 and 2009 has been shown. In this experiment we have identified the Land use and land Cover by different geographical features such as agriculture, vegetation, Settlement and Waste Land with the help of image processing through ArcGIS and Matlab. The experiment will also provide the LULC area of the respective area. The obtained result is providing very helpful information regarding LULC.

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