# Consistency Matching in the Integration of Contour and River Data by Spatial Knowledge

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## Extended Abstract

In GIS applications the requirement of more and more spatial data to be integrated leads to the data matching increasingly becoming an interesting question. The data matching usually happens in the integration of (1) different scale data in same region, (2) different semantic data in same context environment, (3) different source data at different domains, (4) associated data of different features, and others. The logical inconsistency of data representations and spatial relationships need to be detected and corrected by some methods in the process of spatial data matching. In the field of spatial data handling, the matching of different scale spatial data attracts more interests and results in some approaches aiming at data overlap analysis, map generalization, data updating and other applications. The other situation, namely the matching of different semantic features with some associations to each other, such as contour and river data matching, road and bridge matching, vegetation class and terrain level data match, is also an important matching issue. There exists some spatial distribution knowledge between two associated features and the matching should meet some principles. We can use this kind of spatial knowledge to detect the inconsistency between the integrated data and further by some methods corrects them to be consistent. The spatial knowledge could be topological consistency, semantic consistence and spatial association relationship, which are supported by geography research, for example the first law of geography.

This study attempts to investigate the matching question by spatial knowledge taking the example of contour and river data matching. We use the spatial knowledge in contour and river distribution that the river segment should go cross the valley bottom of contour. Generally to combine the source contour and hydrographic data has the question that the river deviates far away from the valley position. So a method is required to detect the wrong distribution and correct the consistency between contour and river data.

We apply the computational geometric model, that is Delaunay triangulation and skeletonlization, to detect the inconsistency. We first detect the bottom points of the valley fragments and then connecting them to a path which stands for the lineal

distribution of one valley, just like the network result of valley extraction by DEM based method. After constructing the Delaunay triangulation, consider the local triangle cluster within one bend and construct the skeleton of triangulation. From the open mouth of the bend to the different terminals of skeleton branches, there exists one path respectively. Select the terminal point farthest away from the mouth as the valley bottom point. An experiment of valley bottom point extraction is shown as the shaded dot in Fig. 1. After the extraction of valley segment hidden in the contour data, we can compare the extracted valley and the river segment to be matched. According to the deviation size between them discovers whether there is inconsistency or not.

As for the correction method, we present two ways. One is to move wrong river segment to a new position consistently with the extracted valley. Another is to adjust the contour bend groups making them consistent with the river. The operation of two methods is also based on Delaunay triangulation.