Settlement Information Management System of Beijing-Shanghai High-speed Railway Based on Google Map Service

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Beijing-Shanghai High-speed Railway lies on eastern coastal areas of China. The length of it is up to 1318 kilometers. Compared to other traditional projects, it has some characters as following:

a) The operating speed is as fast as 350km/h, which indicates that the railway track must be very smooth.

b) Beijing-Shanghai High-speed Railway passes through the North China Plain and the Yangtze River Delta Plain, where the geological structure is loess and sediment. The subgrade of project is unstable.

c) The project uses bridge instead of subgrade, and the whole railway is built of a fully enclosed overpass [1]. If people cannot detect and find settlement information between adjacent bridge piers during construction process, there will be hidden danger in operating process.

d) The project is ballastless track, which means the regulation range is limited than the traditional railway.

In order to provide scientific data and ensure safe operation, it is necessary to design and realize the Settlement Information Management System of Beijing-Shanghai High-speed Railway, in which user can edit, update, query, count and warn settlement information of every monitor points quickly and efficiently.

The function of releasing settlement information via Internet is key representation of system’s social values [2], so this management system adopts Browser/Server structure, using Google Map Service and Ajax (Asynchronous JavaScript And XML) technology. The system is mainly used for managing settlement information of datum points and monitoring points, and also offers profile’s statistic function for small section of whole railway to detect settlement information.

In subsystem for datum point management, user can view three kinds of information of selected point conveniently: the attribute information, the image information and the elevation change trend of datum point. All the points can be chosen individually or in mass form. What should be concerned is

weather report service displayed on the upper left corner of the whole page, which is provided according to the user’s location when he/she registers. The key issue is how to separate and use the data delivered from server asynchronously, the approach to this issue is Ajax technology. First, This system presents data through XML and XSL, generates some XML and JSON files at server simultaneously, And then it informs client to load these files and calls Google Map Service, transforms datum point into instantiation.

In subsystem for monitoring point management, when user chooses a point, the following information will be obtained dynamically under asynchronous mode: the information of all observed data and forecasted data with curve number method, the information of attribute and statistic data related with measurement, the information of “this time settlement” distribution shown by pie chart. Except data transmission, alert to settlement is primary. Through interaction with user, this subsystem could count and display the abnormal data with salient color and size in order to play a real role in monitoring settlement information. The whole process is performed under Ajax technology.

In subsystem for profile management of small section, some statistic results will be shown dynamically after choosing a section: every profile’s cumulative settlement information, every profile’s surveying information and the distribution of cumulative settlement. What can be used to monitor surveying task is the second information for the reason that every profile is determined during design phase. In this subsystem, how to count surveying information of every profile correctly is crucial. This system utilizes interpolation method, compares the spacing between adjacent profiles with theoretical spacing. If the former is longer than latter, it means that there should be other profiles in adjacent profiles and it should be interpolated with theoretical spacing.

Some system interfaces are shown from fig.1 to fig.4:

Fig.1 Elevation change trend of datum point

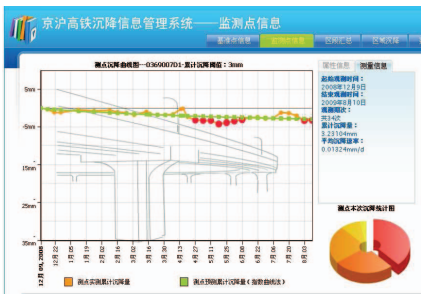

Fig.2 Search, warning and statistics of monitor point’s settlement information

Fig.3 Search and statistics of railway profile's cumulative settlement information

Fig.4 Management of all kinds of data

This system has shown some significant advantages in management of monitoring points and small sections when using. It's realization indicates that Computer Science, Spatial Information Science and traditional surveying task in surveying and mapping can be integrated tightly to expand the scope of information surveying. As the development of information technology and construction of other major projects, it can be predicted that there will be more and more requirements for spatial information technology, that is to say more opportunities will emerge in some professional field.

REFERENCE

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[2] H. Weisheng, W. Xincai, L. Xiuguo, "Study of urban land subsidence information management and prediction system based on GIS", Rock and Soil Mechanics, NO.6, pp.1689, 2008.