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Image Analysis and Processing of Remote Sensing Data with the help of NDVI values

Jitender Kumar [1], Deepak Chaudhary[2], Vijendra Rai[3]
[1]*M.Tech CSE Department, IET Alwar, Rajasthan, India*
[2]*Asstt. Prof. CSE Department, IET Alwar, Rajasthan, India*
[3]*Asstt. Prof. CSE Department, CERT Meerut, UP, India*

Abstract:- This paper focuses on the Image Analysis of Remote Sensing Data Integrating Spectral, and Spatial Features of Objects in the area of satellite image processing. Spatial distributions of land cover types such as roads; urban area, agriculture land, and water resources can easily be interpreted by using the NDVI values for different areas like greenery area, road, residential area, agricultural area etc in MATLAB. We compare these NVDI values with the values provided by the national remote sensing agency. The long-term objective of the thesis is to optimize the land use pattern for economically and environmentally sustainable urban development.

Keywords:- Remote Sensing Material; Geometric Correction; Radiometric Correction; Area Index; Ray Tracing Simulations.

I. INTRODUCTION

Basic aim of our paper to analyze the Remote Sensing Data that we have received from the national remote sensing agency (space department, government of India); Integrating Spectral, Temporal and Spatial Features of the Objects in the area of satellite image processing. Here the multi-spectral remote sensing data is used to find the spectral signature of different objects of the Meerut city for the land cover classification, how the use of land changes according to time and also performed the temporal analysis to analyze the impact of climate over the surface.

In this paper we used the NDVI technique. We calculate and compare the NDVI values for particular city using MAT Lab 7.1 version simulation tool.

During the study following objectives were achieved:

1 General analysis of the different bands data of the multi spectral image.
2 Determination of NDVI values of different images from the ground survey data.
3 Creation of the False Color Composite image for the classified objects such as (vegetation, structures, roads, free land and water).
4 Compare the result values with the reference values for the confirmation of objects vegetation, structures, roads, free land and water.

II. NDVI (NORMALIZED DIFFERENCE VEGETATION INDEX)

NDVI pixel very rarely covers a single homogeneous agricultural region. Instead it may cover roads, buildings, bare soil, small water bodies, natural vegetation and agriculture, all within one pixel. An NDVI pixel is the sum of the radiation reflected from all the land cover types within the area covered by the pixel. NDVI is an indicator of the condition of the overall vegetation in an area, including natural vegetation and agriculture. In rain-fed agriculture, natural vegetation may follow similar patterns to the agriculture. More often however, agriculture is more susceptible to adverse conditions and follows different growth cycles. When looking at NDVI, always remember that you are looking at general conditions and not necessarily the condition of a specific crop.

The formula for NDVI is given by:

$$NDVI = \frac{NIR - ARP}{NIR + ARP}$$

NIR= Near infrared radiation
ARP=Active radiation of pixel conclusion.

III. MOTIVATION

Focus of our study is on Meerut city, which belongs to the Meerut district as shown in the map of Meerut district. Meerut is a large and prosperous city of Uttar Pradesh. It has a population of almost 1.2 million people.

The city is historically important because it was the birthplace of the Indian revolution against British rule, but it is also becoming an economic center for the surrounding area.

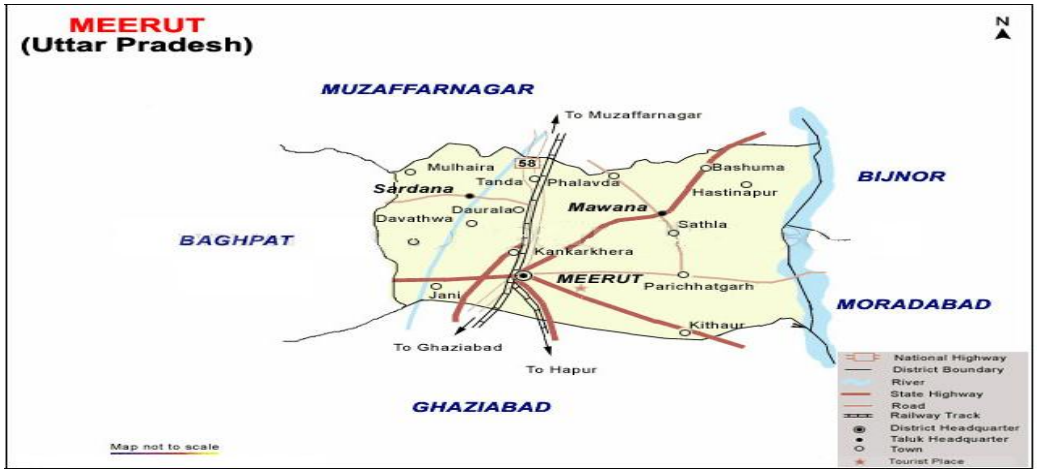


Fig 1. Map of Meerut district (Uttar Pradesh)

Meerut has seen a boom in the construction business as this city now has many buildings, shopping complexes and apartments. Meerut is the largest supplier of sports goods and also the largest manufacturer of musical instruments in India.

IV. MULTI-SPECTRAL IMAGES FROM LISS 4 MX SENSORS

Scene Corners: Fig. 2
North West Latitude: 28.977
North West Longitude: 77.593
North East Latitude: 28.915
North East Longitude: 77.86
South East Latitude: 28.7
South East Longitude: 77.796
South West Latitude: 28.761
South West Longitude: 77.53
At Scene Centre: Fig. 2
Latitude: 28.838
Longitudes: 77.694

Fig 2. Multi Spectral Image of Meerut City

Scene Corners: Fig. 3
North West Latitude: 29.192
North West Longitude: 77.656
North East Latitude: 29.131
North East Longitude: 77.923
South East Latitude: 28.915
South East Longitude: 77.86
South West Latitude: 28.977
South West Longitude: 77.593
At Scene Centre: Fig. 3
Latitude: 29.054
Longitude: 77.757

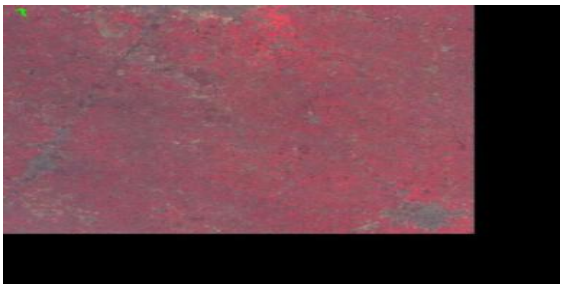


Fig 3. Multi Spectral Image of Meerut City

Concatenation of Images:

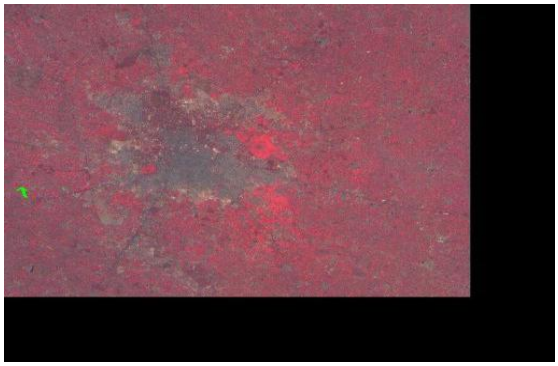


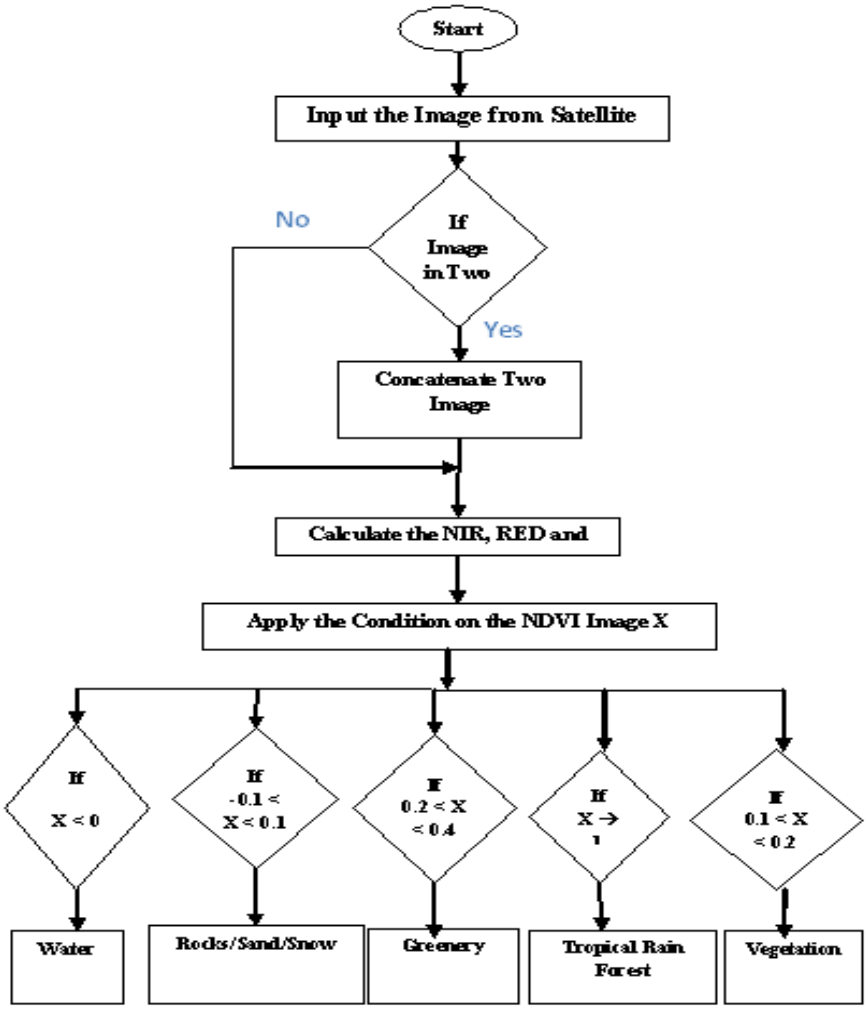
Fig 4. Multi Spectral Concatenation of Fig 2 and Fig 3 of Meerut City

Table 1. Reference NDVI Values for Different Land Areas:-

Different Land Areas	NDVI Values for corresponding Land Area	Mathematical View of NDVI Values(x)
Water	Negative values	X < 0
Rocks/Sand/Snow	Values Close to Zero	-0.1 < X < 0.1
Greenery/Vegetation	Low Positive Values	0.1 < X < 0.4
Tropical Rain Forest	Values Approaching to 1	X → 1

V. FLOW CHART

Flow Chart Image Analysis of Remote Sensing Data with the help of NDVI values:



VI. EXPERIMENTAL RESULTS

After applying the NDVI values which is given by national image sensing agency. We found the different images for different areas like road, water, greenery area residential area of a multispectral image of a particular city. We used MAT Lab tool for simulation 7.1 version; this is a powerful tool for image processing and analysis.

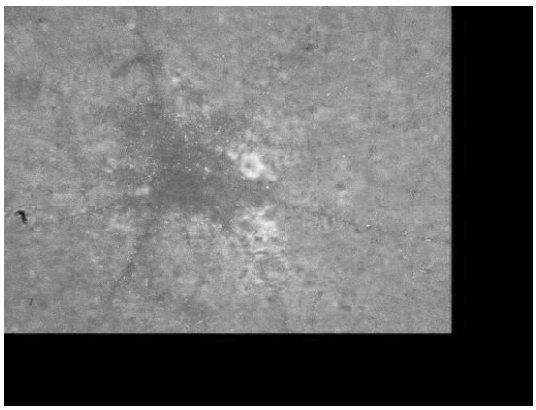


Fig 5. NIR Image

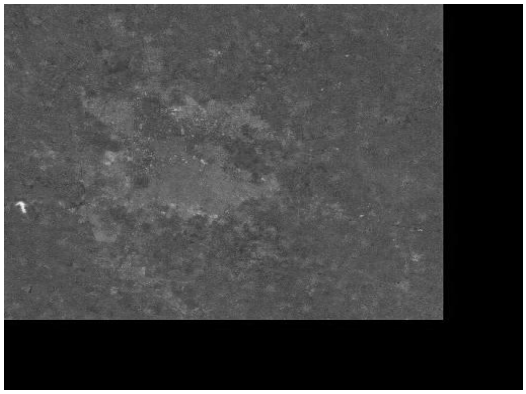


Fig 6. RED Image

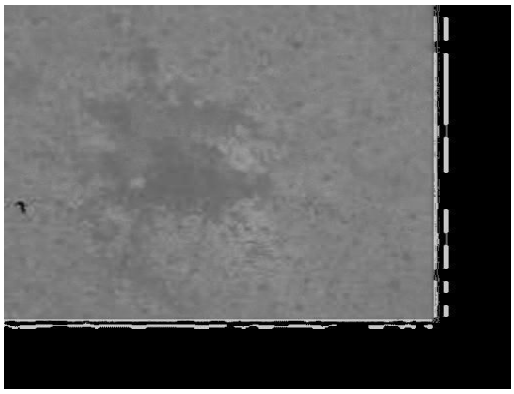


Fig 7. NDVI Image

Fig 8. Land Image

Fig 9. Road Image

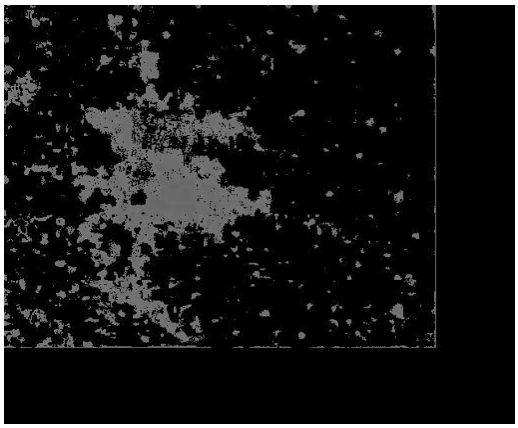


Fig 10. Structure Image

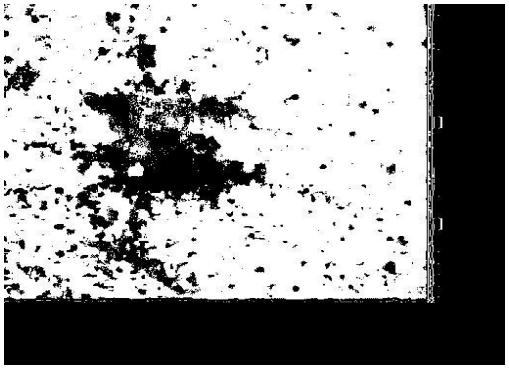


Fig 11. Vegetation Image

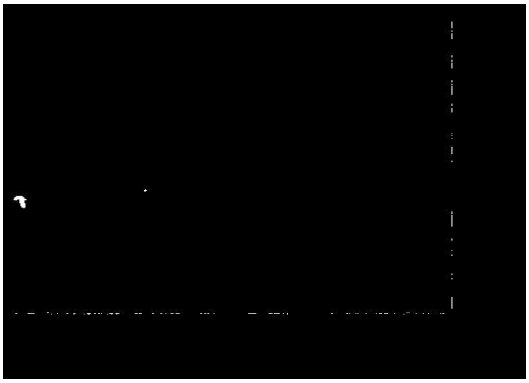


Fig 12. Water Image

VII. CONCLUSION

This paper present the basically detection of land, road, water, vegetable etc. We matched the NVDI values with the data given by the NRSA (National remote sensing agency) which useful to monitoring how the various parameters are changing with time.

This is a very fast and effective method of analysis. It is widely used for the crops classification in the world. But we have used this one for land cover classification because vegetation components are very dominant in the images. And our basic aim is also to preserve the greenery of the city for the healthy environment.

We have achieved all the objectives that I have set for the study. And results that I have found through our analysis are true up to 90 to 95% in case of the vegetation, around 85 to 90 % in case of the structures but in case of the roads, free lands and water error percentage is much higher so the result % are true up to 70 to 80% only.

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