QUERY FUNCTIONALITY FOR 3D VISUAL DATABASES

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ABSTRACT:

Three-dimensional visual databases, created for landscape or 3D map visualisations, consist of integrated data sets including DTMs, orthorectified aerial or satellite images and optionally topographic or thematic maps. Objects models of man-made objects like buildings might be linked to those databases as well as models of natural objects like tree representations. If those databases are optimised for visualisation purposes they generally do not allow for GIS typical analyses or queries. But more and more tools based on those databases are developed which allow for 3D photorealistic visualisation of corresponding virtual landscape or city models. Viewers allow to interactively navigate in the scene or to enable users to virtually participate in simulated events.

The main purpose of this research is to work on the link between highly efficient 3D visualisation systems and GIS. Two different approaches are pursued:

1) Integration of query functionality to a 3 D visualisation tool
2) Integration of a 3D visualisation functionality into a conventional GIS.

The software development for both approaches integrates two different visualisation software packages, G-Vista (offered by G-Graphix) and Terra SDK (offered by Skylinesoft) with Intergraph's GeoMedia.

Query functionality and 3D visualisation tools:
Both visualisation tools are based on Microsoft COM technology. For this reason an Active X-container called

GeoViewer is developed in Visual C++, embedding Active X controls of the visualisation software. GeoViewer allows to link and query GIS databases comparable to the functionality of conventional GIS. The result of those queries may have attribute related information, which will be presented to a user in a dialog box, while the location related result will activate the visualisation tool, eg. by generating a flight path and showing a virtual 3D flight to this place. GeoViewer can handle both, conventional GIS databases containing BLOBs as well as simple databases which may have not more than Points of Interest (POI) described by their spatial xyz co-ordinates.

3D visualisation functionality and conventional GIS:
The second approach basically consists of a GIS customization integrating the 3D visualisation tools mentioned above. For this purpose, a COM server is developed in C++ which can directly be executed within the GeoMedia environment. Analysis carried out with the GIS may lead to information which through the integrated geo-data visualisation functionality can be presented with a capability of the spatial - visualisation tool.

Query functionality for 3D visualisation tools is of interest for a lot of applications like real-estate marketing, virtual tourism, location based services, urban planning and others. All this applications will benefit from the fact that both, GIS and 3D visualisation tools, offer Internet services by streaming the data through the net.