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Application of Remote Sensing and Geographical Information System

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Due to advances in remote sensing, most of the features collected in digital format which has reduced the time to manually delineation/digitization of the features from topographic maps. On the other hand, GIS software tools have been used varying from data management to extensive analysis and output generation. In the field of water resource management GIS functions/tools ranging from runoff estimation for flood management, sedimentation movement to groundwater recharge. GIS Tools are very crucial for gaining new knowledge and for decision support in site specific approaches from spatial simulation. These tools are available in two main categories proprietary/commercial and open source software tools. While the commercial software comes with expensive licenses and restricted to their own domain, their own file specification and features which pose difficulty to work in collaborative distributed environment with stockholders .While lower/cheaper commercial version confined to basic GIS functionalities. For complex analysis a separate license required, and to distribute and disseminate the developed module again licenses needed. Thus commercial products restricted the scope for further enhancement of methods and tools for better approximation and implementation for new assumptions.

Predicting surface water movement over variable terrain is one of the principal goals of hydrologic modelling. The most commonly applied method to route overland flow uses the 'deterministic eight' algorithm (D8), whereby flow direction for a central cell is determined by examining elevation in the eight neighbouring grid cells of a digital elevation model (DEM). Flow direction is assigned to the steepest down-slope neighbour. Though several algorithms for extracting drainage networks from DEMs exist, most methods use neighbourhood information like the D8 algorithm. A typical problem encountered with these methods is that predicted flow can get trapped in depressions. Indeed depressions have been described as the 'nemesis' of neighbourhood methods. Spurious pits without an outlet or real lakes must be 'filled' before flow can continue, and several techniques to perform this task

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have been developed. In addition, areas with little topographic relief are problematic for neighbourhood methods because flow direction cannot be determined for central cells within a flat area by examining surrounding cells alone. Flat areas, lakes, wetlands, and depressions are common in many regions of the world, and there is a real need to automate drainage network detection for these features.

Geographical information systems (GIS) with its ability to gather spatial data from different sources into an integrated environment emerged as a significant tool for delineation of watersheds. Particularly, GIS provided a consistent method for watershed delineation using digital elevation models (DEM's) and based on the contour information depicted on topo-sheets. The underlying functionality of the tools for watershed delineation is built on the reach catchments created.

Remote sensing has become an important tool in analyzing the Earth's surface characteristics, and hence in supplying valuable information necessary for hydrologic analysis. Due to their capability to capture the spatial variations in hydro-meteorological variables and frequent temporal resolution sufficient to represent the dynamics of the hydrologic processes, remote sensing techniques have significantly changed the water resources assessment and management methodologies. Remote sensing techniques have been widely used to delineate the surface water bodies, estimate meteorological variables like temperature and precipitation, estimate hydrological state variables like soil moisture and land surface characteristics.