Hochschule Karlsruhe (HSKA) – University of Applied Sciences
Master Geomatics (MSc) **Faculty IMM**

Candidate
B.Sc. Dietmar Sauer

Bachelor/Master/Diploma Thesis (Year: 2015)
Automatic Delineation of Primary Path Through Stream Networks

Referee
Prof. Dr.-Ing. Heinz Saler, Prof. Dr. Barbara Buttenfield (U Colorado)

Key Words
Generalization, Hydrography, Multi-processing

Summary
This thesis developed a method to automatically select an Upstream Drainage Area (UDA) threshold that delineates a primary path through stream networks of the U.S. National Hydrography Dataset (NHD) for different scales, and used multi-processing to render a more efficient search procedure. Thereby it contributes to the topic of hydrographic generalization.

The UDA threshold influences the length and shape of the primary path and thereby a mapping scale for which it is appropriate (Figure 1). To find a UDA threshold for different subbasins in different landscape types at different scales, this work first compared the results of primary paths delineated using essentially all possible UDA thresholds. This brute-force analysis was applied to a test area of 42 subbasin. This approach established an association between UDA threshold values and primary path lengths. The next step, the formalization of the relationship between primary path lengths and mapping scale was complicated by the lack of a large scale, independently compiled set of stream flowlines. But a small scale, independently compiled version of the NHD was found in the National Atlas database. Using the National Atlas flowlines as a benchmark, an inverted form of the Radical Law computed expected primary path lengths that would be appropriate for mapping at larger scales. Derived primary path lengths were compared to the inverted Radical Law computations to establish an association between primary path length and mapping scale. Therefore the relationship between mapping scale and UDA threshold was found indirectly. But the analysis showed that only ranges of UDA tresholds can be associated empirically to a certain scale, since the differences between the individual subbasins in the NHD are too diverse, even in the same landscape category. But these ranges could be used as starting point for a multi-processed search algorithm, which is able to automatically find the appropriate UDA threshold for each scale between 1:24,000 and 1:1,000,000 and delineate the associated primary path.

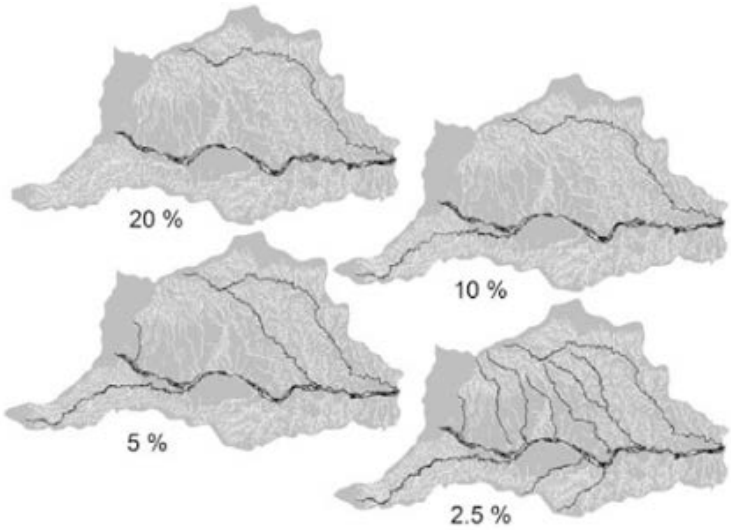

Figure 1: Comparison of 4 different primary paths delineated from different UDA thresholds for the Lower Prairie Dog Town Red subbasin