International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Classification of Land Use and Land Cover Using Remotely Sensed Data for Parbhani City, Maharashtra, India

Nayana S. Ratnaparkhi[1], Bharti W. Gawali [2]

[1] Assistant Professor D.S.M Art's, Comm.and Science College, Jintur

[2] Professor, Department of Computer Science & Information Technology, Dr. Babasaheb Ambedkar Marathwada University Aurangabad, (M.S), India (431004)

Abstract: ***The use of remotely sensed data is an important method to indicate land use and land cover changes on earth's surface. Remote sensing can provide a better picture of monitoring land use and land cover changes. In this study, Remote Sensing and Geographical Information System integration are used in order to analyze land cover of Parbhani city using LISS-IV high resolution data collected from NRSC, Hyderabad. GIS is systematic introduction of different disciplinary spatial and statistical data that can be used in inventorying the environment, observation of change and prediction based on current practices and management plans. This paper discusses the land cover of study area using classification of image. Digital image pre processing and image processing techniques are used for classification of land cover analysis. After image pre-processing, supervised image classification has been performed to classify the image into different land use categories. The study area, Parbhani city has been developing rapidly over the last decade, successful planning will require giving reliable information about land use/land cover distribution. This study illustrates that integration of remotely sensed data and GIS techniques are effective to provide such information. A good knowledge of the study area was achieved by a suitable image enhancement and literature studies.***

Keywords: Land use/Land covers (LULC), Remote sensing, Geographical information system (GIS), maximum likelihood.

1. Introduction

The land use/ land cover pattern of a region is an outcome of natural factors. Land cover is a fundamental parameter that describing the Earth's surface. This parameter plays an important role to describe the physical features of environment. If the area is small then suitable land cover may be based on ground observation and surveys. But if area is large then it is difficult to access the information. Toposheets may be useful for reference but are generally outdated and too harsh for detailed analysis. With the improvement in computer technology, satellite remote sensing is being used for studies. The knowledge of spatial land cover information is essential for proper management, planning and monitoring of natural resources and considered as essential element for modeling and understanding the earth as a system. A classification process of Remote sensing data is a best technique to categorize land cover. The Classification workflow uses either unsupervised or supervised methods to categorize pixels in an image into many classes. You can perform an unsupervised classification without providing training data, or you can perform a supervised classification, where you provide training data and specify a classification method of maximum likelihood, minimum distance, Mahalanobis distance, or Spectral Angle Mapper (SAM) etc. The study area classification is done in ENVI (Environment for visualizing images). Geographical Information System provides a powerful tool for manipulation for land cover feature identification.

2. Study Area

The selected study area was Parbhani city in Marathwada region of Maharashtra State of India shown in Figure: 1. It is located between latitude $19^0$30' N and 19.5^0N and longitude $76^0$45'E and 76.75^0E. Parbhani district occupies area 6,511.58 km^2 and has population 1,835,982(2011). Parbhani city is headquarters of this district. The Parbhani city also famous for store of Jowar in Marathwada region.

Figure 1: Study Area of Parbhani city

3. Technique used

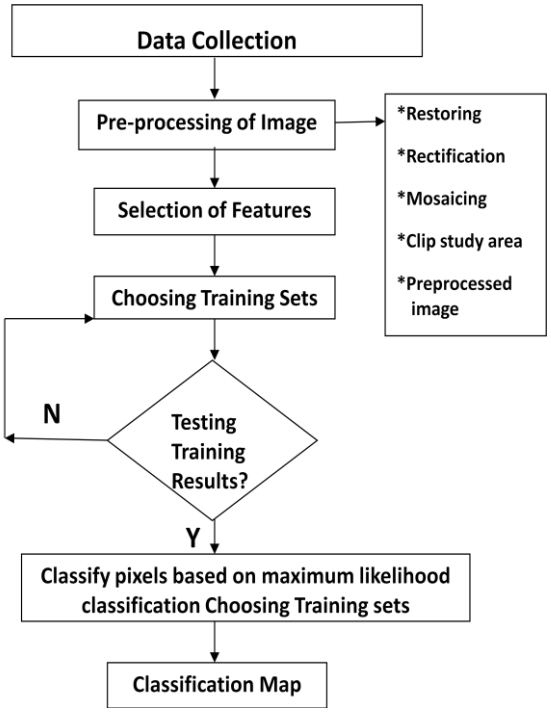

Figure 2: The process of classification

3.1 Data Collection

For analysis and study of Parbhani city, LISS-IV high resolution data were used. For study the multispectral satellite imagery of Dec-2013 is collected from National Remote Sensing Agency (NRSC) Hyderabad, India. Together with this satellite imagery a topographic map and existing land use maps were used to analyze the ground truth.

The LISS-IV sensor is a multispectral high resolution sensor, which operates within three spectral bands (B2, B3, B4). LISS-IV can be operated in either multi-spectral mode (Mx), a swath of 23 Km (selectable out of 70 Km total swath) is covered in three bands, or in mono mode (Mono), the full swath of 70 Km can be covered in any one single band, which is selectable by ground command (nominal is B3 - Red band). The LISS-IV camera can be tilted in the across track direction thereby providing a revisit period of 5 days.

3.2 Preprocessing

In the analysis of imagery, the image pre-processing was carried out. Each preprocessing of an image consists of restoration and rectification of an image. In pre step of study image mosaicing technique is used. It is used to join two satellite images. After joining the images GIS clip tool is used to take appropriate clip of study area. To locate ground features of an image, image enhancement and extraction is used.

3.3 Classification

Maximum likelihood: For analysis, an image classification technique is used. For image classification specific computer software was used like ENVI. The aim of image classification process is converting image data to thematic data. In classification process, classify pixels iteratively, redefine the criteria for each class, and classifies again. In supervised classification technique, the maximum likely hood algorithm will classify the image based on training sets provided by the user based on field knowledge. Training polygons were chosen from composite image and assign to various land features.

Maximum likelihood classification assumes that the statistics for each class in each band are normally distributed and calculates the probability that a given pixel belongs to a specific class. Unless a probability threshold is selected, all pixels are classified. Each pixel is assigned to the class that has the highest probability (i.e., the maximum likelihood).

A good knowledge of the study area was achieved by a suitable image enhancement and literature studies.

Table 1: Land cover classification scheme

Land Cover Classes	*Description*	*Color*
Fallow land	Hills Without vegetation	brown
Built up Area	Residential, industrial, commercial, transportation etc.	Cyan
Water Bodies	River, lake etc.	Blue
Crop land	All farms ,trees	Green
Non crop land	Uncultivated agricultural land	Red

Table 1 shows the different land cover classes of imagery. It also shows the description of classes and different classes is assigning separate color.

3.4 Experimental

The pre classification of image is done in ENVI software. In pre classification step above five classes are created. For classification of an image maximum likelihood algorithm was used. Post classification of an image is as shown in figure 3.

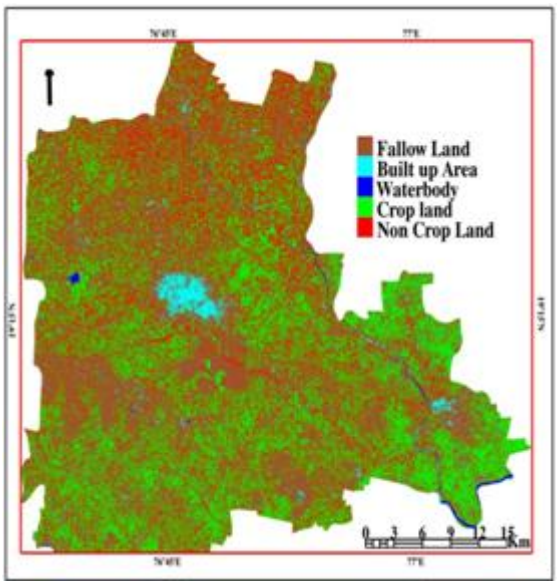

Figure 3: Classified image of Parbhani city

Figure 3 shows the classified image using five different classes. An agriculture is main occupation of the city, so most of the land covered with crop land which is indicated by green color in figure.

Table 2 : Statistic of Land use of Parbhani district

Sr. No.	Categories	Area in km2	Area in (%)
1.	Fallow land	481.7864	20.80
2.	Built up Area	26.7032	1.15
3.	Water body	6.531	0.261
4.	Crop land	531.6436	22.96
5.	Non crop land	374.4953	16.17

Area in Percentage = Category *100 / (Sum of area of all classes)

Table 2 shows the statistical result of different classes of an imagery. The statistical result also shows that the city is mostly occupied by crop land.

4. Results and Discussions

One of the goal of remote sensing data analysis was to produce a land use map of Parbhani city. This paper indicates that how Remote Sensing and GIS techniques are integrated in order to establish land cover analysis in Parbhani city in the year December 2013. This was done using a maximum likelihood supervised classification algorithm using training areas chosen according to field knowledge and literature study. The classification finally gives the land use land cove image of area. Five land cover classes namely Fallow land, Built up area, Water Bodies, Crop land, Non crop land are identified in the study area. The classified images provide all the information to understand the land use land cover of the study area. Each class is assigning separate color. After classification the post classification was done and map is interpreted. The statistical analysis shows that the land is mostly occupied by crop land.

5. Conclusion

The present study of land use and land cover classification establishes the fact that accurate land use data can be obtained from the satellite imagery more efficiently and economically than by traditional method. By using image processing and Geographic Information System techniques the different land use classes are analyzed and mapped easily. In the field of education the Parbhani is known for the famous Marathwada agricultural university which is very helpful for the peoples residing all around. The classified image shows that the city mostly occupied by crop land.

References

[1] D.Amarsaikhana, H.H. Blotevogelb, M. Ganzoriga and T.-H. Moonc, "Applications of remote sensing and geographic information systems for urban land-cover change studies in Mongolia"

[2] John Rogan and Jennifer Miller, "Integrating GIS and Remotely Sensed Data for Mapping Forest Disturbance and Change."

[3] Monalisa Mishra, Kamal kant, A.P. Subudhi, " Urban Sprawl mapping and Land use change Analysis Using RS and GIS"

[4] Srinivasan.K and Poongothai.S, "Land Use/Land Cover Change Detection of Wellington Tank Irrigation Watershed of Tittagudi Taluk, Tamilnadu, India.",International Journal of Advancements in Research & Technology, Volume 2, Issue4, April-2013 28

[5] S.Tamilenthi1, J. Punithavathi1, R. Baskaran1 and K.ChandraMohan, "Dynamics of urban sprawl, changing direction and mapping,A case study of Salem city, Tamilnadu ,India.", Archives of Applied Science Research, 2011, 3 (1):277-286.

[6] F. Bektas , C. Goksel , " Remote sensing and GIS integration for land cover ANALYSIS,A CASE STUDY: GOKCEADA ISLAND"

[7] Gong Jianya, Sui Haiganga, Ma Guorui and Zhou Qiming, " A Review of Multitemporal Remote Sensing Data change detection Algorithms",The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. Vol. XXXVII. Part B7. Beijing 2008.

[8] P. SERRA, X. PONS and D. SAURI,"Post-classification change detection with data from different sensors: some accuracy considerations", International Journal of Remote sensing, 2003,Vol 24, No 16, 3311–3340.

[9] Xiaoyan Li,Zongming Wang, Kaishan Song, Baizhang, dianwei Liu, Zhixing Guo,"Assessment for Salinized wasterland Expansion and Land Use change using GIS and Remote Sensing in the west part of Northeast china ", Envt. Monit Assess(2007) 131:421-437 DOI 10.1007/010661-006-9487-z.

[10] Zeyad makhamresh, Nazeeh Almanasyeh," Analyzing the state and pattern of urban Growth and city planning in Amman Using Satellite Images and GIS", European Journal of Social sciences-vol 24.

[11] Manish k Tiwari, Dr. Aruna Sexena, Dr. Vivek Kalare,"Mapping and evalution of urban sprawl Using an integrated approach of RS and GIS technique.", International Journal of Advanced Technology and Engineering Research.

[12] H.XU, X.WANG AND G.XIAO,"A Remote Sensing and GIS integrated stdy on urbanization with its impact on Arable lands: FUQING city, Fujian Province, China, Land Degradation and development 11 : 301-3014(2000)

[13] S. Tamilenthi, J. Punithavathi, R. Baskaran and K. Chandramohan, " Dynamics of urban Sprawl, changing direction and Mapping: A case study of salemcity, Tamilnadu, India", Achives of Applied Science Research, 2011,3(1) : 277-286.

[14] Alexis Comber, Peter Fisher, Chris Brunsdon, Abdulhakim Khmag, "Spatial analysis of remote sensing image classification accuracy.", Remote sensing of Environment 127(2012) 237-246.

[15] Fei Yuan, Kali E. Sawaya, Brain C. loeffeholz, marvin E. Bauer, "Land cover classification and change analysis of the Twin cities Metropolitan Area by multitemporal Landsat remote sensing.", Remote sensing of environment 98(2005)317-328.

[16] Russell G. Congalton, "A Review of Assessing the Accuracy of classification of Remotely sensed Data." , Remote Sensing Environment 37,35-44(1991).

[17] Nayana S. Ratnaparkhi, Ajay D. Nagne, Dr. Bharti Gawali,"A Land Use Land Cover classification System Using Remote Sensing data",

[18] R.Manonmani, G.Mary Divya Suganya,"Remote Sensing and GIS Application In Change Detection

Study In Urban Zone Using Multi Temporal Satellite, INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES Volume 1, No 1, 2010.

[19] Yudi Setiawan, Kunihiko Yoshino, "Change Detection In Land Use and Land Cover Dynamics At a Regional Scale from Modis Time series Imagery", ISPRS Annals of the photogrammetry, remote Sensing and Spatial Information Sciences, vol 1-7,2012.

[20] Prakasam C.,"Land Use and Land cover change detection through Remote Sensing Approach : A case study of Kodaikanal taluk, Tamilnadu.", International Journal of Geomatics And Geosciences,Vol. 1, No 2,2010.

[21] Y.Babykalpana,"Classification of LULC Change Detection Using Remotely Sensed Data For Coimbatore City, Tamilnadu,India",Journal of computing, vol.2,issue 5, may2010.

[22] Carmelo Riccardo Fichera,Giuseppe Modica and Maurizio Pollino,"Land cover classification and change detection analysis using multi-temporal sensed imagery and landscape metrics", European journal of Remote Sensing 2012,45,1-18,doi : 5721/EuJR20124501.

[23] Selcuk Reis," Analyzing Land Use/Land Cover Changes Using Remote Sensing and GIS in Rize, North-East Turkey", Sensors 2008,8,6188-6202;DOI 3390/s8106188.

[24] Praveen Kumar Mallupattu,Jayarama Reddy Sreenivashula Reddy,"Analysis of Land Use/Land Cover Changes Using Remote Sensing Data and GIS at an Urban Area,Tirupati,India.",The scientific World Journal,vol2013,Article ID 268623,6 pages.

[25] Yasodharan Suresh,D.Balachandar,K.Rutharvel Murthy,R.Muruganandam and K. Kumaraswamy,"LULC change Detection Through Using Remote Sensing And GIS Technology-A case study of ST. Thomas Mount Block, Kancheepuram District,Tamilnadu.",International Journal of Current Research,Vol-3,Issue,11,pp,501-504,Nov,2011.

[26] Dr.S.Santosh Baboo,M.Renuka Devi,"Integration od Remote Sensing and GIS to Land use and Land Cover Change Detectionof Coimbatore District.",International Journal on Computer Science and Engineering,Vol.02,No.09,2010,3085-3088.