3D-GIS in the Cloud. The future of GIS

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SUMMARY

GIS are used to collet, process, manipulate, store and visualize a variety of spatial information located above, below and at ground level. The amount of information that is handled by such spatial systems increases constantly and therefore applications today require additional functionality from these systems. Such applications include advanced urban planning, underground mapping including utility and infrastructure, oil and minerals exploration, geology, etc.

Currently existing 2D systems are hardly able to provide solutions for advanced analysis like 3D spatial systems are able to. Spatial information in 3D enables users to view and analyze data in detail and precision that cannot be achieved in 2D. 3D allows real-world views that improve the users' orientation and increase their ability to perform wide variety of tasks related to their spatial workspace.

Sivan Design's "3D GIS in the Cloud" is a cloud-based web application that provides decision makers, stakeholders, professionals, and public users with 3D views and 3D analysis tools of spatial information. The application offers information-based decision making tool of urban and rural environments in a highly detailed and accurate Smart 3D City model. The application's main goal is to provide a controlled publishing platform that allows data holders to publish their GIS data directly from the spatial systems they work with. The data is published to a cloud located on-premises or hosted online and can be accessed securely or be publicly open. The data can be shared with a single person, a group of people or the public.

The "3D GIS in the Cloud" can be accessed by any web browser and is also available as an iPad App. There is no need to download and install any software, Active-X, plug-ins or add-ons which eliminates problems associated with software installation regulations often found in organizations. No data is downloaded or cached at the client. When a user opens a project, the cloud computing architecture runs all the "heavy duty" processes such as 3D rendering and database queries on the server and the results are instantly steamed to the user.

3D GIS is the future of spatial system as it provides answers for the increasing data amounts needs and for the administrative transparency expected from organizations.

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1. OVERVIEW

GIS in 3D enable users to view and analyze data in detail and precision that cannot be achieved in 2D. 3D allows real world views that improve user orientation and increase the ability to perform wide variety of tasks such as infrastructures management and city planning.

Sivan Design's 3D-GIS is a cloud system (private or public) that provides GIS experts, professional users, and public users with 3D views and 3D analysis tools, enabling them to use spatial information in 3D. The system runs as an iPad App or on a web browser that requires no installation.

1.1 From 2D GIS to 3D GIS in a few steps

3D-GIS enables easy migration of existing 2D GIS projects (and data) into 3D GIS environment in a few simple steps. The 3D-GIS Studio provides an intuitive web interface for creating 3D GIS projects. The 3D GIS project can be published on the web and accessed by both internal and external users anywhere.

1.2 Web Applications – 3D-GIS studio and 3D-GIS explorer

3D-GIS is a set of web services installed on the server. Running on standard web browsers (e.g. Internet Explorer, Safari), the 3D-GIS client is a Silverlight state-of-the-art web application. Built on Silverlight technology, the 3D-GIS Studio provides an interface that allows you to manage, migrate and create 3D GIS projects. The 3D-GIS Explorer, which is also based on Silverlight technology, enables navigating and exploring the data in a web browser environment.

1.3 Cloud computing approach

3D-GIS is a web application running as a suit of web services, which requires no installation on the client side (no add-ons, ActiveX or execution files). This effectively eliminates many of the problems associated with the installation process (either as a full application or a web add-on) such as security problem, and keeping current users updated. The Web Thin Client approach also enables easy usage of the system from mobile devices and browsing kiosks, integrating these services with the enterprise system.

Due to its cloud computing architecture, the system runs its "heavy duty" processes such as

3D graphic rendering and database queries on the server. This design has the considerable advantage of placing relatively low demands on the resources of the user's computer or mobile device.

The system's web services architecture allows easy integration with other enterprise systems.

1.4 Viewing, Analyzing and Exploring in 3D

The 3D-GIS Explorer web application provides an intuitive 3D navigation environment, which combines the classical 2D GIS mapping capabilities with a real 3D world. Other standard GIS capabilities such as layers control, measure and attributes query are also supported. The system also enables analyzing the data through 3D Geo-spatial queries – spatial and attributes selection, 3D buffer, 2D polygon, 3D boundaries etc.

1.5 3D Features

In addition to the conventional 2D features (Point, Line and Polygon), 3D-GIS includes some new 3D features such as the 3D Parcel, Pipeline and Road. While the pipeline feature is an improved version of the regular line, the 3D Parcel is a whole new feature represented as a B-rep (Boundary Representation).

1.6 Domain Specific Solution

3D-GIS provides specific solutions for underground infrastructures, roads and cadastre. 3D modeling of features related to these domains such as road carriage-ways and shoulders are included in the system. Pipe textures and diameters are samples of the 3D symbology, which is also a part the system. The application also provides a set of specific 3D topology rules and tools such as the correlations between an underground 3D parcel and the surface 2D parcels.

2. BUILDING THE 3D WORLD

Building the 3D world using 3D-GIS Studio is a simple task – all it takes to convert 2D projects into the 3D world is browsing for the geo-spatial data source and setting the relevant 3D modeling parameters. For example, structures can be easily modeled using a polygonal layer and its attributes (heights, cover). 3D roads can be created using regular 2D lines (e.g. center lines) and some attributes (number of lanes, width etc.), and the rest is done by the system.

2.1 Support for the most common data formats and geo-spatial protocol

3D-GIS supports the most common GIS data formats such as shapefiles, ArcSDE database, SQL Server FDO database, GeoTiff Raster images and DTM. The system also supports the main OGC Geo-Spatial protocols such as WMS (Web Map Service) and WFS (Web Feature

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Service).

2.2 3D GEO-spatial database

The 3D Geo-Spatial Database is a unique database structure that hosts the 3D World. While the system uses the original Geo-Spatial data sources for queries and data attributes, a 3D geo-spatial database is created to work in conjunction with these sources, storing and managing the DTM, raster images, 3D Models, 3D topology and Symbology etc.

REFERENCES

3D-GIS in the Cloud – www.sivandesign.com/3dgis

BIOGRAPHICAL NOTES

Engineer Shay Cheruty executes as the Chief Operations Officer of Sivan Design – a leading global geospatial solutions provider incorporating GIS with ERP capabilities.
Mr. Cheruty has over 17 years of experience in managing complex engineering projects which for the past 7 years were for Sivan Design.
Mr. Cheruty holds a B.Sc in engineering from the Technion Institute and a MBA in IT from Tel-Aviv University.

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