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ACCURACY ASSESSMENT OF LAND USE LAND COVER CLASSIFIACTION USING ERDA'S SOFTWARE

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Abstract - *Erda's Software is one of the tool which is very important for the production of Land use land cover maps through a process called image classification. For the image classification process to be successfully, several factors should be considered including availability of quality Land sat imagery and secondary data, a precise classification process and user's experiences and expertise of the procedures. The objective of this research was to classify and map land-use/land-cover of the study area using remote sensing and Geospatial Information System (GIS) techniques. This research includes two sections (1) Land use/Land cover (LULC) classification and (2) accuracy assessment. In this study supervised classification was performed using Non Parametric Rule. The major LULC classified were agriculture (65.0%), water body (4.0%), and built up areas (18.3%), mixed forest (5.2%), shrubs (7.0%), and Barren/bare land (0.5%). The study had an overall classification accuracy of 81.7% and kappa coefficient (K) of 0.722. The kappa coefficient is rated as substantial and hence the classified image found to be fit for further research.*

Key Words: **Erda's Software; Accuracy assessment; vector; Raster; Geographic Information Systems (GIS); Land Use Land Cover (LULC); Remote Sensing;**

1. INTRODUCTION

Land Use Land Cover (LULC) Analysis can be done from processed aerial photographs, satellite Images and Google Earth. Erda's imagine provides true value, consolidating remote sensing, photogrammetric, LIDAR analysis, basic vector analysis and radar processing into a single product .Erda's imagine is an image processing software package that allows user to process both geospatial and other imagery as well as vector data . In supervised classification, an analyst uses previously acquired knowledge of an area, or a priori knowledge, to locate specific areas, or training sites, which represent homogeneous samples of known land use and/or land cover types.

Based on statistics of these training sites, each pixel in an image is then assigned to a user-defined land use type (residential, industrial, agriculture, etc.) or land cover type (forest, grassland, paved surface, etc.). Unsupervised classification is useful for scenes in which land cover is not well-known or undefined. Computer algorithms group similar pixels into various spectral classes which the analyst must then identify and combine into information classes (Jensen 2005, Thomson et al. 1998). Both approaches of classification have strengths and weaknesses associated with the physical execution of the classification process and with the final result of the analysis.

ERDA'S SOFTWARE is ERDAS IMAGINE provides true value consolidating remote sensing photogrammetric, LIDAR analysis, basic vector analysis and radar processing into single product. ERDA'S IMAGINE is easy to use, raster-based software designed specifically to extract information from images. Ability to convert more than 190 image formats into all major file formats including Geo TIFF, NITF, and CADRG.

ERDA'S imagine is an image processing software package that allows users to process geospatial and other imagery as well as vector data. Erda's can also handle hyper spectral imagery and LIDAR from various sensors. Erda's also offers a 3D viewing module (virtual GIS) and a vector module for modeling. The native programming language is EML (Erda's Macro Language). Erda's is integrated within GIS and remote sensing applications and storage format for the imagery can be read in many other applications. Leica Geo systems also purchased ER mapped to add to their mapping software. Imagine is tightly woven into the GIS fabric more than other image processing software packages and that is the advantages this packages and that is the advantages this packages.

2. AIMS and Objectives

2.1 Aims

The aim of this study is to produce a accuracy assessment of land use land cover map using ERDA'S Software.

2.2 Objectives

1. The objective of this project is to assess and compare the accuracy of supervised and unsupervised classification by using erda's imagine software.
2. Offers open, modified and extensible feature model.
3. Under land use and land cover categories Agriculture land, Settlement land, Grazing land**,** Forest land, Bush land, Water bodies and Bare/stony land were studied.
4. KAPPA analysis is a discrete multivariate technique used in accuracy assessments .KAPPA analysis yields a Khat statistic (an estimate of KAPPA) that is a measure of agreement or accuracy

3. STUDY AREA

In order to prioritize watershed/ micro watershed for conservation and management of water soil resource, mavinhole area in Ranebennur taluk tributary of Kumadvathi river in Haveri district of Karnataka taken up for study.

Figure 1 Ranebennur city

Ranebennur taluk enjoys arid climate. Dryness and hot weather prevails in major part of the Year. The area falls under Northern Transition agro-climatic zone of Karnataka state and is categorized as drought prone. The climate of the study area is quite agreeable and free from extremes. The year is usually divided into four seasons: summer from March to May; rainy season or south-west monsoon season from June to September; post-monsoon season covering the months of October and November and dry or winter Season from December to February. There is one rain gauge station located in Ranebennur taluk. The data in respect of this station from the year 1981 to 2010 is analyzed and presented. It is presumed that they are representative of the taluk and the same is used for analysis. Normal annual rainfall in Ranebennur taluk for the period 1981 to 2010 is 630 mm.

4. METHODOLOGY

Following is the flow chat of the research work

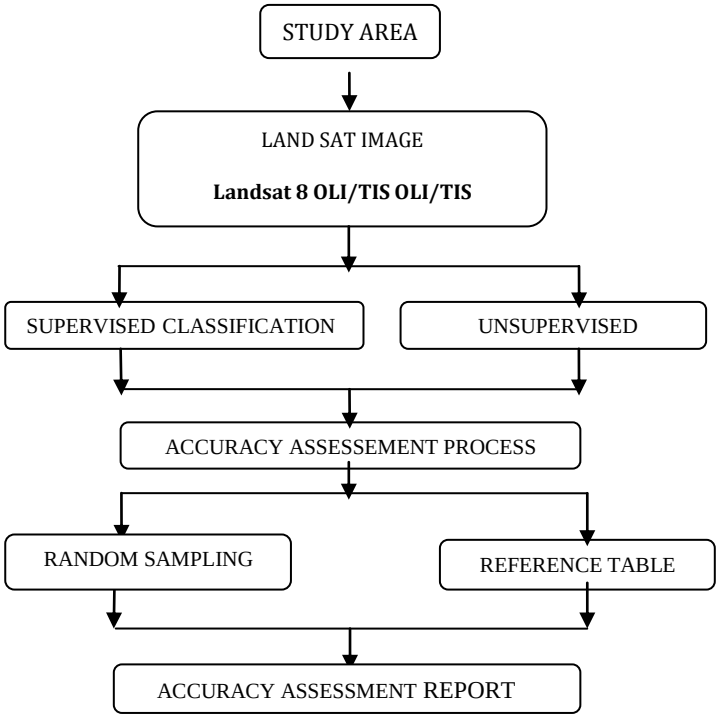

Fig: SCHEMATIC DIAGRAM SHOWS THE METHODOLOGY

Kappa formula:

In this research, various statistics related with classification accuracy as well as overall Kappa statistic are computed based on] formulation as indicated be-low:

Sensitivity = $\frac{a}{a+b}$ (equivalent to producers accuracy)

Specificity = $\frac{d}{b+d}$

Commission error = 1- specificity

Omission error = 1- sensitivity

Positive predictive power = $\frac{a}{a+b}$(equivalent to users accuracy)

Negative predictive power = $\frac{d}{c+d}$

Where:
a = number of times a classification agreed with the observed value
b = number of times a point was classified as X when it was observed to not be X.

c = number of times a point was not classified as X when it was observed to be X.
d = number of times a point was not classified as X when it was not observed to be X. Total points = N = (a + b + c + d)

KAPPA analysis is a discrete multivariate technique used in accuracy assessments .KAPPA analysis yields a Khat statistic (an estimate of KAPPA) that is a measure of agreement or accuracy [5]. The Khat statistic is computed as;

$$K= N\sum_{i=1}^{r} x_{ii}-\sum_{i=1}^{r} (x_i+Xx_{+1})/N^2-\sum_{i=1}^{r} (x_{ii}Xx_{+1})$$

where; r = number of rows and columns in error matrix,
N = total number of observations (pixels)
Xii = observation in row i and column i,
Xi+ = marginal total of row i,
And X+i = marginal total of column i
A Kappa coefficient equal to 1 means perfect agreement where as a value close to zero means that the agreement is no better than would be expected by chance.

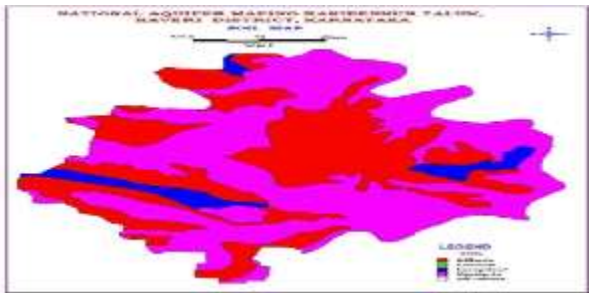

Fig -2 : SOIL

5.GEOMORPHOLOGY

Geomorphology, Ranebennur is generally a gently undulating plain, except for the hilly area on the western most part of the taluk. The general slope in the taluk is in southeast direction .One of Karnataka's most important river-Tungabhadra-flows along the border of Ranebennur taluk in the south. Another river-Kumadvathi-which originates from Madaga Masur Lake flows all the way from Hirekerur taluk & passes inside Ranebennur taluk & finally joins river-Tungabhadra – in Ranebennur Taluk. All the rivers in the district together with their tributaries exhibit dendritic drainage pattern and them from part of Krishna river basin.

6. RESULT AND DISCUSSION:

TABLE: KAPPA RESULT

Table 6. Rating criteria of Kappa statistics.

S.No	Kappa statistics	Strength of agreement
1	<0.00	Poor
2	0.00 - 0.20	Slight
3	0.21 - 0.40	Fair
4	0.41 - 0.60	Moderate
5	0.61 - 0.80	Substantial
6	0.81 - 1.00	Almost perfect

7. CONCLUSIONS

1. ERDA'S Imagine is very important for the production of Land Use / Land Cover maps which can be done through a method called image classification.
2. This method had made huge improvements over the past decades in the following four areas for example; LULC maps production at any scale, improvement and use of advanced classification process such as pre field and sub pixel, classification procedures using knowledge base process and incorporation of auxiliary data into classification procedure such data includes, digital elevation model (DEM), road, soil, land use and census data.
3. Moreover classifying land sat imageries in order to obtain accurate and reliable LULC information still remains a challenge that depend on several factors for example the imageries selected, landscape. Complexity, image processing techniques and classification process it-self.
4. The objective of this report was to classify and map land use - land cover (LULC) of the study area using ERDAS imagine and GIS techniques and also to carry out accuracy assessment in order to assess how well a classification worked.
5. The supervised classification was performed using Non Parametric Rule.
6. The image was classified into six classes; Agriculture, water body, built up areas, mixed forest shrubs, and Barren/bare land. Agriculture was the dominant type of Land use classified which covers about 65.0% of the total study.

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