VISUALIZATION OF 3D CITY MODEL THROUGH INTERNET USING X3DOM

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3D city model is playing an increasingly important role in in our society and people's daily life, such as navigation, urban planning, disaster management etc. Therefore, many cities and companies start to generate their own 3D city models both manually and automatically. Along with the enrichment of 3D city data, it is essential to be able to integrate data from different sources and deliver the 3D city scenes to users quickly and easily.

The objective of this research is to develop a framework to support online visualization of 3D city models. In the proposed framework 3D city data is stored in CityGML format on server side, then the models is converted into 3D scenes in X3D and transmit to the user side using AJAX. Finally, the 3D scenes are visualized in the user browser using X3DOM method.

CityGML is a common information model for the representation of 3D urban objects and was issued in 2008 by OGC as an international standard. However, CityGML is not designed for visualization, so X3D is selected to present 3D scenes of city models. To visualize the X3D file in the browser, X3DOM is employed to integrate X3D with HTML5 and create interactive 3D scenes for the Web. Since X3DOM makes use of certain native features of the Web-browsers, no plugin is required to visualize the 3D scenes. Therefore, it is selected to visualize 3D city models through Internet. AJAX technique, on the other hand, can update the HTML contact asynchronously in the background without interfering with the display and behavior of the existing page, thus is employed to update the X3D scene from the server to user browser dynamically.

A prototype of the proposed framework is implemented using free data from an area around Leverkusen in Germany and 3D data in Stockholm. The development environment is Eclipse 3.4.1 platform, the web server is Apache Tomcat 5.5, and the browser is Firefox 4.0 beta. The experiment results show that the proposed framework can be easily implemented using major browsers and can efficiently support online visualization of 3D city models in small areas without any specific plugins. This framework is also an open platform which can be easily extended for different purposes.

However several issues still need be resolved in the future study. First, the X3D file generation is not efficient enough and faster conversion tools are required. Second, in order to reduce the data volume that is transmitted through Internet, dynamic generalization methods and multiple representation data structure of 3D city models are required to improve the performance.