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EXTRACTION OF WATER BODIES IN GODAWARI BASIN FROM SATELLITE IMAGES

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ABSTRACT

The water bodies are observed with the help of remote sensing images, and it is of high significance as it provides the information of the water resources available and its on going transformations. Image processing of the water bodies helps to control and find the measures related to the water scarcity, pollution, and also predicts the flood occurrence. The location of water bodies are finds. It is also important for the analysis of the hydrological features and for water resource management.

Over the past decade, a significant amount of research been conducted to extract the water body information from various multi-resolution satellite images. The objective of this paper is to review methodologies applied for water body extraction using satellite remote sensing. [1]

Further, the sections in this proposed research development identify the water bodies to predict the location of the water resources.

Index Terms— DEM, Remote Sensing, Satellite image and water body.

1. INTRODUCTION

The water bodies are observed with the help of remote sensing images, is of high significance as it provides the information of the water resources available and its ongoing transformations. Image processing of the water bodies helps to control and find the measures related to water scarcity, pollution, and also predicts the flood occurrence [31]. Hence, remote sensing data is important in the modeling of the geomorphological maps by interoperating the visual images of the satellite. The zonal mapping is investigated using different parameters like ground truth, soil type, hydrological and hydraulic statically collected data [28].

2. LITERATURE SURVEY

The study of X-band HH polarized airborne Synthetic Aperture Radar (SAR) imagery to examine the potential of SAR data to map open freshwater areas extant on 1:100000 USGS topographic maps and SAR image based on technique of imaging in different directions and object oriented. Some researchers study digital elevation model (DEM) to extract the information that helps in the

identification of the river networks [5,16,29]. With this, the river location is updated regularly to extract the changes of the water bodies by comparing the past and present images taken by the satellite. Various rivers are classified based on their surface homogeneity, structure (parallel or straight contours) and radiometry. The information collected from a digital elevation model is implemented to eradicate the geometric and radiometric topographic effects extracted from the synthetic aperture radar (SAR) images. Based on these images, the data related to the river surface is extracted and classified [27]. The basin structure is analyzed with the digital elevation models (DEM) using stereo satellite images. These are applied in real-time decision-making such as flood modeling, pollution modeling, water supply modeling, stream sedimentation analysis, watershed delineation [9]

3. METHODOLOGY

3.1 Study area

The study area focused in this research work is the Godavari delta basin that is situated along the eastern coastal region. The delta covers an area of 5820 km² that is fringed by a 30 km long beach-ridge plain. The river Godavari originates from the an elevation in Nasik located in the Western Ghats at a height of 1067 m and flows towards the eastern side of peninsular India into the Bay of Bengal. The four tributaries of the Godavari River are Gautami, Vasishta, Vainateyam and Nilarevu. The Godavari delta is generally an wave-dominated delta that meets its end in the ocean. The Godavari delta is distinguished into two regions such as the upper fluvial plain and the lower beach-ridge plain. The recent studies that are based on mapping of landforms, mainly concentrate on beach ridges and paleo-distributary courses that are present in the Godavari basin. The annual rainfall that delta receives is 1000-1100mm and the maximum temperature is about 45°C in summer and 17°C in winters [19,20]

3.2. Data Set

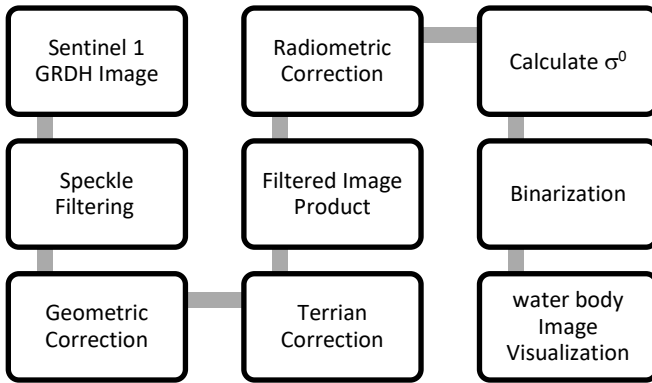
The data is acquired from Sentinel-1 SAR Satellites. The data is collected from the bounded regions of part of Godavari river basin situated in Marathwada region of Maharashtra, India. The coordinates are as shown in Table. 1.

Table 1:-Coordinates of Study area

	Latitude	Longitude
Upper Left Corner	20° 48' N	73° 43' E
Upper Right Corner	20° 23' N	76° 04' E
Lower Left Corner	19° 18' N	73° 25' E
Lower Right Corner	18° 53' N	75° 46' E

The process of analysis is as shown in flow chart (1) to extract river network visualization using Synthetic Aperture Radar Dataset

Flow Chart-1:- Extraction of water bodies image visualization



4. RESULT AND DISCUSSION

4.1 Pre Processing

For each polarization recorded there are two bands: Amplitude and Intensity (Fig 1). (The Intensity band is a virtual one. It is the square of the amplitude).

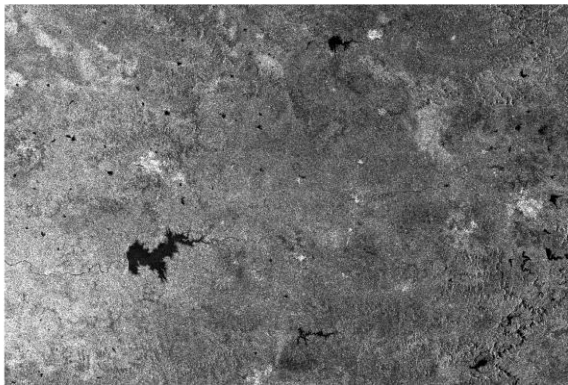


Fig. 1(a) Sentinel 1 SAR Raw Image Amplitude VV

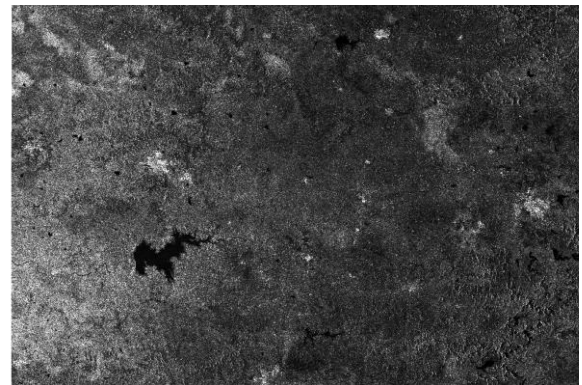


Fig. 1(b) Sentinel 1 SAR Raw Image Intensity VV

After applying orbit file to correct the orbit of Dataset we go to the preprocessing step.

In preprocessing firstly, we will go to radiometric calibration of the data. In this step we select VV polarization for processing parameter (Fig 2).

Next step is filtration using single product speckle filter. In this step we apply Lee filter with filter size 7X7. The result clearly shows the difference between filtered and non-filtered image (Fig. 3). Next step is binarization.

In this step we separate waterbodies from non-water using threshold process. For this, we will analyze the histogram of the filtered backscatter coefficient. A new band with water trace will be added to the product as shown in Fig 4).

4.2 Post Processing

The obtained image is in the geometry of the sensor. We need to reproject it to the geographic projection. To do this we apply Range-Doppler Terrain Correction to the product. In the Processing we select water as a source band and 3 sec SRTM Digital Elevation Model (DEM), The DEM over the region that SAR image covers will be automatically downloaded and DEM Resampling Method is Bilinear Interpolation with applying Nearest Neighbor Image Resampling Method. The Pixel Spacing is fixed with 10m and Map projection is WGS84(DD). The resultant water body is as shown in Fig 5. A terrain corrected product will be created. This product will be in the DIM format. The geometry of the image changed to the geographic projection. This file can now be opened in a GIS software to visualize and create a map.

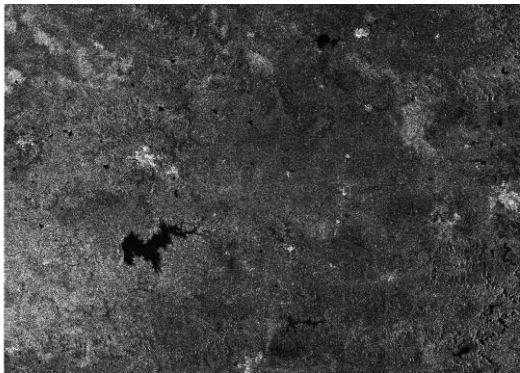


Fig.2 Radiometrically Corrected σ^0 VV

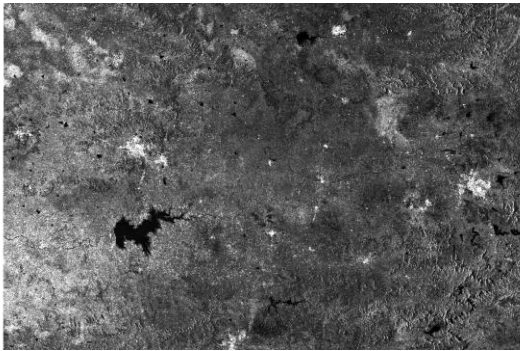


Fig. 3. Lee filter with filter size 7 by 7 σ^0 VV



Fig. 4. Binarization of water trace extraction

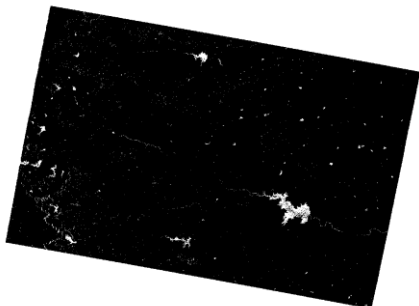


Fig. 5. Terrain Corrected Binarization Image of water trace extraction



Fig. 6. Image of water body extracted.

5. CONCLUSION

Fig 6 shows water body extracted. This study is finding water bodies from satellite image by applying Binarization of water extraction. It is Bilinear Interpolation with applying Nearest Neighbor Image Resampling Method. This study demonstrates an application of GIS hydrogeomorphic characterization for understanding and managing the structure and function of river and water bodies. As further progress is made in determining the critical watershed. It will effectively support river management applications in this study. The proposed method has been tested on SAR amplitude data, panchromatic images. Figure 6 shows the water are as extraction in Godavari watershed area. We propose in this paper an original entropy-based method for water body extraction from satellite images. Further work can be done to improve the accuracy of water border location by combining with edge detection .

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