Data Mining Tools for Decision Support Purposes in the Early Stages of a Tunnel Project

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SUMMARY

The construction of tunnels and underground structures is an increasingly prevalent infrastructural development practice worldwide. Whilst tunnels are costly, their necessity remains high because of the advantages they offer in transportation and other construction needs. An issue of key importance in the design and development of underground projects is the optimization of the tunnel's path and the selection of the alignment as it both affects and gets affected by constructional, operational and environmental factors and criteria.

Alignment optimization in tunnels needs to consider many different types of data from multiple sources, often with varied formats and precision. A database that supports all the information for easy access is an important aspect of the alignment process. The database techniques that use very simple representations of geographic objects and relationships cannot handle dynamic geographic objects and relationships that evolve with time. For this, geospatial data mining techniques have been used which can handle extended objects, spatial predicates and cope with the continuity and high auto-correlation amongst the data features.

In this paper, a brief overview of the various data sources, data formats and data mining techniques applied in underground/tunnel project databases and information systems is provided. Specifically, the development of a dedicated geospatial database is described. The paper will also provide a brief overview of spatial data mining tasks which are generally an extension of data mining in which spatial data and criteria are combined to form various tasks such as to find class identification, association and co-location of spatial and non-spatial data, make the clustering rules to detect the outliers and to detect the deviations of trends. Two different types of spatial data mining approaches will be tested based on clustering and classification techniques using information from the geospatial database. The issues and challenges in the implementation of the mining techniques

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along with results will be discussed.