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Global Positioning System (GPS) for Surveying

Using GPS for Surveying is a cost-effective proposition and ideally suited for developing countries like India.

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By: Rakesh Nayak, R&D Manager,
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Surveying is the first and foremost step conducted before embarking on any large-scale construction or for identifying geographic boundaries. Traditionally surveying has been performed by highly qualified personnel and is a very tedious and labour intensive effort and also there are considerable costs associated with conventional

surveying technology. Methods are time-consuming and often require multiple trips to the same site to gather data and to ensure the collected data is accurate. Crews are not always able to work under certain weather conditions, such as snow, rain, or extreme temperatures.

Agencies embarking on large-scale surveying recognize the importance of increasing survey accuracy while reducing labour costs and improving efficiency. Let us consider the example of construction of the National Highway projects currently being pursued by Government of India. Surveying thousands of kilometers is a very time consuming and an expensive process. Survey teams have to toil for months together in assessing the land and choosing the optimum route. Crews today use distance measuring equipments or total stations for conducting manual survey and often this activity consumes several months.

Putting it in perspective

- It takes many days to survey small sections of road using traditional techniques.
- Complete road inventories may take years.

One of the cutting edge technologies that can enhance the quality of Survey is Global Positioning System. GPS has been used in developed countries such as Europe and US very effectively.

Over the past 5 years, studies across the world and in particular United States have shown that GPS technology increases the productivity of conventional survey crews, reduces data collection time, improves survey accuracy, and allows crews to work under a broad range of weather conditions. Moreover, less expertise is required to operate a GPS surveying unit than is needed to operate conventional surveying technologies.

What is GPS?

GPS is a space-based, radio-navigation system that provides worldwide, all-weather, three-dimensional position, velocity, navigation, and time data to both civilian and military users. Potential uses for GPS within the highway community are diverse and range from providing traveler information to mapping (GPS technology can be integrated easily with Geographic Information Systems).

How does it work?



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GPS can provide a very accurate coordinates of the surveyed points and this can be transferred to any existing digital map database. This can provide very precise digital survey record. GPS is a constellation of 24 satellites that continuously broadcast their position, a timing signal, and other information. By combining the measurements from four different satellites, users can determine their 3-dimensional position with an accuracy of 4-20 meters. This accuracy can be improved further to few centimeters by post processing GPS data through advanced surveying software.

By using a single GPS receiver a surveyor can obtain the precise coordinates of a location within a minute and can move on to the next location. The coordinates can then be stored in a flash memory and can be downloaded to a computer with Map database. The map database could be a GIS (Geographic Information System) database or a terrain database. The GPS coordinates can then be imported into the database and the survey report for the entire area can be generated within a matter of hours. GPS coordinates can also be obtained by mounting a GPS receiver on a vehicle and survey can be performed as the vehicle moves. This provides a very dense survey coordinates with very little additional effort.

The U.S Department of Transportation has found that one person operating GPS equipment is generally twice as fast as a conventional survey crew, and a GPS system with two units is potentially four times faster than crews using conventional surveying technologies.

There are quite a few companies in India who have developed GPS technologies as well as GIS technologies and have excellent products to cater to the Surveying community. Our Government should take up the initiative in modernizing our infrastructure growth and encourage local GPS and GIS industries to grow. Using GPS for Surveying is a very cost effective proposition and ideally suited for developing countries like India, which is aiming at accelerated growth in infrastructure needs.



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