



## A GIS Based Automated Extraction Tool for the Analysis of basin Morphometry in Kolli Hill, Tamil Nadu, India

### KEYWORDS

ArcGIS, Morphometric Analysis, SRTM

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**ABSTRACT** Extraction of Drainage through the SRTM data using ArcGIS technique to delineate the basin morphometry was attempted in this paper. This automated extraction tool will create the possible drainage pattern in the study area. After extracting the drainage, this was used to analyse the morphometric parameters such as, stream network (Strahler's), aspect, slope, DEM, drainage density, hill shade, and basin boundary. The slope generated is in degrees and the drainage density in square kilometer. The DEM gives an exact height variation over the terrain. This technique is very useful for those who work in the field of terrain analysis, hydrology, and watershed analysis as it is easy to use with a single click for the generation of a reliable database for morphometric analysis.

### Introduction

Drainage basin analysis is the most important parameter for the water resource studies. It provides valuable information concerning the quantitative explanation of the drainage system, which is an important aspect of the characterization of a basin (Strahler, 1964). Morphometric analysis requires measurements of linear features, areal aspects, gradient of channel network and contributing ground slopes of the drainage basin (Nautiyal, 1994). Drainage characteristics of Many River basins and sub-basins around the globe have been studied using conventional methods Horton, 1945, Strahler, 1952, Strahler, 1957, Leopold et.al.1956 and Krishnamurthy et.al. 1996. Identification of drainage networks in a basin can be achieved using traditional methods such as field observation and topographic maps alternatively by advanced methods like remote sensing and extracting features from digital elevation models Verstappen, 1983, Maidment, 2002, Magesh et.al., 2011 and Kalaivanan et.al. 2014. Analysis of all drainage networks from field observation is a tedious task because of the extent of vast areas and rough terrain. In this respect, DEMs can be used to extract the drainage networks with the help of GIS techniques.

Extracting the drainage networks from DEMs is based upon the slope characteristics, which means the water will flow from higher to lower elevation using the steepest percentage expected that there is no interception. However, to implement the analysis it involves step by step process without any imperfection. An automated extraction model is developed in this study that can be used to extract the drainage networks with the help of SRTM data through ArcGIS software. The developed tool SRTM data as input parameters for basin delineation and other supporting data for morphometric analysis. The developed tool was applied to Kolli Hill for data validation, and it was found that the generated data are reliable for further morphometric analysis.

### Study area

The proposed study is taken up in Kolli hill, the area chosen for the present lies almost wholly in the Namakkal District of Tamil Nadu State (Fig.1), except a small pocket on the eastern part of the hills, which lies in Tiruchirappalli District. The study area is geographically situated between

the north latitudes 11°11' N to 11°30'N and east longitudes 78°16'E to 78°29'E covering an area of 485 km<sup>2</sup>. On the northern side, it is bounded by Salem District and in the eastern and the south eastern sides it is bounded by Tiruchirappalli District.

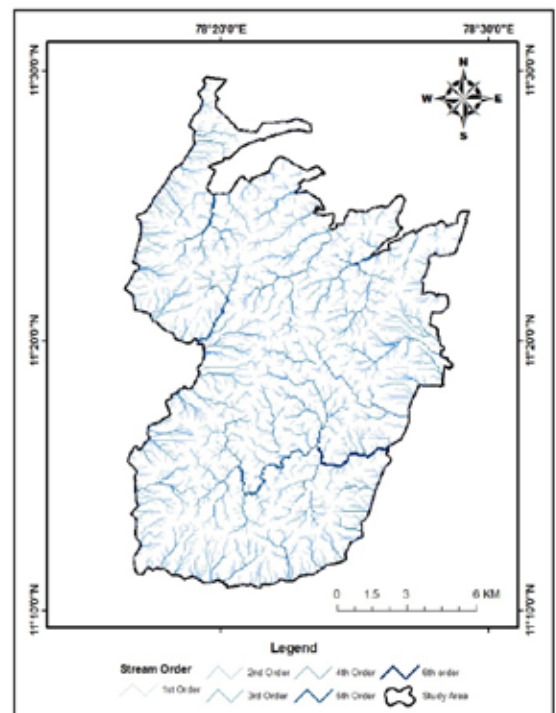
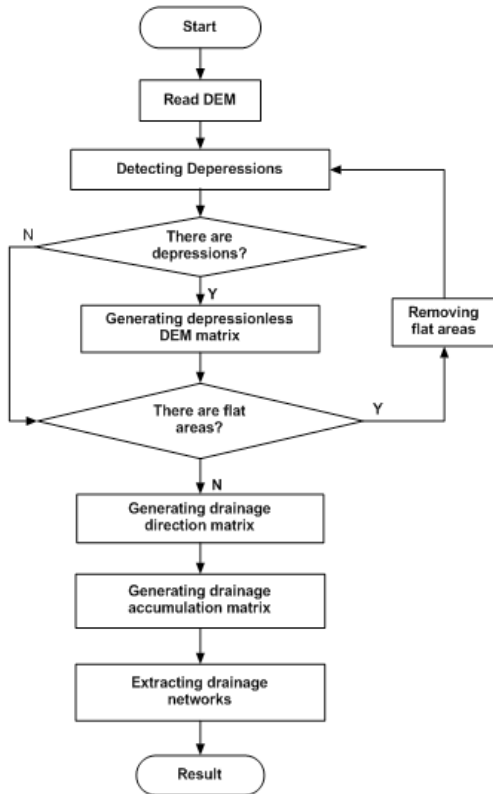


Fig.1. Location map of the study area

The study area forms parts of two taluks viz. Rasipuram Taluk and Namakkal Taluk. While the northern portion of the hills forms part of the Rasipuram Taluk, the southern portion forms part of the Namakkal Taluk. The part of the Kolli hills, which falls in Namakkal Taluk has seven revenue villages viz. Selur Nadu, Devanur Nadu, Thinnanur Nadu, Valappur Nadu, Vazhavandhi Nadu, Ariyur Nadu and Gundur Nadu. The northern part of the hills, which comes under the Rasipuram Taluk also, has seven revenue villages

viz. Perakarai Nadu, Bail Nadu, Sittur Nadu, Edapuli Nadu, Thirupuli Nadu, Alathur Nadu and Kunduni Nadu. All these villages are confined to the upper plateau portion of the hills, which are surrounded by reserved forests.

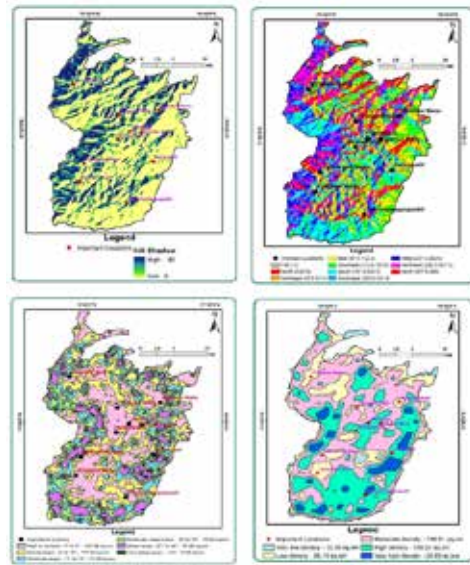
## Methodology



**Fig.2. Schematic diagram showing the basic methodology**

## Result and Discussion

This method effectively explores various spatial analysis tool describes the process of geospatial model structure for the extraction of basin morphometry.



**Fig.3. Raster Created by the Extraction Model (DEM, Aspect, Slope, Drainage Density)**

The raster created by this model are shown in fig. 3. The results reveal that the Kolli Hill is a six order basin with a dendritic drainage pattern. The slope varies from  $0^\circ$  to  $>45^\circ$ , and most of the slope area is seen in the western part of the study area.

The aspect reveals that there is a dominance of north-facing slope of the study area. High drainage high density seen in the southern part of the study area the amount of density is  $156.37\text{km}^2$ . Data validation, the basin polygon is overlaid with Survey of India toposheet of the respective area and found that the boundary line of the polygon is almost matching with the toposheet basin boundary. Hence, it proves that the data generated by this model is reliable for morphometric analysis.

## Conclusion

Extraction of an automated stream network and its analysis through SRTM data is attempted in this paper. The detailed drainage information is extracted through Arc GIS tool. Analyzing the drainage parameters reveals that, slope varies from  $0^\circ$  to  $>45^\circ$ . The aspect reveals that there is a dominance of north-facing slope of the study area. High drainage high density seen in the southern part of the study area the amount of density is  $156.37\text{ km}^2$ .

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