**Hydrologic Flow Accumulation Modeling Using Surface Area**

**Mehran Ghandehari and Barbara P. Buttenfield**

**University of Colorado – Boulder**

**[mehran.gandehari@colorado.edu](mailto:mehran.gandehari@colorado.edu)**

The terrain surface plays a critical role in modeling geomorphic, hydrologic, atmospheric, and ecological processes. Understanding the terrain surface can guide realistic characterization of these processes. Projection of terrain features into a planar surface leads to some distortion in the geometry of terrain elements. Generally, for a Digital Elevation Model (DEM), distance, perimeter and area are underestimated in comparison to actual measurements, due to within pixel variations in slope and curvature. This matter is ignored in most terrain-based GIS analysis. This research employs realistic surface geometries of terrain for a more accurate and precise mapping of streams from DEMs. The flow accumulation model, which employs planar area to delineate the upstream drainage area of each pixel, is the predominant approach for extracting streams from DEM. One key weakness of this approach is that the two-dimensional method used for calculating area does not account for the slope and curvature of the terrain and precious information is lost. This paper presents one possible strategy for the incorporation of surface area into a flow accumulation matrix. This approach substitutes calculation of upstream surface area instead of planar area.