

Application of Remote Sensing and image Processing for Efficient Urban Planning in India

Sanjeev Sharma¹, Hari Kumar Singh², Shiv Kumar Tomar³

¹ R.D. Engineering College, Ghaziabad, Uttar Pradesh,

^{2,3} Department of ECE, FET, MJP Rohilkhand University, Bareilly,

harsdik@gmail.comsanjeevelx@gmail.com

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Abstract:

This paper focuses upon Analysis of Images containing Remote Sensed Data with integration of Spatial, Temporal and Spectral Feature of object in the field of satellite image processing. We utilizes remote sensed data of multi-spectral nature to extract spectral signature related to several objects of different areas to be used in land cover classification, utilization of land changes with respect to time and performing temporal analysis for analyzing climate impact on surface. Some of the band combination related to data through remote sensing is very effective for land cover classification. Spatial distributions related to land cover like: water resources, agriculture land and urban area may easily be interpret. In India pressure of population upon agricultural land becomes higher now. Fertile agriculture lands are more suitable for agriculture apart from non agriculture utilizations. Horizontal expansion, hence, is not the ultimate solution for growing demand for land to be utilized for urban purpose. As cities have primarily horizontal growth, which affects agricultural activities prospects, due to huge agricultural land is used in non agricultural activities. After a limit, it is very difficult to arrange basic amenities for the cities if horizontal growth continued. New Researches preferred the vertical expansion over horizontal expansion as one of the important tool for planning of urban areas. The Situation is different from the cities in developed west as vertical expansion, regarding the cities of roughly size equivalent to Bareilly, provides solution for requirements of land as demand is increasing. Hence we can save the land utilized in agriculture. Vertical expansion has potential to provide basic facilities for the population as the cost is reduced for these services. Hence, Government should promote the vertical expansion instead of horizontal expansion at least at present.

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I. INTRODUCTION

The current structure of nearly all Indian cities shows increasing growth surrounding their heart by occupying the nearby rural areas. As country's one third population lives in urban regions, hence it is very important to gather latest information regarding pattern of urban growth and its effect on the environment to live. It is established that present urban growth phenomena is haphazard on the urban rural periphery in almost all cities of India. For providing infrastructure and basic facilities in dynamic and complex urban areas, administrators

and planners are required for monitoring the changing land use and uneven growth pattern within urban rural periphery, and in high dense populated urban heart. The expansion of cities leads to several problems like: significant change in the pattern of land use, threats to the wildlife phenomena, rivers becoming polluted due to discharge of water from cities. Urbanization includes the changes of economy from rural to current industrial one. It leads to dynamic deployment of population in urban areas. At present India has relatively low level of urbanization compared to other nations. In last fifty

years, increment in population of India increased by 2.5 times whereas urban area developed by 5 times. In India 306.9 million population, about 30.5% was living in 3700 cities and urban areas in 2001, it is expected an increment by 400 million and 533 million up to 2011 and 2021 respectively. At present, India falls in the category of less urbanization comparatively. The main challenges in cities are deficiency in lodging and water supply, urban infringements in the peripheral territory, deficiency in sewerage, traffic jam, contamination, social distress and poverty, which makes urban administration a difficult task. The increasing growth rate of the population of cities causes a worry for Indian planners for urban planning efficiently. In this context, Government of India took an effective step for efficient municipalities' governance, by implementing 74th Constitution Amendment Act, CAA, 1992. This ensures the improvement in the performance of municipalities / local urban bodies, so the increment in efficiency of these bodies for planning and development of urban areas. To achieve above planning systems, use of modern technologies is required including; remote sensing having aerial and satellite based systems, effective in physical data collection in mass amount conveniently, repetitively and fast, use of GIS for spatially data analysis, hence possibility of modeling and several options generation. Spatial or physical interpretation of data is possible combining with different socio economic data, with use of these systems, so are very useful for processing effective and meaningful planning.

II METHODOLOGY

An important part required for progress discovery is the assessment of changes, means this data will access unfortunate and magnetic changes in the classes which are gradually becomes stable. Such data will prove to be natural instrument for administration requirements. In this method, pixel-to-pixel examination of the image carried out through the surface. The Planning used in this

research including Land Use / Land Cover elements are presented in the block diagram as below:

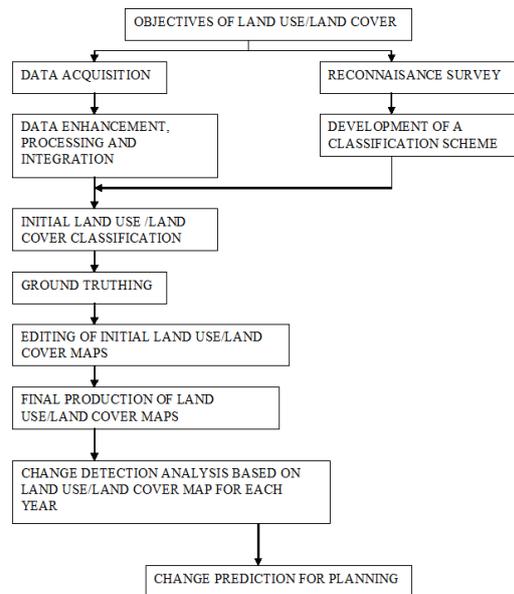


Figure 1 Flow Chart of Research Methodology

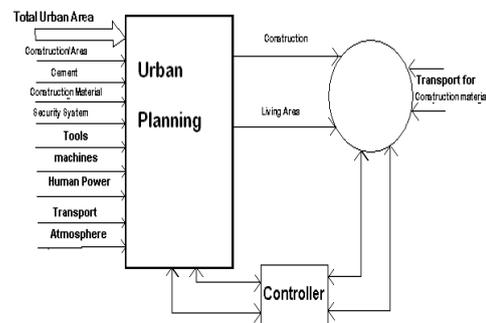


Figure 2 Urban planning model

1. Selecting an area of examination and arrange satellite images for it. The things based on territory would be perceived with the use of images related to the system. Image clusters having same quality of pixels may be encircled using C-mean estimation using subsequent step.
2. Using the encircled clusters as above, assessment of provincial territory region will be done. The earth type may be apparent which will be useful to evaluate the urban area for producing the desired region. This process requires application of neural system in combination to image processing. This

technique may be used to recognize the deficiencies in urban enhancement.

The model for Urban Growth related to may be barometrical conditions, soil conditions, workmen accessibility, materials accessibility etc. In this model, item developed will be gauged, differentiate it and target, and mistake will be feedback in the model information. In this work, iterative path is followed up to a characterization met be gained.

III ARTIFICIAL NEURAL NETWORKS FOR MULTISPECTRAL IMAGE CLASSIFIER

Artificial neural networks, ANNs, a calculation and display of cerebrum style, are being used for different regions of application, e.g. image characterization, discourse recognition, and vector quantization. In the case if all is done, ANN enables the enduring for commotion, data deficiency and mutilation, received from normal applications. Some unique and ideal models of ANNs are made by scientists. These models are able to identify several features from input signals. ANN is made with several components of nonlinear computation. These components works in parallel for recreating the human mind capacity. Consequently, an ANN is described by the topology, initiation capacity, and learning rules (Robert E. Uhrig Anna Loskiewicz-Buczak ZhicahoGuo, 1995).

Multi spectral images are analyzed using ANN, we are using Back Propagation algorithm. In this algorithm, firstly we characterize the neural system, which further mirrors mapping connections in between the objective and data. Info data are in the form of pixels, which clearly tells about specific components included in image like, vegetations, solid structures, water bodies etc, and objective is desired estimations of hues in image's FCC. When the learning of system is over, this system is connected with complete image for creating desired FCC.

Multi-Spectral Images FromLiss 4 Mx Sensor

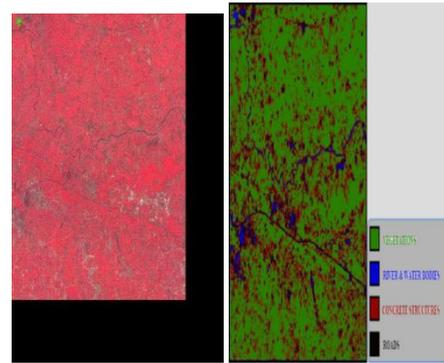


Figure 3 Multi Spectral Image of Bareilly city (We have received these images from the National Remote Sensing Agency, Department of space, government of India, and FCC obtained by ANN).

Network Response for Whole the Image

Currently, we have established connection between data and objective, now we are ready for creating further matrix to compare previous FCC of image. Before we use the neuron system upon the image to reproduce it, we are required to change the 3-D network for measurement (512 x 512 x 3) multi spectral image comparing, into a 3-D matrix of measurements (3 X 512X512) i.e. (3 X 262144).

Currently this modification in the type for multi spectral image, associated with neural system, is for reproduction. After simulation process we get again a 2-D matrix having same measurements (3 x 26212144), which is further changed in 3-D matrix having measurements related to FCC of multi spectral image.

IV NEURO FUZZY SYSTEMS

Neural systems are able to be picked up from data, even may not be interpreted, hence they are mysterious components for customer. A fuzzy system includes interchangeable etymological statutes which may not be extracted from data. Learning figurings are able to learn fuzzy sets as well as fuzzy principles and are able to use past data. These systems are known as Neuro-fuzzy systems, which have following procedures and properties: (Sankar K. Buddy and Ashish Ghosh, 1996)

1. Neuro-fuzzy systems has base of fuzzy structures which is prepared using the theory of neural systems. In heuristical learning method, adjacent data are used and extracted, and made adjustment in neighborhood of the fundamental fuzzy systems. (J.C. Bezdek, J. Keller, R. Krisnapuram, N.R. Buddy, 1999)

2. Neuro-fuzzy system may be seen like 3-layer sustenance neural systems of forward nature. Essential layer used in data factors addressing, Middle layer which is covered one, is used in fuzzy course of action for laws addressing and third layer is used in factor of urban growth addressing. Fuzzy sets used to encode like fuzzy affiliation weights. Fuzzy structure is not necessary to be addressed as it is used to apply learning computation within it. It has a worth from the point of view that it has addressing of data stream for the data requiring care.

3. Neuro-fuzzy systems may be constantly interpreted as fuzzy principle's course of action. The influence of the system is possible for output data without help from outside, as it may be installed using past learning in a type of fuzzy standards.

4. Neuro-fuzzy systems adopts semantically property for its learning method for fuzzy structures to enable interpretation. The output of this are the goals containing considerable changes, justified with system parameters.

5. Neuro-fuzzy structures are used to approximate the N-dimensional, unidentified, limit which is described using classification data up to some degree. Fuzzy rules which are encoded in the system itself address hazy cases and may be viewed as classification data models.

6. Neuro-fuzzy structures may supervise data having several parameters and issue related to urban growth of different classes, are generally known as imperative Neuro-fuzzy structure. (B. Gabrys, 2001)

Results of Bareilly Region Images after Applying Different Algorithms:

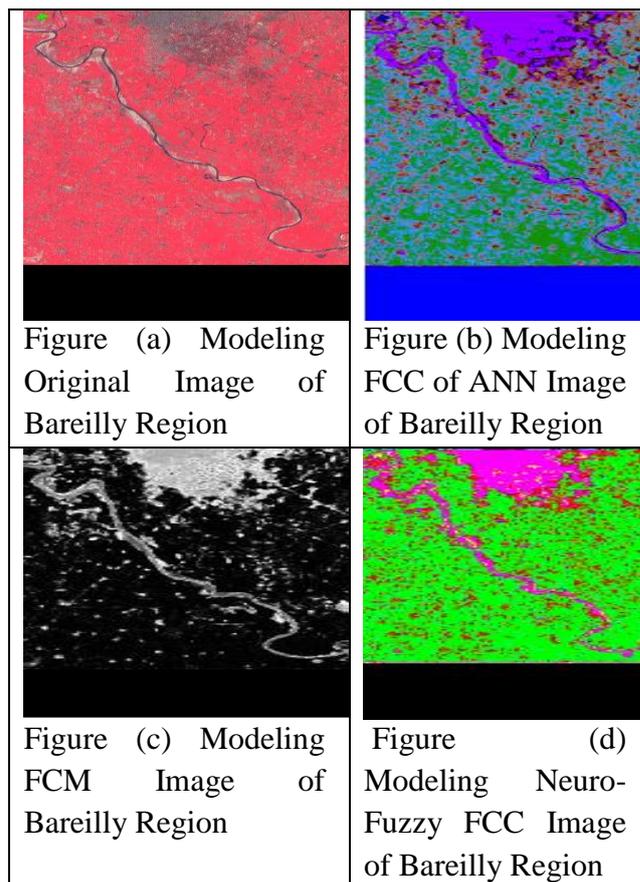


Figure 4 Images of Bareilly using different algorithms

V ANALYSIS OF THE MULTI SPECTRAL IMAGE USING NDVI

Step 1

We have achieved the color image that has the RGB segments, in the given images R speaks to the close infrared band, G speaks to the red band, and B is for the green band. By utilizing the MATLAB, we got the three distinct images of the diverse groups.

Step 2

After getting the images of the distinctive groups now our point is to discover the NDVI estimations of the given image $NDVI = (NIR - RED) / (NIR + RED)$ By utilizing the MATLAB we got the NDVI estimations of every pixel lastly we got image as appeared in the figure. The estimations of NDVI are in the scope of - 1 to +1. For influencing the image we to have changed over this range to 0 to 200; as $NDVI \text{ image esteem} = (NDVI \text{ esteem} + 1) * 100;$

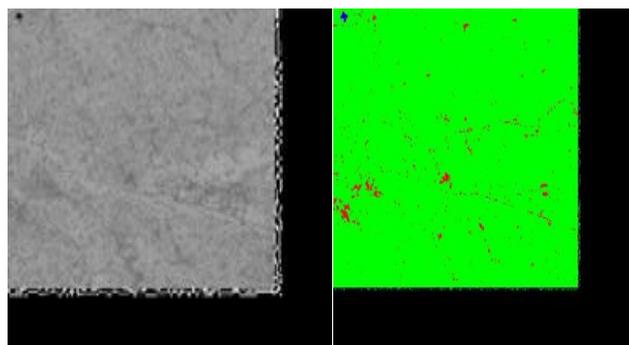


Figure 5 NDVI Image and FCC of Multi Spectral image.

VI STATISTICAL PARAMETERS FOR MULTISPECTRAL IMAGE

Original image 	Mean=90.12 65	Kurtosis=2.410 7
	Entropy=7.5 705	Standard Deviation=49.5 981
	Mode=206	Convolution=2. 4600e+03
	Power Spectrum=3 1.9687	Median=171
	RMS=11.69 00	Variance=6.419 4e+03
	Skewness=0 .2647	PSNR=-3.7852
	MSE=0.418 3	First Central Moment =0
	Second Central Moment = 18.3297, 6.3980e+03	Third Central Moment =3.0019e+05, 3.9132e+05

VII HARD CLUSTERING

Hard clustering expect sharp limits between bunches, a pixel has a place with one and just a single group. A prominent and understood hard

bunching calculation is k-implies grouping calculation. K-implies calculation is a bunching procedure to parcel n pixels into k groups, where $k < n$.

K-Means Algorithm:

K-Means calculation is one of the most straightforward unsupervised learning calculations take care of the notable bunching issue. The methodology takes after a basic and simple approach to characterize a given dataal index through a specific number of groups (accept k bunches) settled from the earlier. The fundamental thought is to characterize k centroids, one for each group. These centroids ought to be set shrewdly due to various area causes diverse outcome. Thus, the better decision is to put them however much as could be expected far from each other (V. K. Dehariya and S. K. Shrivastava, R. C. Jain,2010). The following Step is to take each direct having a place toward a given data collection and partner it to the closest centroid.

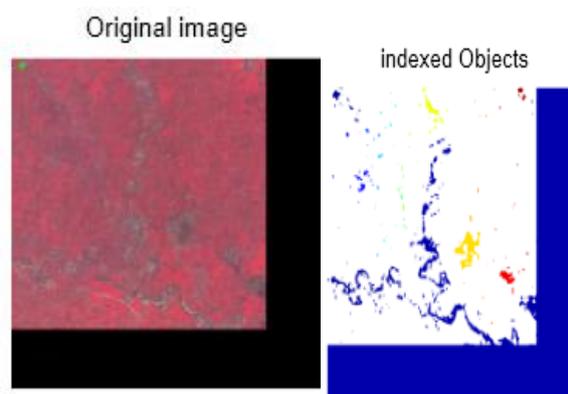


Figure 6 Original Image and indexed objects

VIII PLANNING AREA:

The zone of urbanization is the zone near the proposed ring street of Bareilly city. The ring street is around 87 Km long which encompasses Bareilly city. It goes through each of the six tehsils and covers for the most part the undeveloped region of Bareilly region with the goal that the urbanization might be all around supported for over 20 years. This will help in engineering up the urban area in a flawless way.

Analysis of modeling parameter

The modeling parameters for urban planning can be of two types:

1. Measurable parameter
2. Non-measurable parameter

Optimized Graph for Measurable parameter

The diagram that demonstrates the impact of the considerable number of parameters on various cities is demonstrated as follows. This diagram demonstrates the advanced outcome and we have likewise decided the general condition for the improved chart.

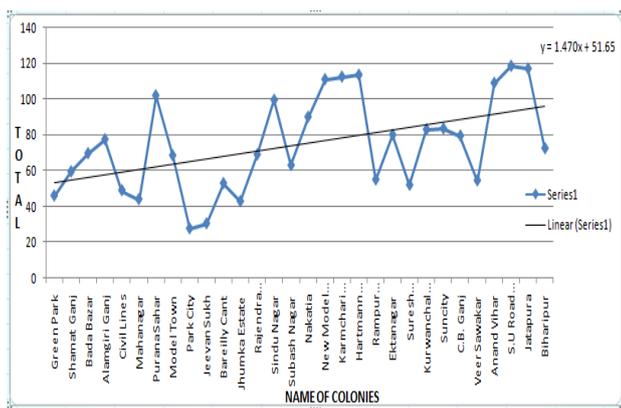


Figure 7 Graph between modeling parameters and different colonies

Optimized Graph for Non-measurable parameter

The diagram that demonstrates the impact of the considerable number of parameters on various cities is demonstrated as follows. This diagram demonstrates the improved outcome and we have additionally decided the general condition for the upgraded chart.

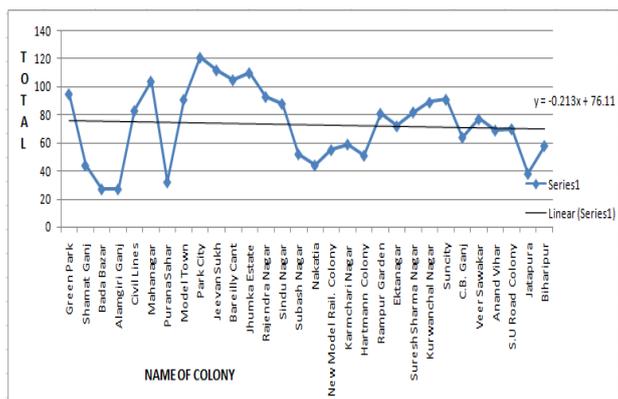


Figure 8 Overall graph of Non- Measurable parameters

Regression condition for count of house cost

The relapse display is depicted model is portrayed as a straight condition that takes after. y is the reliant variable, that is, the variable being anticipated. x is the autonomous variable, or the indicator variable. There could be numerous indicator factors, (for example, x1, x2, ...) in a relapse condition. Notwithstanding, there can be just a single ward variable (y) in the relapse condition.

$$y = \beta_0 + \beta_1x + \epsilon$$

where β_0 and β_1 are the consistent, and the coefficient for the x variable and ϵ is the arbitrary mistake variable. The cost area is around MJP Rohilkhand University, Bareilly



Figure 9 Graph between house price and size

It models the coefficient of correlation to be 0.891. Regression coefficient help creates the following equation for predicting house prices.

$$\text{House price} = 3041.3 * \text{Size (Sq. ft)} + 8728.7$$

This equation explains only 79% of the variance in house prices. Suppose other predictor variables are made available, such as the number of rooms in the house. It might helps improve the regression model.

X CONCLUSION

Weak expansion of Indian cities took place in between Agriculture areas for the process of urban development. These areas are changing to organized business or private areas. In all the cases, our focus is on urban development, indiscriminate and unprepared, taking place on rural area.

At present large portion of urban areas in India shows advance development as intrusion in regional margin regions. An essential consideration as well as foundation required for dynamic and random urban positions, hence it seriously requires managers and heads for screening unorganized enhancement patterns in urban periphery and into the dense populated urban areas. The huge area is governed by fundamental law for urban settlements in India like; Old areas are very dense populated whereas newly developed areas are developed with relatively rare population. Bareilly city is one of the examples for it. The core area which is mostly recognized and well organized and placed on hills has dense population. Land is recognized as an asset due to increasing population as well as increment in interests of provisions. Land use/ land cover data and their outcomes are used in planning, resolution and execution of plans to meet out the growing demands of lands for human needs and wellbeing. Land use/ land cover samples of an area are used as usual and economic elements. Land use/ land cover represents the use of the land in time and space by humans. Land use and land cover, LULC, analysis is now used as basic technique in natural variation at global level. In this research we have used several Artificial Intelligence techniques like- Neuro Fuzzy rationale, Fuzzy rationale and ANN which utilizes remote sensed data received by Remote Sensing. The information gathered motivates us for learning the city and proves as method which helps in urban planning. The supervision of different non-measurable and computable parameters are possible to prepare, which are necessary for the survival of a man. The analysis of all of the parameters shows that in Bareilly, Park City is best arranged which is

fulfilling all the fundamental requirements for the persons of all age group. Decrement in the prices of House as well as its size in Bareilly city is determined by the modeling of the cost enhancement when planning a house in the city. From this view also, Park City is best one from the price point of view suitable in the budget of a common man.

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