TECHNOLOGY FOR A BETTER CITYSCAPE

Intelligent Mapping to Give Urban Planning a Big Lift

Indian geospatial firms create 3D digital city models that capture minute details – a game-changer for city planning

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Low-flying planes fitted with cameras, sub-contracted by Indian company Rolta, would be seen hovering over skies in the Middle East over the next few months clicking snapshots of the landscape. These shots will be used to create 3D "intelligent" digital models of cities, which will also capture intricate details of even insides of buildings.

These models would be the foundation for the city planners to carry out sophisticated analyses for town planning, disaster management, emergency response and traffic management, says AP Singh, board member and principal advisor, Rolta. The company, which was awarded this multi-million dollar project, and is now expected to sign the contract soon, is among the many Indian companies vying for a share of the evolving, highly-lucrative geospatial markets in the Middle East and North America.

Companies are deluged with requests from governments and public utilities to offer intelligent maps which integrate data from different sources – an exercise which involves mapping of terrains, creating real-life visuals of the inside of buildings and integrating details on these 3D models.

With the size of these contracts growing from roughly $2 million two years back to around $50 million today, geospatial majors are developing technologically sophisticated products and solutions to keep abreast with competition. Indian companies Rolta, Infotech Enterprises and Magnasoft are vying for a share of this fragmented market which, say industry sources, is worth $10 billion in India and Middle East alone and likely to grow at 12% over the next 5 years.

The heightened activity in this sector is mainly triggered by the cash-rich Middle Eastern countries which are investing heavily on creating 3D models of their cities to help them manage their assets better.

Several counties in North America are also in the process of opening up contracts to upgrade their existing mapping formats to more intelligent models. "North America already has a digital mapping system in place. However, these are quite outdated and they are now interested in upgrading the existing platforms with the latest software," says SA Laxminarayanan, COO (content business), Infotech Enterprises.

Besides town planners, specific agencies like the city police are interested in 3D models to map out crime-prone areas of a township to tackle crime, he says. On Thursday, Rolta announced that it had been awarded an over $31-million contract in which they, along with a team of partners, will be managing the assets of the largest three-service municipal utility in the US – the Memphis Light Gas and Water. This is part of Memphis' efforts to replace their 22-year-old asset management support system.

"A good part of this project involves geospatial work where data from different sources would be integrated with online maps," says Singh. It's not just the town planners who need 3D models but also the property tax departments in the US.

According to Bobbie H Kalra, CEO of Magnasoft, new US laws to be introduced soon will have city authorities examining 3D models of houses before determining the property tax. "Property tax is now decided according to the size (area) of the houses. But soon government officials would want to see the 3D models of the house to assess its size, the additional facilities it has, and how posh it is," says Bobbie. This calls for extensive maps with 3D modelling of residential buildings in a particular locality.

Integrating diverse details from different sources on a single platform can be challenging. For instance, when Rolta took up work for the Ministry of Economic Development and Trade, Ontario, Canada, they had to create an intelligent and interactive system for investors to identify the ideal site to set up factories.

Talking Maps

Creating intelligent 3D models involves the following steps:

Snapshots of locales

a. **Satellite imagery:** Shots taken by satellites

b. **Planes:** Low-flying planes fitted with cameras capture aerial views

c. **Streetview technology:** Cars fitted with cameras are driven through streets to capture pictures

d. **LiDAR technology:** Lakhs of laser beams are flashed onto an object. A rough data of the inside of a building is captured with this. The result is a point cloud (a cloud image) of the buildings. This is then processed

Data Processing

- **The image** is registered with ground control points
- **3D digital** models are created with photogrammetric mapping software
- **3D views** of interiors are then made
- **Additional data** is merged
- **Links are** established between features on the 3D map/model, and the corresponding database elements

"This was a complex process as parameters like the distance from the nearest highway, the types of schools/colleges in the vicinity, the presence of a particular community in that area and the tax implications had to be accessed from disparate databases and then integrated in real-time for presentation through a web-interface that could be used by business users, and not necessarily by IT experts," says AP Singh of Rolta. To capture such details and create a platform where public utilities and governments can access specific details is a complex process. But Indian companies seem to have an edge over global rivals.

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INDIA'S EDGE

The intelligent map-making procedure involves three phases. First, the snapshots of a location either through satellite imagery, mobile mapping, laser technology or the LiDAR technology, explains Bobbie Kalra of Magnasoft. While aerial shots are taken either by satellite imagery or low-flying planes fitted, the inside views of buildings are captured with LiDAR technology.

In the LiDAR technology, lakhs of laser beams points are flashed onto an object and depending on the distance the light travels, a rough data of the inside of a building is captured. The result is a point cloud (that is a cloud image of the entire structure). This data is then sent to the back-offices in India, where staff in places like Bangalore, cull out the information by taking each and every slice of this cloud point and recreate it. They then manually create a 3D model, explains Bobbie.

"The latest laser technologies can capture the inside of oil refineries housed in old buildings and which do not have proper maps available," he says. Each company has been creating their own ways of mapping. Infotech, for instance, has been taking up mobile mapping (Moma) in a big way. "We run a car with six cameras – two in the front, two in the middle and two in the rear – to capture pictures of streets. These images are stitched together using MoMa technology to create maps," explains Laxminarayanan. While this is the basic format to create 3D models, what is being demanded today is a fusion platform. For this, companies develop their own software products, like the Rolta Geospatial FusionTM, which can integrate diverse data on a single map.

To carry out 3D modelling and data conversion, a highly-trained set of staff is needed. Magnasoft has a 100-seat training institute in Hassan where students are trained in skills like photogrammetry.

THE INDIAN SCENE

While Indian firms may have the latest software and products for geospatial work, these tools are seldom applied in India. For one, utilities lack the funds to finance such projects. Second, there are restrictions on aerial surveys due to security reasons. But a small start has been made in Karnataka where land records are being digitised under the Urban Property Ownership Records programme. "Four districts in Karnataka – Shimoga, Hubli-Dharwad, Mysore and Mangalore – are getting kiosks where people can check out the authenticity of their land records.

The software verifies parameters like whether the land has been encroached, whether it is in the green belt, whether it is near any chemical factory and provides the details. Since the details have been provided by the Karnataka government, this is authentic information for the buyer/seller of the land," explains Laxminarayanan of Infotech, which has won the contract for this.

"This is a build-operate-transfer model for seven years and the money for the project has started trickling in. About 30-40% of these towns will be digitised by this year-end," he says.