
Cloud Model-Based Spatial Data Mining

Shuliang Wang^{1,2}, Deren Li¹, Wenzhong Shi², Deyi Li³, and Xinzhou Wang¹

¹National Laboratory for Information Engineering in Surveying Mapping and Remote Sensing
Wuhan University, Wuhan, Hubei, China, 430079

²Department of Land Surveying & Geo-Informatics, The Hong Kong Polytechnic University, Kowloon, Hong Kong, China

³Chinese Institute of Electronic System Engineering, No.20, Fuxing Road, Beijing, China, 100840

Abstract

In spatial data mining, we have to deal with uncertainties in data and mining process. The nature of the uncertainties can be, for example, fuzziness and randomness. This paper proposed a cloud model-based data mining method that may simultaneously deal with randomness and fuzziness. First, cloud model is presented, which is described by using three numerical characteristics, Ex, En and He. Furthermore, three visualization methods on cloud model are further proposed, which can be produced by the cloud generators. Second, cloud model-based knowledge discovery is further developed. In cloud model context, spatial data preprocessing pays more attention to data cleaning, transform between qualitative concepts and quantitative data, data reduction, and data discretization. Spatial uncertain reasoning is in the form of linguistic antecedents and linguistic consequences, both of which are implemented by X-conditional and Y-conditional cloud generators. Spatial knowledge is represented with qualitative concepts from large amounts of data, and also the cloud model. Finally, as an example, these methods are applied to mine Baota landslide monitoring database. The experimental results show that the cloud model can not only reduce the task complexity, and improve the operational efficiency, but also enhance the comprehension of the discovered knowledge.
