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Research paper

Automated Surface Water Mapping from Resourceat-2 Awifs Image Using Automated algorithm, Krishna District, Andhra Pradesh, India

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Abstract

In India surface water features are chief source of Irrigation. Irrigation is the application of controlled amounts of water to plants at needed intervals. In the recent past significant investigation has been taken place on surface water features. The surface water includes lakes, ponds, rivers, streams and other exposed inland water bodies. The function of rainfall amounts, intensity of rainfall etc. over season / year are the variation in spatial extent of these features. Remote sensing providing lot of data and extracting lot of information over the changes from time to time. Nowadays the role of satellite image process is widely used in extraction of water bodies. Different researchers are using various methods to delineate water bodies from different satellite imagery varying in characteristics like spatial, spectral, and temporal. Our present study includes an automatic approach to capture the water body from a Resourcesat-2 AWiFS (Advanced Wide-Field Sensor) imagery using a Automated Algorithm for extraction of surface water bodies model. The dynamics of surface water bodies in Study on geospatial analysis of the extraction of water feature sheets for the month of April, 2018 of the study area. The water features information was generated on geospatial database from the Resourcesat-2 AWiFS image By using bands of 1.55- 1.70 µm (SWIR), 0.77-0.86 µm (NIR), 0.62-0.68 µm (Red) and 0.52-0.59 µm (Green) for the estimation of the water spread area. The Water spread area (WSA) calculated for each is 227428 ha.

Keywords: *Surface Water Bodies, Water Spread Area, Remote Sensing and G.I.S.*

1. Introduction

India has large quantities of water resources, but they are very variable in their source distribution and use. India gets 4000 km3 of aggregate precipitation annually. Only 1122 km3 of it is utilizable. Out of this utilizable water surface, water resources are 690 km3 and the ground water is 432 km3 basin wise annual river wa ter flow into the sea is 1953 km^3. India has a large net work of basins of 256 M ha, 25 M ha of 46 medium river basins and 7 M ha of water bodies like tanks and ponds. Finally irrigation potential is only 140 M ha. Since our independence Indian Government spent a lot (approximate Rs. 2400 billion) to exploit water resources for irrigation, domestic industrial and other purposes. This expenditure comes to about 15% of the total excheques expended till 2001[1].

Water resources, in different seasons have temporary variations. This results in changes in the quantity of water in the water sources from monsoon season to summer. It is practically a very difficult work, through traditional methods to interpret these changes and organised stock taking regularly. Presently, satellite data about multi spacial resolutions at regular intervals is available. With the help of that data, mapping and monitoring of the surface water bodies, with reference to their presence and spacial area of extent is possible. This kind of information can be applied at field level, and furnishes continuous study of surface water resources over space and time.

This studies gives an approach to evaluate the water feature from Resourcesat-2 AWiFS resemblances using a Automated Algorithm for extraction of surface water bodies model. In view of this, we started a major task of mapping surface water bodies at national level through development of automatic feature extraction techniques using data sets. It provides integrated view of water-spread dynamics for more than 12,500 water bodies in the country. The mapping, monitoring of dynamics of surface water bodies were acquire by satellite sensors through synoptic and dynamic coverage of earth surface at frequent intervals. The aim of present study is automatic delineation of water bodies.

2. Materials and Methods

The Krishna district is divided into four revenue divisions namely Bandar division, Gudivada division, Nuzvid division and Vijayawada division. Machilipatnam town is the district headquarters. The district has a coastline of 88 km. The area geographically surround between North latitude of 15° 43’ and 17° 10’ and East longitudes of 80° 00’ and 81° 33’ with an aerial extent of 8797 km^2. It was surrounded on the east by Bay of Bengal and west Godavari district, on south by Bay of Bengal, on west by Guntur and Nalgonda districts and on north by Khammam district, Telangana state. The study area, vary with extreme hot summer and cold winter[2]. Machilipatnam city in the study area is frequently hit by cyclones originate in the Bay of Bengal, Fig.1.

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Fig. 1: Location map of the study area

2.1. Drainage

Surface water availability mainly depends on the site of the location, economical condition, river flow, canal, channel water supply system. In the study area the prime source is Krishna River and its corresponding canals, channels, sub channels. The Krishna River and its canals, channels other distributaries branch from the Canals. Budameru River, Kolleru Lake and tanks etc are also other sources in study area.

2.2. Hydro-Geomorphology

The study of landforms related to water is the Hydro-geomorphology. The fact that images provide the much needed information on morphological and structural features that influence groundwater flow, which play an vital role of the remote sensing in hydro-geomorphological application. Also, satellite data portrays an unbiased picture of the area providing integrated information on different factors controlling the ground water regime. The Geomorphological units of the study area consists of Coastal and deltain plains, Pediplain and Alluvial plains [2].

The oldest Archaens to fresh alluvium encompasses the underlying geological formations of the study area. Unconsolidated, consolidated and semi-consolidated formations are the classification of these formations. The directions of the lineaments are in NE-SW, NW-SE and NNE-SSW direction.. The overall methodology for the extraction of the water features were illustrated in Fig. 2

2.3. Data Used For Study

The main source of satellite data for monitoring variations in water spread are through the missions of Resourcesat-2, RISAT – 1 of Indian Remote Sensing (IRS). Tables 1 & 2 showing the evaluating the satellite data used from various sensors.

Table: 1

Satellite-Sensor	Spatial Resolution	Repetivity
Resourcesat-2 AWiFS	56 M	5 Days
Resourcesat-2LiSS III	23 m	24 Days

Table: 2

Year	Month	Source of Satellite Data
2016	Dec, 2016	Resourcesat -2 AWiFS

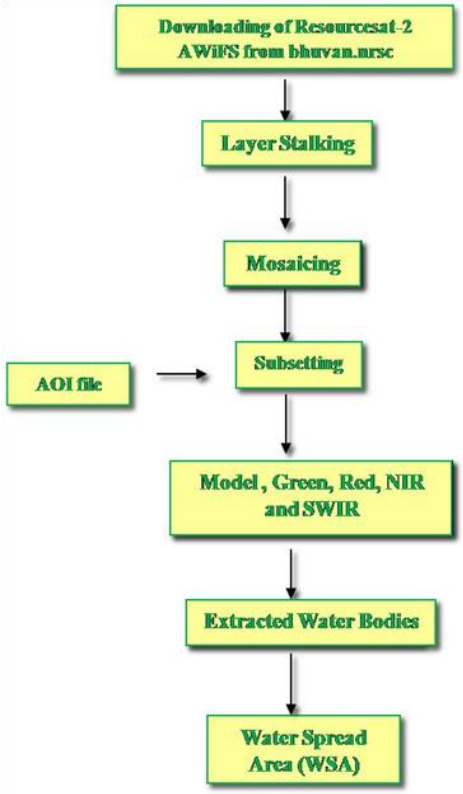

Fig. 2: Overview of methodology

2.4. Water Bodies Information System (Wbis)

Water Bodies Information System (WBIS) is developed using web technologies like Vue JS, Leaflet and eCharts for data visualization and map elements. Raster data is mechanically pooled from time-series water layers into a PostGIS enabled Postgres database. Java script and REST APIs are provided using node.js. and Cassandra for generating the statistics of an individual water features, topographical (River Basin, River Sub-basin, State, District) Mapnik was used as rendering Engine [3]. Process flowchart of WBIS is illustrated in Figure 3.

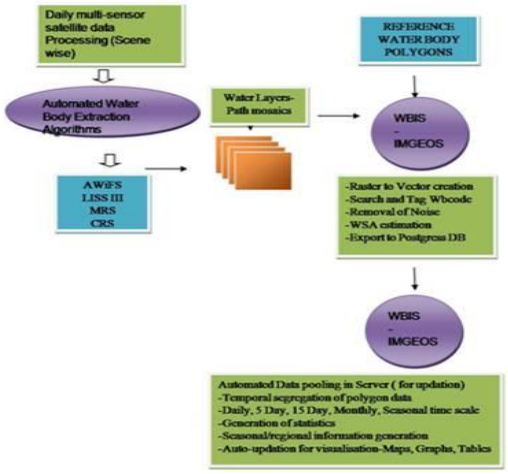

Fig. 3: Process flow chart of water bodies information system

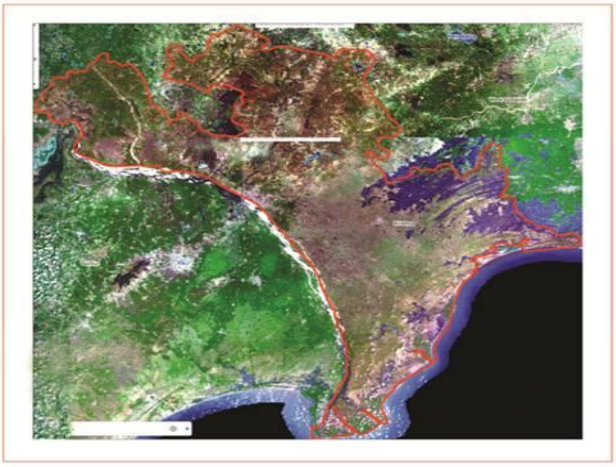

Fig. 4 District boundary layer of area of interest

3. Results and Discussions

By the Analysis of spatial temporal satellite derived water bodies information of Krishna district, results acquired from the Model framework for the evaluation of surface water features with the resourcesat-2 image of Krishna district of Andhra Pradesh by the observation of the study. By the images water feature area acquired which is made from the satellite deliberation. Using Resourcesat-2-AWiFS, water feature sheets was determined by the model for evaluation of water feature information of the study area. Surface water features has been analysed by its focal point [4].

3.1. Sub Setting of Study Area for Water Extraction

The area of interest was subset by using a study area shape file to clip the demand area by discussing in the methodology section. The Figure 4 illustrate the district boundary layer of area of interest.

3.2 Extraction of Water Bodies from Satellite Image

Extraction of water features from the Resourcesat-2 image for using the model represents in methodology. The Figure 5 shows that the extracted surface water feature layer for the Krishna district of Andhra Pradesh. The water spread is the single water features as illustrated in Figures 5 and 6. Application of the new model, the total water spread area of the Krishna district is 227428 ha. Pixel wise analysis has made for the identification of water and non water features with the analysis of model [5] and [6].

Fig. 5: Subsetting of area of interest

Fig. 6: Extraction of water layer from satellite image

Conclusions

In the evaluation of surface water features, analysis and information with the G.I.S. application and the remote sensing mechanism are very serviceable. In April month 2018 the water spread area was analyzed. During this by size as observed from satellite data and aggregated WBA in single class was derived by satellite derived total WBA etc. The total water spread area of Krishna district is 227428 ha. Total number of water bodies in Krishna district is 25419.

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