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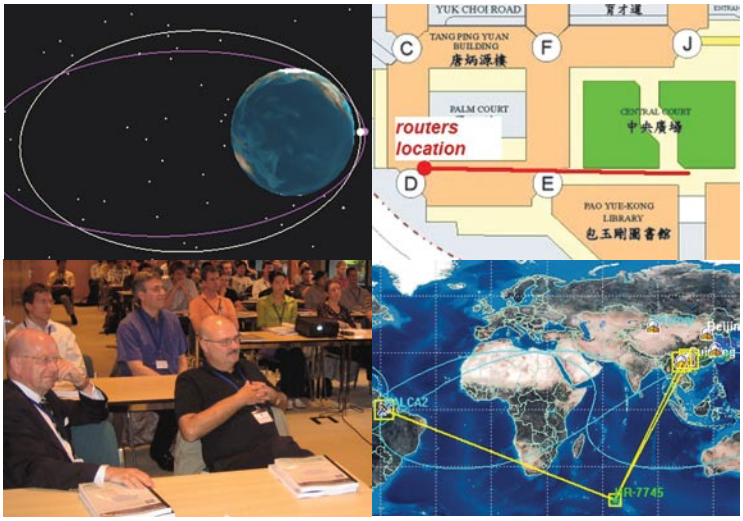

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Columns

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The technology limits

Last month, New York witnessed cab drivers' strike.

A protest against a city rule that cabs be equipped with GPS.

Popular contention among others is that GPS is overly intrusive.

It might be possible that such protests are driven by vested interests.

Nonetheless, the privacy issues cannot be ignored.

Many feel that technology is spilling into the zone of privacy.

At times, in the name of evolving better systems.

No doubt, the potential of the technology should be unleashed.

However, it has limitations and limits too.

Bal Krishna, Editor
bal@mycoordinates.org

Testing of location systems using WiFi in indoor environments

The use of WiFi for location determination has the advantage that no transmitters or receivers have to be installed in the building like in the case of infrared and ultrasonic based location systems

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WIFI technology has won growing interest in recent years. In particular the comfortable and mobile access to the internet were here the driving factors. Access points can nowadays be found in our daily environment, e.g. in many office buildings, public spaces and in urban areas. Parallel to this development there is meanwhile substantial interest in offering the user information which refers to the current location of the user (so-called Location Based Services LBS). Such Location Based Services, however, will be accepted by the user only if the cost performance ratio is satisfactory. If existing infrastructure such as WiFi without additional hardware installation can be used for location determination, then the realization costs are small and the service can be offered under attractive conditions. Several systems are nowadays available for location determination using WiFi signals. Their major application is the location determination of persons and objects inside buildings.

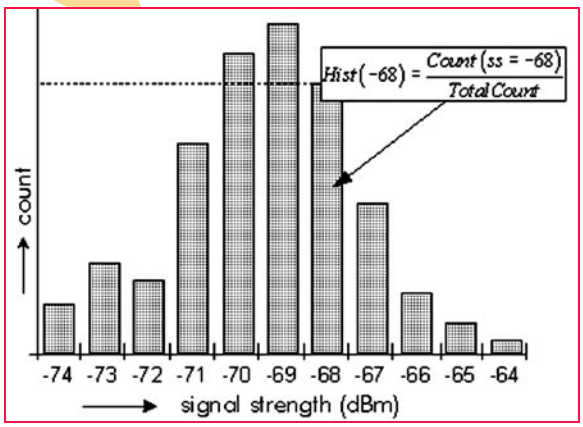


Figure 1. Histogram of the measured signal strength values for one acess point (where ss is the signal strength and Count is the number of the measured signal strength values)

Principle of WiFi Positioning

A common approach for the localization of a handheld terminal or mobile device by means of WiFi is based on measurements of received signal strengths of the WiFi signals from the surrounding access points at the terminal. This information is available due to the beacon broadcast multiple times a second by every access points. An estimate of the location of the terminal is then obtained on the basis of these measurements and a signal propagation model inside the building. The propagation model can be obtained using simulations or with prior calibration measurements at certain locations. In the second case, the measured signal strengths values at a certain location in the building are compared with the signal strengths values of calibrated points stored in a database.

The calculation of the location of a user takes place in two phases: an offline and an online phase. During the offline phase, which has to be executed only once for each building, a so-called radiomap will be composed. This radiomap can be considered to be a collection of calibration points at different locations in the building, each with a list of radio signal strength indicator (RSSI) values for visible access points at that particular location. This process is also known as fingerprinting. During the online phase, the calibration points are being used to calculate the most probable location of the user, whose actual location is unknown.

Offline Phase

As mentioned before, the offline phase can be seen as a calibration. A certain amount of locations will be chosen, depending on the size and layout of the building. At each of these locations, a number of calibration measurements will be performed. This is due to the fact that the orientation of the user affects the RSSI value measured by the WiFi device. For example, if the user's physical location is between the access point and the mobile device, the measured signal strength will probably be smaller

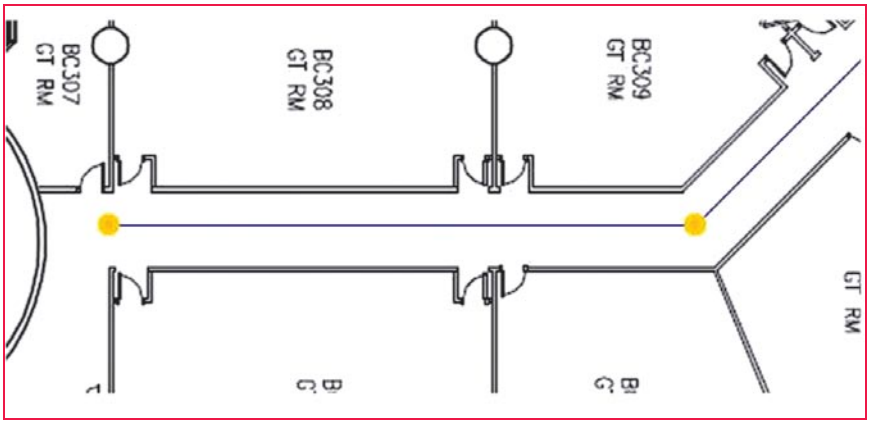


Figure 2. Definition of tracking rails for identification of the possible user's paths in the Ekahau software

compared to the situation where the user positions itself on the opposite side of the device. This is due to the fact that the signal is attenuated by the human body. The difference between two orientations has been reported to be as much as 5 dB (Bahl and Padmanabhan, 2000; Ladd et al, 2002). Therefore four different orientations are usually performed on each calibrated point (see Retscher et al., 2006).

The goal of a single measurement is to determine the received signal strength of every visible access point at this location with this orientation. Due to the fact that the received signal strength is being influenced by many factors, a number of sequential measurements will be taken in order to collect statistically more reliable information on what average signal strength can be expected. Every measurement consists of a list of visible access points. For each access point, the received signal strength is measured. Once the measurements have been performed, a histogram is made with the measured data (see Figure 1). Each access point yields a separate histogram. These histograms are stored in the system database.

Online Phase

The online phase is the phase where the calculation software periodically receives measurements from one or more mobile devices of different users. This information is compared against the values obtained from the offline phase, which yields a calculated position for each device. Once the received measurement has been parsed and found to be correct, it will be used as input for the calculation algorithm.

Performance of WiFi Positioning Systems

For the achievable positioning accuracy of WiFi location systems usually a value of 3 to 5 m for indoor positioning using signals from several visible access points is claimed by some system manufacturers. The positioning accuracy, however, depends very much on the surrounding environment. Radio signal propagation errors caused by multipath and other error sources and signal interference can degradiate the achievable positioning accuracies significantly. Therefore no general valid numbers for the achievable positioning accuracies can be given. In the following two different WiFi positioning systems are tested in different environments. One test bed was chosen in the Hong Kong Polytechnic University and the second in the Vienna University of Technolgy. Furthermore an approach for the conversion of the measured signal strength to the corresponding distance between the user's current location and the access point is presented.

Tests of the Ekahau Positioning Engine at the Hong Kong Polytechnic University

At the Hong Kong Polytechnic University the Ekahau WiFi Positioning Engine was tested in two projects at the campus in indoor as well as outdoor areas (see Chan, 2006; Yiu et al., 2006). The WiFi positioning system was developed by the Finish based company Ekahau for the location determination of persons and objects mainly in indoor arreas where WiFi access points are present. In the following selected test results for the location determination of a user are presented.

Before a user can be located, calbration measurements have to be performed in the area where the user has to be located. For that purpose a floor plan is loaded into the Ekahau positioning software and tracking rails must be drawn and placed on the map (see Figure 2). The objective of this is to indicate the possible travel paths of the user. Since the estimated locations

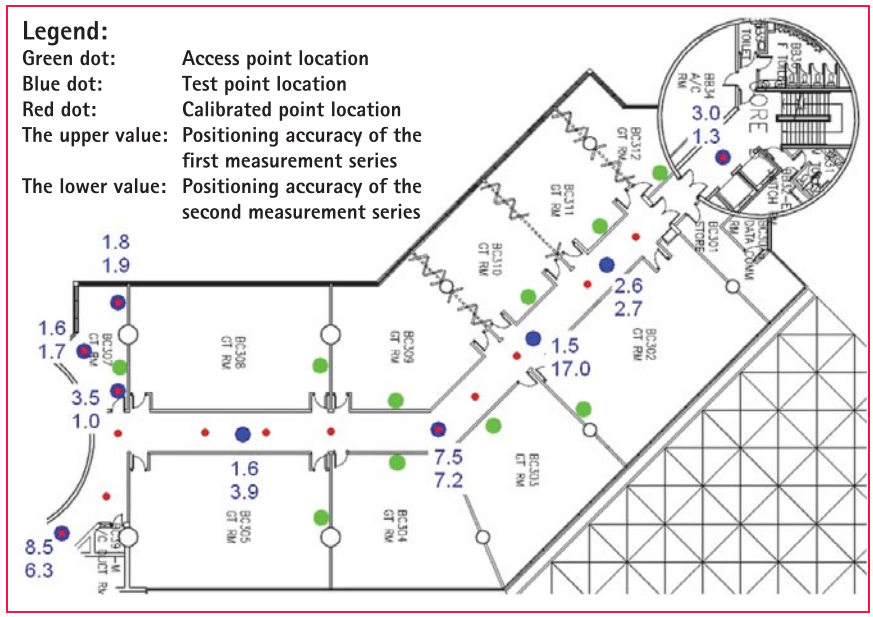


Figure 3. Performance tests on the 3rd floor of core BC of the Hong Kong Polytechnic University

determined by the software depend on the rails placed on the map, the rails drawn must be correct and accessible. After the tracking rails were drawn, an empty positioning model has to be created with no signal data. To combine different maps (floor plans) together for a multi-floor investigation, two adjacent maps must be connected by setting up common points which are points with the same horizontal position but with different levels or floors. For example, positions in front of the elevator or around the staircase are suitable for connecting the maps together.

After drawing the tracking rails, the calibration procedure can be started. In the presented tests calibrations were made only along the rails which were already drawn. In the calibration procedure any location on the rails in a distance of 3 to 5 metres may be chosen. On this point signal strength observations are performed while the notebook computer is rotated around 360°. This observations are then stored in the Ekahau database. After finishing the calibration a user can be located in the calibrated area.

Figure 3 shows performance tests of the system on the 3rd floor of core BC of the Hong Kong Polytechnic University. As can be seen from Figure 3 the achievable positioning accuracies vary quite significantly and range from ± 1.3 to 6.3 m with a few outlieres with even larger positioning errors. The best performance was achieved in the general teaching rooms which are equipped with an access point each. Table 1 summarizes the positioning accuracies in the teaching rooms. In the tests an average value for the positioning accuracy of ± 2.3 m could be achieved. For the points located on the corridor, however, the positioning accuracy was lower. A main reason for that could be that the average signal strength values were higher for the points located inside the teaching rooms than for those located on the corridor. The difference in the signal strength was in the range of 10 to 20 dB for at least three access points with the strongest signal.

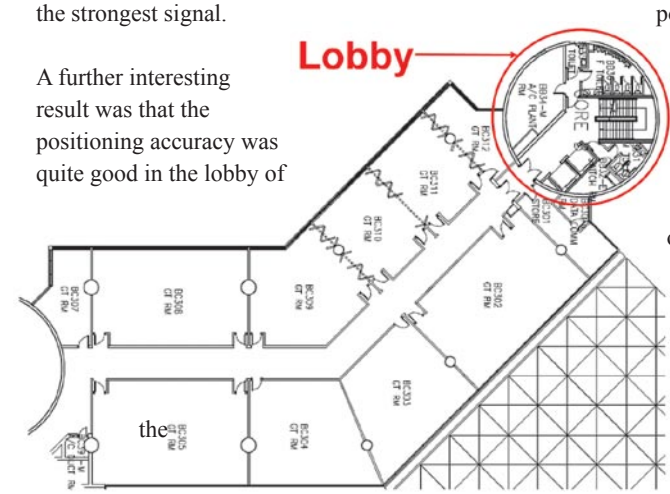
A further interesting result was that the positioning accuracy was quite good in the lobby of the staircases (see Figure 4) where no access points are located and the average signal strength values are quite low. Generally, more than 10 access points could be seen and the average signal strength was around -40 to -80 dB along the corridor. However, if the notebook computer was placed at the lobby, then the signal strength dropped quite significantly by more than 20 dB. The achieved positioning accuracy, however, was in the range of ± 1.3 to 3.2 m.

In conclusion it can be said that an average positioning accuracy of around 3.9 m could be achieved in core BC and about 5.3 m in core PQ in indoor area in the performance tests at the Hong Kong Polytechnic University. Thereby the minimum number of used access points was always 5. Basically the results could confirm the achievable positioning accuracies using the Ekahau system obatined by other tests reported in the literature (see e.g. Teuber and Eisfeller, 2006).

Table 1. Achievable positioning accuracies in the general teching rooms of core BC of the Hong Kong Polytechnic University

Floor of Core BC	Accuracy	
	1st	2nd
3/F	3.5	1.0
	1.6	1.7
	1.8	1.9
4/F 5/F	3.1	–
	1.6	–
	2.2	–
	3.0	–
	0.6	0.0
	3.0	2.9
	3.8	4.8
6/F	3.0	–
Mean (GT)	2.3	
Mean	3.9	

where Mean (GT) (2.3 m) is the mean accuracy of the tested points in the general teaching rooms and the Mean value (3.9 m) represents the mean accuracy of all tested points in core BC.



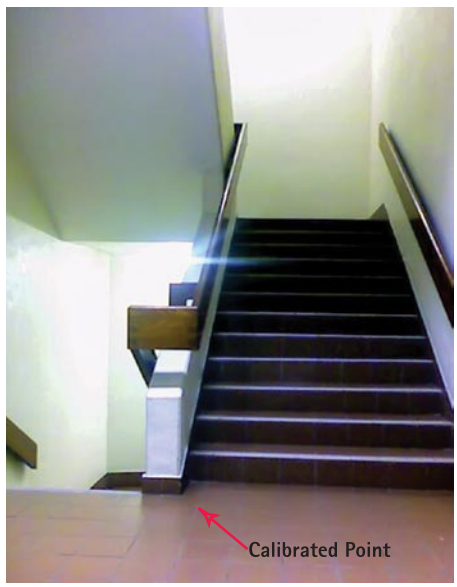


Figure 4. Location of the calibrated points for the performance tests in the staircase lobby of core BC of the Hong Kong Polytechnic University

Tests of the WiFi Positioning System 'ipos' at the Vienna University of Technology

The system 'ipos' was developed by the German company IMST GmbH. It is a software platform as a basis for the realization of LBS applications. It consists of an efficient, freely parameterizable framework, which is suitable for multiple application architectures. Thereby signal strength measurements are performed on user terminals, while evaluations and visualizations can take place if necessary on user terminals. The developed positioning system "ipos" makes use of a standard WiFi infrastructure and no modification of the hardware is required. In a study the performance and the achievable positioning accuracies of the positioning system "ipos" have

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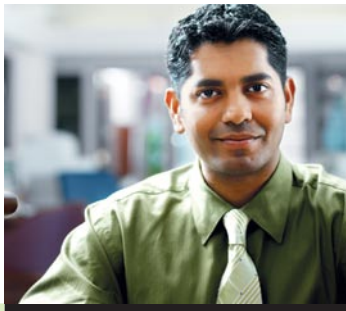

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been tested. This study was conducted in cooperation between the Vienna University of Technology and IMST GmbH. The tests were performed in a localization test bed in an office building of IMST (see Retscher et al., 2006). With seven access points an area of over 1500 m2 is covered and the tests have been performed in an area half of the total covered size. It could be seen that it is possible to localize a user in the test bed with an accuracy of around 3 metres.

Further system testing was performed at an office building of the Vienna University of Technology where our institute is located. For this purpose a cooperation with the German company IMST GmbH was established and they provided the indoor location system 'ipos'. First test results are shown in Figure 5. Figure 5 on the top shows the location of the calibrated points for a first system test on the 3rd floor of our office building and Figure 5 bottom the location test performed by students in our Practical Course on Location-based services moving along the corridor. Due to the small number of calibrated points and the location of the access points the trajectory of the moving user could be obtained with a standard deviation of about ± 3 to 5 m. Using the knowledge of the building model the trajectory can be matched to the corridor in a post processing step.

Figure 5. Indoor location determination using WiFi fingerprinting with the system 'ipos' on the 3rd floor of our office building (on the top the location of the calibrated points is shown and on the bottom the trajectory of a moving user along the corridor)

As the WiFi positioning systems usually provide only location capability in two dimensions, the augmentation of the indoor location system with a barometric pressure sensor for direct observation of the altitude of the user was also investigated. For that purpose the Vaisala PTB 220 pressure sensor was employed for the direct observation of the altitude of the user. This study was conducted in our research project NAVIO (Pedestrian Navigation for Combined Indoor/outdoor Environments) and the results are presented in Retscher (2005) and Retscher and Thienelt (2006). In the study it could be seen that we are able to determine the correct floor of a user in a multi-storey building. The maximum deviation of the determined height in our office building was less than ± 1 m for over 90 % of the oberservations.

WiFi Signal Strength to Distance Conversion

In order to integrate WiFi positioning determination with other location techniques it might be interesting to convert the measured signal strength values at one location to a range or distance to an access point. Then it would be possible to perform a trilateration using distances to several access points or radio transmitters. An approach for combined WiFi positioning and GNSS was presented in Mok and Xia (2005) and Mok et al. (2006). In this approach the distances to WiFi access points are combined with pseudorange observations to GPS satellites to determine the curent user's position. In the following the relationship between the measured signal strength and the distance to the corresponding access point is investigated.

Figure 6 shows the test site at the Podium level of the Hong Kong Polytechnic University. At one end of the 100 m long line either a Linksys or 3com access point was positioned. The signal strength was determined at 5 m intervals along the line. The observations were performed twice in both forward and backward direction. Figure 7 shows a graphical representation of the measured signal strength values on the top and the trend on the bottom. As can be seen from the Figure 7, the signal strength degrades with the distance from the access point. However, the ratio of decrease in signal strength is not the same along the whole straight line. In the first 10 metres the signal strength decreases very fast, followed by a slower decrease when the user moves away from the access points.

Results of further tests reported by Mok et al. (2006) have shown that the signal strength can be converted successfully to a distance. The signal strength quality, however, varies significantly under different environmental conditions. Errors are mainly caused by radio interference and multipath effects. For environments with less environmental interference a least squares polynomial fitting may be able to establish a reasonable signal strength to distance conversion relationship. For more affected areas an approach was developed for the conversion of the signal strength to the corresponding distance. This algorithm has been verified in an unfavourable site condition and has proven to be successful with a 90 % success rate in a 20 m radius area around the access point with the accuracy threshold set to 5 m. If only the determined ranges to the access points are used in the location process, it would not be necessary to perform calibration measurements in the beginning as it is the case for the fingerprinting method (see section 2.1). This would be a major advantage of this approach.

Conclusions

The performed tests have shown that WiFi positioning systems based on fingerprinting are able to determine the current location of user inside a building with an average standard deviation of ± 3 to 5 m. To achieve this level of positioning accuracy observations of the signal strength values to at least 3 to 5 access points are required. The main disadvantage of the employed fingerprinting method,

Figure 6. Test site at the Podium level of the Hong Kong Polytechnic University for the determination of the relationship between the signal strength and the distance

however, is the required calibration of the system in the beginning which is time consuming and very costly. The system requires the observation of the signal strenght values at known location inside the selected areas where the user has to be located. In this calibration usually signal strength values for at least four directions on each calibrated point are measured and stored in a database.

If the signal strenght is converted to a range or distance to the corresponding access point and the location of the user is determined using trilateration, no calibration of the system would be required. Therefore the relationship between the measured signal strength values and the corresponding distance was investigated and a new approach for conversion of the signal strength to the distance was investigated. In future an integration of different location techniques using radio signals with GNSS will be achieved if the range to the access point or radio transmitter is determined. This would lead to an ubiquitous location method where the signals of different radio transmitters can be used to obtain an optimal location determination of the user.

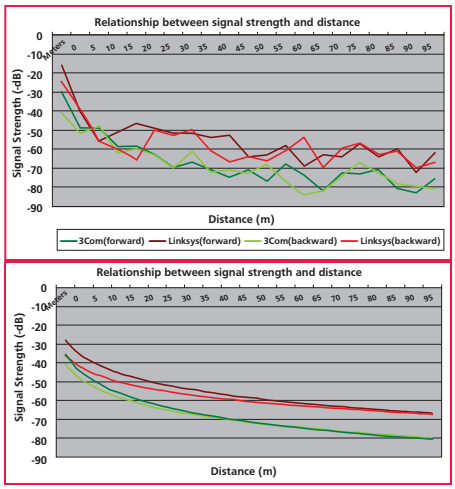

Figure 7. Relationship between signal strength and distance over a 100 m long straight line (measurements in the top, trend function in the bottom Figure)

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The First International Summer School on Global Navigation Satellite Systems closed successfully on Sunday 9th September. Organised by the Institute of Geodesy and Navigation in cooperation with Stanford University (USA) and École Nationale Supériore de l`Aéronautique et de l`Éspace (Toulouse) Summer School started on September 5th in Berchtesgaden, Germany where the Galileo Test Environment GATE is located.

The Spirit of Summer School

About 50 attendees joined the unique event with its highly qualified lecturers as for example Bradford Parkinson (Father of GPS), Rainer Grohe (former Executive Director of Galieo Joint Undertaking) and Peter L. Levin (Founder and President of DAFCA Inc.). Organiser Prof. Dr. Guenter W. Hein from the Institute of Geodesy and Navigation was glad about this overwhelming echo. He pointed out that the main goal of the Summer School was to educate the PhD students, postdoctoral researchers and engineers interdisciplinaryly and to create a kind of Summer School Spirit which was ment to bring students and teachers close together. “The First International Summer School was a wonderful experience for me, and the highlight of my summer.”, Peter Levin told us. “The students there were self selected”, he went on, ”they ALSO were taking time to voluntarily participate in a special event, not required by the curriculum, to expand their horizons into technology and business. These are exactly the people who are incentivized, self-motivated, and exciting to spend a week with.”

Student Work Competition

The lecture program offered a broad spectrum of GNSS topics as there were: “The Future of Satellite Navigation”, “Frequencies, Signals and Signal Processing”, “Orbit Determination” and “Business Engineering”. This dense program was one of the special qualities of the Summer School. Dr. Christopher Hegarty from MITRE Corporation explained: “The First International Summer School was special in that brought together a very bright collection of students with lecturers with a diverse set of backgrounds and expertise in various aspects of GNSS.”

In the session “So, you really want to start a business?” Peter Levin answered the various questions of the attendees concerning business plans and funding. This helped the students to face the Student Work Competition where they had to create a new GNSS business idea with fundamental technical or application oriented background. The most innovative ideas were a toy for overweight kids and an intelligent life jacket. The best five groups were awarded at the end of the week.

Summit & Summer School

The First International Summer School on GNSS and the Munich Satellite Navigation Summit are both famous Satnav events organised in charge by the Institute of Geodesy and Navigation. Next Summer School will be held in autumn 2008, Munich Satellite Navigation Summit will be held from 19.-21. February 2008 in the Residence Munich.

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Facilitating land-sea interface through seamless SDI

The paper discusses coastal zone and spatial information management issues and the potential for adding a coastal dimension to an SDI to facilitate coastal zone management

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THE land-sea interface is one of the most complex areas of management in the world consisting of both the marine and terrestrial environments. The coastal zone is also home to an increasing number of activities, rights and interests. Population along the coastline is continuously increasing, bringing about new pressures on the fragile eco-system of the coastal zone. This has brought with it an increased need to more effectively and efficiently manage this area to meet the economic, environmental and social outcomes of sustainable development.

In this respect, Coastal Zone Management (CZM) initiatives are turning to more integrated strategies worldwide, attempting to harmonise economic, social and environmental objectives, similar to the better-developed land use management frameworks of many urban areas. In coastal areas however, the diversity of interests, some terrestrial and some marine, compounds the issue. Integrated Coastal Zone Management (ICZM) recognises that the coastal resources management situation is unique; that is, it differs greatly from management of either land or water resources, being a combination of both (Bartlett et al. 2004).

It has been established that access to spatial data aids in decision making for management and administration .In response to this situation, on land, Spatial Data Infrastructure (SDI) have been developed to create an environment that will enable users to access and retrieve complete and consistent spatial datasets in an easy and secure way. Within the marine environment tools such as marine cadastre can provide a means for delineating, managing and administering legally definable offshore boundaries, however there is still the need for an overarching spatial information platform to facilitate the use and administration of these tools in a holistic fashion. Currently, most of the SDI initiatives mainly restrict their attention to the landward or seaward regions with little or no consideration of coastal zones. There is the growing and urgent need to create a seamless SDI model that bridges the gap between the terrestrial and marine environments, creating a spatially enabled land-sea interface to more effectively meet sustainable development objectives.

With this in mind, this paper discusses coastal zone and spatial information management issues and the potential for adding a coastal dimension to an SDI to facilitate coastal zone management. It looks at the complexity and issues regarding management of the land-sea interface. Further it discusses the need to develop a seamless SDI as an enabling platform to increase the efficiency and effectiveness of management across regions and disciplines.

Costal zone issues and challenges

On land issues and challenges such as data interoperability and data integratability have been identified as major issues. However, there are more issues facing marine environment as it is highly dynamic with 4D boundaries and thus natural resources or features are more likely to move with time which leads to poor accuracy, precision, consistency

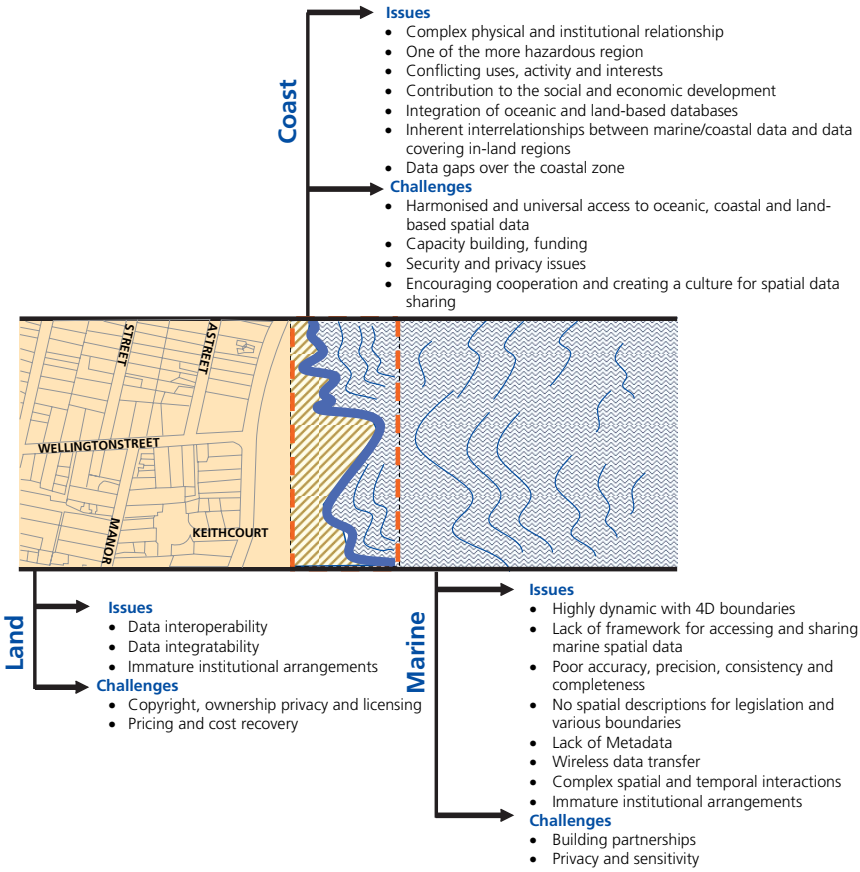

Figure 1: Issues and challenges of the land, coast and marine environments

and completeness of marine spatial data. These difficulties compound in the coastal zone, as it is both the on and offshore environments combined and interrelated.

As the interface between marine and terrestrial environments, coasts have diverse and ever increasing conflicting pressures and demands requiring effective administration and management. To improve management of the coastal zone, there needs to be access and interoperability of both marine and terrestrial spatial data.

However the need to effectively manage the coastal zone as well as the need for interoperable data between the three environments (land, coast, marine) requires a management system that incorporates them all. This has been recognised through the development of integrated coastal management (Gillespie et al. 2000), an initiative that aims to combine management of the coastal zone, spatially, institutionally, and ecologically. Figure 1 shows the conceptual demonstration of issues and challenges of the land, coast, and marine environments. It implies the need for overarching spatial information framework to facilitate the management of the whole environment.

Based on the issues and challenges demonstrated in the above figure and having said that, the development of a framework such as a seamless SDI would aim to aid in facilitating decision making in order to respond to these complexities a number of institutional, technical and policy issues would need to be overcome in order to facilitate the management of land sea interface.

Institutional Issues

The coastal zone is difficult to manage due to the fact that it is governed by a complex array of legislative and institutional arrangements from local to global scales. A coastal state may be a party to many international conventions (i.e. RAMSAR, MARPOL, and London Convention) in addition to developing its own national, and even state or local regulations. Activities and resources are usually managed in a sectoral and ad-hoc approach with legislations or policies created when the need arises and specific to only one area of interest (Strain et al. 2004). Furthermore, there is currently some confusion about the management of the land-sea interface, an example being in Australia where local governments manage land to High Water Mark (HWM), and state governments manage the marine environment from the Low Water Mark (LWM). This means that there are no overlapping arrangements in place to enable efficient coastal zone management. There is also a strip of land between the two boundaries which is not within a management jurisdiction at all (Binns & Williamson 2003).

There are also a large number of stakeholders with rights, interests, or responsibilities for management in the coastal zone. Binns (2004) states that there is often little cooperation or collaboration between these groups responsible for managing the same area offshore. To add to the complexity these rights and interests can often be overlapping and sometimes conflicting or competing for space.

In any jurisdictions groups typically collect and maintain data to support their own specific disciplines or programs, with little or no consideration given to collecting, processing or managing data for use by other users. As such, available data are often inadequate for clear, rational decision making which is both environmentally and economically sound (Gillespie et al. 2000). The result is that organisations working in the same country or in the same discipline collect similar data in different ways, engage in much duplication of effort, suffer from insufficient or inappropriate standards, or are insufficiently aware of methods that should be used, or of the availability of existing data.

Technical Issues

Results of a GIS pilot study undertaken on Port Philip Bay, Victoria summarised

coastal management issues as consisting of: overlapping coastal interests; data gaps between terrestrial and marine environments; resolution differences and scale variations in coastal demarcation, spatial relationship between conflicting interests over the coastal zone; and representation inconsistencies due to data errors (Loton, 2006).SDI must be based on 'interoperability' (seamless databases and systems). International standards organisations are addressing the development of standards for both land-based and marine-based spatial data and technologies. S-57 (Special Publication No. 57) cartographic standard developed and maintained by the International Hydrographic Organisation (IHO) International Hydrographic Bureau (IHB) in Monaco (IHO 1996). Within the terrestrial environment, the International Standards Organisation's Technical Committee 211 (TC/211) on Geographic Information/Geomatics creates a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth . For coastal zone users, a big issue is the difference in standards between land and ocean data products. In many instances, these data products are incompatible in terms of scale, projection, datum and format (Gillespie et al. 2000). Additional CSDI considerations include: metadata creation and related standards; guidance on spatial precision, accuracy and data formats; data access policies; and intellectual property and related legal issues (Longhorn 2004).

Table 1: Marine/Coastal issues

ISSUES	EFFECTS
Institutional Issues	
Various spatial datasets are collected and stored by different organisations	Finding and obtaining datasets is difficult
Immature institutional arrangements	Reluctance of organisations to share their data
Limited knowledge of marine and coastal environment, boundaries and their associated rights, restrictions and responsibilities	Inefficient and ineffective marine and coastal management and administration
Policy Issues	
Restrictive national security and pricing policy regarding marine and coastal data	Coastal and marine data being withheld from stakeholders and general public
Complex, fragmented regulating framework for marine and coastal management	Inability to adequately handle the pressure of different activities and stakeholders within the coastal zone
Lack of agreed framework of standards, policies and coordination mechanisms	Lack of coordination and sharing of marine and coastal spatial data
Technical Issues	
The dynamic and fuzzy nature of the shoreline as the one of the main fundamental datasets within the coastal zone	Complexity in representation and also barrier to seamless data sharing between disciplines and administrative sectors
Existence of different data formats, reference frames and also lack of metadata and consistency in data	Lack of interoperability of different datasets
Difference in scale, quality , coverage and format of spatial data as well as the lack of, or poor quality metadata	Difficulty in integrating different datasets
S-57 hydrographic data standards is not at the same level of completeness as ISC/TC 211	Difficulty in the interoperability between marine and terrestrial spatial data creates confusion in the coastal zone
Different technology to capture spatial data in marine and coastal environment	Difficulty in achieving the same level of completeness, currency and reliability as terrestrial data

Policy Issues

The population and development pressures that coastal areas experience generate a number of critical problems and policy issues and raise serious and difficult challenges for coastal planners. In many parts of the world, access to detailed information about the coast is considered a very sensitive issue, primarily due to concerns over national security. These restrictive national security and pricing policy regarding marine and coastal data lead to coastal data being withheld from stakeholders and the general public. Other issues also need to be taken into account, including the need for harmonised data access policies and exploitation rights for spatial information, particularly that collected by public sector agencies across different nations and even within single governments (Bartlett et al. 2004). These issues add to the institutional challenges described above, showing that current management strategies are 'fragmented, complex and poorly understood' (Neely *et al*. 1998).

Many coastal management issues could be overcome if a spatial data platform that enables a holistic, integrated and coordinated approach to spatial information for decision-making existed. SDI provides an enabling platform enhancing decision-making and facilitating a holistic approach to management (Strain *et al*. 2004).

Table 1 outlines the current institutional, policy and technical marine/coastal issues and their consequent effect.

Based on the above table, the institutional issues such as collecting and storing various spatial datasets by different organisations result difficulty in finding and obtaining datasets also existing of different data formats, refrence frames and lack of metadata leads to lack of interoperability of different datasets. Accordingly this complex, fragmented

regulating framework for marine and coastal management causes the inability to adequately handle the pressure of different activities and stakeholders within the coastal zone. Therefore there is a need for a framework to better respond to these issues and their consequent effects.

Seamless SDI

As a result, incorporation of marine and coastal regions within global, national and regional SDIs will bring substantial additional benefits of integration, standardisation and interoperability of technologies, enabling better policy formulation, monitoring and enforcement, often reaching beyond the coastal zone itself (Bartlett *et al*. 2004). A more integrated and holistic approach to management of coastal and marine environments would be facilitated by the extension of the SDI on a seamless platform. This would promote data sharing and communication between organisations thus facilitating better decision-making involving marine and coastal spatial information.

For modelling the coastal zone, there is likely to be one source for the land, another for the sea and potentially other subsidiary datasets straddling both. In these cases there will inevitably be some data interoperability issues. One of the typical problems is differences in scale when trying to join together data captured at different scales. Seaward datasets which are often at smaller scales simplifying the geometry of the features while landward datasets are large scale with much more complexity and greater density of details. This results in a disparity in the feature common to both zones. Another barrier to a seamless SDI is in different projections regarding land and sea data, which creates a problem in defining the parameters required for transformations (Gomm 2004).

Common standards and well documented metadata are essential for data discovery, management and compatibility within a SDI.. In this respect the IHO has an important role to play in developing the appropriate standards needed for its hydrographic and cartographic applications, in close cooperation with appropriate organisations responsible for standardisation, such as ISO. As an example the IHO S-57 standard, although limited in scope and implementation, provides important compatibility for data sharing in the hydrographic information community. The next edition of the standard will not be a standard just for hydrography, but will have manageable flexibility that can accommodate change and facilitate interoperability with other GIS standards. It will also allow hydrographic offices to use other sources of geospatial data. The next edition of S-57 (which will become S-100), is being based on the ISO/TC211 base standard. This will facilitate the development of additional products and services "other than for navigation" requirements. Funding for the development, maintenance and dissemination methods adapted to user needs and new technology of this Infrastructure, is a very crucial issue, which of course will depend on national policies for recovery or not of the necessary funds (Maratos 2007).

A seamless infrastructure was endorsed by the UN as part of the International Workshop on Administering the Marine Environment held in Kuala Lumpur, Malaysia, 2004 (Rajabifard et al. 2005). It was recommended that a marine cadastre act as a management tool within a marine SDI as an extension to NSDI's across Asia-Pacific. Recently, a recommendation of the 17th United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP) in Bangkok further supported the inclusion and development of a marine administration component as part of a seamless SDI to "ensure a continuum across the coastal zone" (UNRCC-AP 2006).

A seamless SDI platform would enable the utilisation of common boundaries across the coastal zone to ensure no ambiguity exists and no areas are unaccounted for over the coastal interface. This infrastructure will become a powerful information resource for managers in fields as varied as fisheries habitat management,

pollution monitoring and control, shoreline erosion, weather forecasting and tourism development, etc. The information that can be derived from such a fully integrated information infrastructure will facilitate improved decision making at all levels.

Future direction and concluding remark

As discussed above there is a growing need to develop the seamless SDI model as one platform instead of two to increase the efficiency and effectiveness of the management and administration of the land, marine and coastal environment. However, the differences in the marine and terrestrial environments in fundamental datasets, data collection and technology used in these environments will make interoperability and integratability between marine and terrestrial spatial data a big challenge.

In order to create a seamless SDI across terrestrial and marine environments and jurisdictions, it is worth accepting that it is a dynamic and complex process at different levels of government and requires research and collaboration with academia and private industry.

Research into the technical and institutional aspects of creating a seamless SDI in Australia is one of the major research priorities of a research project being undertaken in the Department of Geomatics at the University of Melbourne. The aim of this research project is to design an overarching architecture for developing a seamless SDI that allows access to and interoperability of data from marine, coastal and terrestrial environments.

The ultimate aim will be a refined SDI model and implementation guidelines that seamlessly covers both land and sea that can be used by jurisdictions to create an enabling platform for the use and delivery of spatial information and services. This development aims to aid in meeting the sustainable development economic, environmental and social objectives of the region through the development of a seamless enabling platform to provide more efficient and effective decision making capabilities across both the marine environment and the land-sea interface. However the multidisciplinary interactions in the land–sea interface require sophisticated information infrastructures that not only do not yet exist, but which will not appear if disciplines continue to develop their SDIs in isolation from one another.

Acknowledgements

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The Potential of VSOP2

The feasibility of the latest SVLBI program—VSOP2 for geodetic applications is analyzed

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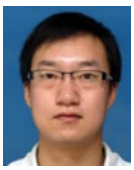

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SVLBI (Space Very Long Baseline Interferometry) is an extension of the ground-based VLBI into the space. It has some important potential applications in geodesy and geodynamics, including the definition, practical realization, and the interconnection of different reference frames, determining the geocentric positions of VLBI stations, estimation of the gravity field of the Earth, and satellite orbit determination using the delay and delay rate observables.

The idea of SVLBI was brought forward by N, S. Kardashev in 1970s. More deeper research had been done in 1970s and 1980s. With the launching of the first SVLBI satellite of the VLBI Space Observatory Programme (VSOP) of Japan, in February 1997, this technique has become a reality. An international team of scientists, working under the auspices of the FÖMI Satellite Geodesy Observatory, Hungary, has designed the Geodesy Demonstration Experiment (GEDEX), for the purpose of exploring the feasibility of the geodetic applications of SVLBI. However, several major problems also exist. It is not suitable for geodetic and geodynamic study, which requires precise tracking capabilities resulting in cm orbit accuracy. But the precision of orbit determination is within 10 meters. It is not suitable to frequently changing observing objects. So it cannot provide observations aiming at more radio sources, which are required for geodetic and geodynamical studies. On the other hand, the satellite stopped transmitting observation data after October 2003 and terminated its work on 02:28UT November 11th 2005.

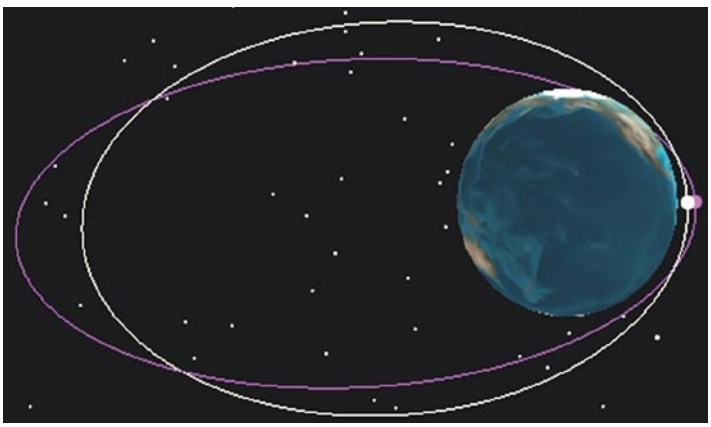

Fig 1 Simulate orbit of VSOP and VSOP2

Introduction of VSOP2

The project

Following the success of the VSOP, a next generation space VLBI mission, currently called VSOP-2, is being planned in Japan with international collaboration for a launch as early as 2012.

Although there are some obvious defects in VSOP, it is more preponderant than ground-based VLBI. For example, it can provide radio observation with a baseline length longer than the diameter of the Earth to increase observation resolution; also, it can provide all-day VLBI imaging; It has the ability of quick-imaging by the fast movement of VSOP surrounding the Earth; Observation of microscale characteristic is provided by the reduction of $\boldsymbol{u} - \boldsymbol{v}$ empty and so on (SHEN Zhiqiang, 1998). VSOP can achieve more difficult researches with these advantages, such as revealing the fine structures of active galactic nuclei (AGNs). VSOP has achieved its preconcerted mission requirement and has obtained some successes after several years, including: the quick-change of radio source in 1 day can be observed by quick-imaging; north-south resolution is increased obviously; increasing the dynamic range of image (WAN Tongshan, 1999). So VSOP has promoted the development of SVLBI.

Based on the successes of VSOP, the science goals for the VSOP-2 mission will place the emphasis on observations in the millimeter wave-band, enabling imaging on the scale of the accretion disk and jet acceleration region surrounding the supermassive black holes in the center of active galactic nuclei, and allow the structure of protostellar magnetospheres to

Table 1 Orbital parameters of VSOP and VSOP2

Orbital parameters \ Satellite	VSOP	VSOP2
Apogee height ha km	21400	25000
Perigee height hp km	560	1000
Orbit period T h	6.3	7.45
Inclinatio i °	46.4 or 31	31
Arg.of perigee ω °	285 315 or alterable	questionably
Eccentricity ε	0.379	0.7
RAAN Ω	alterable	-0.46

be clarified. Because of the improvement of satellite orbit and structure, such as large deployable reflector (LDR), VSOP2 is more efficient than its precursor. These improvements include: ten times higher observing frequency; ten times better resolution; ten times higher sensitivity; astrometric capability and further sensitivity gains from phase referencing; Measurement of magnetic fields through dual polarization observations and so on.

Satellite orbit parameters

As the next generation of VSOP, VSOP2 makes progress in many aspects. According to VSOP-2 Proposal Abridged English Version, the satellite orbit parameters of VSOP2, such as apogee height and perigee height, are appropriately adjusted by studying the influence of high angular resolution and orbit period caused by high apogee height, the influence of atmospheric resistance near perigee and so on. The adjustment makes VSOP2 more suitable for science researches. The comparison of VSOP and VSOP2 parameters is listed in Table 1.

In the following, simulation analyses will be made.

Requirements for Orbit Determination

The simulation of VSOP2 in this paper includes: Orbit Determination (OD) of VSOP2 satellite by GNSS, the tracking status of the satellite and the feasibility of connecting observation between the satellite and the observation stations on the ground. During the stimulation, the orbit period is 447.43 minutes and other parameters are invariable. The orbits of simulant satellites are shown in Fig 1, in which VSOP orbit is yellow and VSOP2 orbit is purple. The simulant time is from 2008 1 1 12:00:00 UTC to 2008 1 2 12:00:00 UTC (almost three orbit periods). Sampling interval is 60 seconds.

Orbit determination accuracy requirements

In the report prepared by the RADIOASTRON Navigation Astrometry and Geodesy (NAG) Working Group about the precise navigation of the SVLBI satellite, the following orbit determination accuracy requirements have been specified (NAG, 1989):

1) Standard Orbit: Required accuracy better than 1000 m for satellite control, orbit prediction, tracking and data communication.
2) Precise Orbit: Required accuracy better than 50m for processing ground-to-space VLBI data, and most astrometric applications.
3) Highly Precise Orbit: Required accuracy better than 1 m for geodetic and some astrometric.
4) Required accuracy better than 0.1m for geodynamic applications.

The accuracy of standard orbit and precise orbit has been achieved with the development of tracking technology. Even the OD accuracy of VSOP can be achieved 3-10 m which satisfies the requirement of above two accuracies. But It is not suitable for geodetic and geodynamic studies because it can't achieve the accuracy of highly precise orbit, better than 1 m, because of its irregular shape, big ratio of area/mass, the limit of the accuracy obtainable using Doppler data only and so on. VSOP2 makes some improvements in its structure. Its higher science goals request higher accuracy of OD. Some studies indicate that OD accuracy can achieve cm level which is suitable for geodetic applications by using GPS and accelerometer (ISAS, 2003).

As reported (ISAS, 2003), the satellite in relatively low Earth orbit can achieve 5 cm level OD with GPS and accelerometer. But there is no signal from GPS near VSOP apogee. Using GALILEO system as a supplement of GPS is a best way to improve OD. Pre-literature has been discussed the coverage instance of SVLBI satellite by GPS and GALILEO system (WEI Erhu, 2006). As some papers (IAIN/GNSS 2006) have studied, it will be possible to use GPS and GALILEO as one system. In this paper, the OD accuracy of VSOP2 by above situation is discussed.

Simulation Study

Simulation Condition

GALILEO constellation in simulation is composed of 27 satellites. They spread equably in 3 orbits whose inclination is 56°. The satellite's altitude is 23062 km and orbit period is 14.0 hs. The ratio of coverage of VSOP2 near apogee, which is advantaged for OD, will be improved because of higher altitude of GALILEO. The parameters of GPS are from NASA website (ftp://cddis.gsfc.nasa.gov/gps/data/daily/2005/). There are 24 satellites in the simulation.

On the other hand, considering the antenna is not globose to receive signal from all directions, and the influence of ionosphere and troposphere, the antenna is designed to point to space. It is designed as a cone with an apex angle of 80° to let the satellite to receive as more signals as possible. The coverage instance of VSOP2 by GPS and GALILEO system and its DOPs (PDOP which will be chose the best 6 satellites to calculate is mainly considered) is analyzed to achieve high accuracy OD. VSOP's Simulant conclusion in the same time is compared.

Results of Simulation

There is not enough number of satellites to calculate the coverage time and PDOP

Table 2 Coverage instance of VSOP and VSOP2 by GPS and GALILEO system

Items / Satellite	Coverage time percentage	Mean PDOP	Max PDOP	Min PDOP
VSOP	61.4903%	4.406	1000	1.573
VSOP2	48.0663%	2.454	22.766	1.61

during the simulation because of the design of the antenna. For example, the coverage near the apogee is too bad for OD. The coverage instance of VSOP and VSOP2 by GPS and GALILEO system is shown in Table 2.

According to the Table above, VSOP2's coverage time by GNSS is shorter than VSOP in the simulation because its apogee height is higher. But during the natural tracking time, VSOP2's mean PDOP is appreciably smaller than VSOP. And VSOP2's PDOP is steadier than VSOP by analyzing their max and min PDOPs. That means the geometric structure of VSOP2 and GNSS system is better. It ascribes to the superiority of VSOP2's orbit design.

As reported (ISAS, 2003), because of the combination of GPS and GALILEO system, the mean square error of OD accuracy can achieve 3 cm, so the actual OD accuracy can achieve 0.073 m by calculating with the mean PDOP—2.454. During the simulation, the time which OD accuracy under 1 m accounts for total time 100%, excluding the epoch which doesn't satisfy the OD requirement. The OD accuracy of VSOP2 and VSOP by GNSS is shown in Fig 2. This conclusion is suitable for geodetic and geodynamic studies.

Improvement

Although PDOP for VSOP2 is better in the simulation, coverage time is an important factor in OD. So if the pointing of GNSS antenna can be set to more directions, the OD accuracy will be better. For example, if another GNSS antenna points to the Earth and its apex angle is also 80°, the percentage of coverage time will increase to 100%. Its mean PDOP is 4.196. But the influence of atmosphere in this kind of situation should be considered. The details are shown in Table 3 and Fig 3

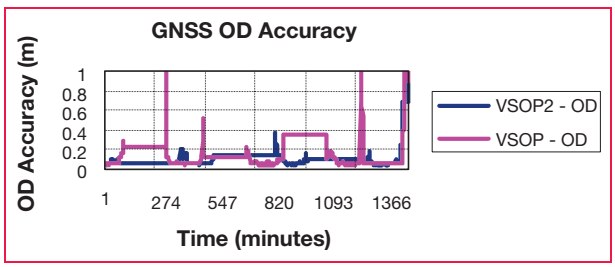

Fig 2 The OD accuracy of VSOP2 and VSOP by GNSS

Table 3 Improved results

SVLBI Satellite	Coverage time	Mean PDOP	OD accuracy	OD accuracy under 1 m
VSOP2	100%	4.196	0.126	100%

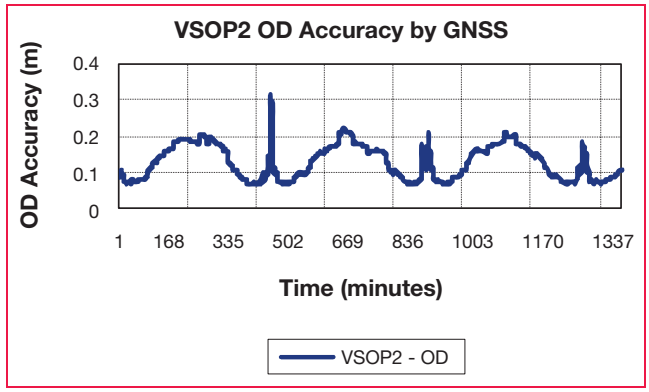

Fig 3 VSOP2 OD Accuracy by GNSS

The simulation above shows that VSOP2's OD accuracy is suitable for geodetic applications by using GNSS system.

Coverage of the tracking network

Tracking station

The ground tracking station is to receive and record observation data from satellite, to measure the position, movement velocity and orbit parameters of the satellite. And it is an important factor to guarantee the successful observation, so it is necessary to establish tracking stations and use advisable technique to complete these tasks. Mainly, VSOP2 system use K waveband to track and observe the satellite.

There is no material about the tracking stations for VSOP2, so tracking stations for VSOP will be used in the simulation, which are Usuda in Japan (10 m caliber), Green Bank in USA (14 m caliber) and other three DSN (Deep Space Network) stations of NASA (Goldstone in USA, Tidbinbilla in Australia and Madrid in Spain, all 11 m caliver).

Results and analyses

The simulation gives the dynamic and real-time coverage result of satellite and shows the report of coverage time. According to the simulate results, the total coverage time of VSOP2 satellite by tracking stations is 151875.737 seconds. The shortest coverage time is 2944.578 seconds in Usuda and the longest one is 22135.337 seconds in Green Bank. The percentage of coverage time of each tracking station is shown in Fig4. These results are improved by comparing with VSOP (VSOP's coverage instance in the same time is shown in Fig 5.The total coverage time is 130764.923 seconds). These improvements are attributed to the new design of satellite structure and orbit.

According to Fig 3 and Fig.4, the coverage

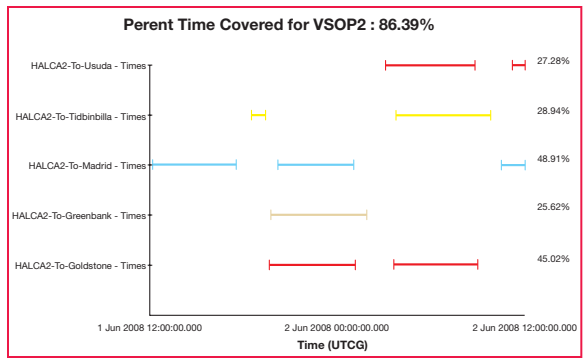

Fig 4 The coverage instance of VSOP2 by tracking station

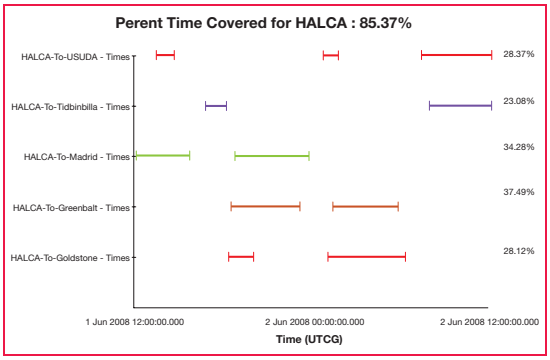

Fig 5 The coverage instance of VSOP by tracking station

percentage of VSOP and VSOP2 by tracking network is respectively 85.37% and 86.39%, excluding the overlapped parts of coverage. For VSOP2, the coverage time of satellite by tracking station can be improved obviously from the example of Tidbinbilla and Madrid. But the coverage time of some stations, such as Green Bank, is shorter than VSOP. VSOP2 is designed to observe radio source in the south sky, so the coverage time of high latitude station is shorter.

If more tracking stations all over the world are added, the situation will be improved. In a word, the ability of coverage time of VSOP2 by tracking station is improved.

The baseline formed by observation station and VSOP2 satellite

Simulation condition

The formula of radio telescope angular resolution is

$$\theta'' = \lambda / \boldsymbol{D}.\rho'' \qquad (1)$$

in which θ is angular resolution, λ is the wavelength of radio wave received by telescope, ***D*** is the length of baseline.

According to the formula (1), the length of baseline is a crucial factor to influence SVLBI angular resolution when the wavelength of radio source is invariable. High angular resolution caused by long baseline will be useful for geodetic applications.

Table 4 The observing time and proportion of different number of baseline

Item Number of baseline	Observing time (seconds)	proportion
1	27000	31.25%
2	19920	23.06%
3	14760	17.08%
4	5771	6.68%

Although the length of SVLBI baseline of VSOP2 is extended, actual baseline formed by observation station and VSOP2 satellite is the guarantee of interferometry. To consider its applications in China, several Chinese radio telescopes will be selected in the simulation. There is a radio source in the simulation too. The observing time and the number of baselines formed by observation station and VSOP2 satellite will be analyzed.

The selected radio telescopes are located in Beijing, Shanghai, Kunming, Urumqi and Guizhou. The diameter of telescope in Beijing Shanghai and

Fig 6 The illustration of VSOP2's longest baseline

Urumqi is 25 m, in Kunming is 40 m and in Guizhou is 500 m. The latter two are being established now. The selected radio source's code is HR-7745, its right ascension is 20h18m56s and declination is -47°42´39″, located in the south sky.

Results and analyses

Observing time is the guarantee of baseline observation. In the simulation, the observing time of HR-7745 by VSOP2 satellite is 79501.476 seconds, accounts for 92.02% of the simulation time. The observing time and proportion of each telescope is: Beijing, 11148.078 seconds,12.90% Shanghai, 23077.354 seconds, 26.71% Guizhou, 27132.087 seconds, 31.42% Kunming, 28297.055 seconds, 32.75% Urumqi, 0 seconds, 0%. The observing time of radio telescopes in China is decreased by the increasing latitude and longitude. Especially for Urumqi radio telescope, it can't undertake the mission of tacking radio source in south sky.

According to the observing time, there are the most 4 baselines can be formed from 1 Jun 2008 18:18:27.371 to1 Jun 2008 19:55:06.457. The observing time is 5771 seconds and accounts for

6.68% of the simulation time. The observing time and proportion of different number of baselines is listed in Table 4.

Table 5 The simulate results of VSOP

SVLBI Satellite	Observing time	Proportion	4 baselines	
			Time	Proportion
VSOP	74918.6s	86.7%	1090s	1.2%

According to the results above, three observation stations' observing time which can form baselines with the satellite is more than an orbit period in the simulation, excluding radio telescopes in Beijing and Urumqi. The observing time is long enough for observation. In the simulation, Kunming and Guizhou can form baseline with VSOP2 satellite when it is in the apogee (it is shown in Fig 6 in which VSOP2 and HR-7745 are both projection of Sub-satellite point). So the length of baseline can be longer than 31000 km. The angular resolution can achieve 0.086 seconds by calculating with a radio wave length of 13 cm. The conclusion is considerable.

The simulant results of VSOP in the same time are listed in Table 5. According to the results, the VSOP2's ability of observing radio sources in the south sky is improved.

In the simulation, only radio telescopes in China are considered. The observing results will be better if there are more radio telescopes all over the world. According to the observing time of simulant radio source, the observing ability of radio source in the south sky is one designing purpose of VSOP2. The observation of radio sources in this area is a weakness of Chinese radio telescopes. The use of VSOP2 is hopeful to improve it.

Conclusion

According to the three simulations above, an elementary conclusion can be made that the ability of VSOP2 in the applications of geodetic research has been improved obviously. First, the average accuracy of OD is less than 0.5 m by GNSS system. It is achieved the requirement of applications for geodetic studies. Second, the proportion of tracking time of satellite by observation station is over 85%. It ensures the transmission of observing data and controling command. Finally, the observing ability of radio sources in the south sky is improved.

It is just considered the improvement of VSOP2's orbit design in this paper. The improvement of satellite structure is ignored. Considering the scarcity of data and information, we believe that more successful results can be achieved in further studying.

Acknowledgement

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e-Governance

Decision-making has to become more transparent and accountable. Geo-Information technology can play an effective role

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E-GOVERNANCE means governance using electronic tools whereby the government offers services and information to the public. It is not just having computers in offices or creating websites, but it involves the creation of systems; integrating technology with administrative processes; human resources and dispensing information and services faster to the citizens. e-Governance offers a number of advantages for the government as well as the public. It shifts the centre of power from human agencies to technology, which is easier to deal with. For example, if a citizen wants some information on building codes, he/she has to go to the office of the local authority to get it, often shuttling from one table to another. If such information is made available on websites, it makes things easier for the citizens as well as the authorities.

The objectives of e-governance are:

For the public:
- Faster, better services
- Easy access to information (rules, regulations, etc.)
- Reduces hassles and need to travel
- Diminishes the chances of corruption and bureaucratic delays
- Saves time and money

For the government:
- Cuts down the cost
- Limits the requirement of human resources in administration
- Reduces inefficiencies
- Increases productivity
- Places responsibility on officials

With emerging technologies aiding transparency, governments can not remain insulated for long from the public. Decision-making has to become more transparent and accountable. Unfortunately, the use of information technology in government has meant a mere shift from a manual system to a computerised one. Without existing procedures being overhauled so that they can deliver superior service to citizens, such a change is pointless.

Significant areas of change

In future, the prosperity of cities will most likely be measured in terms of PCs per household and bandwidth per capita. India needs to develop its telecommunications infrastructure rapidly, so that it can provide connectivity at affordable rates to large sections of its people. Fortunately, it is easier, and cheaper, to extend telecommunication networks to rural areas than it is to build road communications.

IT revolution is witnessing several radical changes in the way we live, work and communicate. With light speed communications and opening up of the floodgates of information, the modes of education, commercial transactions, production and industry are fast changing. The borders of urban-rural, nation-states are vanishing. This is the time planners think over the consequential and desirable changes in the city planning process and seize the opportunity to make the cities more prosperous, livable, efficient, participatory, healthy and intelligent. The effect of IT on Indian cities is not confined to development of IT parks or Hi-tech zones, but on all the aspects of planning process. Taking a comprehensive view, the emergence of IT sector would make the following changes in the planning system inevitable:

i) Spatial Pattern
- The globalization of cities
- Vanishing concepts of

urban-rural divide
- Tech-citta layer on physical structures
- Cyberspace

ii) City Economy & Employment

Tertiary sector as the economic frontier
- Changing patterns of production, business and work
- Information production
- From local to global markets
- Development of IT Parks / SEZ etc.

iii) Infrastructure Services
- Dynamic networks
- IT infrastructure
- Intelligent cities, services, transport and buildings
- Self-sufficient, self-contained settlements

iv) Land Information & Management
- GIS, geo-computing and geo-positioning system of land management information, records, registration, transfer, litigation, land use, services, development etc.
- Assets management

v) Land Use
- Flexible zoning and development controls
- Land Use – Services – Transport Synthesis
- Implementation, Enforcement, Monitoring

vi) Transport & Communications
- Light speed communications, new automation systems, telecommunity, superhighways etc..
- IT enabled Transport Services
- Dynamic networks and Floating nodes

vii) Environment
- Pollution Information, Monitoring and Control
- Eco-technology and Bio-architecture and Circulate Metabolism
- Intelligent Services & Transport
- Non-conventional sources & Energy Efficiency / audit

viii) Governance & Urban Management
- Managing Time-Space relationship
- Knowledge Platform and Distant Learning
- Participatory mode of local planning through Virtual townhall meetings, video-conferences, MIS, interactive web site etc.
- Capacity Building, Empowerment of the Civil Society

The concept of urban planning needs to be reviewed. Planning at District/ Taluk and regional level becomes more pertinent than at the settlement level. The phenomenon of high quality development of smaller towns (like NOIDA, Gurgaon etc.) catering to multinationals and hi-tech sector is already discernible. The planners have to explore the potential of growth of smaller towns, linked with high standards of transport and communication networks. The definition of urban-rural needs to be reviewed and the concepts like polynodal, polycentric pattern need t o be reassessed. The planners have to be hi-tech with deeper perceptions of cyber city and space.

e-Governance has been successfully implemented in certain States and is in the process of implementation in other states.

SARITA in Maharashtra

The Government of Maharashtra has computerized its property registration system, speeding up the registration process and making it easier and reliable for the public. SARITA (Stamps & Registration Department IT Application) is the stamp and registration software used by the registration department of Maharashtra for the registration of 67 types of documents, property registration as well as those of other deed mandated by the government. The documents are registered and delivered in less than 30 minutes. SARITA is an error-free registration with online monitoring and document encryption with the photographs and thumb impressions of sellers, buyers and consenters.

Bhoomi Project in Karnataka

The Bhoomi Project of Karnataka is one of the success stories of e-governance. Under the Bhoomi Project, 17 million land records have been computerized. Bhoomi kiosks have been set up in various areas in Karnataka and farmers can get printouts of their land records and revenue survey maps for Rs. 15 per copy at these kiosks. The government has recovered most of the cost of this project by selling these records.

Bhoomi is a project of computerizing land information, which was started in the year 1999, with data entry of backlog information. The project covered all taluks by 2002 and manual system of issuing Record of Rights was stopped, benefiting 70 lakh farmers. Approximately 200 lakh documents were computerized under this project. The records are updated 3 times a year. An extension of Bhoomi project called 'NEMMADI' was introduced in 2006, with Telecentres at sub-taluka level. 230 such centres are already working. These telecentres provide 30 services alongwith Land Records like Death and Birth certificate, Domicile certificate, Renewal of licenses, Collection of taxes etc. This project is totally outsourced.

The Computerisation of Department of Stamps and Registration – KAVERI (Karnataka Valuation and E-registration) project, started in 2003, covers all the activities of Registration department. The Registration process is completely automated which includes taking digital photos of Seller, Buyer & witnesses and also thumb impressions at the time of Registration & storing in electronic media. At present it is working in all 203 Sub-Registrar's offices in Karnataka. The Kaveri and Bhoomi integration is achieved by electronically connected system. The sub-registrar's office generates XML file and sends it to Taluk Bhoomi centre. By using Internet the 'J' slip information is electronically generated which is sent to State Data Centre first and from there through dedicated Satellite lines. The taluk office processes Registration transactions through automated process. All the 203 Sub-Registrar's offices and 203 Bhoomi centres are interlinked through State Data Centres for online data transmission.

e-Governance in Andhra Pradesh

e-Governance in Andhra Pradesh is an excellent example how the cities can incorporate information technology in the day-to-day functioning of the

government, and re-engineer the manner in which services are provided to common citizens. Under its 'one-stop non-stop' approach, a pilot project called TWINS (Cities Integrated Network Services) integrated 18 services of six departments over one counter. It provides fast and easy access to government services, makes the government appear much simpler, and also cuts down on corruption.

The government is able to keep database of citizens, which helps in better targeting of welfare programmes and minimise misuse of funds; Virtual town hall meetings allow citizens to watch the proceedings of municipal meetings, and also enable them to participate in decision-making, which otherwise is not subject to public debate. This participation in the form of interactive sessions, panels and discussion groups, planning consultations, chat lines, and electronic online voting is becoming commonplace. Expanding cable television networks have made it possible to deliver the electronic information into the homes of the people.

The Government of Andhra Pradesh has come up with citizen utility centres called e-Sewa Centres, which are one-stop shops for various services such as payment of electricity, water and phone bills, property tax, sales tax and getting birth and death certificates. More than 20 centres are operating in Hyderabad. These centres are being opened in other parts of the State.

HARIS in Haryana

The HARIS (Haryana Registration Information System) provides a facilitates the registration of property documents. It functions very much like the SARITA of Maharashtra. The experience shows that e-Governance has improved public service, which has huge potential of its applications.

Land Management Information System of the DDA

The LMIS project was started in 2001 to computerize the village wise land inventory of the Delhi Development Authority (DDA). The objective of this project is to have accurate and readily available information in respect of DDA lands and its utilisation. The information used for this project is based on the records of DDA and the records of L&B Deptt., and Divisional Commissioners, GNCTD,

S.No.	Activities	Status (2007)
1.	Villages where DDA has acquired land or acquisition under process	238 villages (227 + 11)
2.	a) Data entry of land records of acquired/ under acquisition village	238 villages (227 + 11)
	b) Preparation of land inventory of Nazul Villages	3
	c) Cross checking of inventory prepared	227
3.	Scanning of maps (massive / sajras) of acquired or under acquisition villages: Good Bad / tattered Not available	
4.	Digitisation of maps a) Villages in which acquisition took Place b) Villages under acquisition process	 187 8
5.	Validation of maps	176
6.	Integration of land records with digitized maps	161

The experience of the LMIS project indicates the following major problems:

- Incomplete Land Record Registers.
- Non-availability of old records such as Notifications under Section-4 and 6, Awards, Possession proceedings etc..
- A number of shazra land maps / records (massive) are either in tattered condition or not available.

In such cases, the digitization of villages is done on the basis of field books and sajras available with the revenue authorities. The LMIS attempts to depict a coordinated and layered set of land information relating to status of acquisition / ownership, land use, compensation paid / due, utilisation, transfer, court cases, its development / services, encroachments, and other relevant information. This will provide a clear picture of all lands on the computers.

The way forward

A lot needs to be done to offer better governance. The adoption of e-governance by local authorities can simplify things and improve government. Local bodies need to dispense unclassified information, which is useful to the public, through their websites. This will not only save the time and resources of the local bodies, but also make the task easier for the public.

- Information on building codes and development plans can be put on web-sites. Such information is already available to the public some cities in India and abroad.
- New projects and layout plans etc. approved by local bodies can be put into a website, so that people can access the information and avoid buying properties in certain unapproved projects.
- Information like a cut in water supply and power can be announced on the sites itself.
- All the applications / forms for services offered by local authorities can be made available online.
- Committee reports and enquiry reports, which are not confidential, should also be placed on websites for public view.
- Payment of property tax and other bills needs to be made online to make it easier for the public.
- Customer service cells can be created at the local level. These can look after the complaints and suggestions registered online as well as cover the phone. There should be a strong backup system to take action against these complaints and send the feedback to the person who has filed the complaint.

When technology crosses limits!

GPS is overly intrusive

THOUSANDS of cabbies in New York went on strike for two days last month to protest a city rule requiring that all 13,000 cabs get the equipment by year's end, and among their gripes was that the technology was faulty.

But the new features worked properly 99.21% of the time during a series of checks by the Taxi and Limousine Commission staff last month, the agency said. The lowest individual grade was 96%, according to the TLC.

"The monitoring process we have in place will ensure that the Taxicab Passenger Enhancement Program does everything it was designed to do and that taxi riders get to enjoy the most that these amazing systems have to offer," TLC Commissioner Matthew Daus said. Installations are taking place in waves, and the TLC scrutinized the equipment in more than 2,300 cabs last month.

The Taxi Workers Alliance, the group that called the two-day strike last month, has blasted the Global Positioning System as overly intrusive tracking by Big Brother. And they cited technological problems, including credit-card transactions not going through, that have resulted in drivers not getting paid. Taxi Workers Alliance head Bhairavi Desai called the TLC statistics "nonsense," saying the agency did not seek input from drivers who use the systems for up to 12 hours a day. Instead, she said, the vast majority of inspections were simply brief checks of the equipment, a less accurate assessment. "It's just a whitewash," Desai said.

The drivers' group has called another strike for Oct. 22 and is urging members to park their cabs and attend a noon rally outside TLC headquarters. *www.nydailynews.com*

Google map may break Canada privacy law

The Street View feature of Google Maps, with its close-up views of city streets and recognizable shots of people, could violate a Canadian law protecting individual privacy, officials said recently.

Google Inc introduced street-level map views in May, giving web users a series of panoramic, 360-degree images of nine U.S. cities. Some of the random pictures feature people in informal poses who can clearly be identified. The images for Canada were produced in partnership with a Canadian firm Immersive Media Corp, which says it has taken similar street level pictures of major Canadian cities. Canadian law obliges businesses wishing to disclose personal information about individuals to first obtain their consent

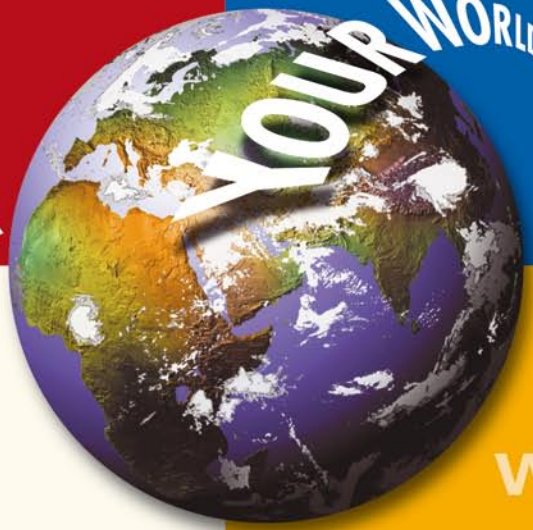
Canada's Privacy Commissioner Jennifer Stoddart wrote to Google in early August asking for more details. She said if the Street View product were expanded to Canada without being amended; it could well violate privacy laws. Stoddart said pictures of people on Street View were clear enough to be considered personal information. Stoddart sent a similar letter to Immersive Media and the documents were posted on her website, www.privcom.gc.ca

No one from either company was immediately available for comment and Stoddart did not give either firm a deadline for a reply. If Google launched Street View in Canada without taking privacy laws into account, Stoddart could launch an official investigation, said her spokesman Colin McKay.

"We thought we'd get out in advance of any implementation and ask them how they were going to take into account Canadian privacy rights," he said.

"From our point of view, if you spot yourself and you perceive that as a violation of your privacy rights, then the act has already been violated," added McKay. *http://investing.reuters.co.uk*

TAKE A CLOSER LOOK AT OUR WORLD



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GAORFID Inc. announces LocateWare software

GAORFID Inc., Canada announces LocateWare, an RFID middleware that reports real-time location of people, animals and things. It enables tracking, locating and identification for a wide range of businesses. *www.gaorfid.com*

Nokia to acquire NAVTEQ

Nokia to acquire NAVTEQ. Nokia will pay $78 in cash for each share of NAVTEQ including outstanding options for an aggregate purchase price of approximately $8.1 billion. The acquisition has been approved by the board of directors of each company and is subject to customary closing conditions including regulatory approvals and NAVTEQ shareholders' approval. *www.nokia.com*

HP Launches New iPAQ PDA Phones

HP has launched new range of iPAQ devices, including two new PDA phones called iPAQ 610 and iPAQ 910. Both new iPAQ devices include A-GPS functionality, the 610 is marketed as the 'Business Navigator,' and includes an interesting touch-sensitive scroll wheel integrated into the numeric keypad. *www.mobileburn.com*

NAVTEQ Traffic RDS service in Mercedes

NAVTEQ Corporation announced with Mercedes-Benz USA (MBUSA) the availability of Traffic RDS (Radio Data System) with navigation as a standard, lifetime traffic service in all 2008 Mercedes-Benz S-Class and CL-Class automobiles.

IT firms provide GPS solutions to radio taxis

ORG Informatics has launched an end-to-end vehicle tracking solution for radio taxis. The radio taxi business is touted to grow to 50,000 taxis across India (in the top seven-eight cities) by 2010. The larger radio taxi service companies in India include Orix, Hertz, Easy Cab, Route and V-link. MapMyIndia.com also has launched a GPS device at Rs 21,000 which provides step by step route to a driver. *http://economictimes.indiatimes.com*

Telmap, Boost Mobile partners for navigation application

Telmap Inc. mobile navigation technology has been selected to power the new Boost Navigator application by Boost Mobile, a wholly-owned subsidiary of Sprint Nextel. It is customized to incorporate the Boost brand look and feel as well as to provide menu options catering to younger target customers. The application will be deployed on iDEN and CDMA handsets. *http://global.telmap.com*

PNDs becoming "must-have" for motorists

According to iSuppli's forecasts of worldwide PND shipments and revenue for the period of 2006 to 2013 it is estimated that 40 companies now are offering GPS navigation capabilities on a range of products, from PNDs and embedded systems, to smart phones. Shipments of GPS-enabled mobile handsets are expected to reach 250 million units by 2010, up from more than 70 million units in 2006. It would also present a significant revenue opportunity for the rest of the navigation value chain, from map-supply and memory to LBS. A key market driver shall be Enhanced 911 (E911) in the USA, which is a feature that automatically associates a physical address to a mobile number. Other market drivers will include the growth in LBS and mapping applications for mobile devices from a range of third-party suppliers and Internet search companies such as Yahoo and Google.

GfK raised forecast for navigation systems sales in Western Europe

According to GfK sales of navigation systems in Western Europe will amount to 13.9 million units in 2007. "The navigation market segment, which has the backing of an improved and generally attractive price/feature ratio, achieved growth of 46% in terms of value" for the first half of the year compared to the same period last year. *www.gfk.com*

IDC expects PND market to grow 93% in 2007

According to a new report published by IDC (Navigation Devices: Finding Your Way), Portable navigation devices (PNDs) remain the most popular segment of the consumer navigation market, representing 62% of the total worldwide market and nearly doubling in size with 93% growth over last year. IDC expects the entire consumer navigation market to grow by 53% worldwide in 2007. *www.idc.com*

Handset navigation users to reach 43mln in 2012

According to Berg Insight the number of mobile subscribers accessing maps and downloading routes is expected to grow from 4 million users in 2007 at a compound annual growth rate (CAGR) of 60.8 percent to reach 43 million users in 2012. *www.prnewswire.co.uk*

Nokia Maps downloaded over 1 million times

Michael Halbherr, head of the location-based experience team at Nokia shared insights about the state of navigation and plans for Nokia Maps. The Nokia Maps mobile application and the Nokia Map Loader for PC's have each been downloaded over 1 million times since Feb 2007. Nokia Maps has been activated by 100% of N95 users. 68% have tried Nokia Maps at least 14 times. 95% have established a GPS fix. 94% have generated packet data with maps. 44% use it for real use like navigation, etc. *www.nokia.com*

Multiple benefits from LIDAR and ortho imagery

Forestal Arauco S.A., a leading forest products companies in South America is using LIDAR and imagery and realizing significant benefits to their operations. It has contracted Digimapas Chile to acquire, process and map 7,500,000 hectares of aerial LIDAR and ortho photo data of forested areas in Chile. On a weekly basis, Digimapas is delivering DTM, DSM; LIDAR intensity images; true ortho images in RGB and CIR; and LIDAR wave form data. It is being used for updating general forest inventory.

First UAE research satellite being built

Dubaisat-1, the UAE's first research satellite, is expected to be used for civilian purposes and contribute to scientific research for local, regional and international entities. Accoridng to officials at Emirates Institute for Advanced Science and Technology [EIAST], the satellite could be used for commercial purposes in the future, adding that more information about the services it will offer will be made at a later stage. "Dubaisat-1 will also help manage natural disasters and promote research and development, space science and other scientific disciplines The satellite project consists of three phases over a three-year period.

GeoEye insures its GeoEye-1 satellite

GeoEye has secured approximately USD 270m of launch and first-year on-orbit insurance for GeoEye-1. The launch is slated for late first quarter or early second quarter of 2008. *http://geoeye.mediaroom.com*

DM Solutions and DigitalGlobe partners

DM Solutions Group will resell DigitalGlobe data and web services through a partnership agreement. It will be sold to DMSG's existing customers and users of MapServer, MapGuide, and OpenLayers technologies. *www.dmsolutions.ca*

DigitalGlobe successfully launches Worldview-1

DigitalGlobe announced the successful launch and deployment of WorldView-1 satellite. It also marks 75 consecutive successful launches of a Delta II rocket and the second successful commercial launch for Boeing Launch Services in 2007. *http://media.digitalglobe.com, http://www.boeing.com*

PCI Geomatics to support THEOS satellite

PCI Geomatics, announced that it will support image products from the THEOS satellite (Thailand Earth Observation System), to be launched in November 2007. It will develop support for data import, precision orthorectification models, image mosaics, and advanced data fusion techniques such as panchromatic sharpening.

Leica TPS1200+ Total Station

Leica Geosystems introduces TPS1200+, its most competitive total station ever. It provides the market's most accurate reflectorless EDM with the smallest laser dot and measures distances over 1000 meters. It has also launched Leica GNSS Spider V3.0, which provides the full range of GNSS Network RTK services including GPS & GLONASS.

New Eclipse™ Dual-Frequency GPS Receiver

Hemisphere GPS has announced Eclipse dual-frequency GPS receiver technology. It incorporates techniques for reducing code measurement noise and mitigating multipath signals, with centimeter-level accuracy. It allows OEM customers to integrate into a wide variety of precise applications including navigation and GPS machine control. *micro.newswire.ca/release.cgi*

Altus, Veripos pick Septentrio AsteRx2 Receivers

Septentrio shall deliver its dual-frequency GPS/GLONASS OEM receiver module AsteRx2 as a core component of Altus Positioning Systems' new survey product, APS-3. It is a fully integrated, compact, lightweight and high-precision GNSS survey receiver. *www.septentrio.com*

GE introduces fleet management technologies

GE Equipment Services introduced VeriWise™ RAIL and VeriWise™ INTERMODAL, remote asset management solutions that provide customers with on-demand visibility into the status of their fleet and the cargo it carries. *www.genewscenter.com*

Navteq launches Arabic PDA

Navteq has launched its first Arabic-language PDA and mapping software. It has developed the Gulf Way PDA in conjunction with partner Maction Mobile Technologies. The Gulf Way features full English and Arabic-language functionality and GCC mapping software. *www.arabianbusiness.com*

TomTom reveals GO 920 T

TomTom reveals GO 920 T. It comes preinstalled with complete maps of Europe and USA & Canada on the 4 GB of internal memory. It includes the new Enhanced Positioning Technology and an RDS-TMC Traffic Receiver to receive up-to-date traffic information. *www.tomtom.com*

Infotech gets Survey of India contract

Infotech Enterprise Ltd (IEL) has bagged a contract from Survey of India for mapping the cities of Ahmedabad and Chennai.

IEL will be employing softcopy photogrammetry technology to extract features in 3-D image. The project will be completed in four months. *http://economictimes.indiatimes.com*

Trimble GNSS receiver module

Trimble has introduced the Trimble BD960, RTK compact GNSS card for high-precision guidance and control applications. The receiver is designed to allow OEMs and system integrators to easily add centimeter-level positioning to specialized or custom hardware solutions. *www.trimble.com.*

Optech upgrades ALTM-NAV

Optech announced a major upgrade to ALTM-NAV integrated mission planning, navigation, and operations software through the incorporation of underlying digital elevation models (DEM). Users will be able to plan airborne missions more effectively and efficiently using ancillary DEM information from a variety of sources. *www.optech.ca*

NGA awards Intermap additional USD 1.3 million contract

National Geospatial-Intelligence Agency (NGA) has awarded Intermap Federal Services Inc. subsidiary a USD 1.3 million contract to provide imagery and elevation data from Intermap's comprehensive NEXTMap USA geospatial dataset. The licensed data includes the gulf coast areas of Alabama, Arkansas, Florida, Louisiana, and Mississippi. *www.intermap.com*

Magellan® MobileMapper® CX GIS Data Collector

Magellan, has introduced the MobileMapper CX, a handheld sub-meter real-time GPS receiver for GIS users that comes with application software, a phone-like keypad and outstanding communications. The software has key GIS data logging capabilities include GIS feature libraries for logging feature descriptions; support for logging point, line and area features; an offset function for logging hard to reach features; and more.

Pitney Bowes creates single software Business Unit

Pitney Bowes Inc. announced that it's Pitney Bowes Group 1 Software and Pitney Bowes MapInfo business units, acquired separately, will combine into a single software company called Pitney Bowes Software. The move is effective immediately. Mike Hickey, currently president of Pitney Bowes MapInfo, will become president of the combined entity Pitney Bowes Software. *http://news.pb.com*

BarZ and u-blox introduce multimedia GPS tour guide

BarZ Adventures, has announced their cooperation in bringing GPS-based tour guides to a number of U.S. National Parks and Zoos. It introduced the GPS and Zoo Ranger, a handheld device which delivers multimedia content based on the user's current location. It uses u-blox' SuperSense® Indoor GPS technology.

DVP-GS version 6.4 release

Groupe ALTA has released Version 6.4 of its professional photogrammetry software DVP-GS. Key features in this update include enhanced Vector editing tools like: Move multiple vertices (including shared vertices between 2 or more elements) and element smoothing and better management of vector reference files. *www.groupealta.com*

Spirent® announces enhanced global support for satellite test products

Spirent announced improvements to customer support capabilities across the world. In Asia, Spirent has added dedicated support facility for its GNSS test systems, in Beijing, P. R. China enhancing Spirent's existing support offices in USA and Europe. The new support facility provides technical support for customers across Asia as well as a local calibration and repair services. A dedicated suite of test equipment has been commissioned in Fort Worth, Texas similar to the Verification Office facilities recently announced by Spirent for in the UK.

NovAtel Inc. Launches OEMV(TM) Product Line Enhancements

NovAtel Inc. recently launched the latest enhancements to its OEMV product line, including Version 3.210 firmware release and the new SMART-V1G enclosure. The latest firmware features many performance enhancements, including the addition of GLONASS measurement and position capability into NovAtel's single frequency AdVance(TM) Real Time Kinematic (RTK) product models.

Rockwell Collins unveils GPS receiver for the commercial market

Rockwell Collins has introduced the Polaris family of Standard Positioning Service (SPS) GPS receivers. It offers the same functionality featured in its popular Defense Advanced GPS Receiver (DAGR) and Miniature Precision Lightweight GPS Receiver Engine (MPE), but without the Selective Availability Anti-Spoofing Module (SAASM). *www.rockwellcollins.com*

Applanix unveils new GNSS software

Applanix has introduced new version of GNSS-Aided Inertial post-processing software for airborne mapping and surveying applications–the POSPac™ Air 5.0 software. It includes module for using GNSS network corrections to increase accuracy.

MobileMapper CE Makes Dangerous Work Safer

Wildfires have become a serious problem in Extremadura, a 41,600 sq km area in Spain. Wildfire fighters are equipped with the MobileMapper CEs to pinpoint their location and view topographic maps and aerial photos that display detailed information about their surroundings, including the location of nearby roads, where they lead, contour changes, locations of water points and the amount of water available in each.

GPS-enabled mobile gaming gets out of the lab in Germany

Students from the University of Bonn, with the game publisher Ravensburger Spiele and T-Mobile have invented *Scotland Yard – to go!*, a wireless version. The players are equipped with a Ultra Mobile PC including a GPRS connectivity and a GPS receiver. The GPS-enabled device provides the current location of the different players which is fed to a webserver. *www.gpsbusinessnews.com*

BKV tests GPS as public transport gridlock remedy

The Budapest Transport Company (BKV), Hungary is testing the use of GPS for traffic monitoring. The system had already been installed on one bus line, which carries passengers traversing many important traffic junctions that are particularly prone to gridlock. The system will also include traffic light monitoring. *www.tmcnet.com*

City council backs public safety GPS tracking system in Poland

The City Council of Bydgoszcz in Poland has added Fleet Vehicles Navigation module based on distributed real-time GPS data. Vehicles are equipped with GPS/GSM unit and a client-server system passes GPS position data from the vehicles to the Command Center. Vehicle also alarm status and text messages can be sent between in order to control and supervise the operation. Moreover, areas on the GIS map can be defined as alarm zones and if a vehicle enters such an area, an alarm will be generated and followed on the map and all positions are recorded. *www.sat-gis.utp.edu.pl*

GPS to help reduce Mumbai traffic woes

Infrared and GPS may soon be the answer to the traffic woes on the streets of Mumbai, India. IT company Mastek has been commissioned to evolve a toll system based on infrared and GPS that would make it mandatory for motorists to pay a premium for using the roads during busy hours. *http://inhome.rediff.com*

Need to redirect China's GPS market

According to CCID Consulting report, there are over 1,000 GPS operators in China with over 1 million vehicles currently in the network. Currently, GPS operators in China mainly include GPS terminal makers which integrate the development, production, sales and operations of terminal products and system software into one body; software developers, who mainly develop system software, also engage in operations, while third parties operate independently. China's GPS operation market is still at an opening stage and operators have yet to gain a mature understanding about automobile and personal services. Being new in the industry, GPS operations result to unsatisfactory quality of automobile and personal services provided. However, what cannot be ignored is that inadequate work on GPS hardware and software is also an important reason for the staggering quality of GPS operation service in China.

GPS navigation services with high precision and high stability require high quality GPS terminals, however, GPS terminals in China remain at an assembly stage. Manufacturers rarely produce their own technologies, in return, they are not able to control product quality or able to introduce new functions.

Currently, domestic GPS operators mainly offer assisted navigation and automobile safety protection. Much-demanded driving guides, vacant parking slot indication services based on dynamic road conditions, vehicle speed and route restriction information have yet to be introduced. Also, poor service quality and basic service content have caused a passive situation for operators in which users already join in the network are leaving, while new users can hardly be attracted to join. *www.eetasia.com*

Lockheed Martin to add GPS demonstration signal to GPS IIR-M

A Lockheed Martin-led team has begun production activities to reconfigure a modernized GPS Block IIR (GPS IIR-M) satellite to include a new demonstration payload that will temporarily transmit a third civil signal following a successful review with the Air Force. Lockheed and its navigation payload supplier ITT are on-schedule to develop and integrate a payload that will provide an on-orbit demonstration capability for the new civil signal. *www.lockheedmartin.com*

India's regional Sat Nav on track

According to G. Madhavan Nair, secretary of the Department of Space and chair of Indian Space Research Organization (ISRO), the ISRO was nearly ready to build a prototype satellite for the navigation system. The satellites' design is more or less complete, he said. He suggested that the first launch should take place in 2010, with all seven satellites in orbit and functioning by 2012. *http//:sidt.gpsworld.com*

Leica Geosystems to offer a compliance path to all GNSS systems!

By the end of this decade, four independent GNSS will be operational - GPS GLONASS, Galileo and the Chinese Compass system. China and Europe have begun their deployments with the launch of test satellites. With Leica System 1200, all GNSS sensors can be upgraded to support all four constellations to offer additional benefits in performance and survey efficiency. Although system providers have not fully defined what signal restrictions they will apply, Leica can offer a compliance upgrade path to all four systems which is based on publicly available system definition.

Bush accepts Pentagon position on GPS

President Bush accepted the Pentagon's decision to stop buying GPS satellites that can intentionally degrade the accuracy of civil signals used for a myriad of purposes. The move coincides with the Air Force's solicitation to purchase the next generation of GPS satellites known as GPS III. *http://ap.google.com*

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Galileo update

EC issues Galileo restructuring plan

The European Commission has proposed changes in running and funding the Galileo and Egnos satellite navigation systems, but deferred proposals on procurement competition and private sector involvement.
The proposed revamp was recently submitted to the European Parliament and the European Council, which in June agreed to abandon the public-private partnership arrangement that had been set up to manage and fund deployment of the 30-satellite system.

Lack of clear governance was pegged as a major shortcoming of the original managing structure. Under the new setup, the Parliament and Council are to be fully responsible for political and program oversight, the latter through a new European Global Navigation Satellite System Program Committee. The European Commission will act as owner or sponsor of the project, under the supervision of the GNSS Committee.

The European Space Agency will act as prime contractor, under contract to the EC, with responsibility for the In Orbit Validation (IOV) spacecraft, the 26 Full Operational Capability (FOC) satellites and the related ground segment. The agency will report regularly to the Parliament and Council on program progress. The GNSS Supervisory Authority (GSA), which had been created to manage negotiations with the private sector under the original public-private partnership scheme, was given a new job. The GSA will be beefed up and made responsible for preparing market services, handle accrediation/certification, and serve as advisor to the Commission.

The EC determined that the cost of building and deploying the system would not exceed 3.4 billion euros ($4.7 billion) - in line with earlier estimates - provided that there are no further delays or major changes in procurement policy. *www.aviationweek.com*

Galileo's GIOVE-B completes initial testing

Thales Alenia Space is shipping GIOVE-B, the second test satellite in the Galileo navigation constellation, from its plant in Rome this week to the ESA-ESTEC facility in Noordwijk, the Netherlands. The production team, led by prime contractor Thales Alenia Space and including Telespazio, EADS Astrium and the European Space Agency, has now completed all preliminary tests, including the thermal-vacuum test that duplicates the satellite's in-orbit environment. *http://sidt.gpsworld.com*

EU to sort out Galileo funding issue before talks with India

Two years after India signed up for partnering in the European Union's Galileo satellite navigation system, the project is yet to take off due to internal bickering within the bloc. Serious differences have cropped up within the EU over the funding of the project and it is not in a position to hold discussions with India until they resolve the issue among themselves. "We cannot hold talks with India until we sort out the issues among ourselves," European Space Agency Director General Jean-Jacques Dordain told reporters in Hyderabad. *http://economictimes.indiatimes.com/*

VNU-HCM plans to establish the Institute of Space Science and Technology

Vietnam National University – Hochiminh City (VNU-HCM) plans to establish the Institute of Space Science and Technology (ISST) to educate and carry on research in the disciplines of space science and technology, to develop applications of space technology for socio-economy.
It will also aim at collaboration with other scientific institutions. With this mission, President Board of VNU-HCM expects collaborations, supports from international institutions on space science and technology. Dr. Tran Vinh Phuoc, Associate Professor in GIS & RS of the VNU-HCM is assigned to hold the Head of the Project Establishing the ISST.

Mapping health facilities in India

The Jansankhya Sthirata Kosh (National Population Stabilisation Fund), a registered society under the Union Ministry of Health and Family Welfare has undertaken an exercise of mapping the existing health facilities in the country upto the district level. An amalgamation of GIS maps and the Census figures of 2001, the survey gives a picture of each district, its sub-district, prominent towns and urban areas and the distance of each village from the nearest primary health centre. The maps highlight inequities in coverage down to every village to enable resources to be targeted where they are most needed. *www.hindu.com*

Pune University students to map regional villages

Students of University of Pune (UoP) in India are undergoing rigorous training to map the villages in Pune, Ahmednagar and Nashik districts of Maharashtra state using GIS. Under this intiative, Samartha Bharat Abhiyaan (SBA), detailed geographical, historical and socio-economic data of each village will soon be available in digital maps. The colleges affiliated to UoP will adopt one village each and the UoP's Geo-informatics department will be coordinating the exercise. Using the revenue maps, students divided the village

into sections and then surveyed through the village, measuring road lengths and noting latitude and longitude coordinates using GPS devices. *www.expressindia.com*

Urban monitoring initiative in India

Union Minister for Science and Technology, Kapil Sibal initiated a project for developing an artificial intelligence system to detect unauthorised construction in any part of the Delhi. It was a joint venture with the Russian Academy of Science, that will utilize satellite imagery, aerial photography, manual videography, remote sensing, terrain mapping as well as watchdog cameras. According to project in-charge Brig. Siva Kumar, each building in the city will be given unique ID. The system shall also identify illegal construction or if private buildings have come up on government land and vice versa. Water pipes and sewer lines will be fitted with sensors to detect ruptures or leakages. This system will also complement the GIS method for assessing property taxes and its collection. Currently, it is running trials in a 15-kilometer radius area in Chandni Chowk. *www.expressindia.com*

G.S. Roonwal awarded National Mineral Award

Professor G. S. Roonwal, a prominent Indian geoscientist has been given to prestigious J. Coggin Brown Gold Medal for his outstanding contribution in the field of geological science for the year 2006-2007, by the Mining Geological and Metallurgical Institute of India.

Ordnance Survey vision helps shape a VISTA for underground assets

A national project to increase the visualisation of underground assets via 3-D mapping is initiated by Ordnance Survey. VISTA (Visualising integrated information on buried assets to reduce street works) is a collaboration of 21 organisations developing an integrated infrastructure to enable data sharing for all buried assets across Great Britain. Ordnance Survey's intelligent large-scale data OS MasterMap Topography Layer is the reference base underpinning preliminary trials by researchers at Leeds and Nottingham Universities to integrate disparate records of buried pipes, cables, ducts and wires. VISTA will combine this information with in-situ survey observations using real-time centimetre-level services provided by OS Net, Ordnance Survey's GPS correction network, and by Leica Geosystems' SmartNet.

Canada's Government funds $1.6 million in Modern Geography

Through GeoConnections, Canada's New Government is supporting new research projects promoting merger of geomatics with public health because of the obvious benefits to Canadians. GeoConnections is providing approximately $1.6 million to help fund 14 research projects in British Columbia, Ontario, Quebec and New Brunswick. Project partners are contributing another $2.1 million for a total of $3.7 million in funding.

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http://www.conference.co.nz/index.cfm/surveyors2007/

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30 Oct 2007 -01 Nov 2007
www.rin.org.uk, conference@rin.org.uk

November 2007

IMTA (Asia Pacific) Annual Conference & Trade Show 2007
November 2 - 3, Gold Coast, Australia
imtaaspac@chariot.net.au, http://www.maptrade.org/events/displayevent.php?id=79

International Symposium and Exhibition on Geoinformation & International Symposium on GPS/GNSS
05 - 07 Nov 2007, Johar Bahru, Malaysia
http://www.fksg.utm.my/isg07/index1.html

Trimble Dimensions 2007
November 5-7, Las Vegas
www.trimbleevents.com

4th International Symposium on LBS and TeleCartography
8-10 November, Hong Kong, SAR, China
http://www.lsgi.polyu.edu.hk/LBS2007/

ACRS2007
Nov 12-16, 2007, Kuala Lumpur, Malaysia
http://www.macres.gov.my/acrs2007

27th INCA International Congress
Visakhapatnam, India. 21-23 Nov 2007
http://www.hydrobharat.nic.in/lst_Circular_INCA_2007.pdf

14th Session of the Asia-Pacific Regional Space Agency Forum
21-23 November
Bangalore, India
www.aprsaf.org/text/ap14_info.html

ESRI South Asia User Conference 2007
29 - 30 November
Singapore
uc2007@esrisa.com
http://www.esrisa.com/pages/uc2007

December 2007

MEST 2007: 4th Middle East Spatial Technology Conference and Exhibition
10-12 December 2007
Kingdom of Bahrain
bseng@batelco.com.bh, http://www.engineer-bh.com/mest2007/

IGNSS2007
4-6 December 2007
Sydney, NSW, Australia
www.ignss.org/
rob@ignss.org

February 2008

GSDI-10 St. Augustine, Trinidad
February 25-29, 2008
http://www.gsdi.org/gsdi10/

Munich Satellite Navigation Summit
19 - 21 February 2008, Residenz München, Germany
http://www.munich-satellite-navigation-summit.org/

May 2008

Plans2008: Position Laction and Navigation Symposium
May 6-8, 2008, Monterey, California,
www.plansconference.org

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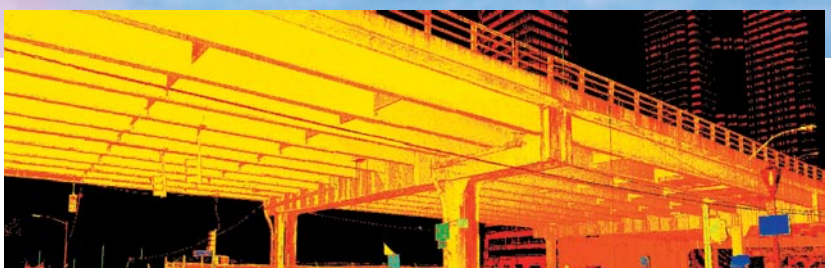

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