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Automated drainage extraction using spatial technologies, Kodavanar river basin, South India

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Extraction of Drainage through the SRTM data using ArcGIS technique to delineate was attempted in this paper. This automated extraction tool will create the possible drainage pattern in the study area. The objective the model to obtain drainage network. Objective of this investigation is to compare the drainage extracted from Shuttle Radar Topography Mission (SRTM) data with matching from Google Earth image of Kodavanar River basin. The analysis reveals that the drainage extracted from the SRTM digital elevation model (DEM) is having an area of 2254.65 km^2. This study reveals the importance peculiarity of drainage network derived from the SRTM using the Arc Hydro Tool.

[Keywords: Kodavanar River, Arc Hydro Tool, Drainage Extraction, SRTM]

Introduction

Information about topography reflects terrain composition and has an important role in many research fields of GIS (such as hydrologic analysis, environmental analysis and mineral mapping [1, 2]. Grid DEMs [3] consist of digital les storing terrain elevation values at the nodes of a regular square grid. The use of DEMs for the purposes of automated drainage network delineation has increased dramatically in recent years.

Generating flow direction is the most important procedure for automated drainage network extraction [4]. Almost all the computation of flow direction is based on the flow transmitting model. In such a model, the main task is to derive three matrices from the raw DEM, the depression less elevation matrix, the flow direction matrix and the flow accumulation matrix [5, 6, 7]. Important parameters can be derived easily and unambiguously when unique flow direction delineated, including flow accumulation, distance along the network, drainage network analysis, and drainage basins. Values to calculate these parameters from flow direction have been incorporated in most GIS software, such as [8, 9, 10].

Materials and Methods

Kodavanar sub-basin, Cauvery River, a major part of the study area falls in Dindigul District and a small portion of the Karur District is an interior part of Tamil Nadu with a total area of 2254.65 km^2. The plain area 1857.58 km^2 and Hill and forest area is an area about 397.07 km^2 (Fig.1). The Kodavanar sub-basin lies between north latitudes 10°09’56.70” and10°52’31.5”, east longitudes 77°37’29.29” and 78°13’14.21”.

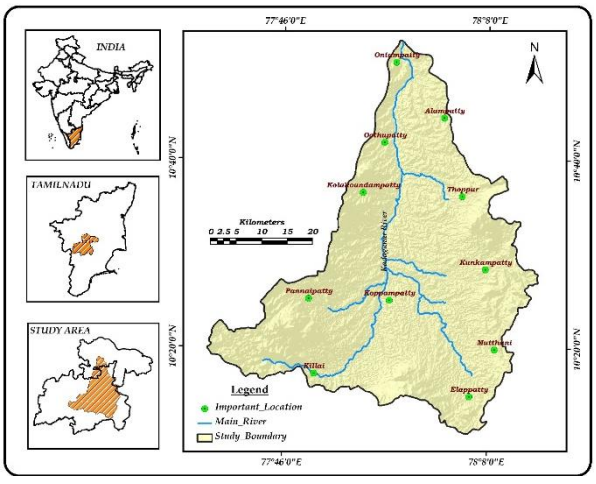

Fig.1. Location map of the study area.

Result and Discussion

The drainage network delineated by the above methodology as illustrated in the flowchart (Fig.2).

To examine the suitability and performance of ArcGIS hydrology tool, make Fill, Flow Direction, and Flow Accumulation Raster experiments in the study area (Fig.3). For presentation purpose, all raster maps are converted into a vector format. There is no standard method to assess the quality of the delineated network. Networks are difficult objects to compare quantitatively [11].

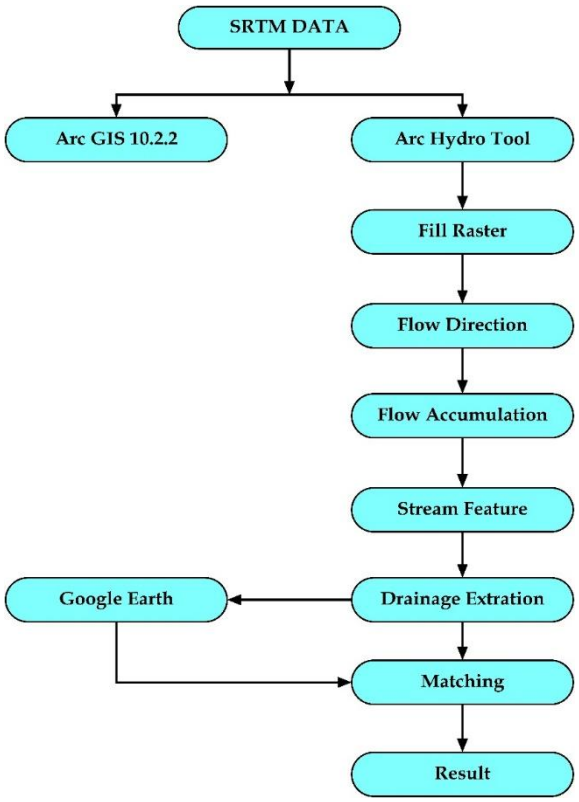

Fig.2. Flowchart showing Methodology.

Although, we compare SRTM to one of the existing methods, is implemented with the Arc Hydro tools. Arc Hydro tools are a set of public domain utilities developed jointly by the Center for Research in Water Resources (http://www.crwr.utexas.edu) of the University of Texas at Austin, and the Environmental Systems Research Institute, Inc. These tools provide functionalities for terrain processing, watershed delineation and attribute development. They work on a maximum of the Arc Hydro data model in the ArcGIS 10.2.2 platform.

Conclusion

The present study reveals that the application of automated drainage extraction rightly matched with the real earth scenario. It mainly consumes the economy and the valuable time. By utilizing the remote sensing technologies, people can identify the appropriate requirements of resources like water. Here, a tool that Arc Hydro, can extract drainage automatically from the raster data by using satellite data and it matches on original coordinates on the topographic map. Drainages extracted from SRTM data, and it is compared with Landsat data. Basin boundary and its major stream were cross-checked very closely. Maps are matching exactly. The other attribute information taken from Google Earth image (Fig. 4) like the name of basin, catchment, and sub-basin are exactly matching in this execution. Hence, it is concluded that the quality of output of SRTM data matches with the real drainage, and also concluded that extracting this information it is consuming the time of digitations of drainages and its processes.

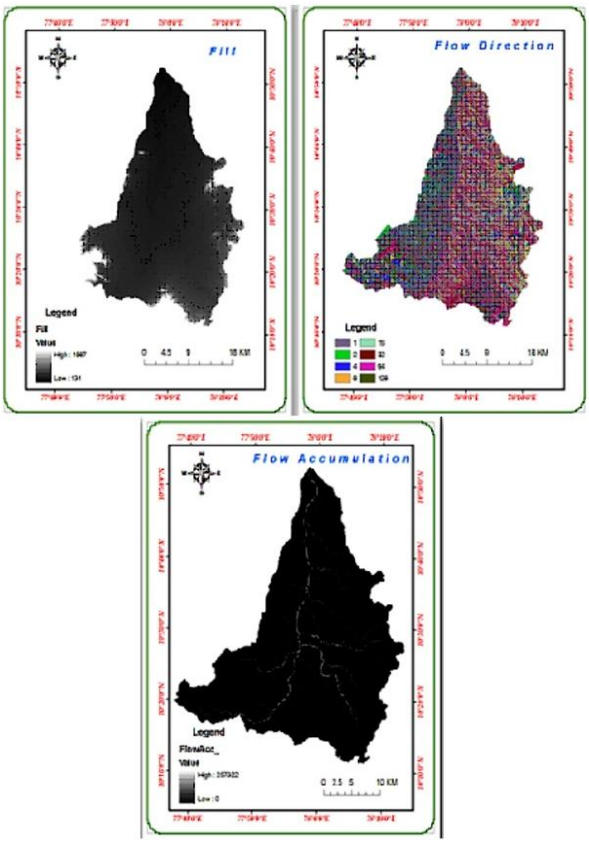

Fig.3. Maps of Fill, Flow Direction, and Flow Accumulation Raster.

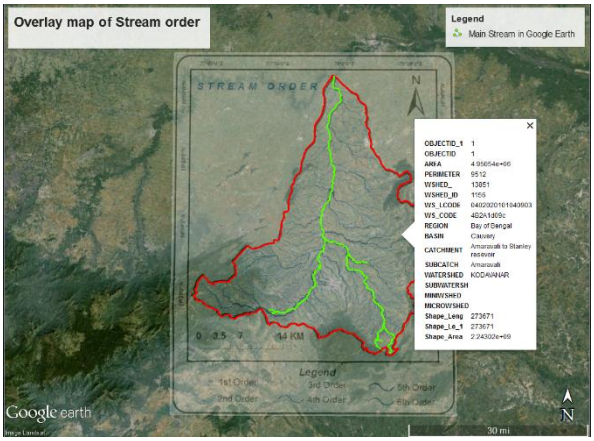

Fig.4. Overlay Result of Stream Order on Google Earth.

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