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Volume V, Issue 7, July 2009

THE MONTHLY MAGAZINE ON POSITIONING, NAVIGATION AND BEYOND

50th Issue

Different Strokes

GNSS - The inevitable
Navigation bottlenecks
Location is not private
Dwindling surveyors
Millennium goals
Geomatics education
Surveyors in crossfire
Geomatics agenda
SDI issues

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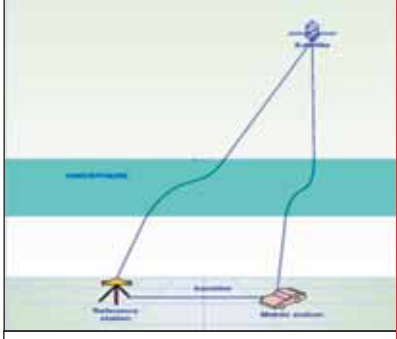

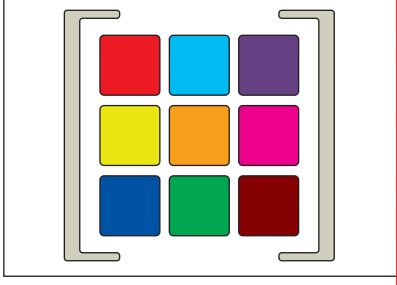

In this issue

Coordinates Volume 5, Issue 7, July 2009

Articles

Columns

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50th Issue and going...

Fifty months ago, the journey started.

With passion, confidence and conviction.

All the while, we navigated through technology trends.

Raised issues and followed up.

Captured the pulse of the market.

Added dimensions to the domain (refer page number 16).

Presence was felt, impact is notable.

And the journey continues…

Set to embrace new challenges.

Geared to move on…

With a sense of gratitude.

To all those who have been with us since beginning.

Our readers, authors and advertisers.

Bal Krishna, Editor
bal@mycoordinates.org

CENTIMETER-LEVEL GPS AND GLONASS POSITIONING

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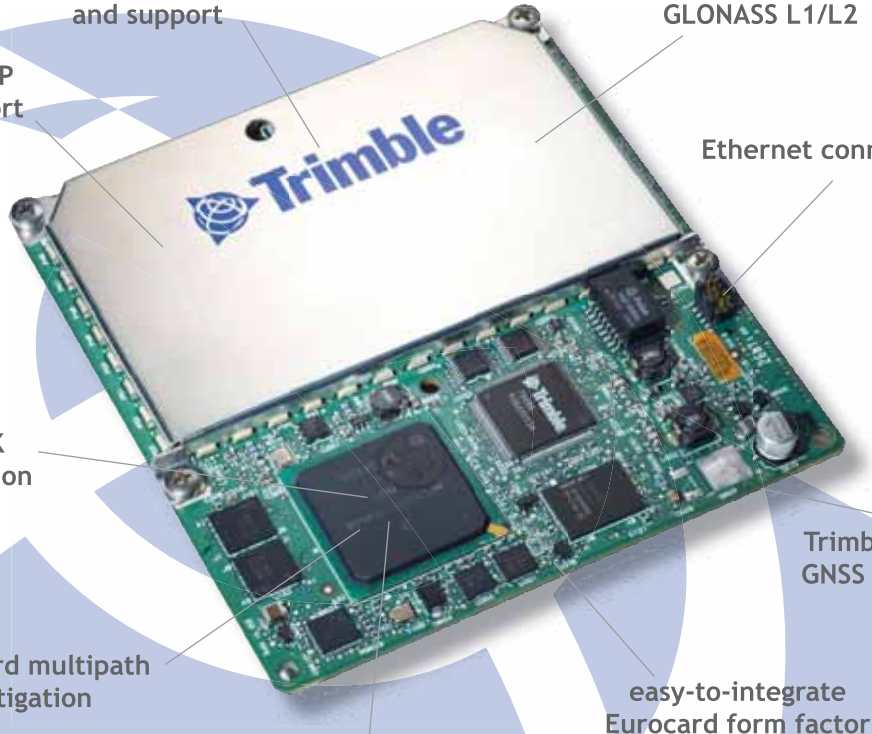

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Different strokes

The article presents views and opinion about current issues and priorities surrounding Geomatics and GNSS by experts in their repective domain.

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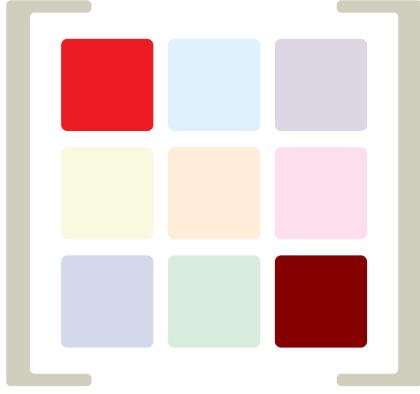
GNSS: The international cooperation is inevitable

Basic Act on the Advancement of Utilizing Geospatial Information was approved by the cabinet in Japan last year. It states the promotion of the various kinds of the applications of geodetic information in both private and public areas to realize the convenient and safe society. The supplementary budget to save the economical crises this year in Japan prepares a lot of money to promote the utilization of geographic information. In order to realize such society in near future, the further preparation of the positioning infrastructure and improvement of the positioning technique much more than present state. The academic sector is preparing the application of the budget for the coming five years.

Built in type car navigation device are very popular in Japan. Recently, low cost PND (Portable Navigation Device) is being accepted for its low cost, convenience and acceptable accuracy on car. There are several problems, when used by pedestrian. If the sensitivity of the GPS receiver is not enough, he may lose his position. The multipath scatters his position sometimes hundred meters with high sensitivity GPS receivers. It also misleads his route. The energy consumption is also an issue. Improvement of performance in the urban area is essential for personal navigation.

As for the personal navigation, the positioning in the building and underpass, there are some ideas are proposed such as IMES. They will offer seamless navigation continuously from outside and help them for their activities in some extent with various regional information. However, they do not offer real time accurate positions. Thus they are not applicable to the machine control inside the building such as controlling nursing robot. The development of the indoor navigation system is important for the future aging society.

The globalization of the GNSS will proceed in the next decade. In addition to GPS and GLONSS, Galileo and



COMPASS are on line. They were developed for the hegemony of the developing countries regardless whether it is conscious or not. QZSS is under developing by Japan to supplement and augment GPS performance for civil use. Integrated use of these satellite navigation systems will promote significantly the performance of satellite navigation. Then the unification of the time scale and geographic coordinate are essential. The international cooperation is inevitable.

SDI: Human issues are most critical

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I think there are both technical issues and human issues to deal with, but the most critical are the human issues, eg we need find ways of selling the need for SDI development at the ministry level. We need business case examples that are convincing to the Ministers of the many nations that are emerging SDI candidates and the ones that have not yet started anything. We need to identify the economic and policy examples that convince ministers and minister managers. We also need to develop assessment tools that help us to evaluate the credibility or existing SDI programs.

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Navigation: Accuracy, availability, infrastructure and cost of deployment

The bottlenecks faced by current navigation technologies relate to accuracy, availability, infrastructure and cost of deployment. There are many technologies that are very promising in terms of accuracy and availability, such as RFID and UWB, but cannot be deployed in mainstream due to infrastructure requirements and time spent customizing an environment. There are also technologies that are very accurate and self-contained, such as high grade INS, but these are extremely costly and are limited to military and high-end surveying applications. Even the most commonly used navigation methods such as GPS, AGPS and cell tower positioning are not

always available or accurate due to signal availability and infrastructure restrictions.

Starting from the military navigation needs that gave birth to the ubiquitous, yet not-always-available Global Positioning System (GPS) for absolute outdoor navigation, to highly accurate, yet expensive, inertial navigation systems, there is not a single system that is always available for all environments, which is also low cost and infrastructure free. The lack of such a system for consumer applications is especially noticeable for applications such as E911, indoor emergency personnel localization, and even indoor mapping or simultaneous location and mapping.

The concept of combining complimentary navigation systems has been gradually gaining acceptance for commercial applications. This has been the maxim in safety-related or mission critical applications, and as such, it is imprudent to depend on a single navigation technique. The requirements for cost and space constraints are currently driving providers of positioning technologies and applications to investigate and develop the next generation of low cost and small size navigation and guidance systems to meet the fast growing location services market demands. Interesting advances in Micro-Electro-Mechanical Systems (MEMS) technology have shown unleashed potential towards the development of such systems. MEMS are integrated micro devices or systems combining electrical and mechanical components whose sizes range from micrometers to millimeters. MEMS is an enabling technology and the MEMS industry has a projected 10-20% annual growth rate to reach 200 billion US$ market by the end of 2009.

Advances in MEMS technology combined with the miniaturization of electronics, have made it possible to produce chip-based inertial sensors for use in measuring angular velocity and acceleration. These chips are small, lightweight, consume very little power, and are extremely reliable. They have found a wide spectrum of applications in the automotive, mobile phone and other industrial applications. However, while MEMS sensors are not very accurate for navigation and positioning, if harnessed, the resultant system design can be driven by a trade-off between cost and performance.

The push to integrate MEMS with existing wireless infrastructure will enhance system availability and accuracy without increasing cost or infrastructure. The MEMS sensors themselves are inherent to many existing electronic devices for other uses, and as such their deployment cost is negligible and there is no required infrastructure. Wireless signal infrastructure is always being improved, but not a single system can say it covers every environment; it is the fusion of low-cost inertial navigators with all available wireless signals that will form the solution.

MEMS technology can be used to develop positioning and navigation systems that are inexpensive, small, consume low power (microwatt), require no additional infrastructure, and provide a solution that is always available. All the necessary hardware components for this type of positioning system exist; it is the data fusion of the components that is the bottleneck of a successful solution.

Researchers and companies alike continue to work on a fusion solution. In Calgary, this has spawned the creation of a University of Calgary spin-off company called Trusted Positioning Inc. (TPI). TPI has over thirty (30) person years of research and development specializing in processing techniques required to make the signals of low-cost MEMS navigation systems usable for positioning purposes when combined with any number of wireless updates.

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Remote Sensing: Contributing to Millennium Development Goals

Humanity stands on the threshold of a peaceful and prosperous future, with an unprecedented ability to extend life spans and increase the power of ordinary people – but is likely to blow it through inequality, violence and environmental degradation. And governments are not equipped to ensure that the opportunities are seized and disasters averted. Therefore the 3 important issues which "Remote Sensing", needs attention is as below outlined; For a human living on this planet is to think about the future of his/her environment. This is currently the most important issue for scientists, whether or not he or she is working on an area close to the subjects such as

- Environmental Monitoring
- Climate Change or Global Warming,
- Powering a Sustainable Future: Policies and measures to make it happen.

We should investigate how we can contribute to reach the "Millennium Development Goals".

Nobody doubts that there are serious threats to the population of planet Earth, many from physical phenomena brought about by changes to the environment caused by human activities. A list of these would include threats from weather, natural disasters (although some of these, such as earthquakes, are not new threats, or brought about by human activity), disease and loss of adequate water of food supplies. These threats have not escaped the notice of governments, and although there is discussion over who is responsible and what should be (GEO) established by the first Earth Observation Summit in July 2003 which declared the need for "timely, quality, long-term, global information as a basis for sound

decision making". The second Earth Observation Summit in April 2004 agreed to a Framework which established the basic principles for preparing an Implementation Plan for a Global Earth Observation System of Systems (GEOSS).

The plan also calls for support to countries, particularly developing countries, in their national efforts to collect data, use satellite and remote-sensing technologies for data collection and to access, explore and use geographic information.

As members of international and regional scientific societies we need to ask whether we are playing a role and whether we should be doing more. We also need to ask whether our members want us to devote resources to this type of activity and whether the right people are already involved. ISPRS is represented on COPUOS, CEOS and ICSU and makes a contribution through discussions at meetings and through the advice of experts nominated by ISPRS. This has been done in the area of education and data policy for example.

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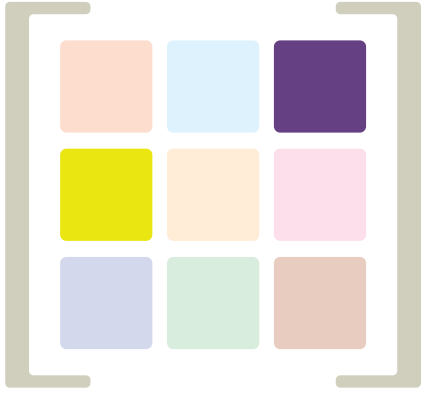
Surveying: Dwindling number of qualified surveying professionals

For me, the three most important issues confronting the surveying profession are recruiting of new professionals, education and research, and application of current technology.

As an academician, one of the most urgent and pressing issues for me is the dwindling number of qualified surveying professionals. Although the demand for qualified surveyors is increasing, enrollment in surveying institutions is at an all-time low. In addition, the average age of the professional surveyor keeps increasing. This means that more of the practicing surveyors are either retiring or leaving the profession whiles very few are entering it. Very few high school students are choosing surveying as a career choice. This is a concern which can potentially lead to the demise of the profession. The situation is even worse when it comes to graduate education.

Shortage of undergraduate surveying students means that even fewer students will enter graduate school. The launch of Gravity field and steady-state Ocean Circulation Explorer (GOCE) and similar satellites are creating opportunities for advanced studies in surveying such as the gravity field of the earth, an improved definition of the geoid, and to the determination of other physical characteristics of the earth. Together with current GPS technology,



the potential exists for more accurate navigation and position determination. GPS technology has already improved surveying and mapping procedures and accuracies. However, there are areas for further improvement such as application of the technology in tunnels, in ocean floor mapping, and many more. Lack of graduate students implies reduced, and in some cases, lack of research in surveying institutions.

On the application of current technology, GIS and LIS technologies are maturing around the world. Benefits of these technologies include effective land administration, sustainable development, and resource management, to list a few. Very few local government administrators can boast of an effective land or geographic information system. Many local government personnel who are responsible for developing such information system have little or no knowledge about maps accuracies, coordinate systems, map projections, data conversion, and other processes that are mainly the domain of the land surveyor. Some are unaware of the surveyor's role in its development. However, many surveyors are not proficient enough in the technology to be of much help to the administrators. It is important for surveyors to educate themselves about the development of GIS/LIS, and be wiling to expand their expertise and services so as to be able to provide the necessary support and guidance to customers. Of all these, recruiting of new student is paramount and should be addressed immediately.

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Knowing where you are is no longer a private matter

A well-known adage among real estate agents is "location, location, location". Likewise, in this short commentary there may be three priorities of concern when one links privacy to location. Much like the triple bottom line there are social impacts, economic imperatives and policy perspectives to the privacy question. But privacy may be dead and that we should either do one of three things or a combination of them, that is, get over it, get on with it or get out of it.

Social Impacts

At the start of the new millennium it was said that "you have no privacy, so get over it". Such a sentiment has been attributed to Scott McNeely of Sun Microsystems. It seems that modern technology has liberated us from the shackles of the past in that it is now much easier to do things, it is much easier when we do things and it is much easier to do most things. We can send and receive messages instantly online on a 24 by 7 basis – a phrase brought into vogue where the modern world never sleeps. However, the price we have paid for these gains is at the expense of privacy. The phone carrier whether fixed line or

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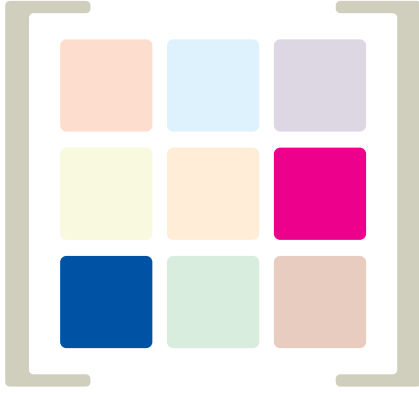
The challenge therefore is that to consider privacy as no longer a right but a privilege which we much studiously protect. One is able to do so because one has the means in an affluent society and one can enforce this either through custom or through the courts. But think of those that are not so well disposed especially when the very same are struggling to earn a living and are especially vulnerable in that they are willing to sacrifice their privacy for 'a piece of the action'. Even the privileged are happy to trade a bit of their privacy for convenience in return for discounts, ease of future access and the prospect of winning something. This seems like social engineering *par excellence* – not to mention the phishing, vishing and other scams that gambol about in cyberspace.

Therefore it looks like technological advances, the demand of modern-day business models and practices and public sector requirements have made some of our ideas of privacy old-fashioned, out-of-date, unsustainable and incompatible with our existence.

Economic Imperatives

In the electronic age there can be no privacy with any location because that is the very element that makes the economy go round. Analytics of various forms can mean that whilst the digital explosion has blown things apart, in a perverse way it may also have blown things together. Today, there are data aggregation companies that build warehouses of data and information or mine into such repositories in order to gather information and form intelligence. Such software are able to join the dots and assemble parts of the puzzle to form a clear picture of the terrain. Indeed, GIS technologies have been doing this all along for the past thirty or more years but mainly in relation to layer information to assemble maps and data views. The natural extension to this activity are those who use geodemographics techniques to market to target groups in specific localities. One can only wonder by asking "how did they know that?"

Courts in the US and Canada have ruled that there can be compensation for serious invasions of privacy. Whether this will be the trend further in the 21st C



is something to watch. The famous case of Barbara Streisand who objected to the aerial photography project of the California Coast program comes to mind. However, this litigation failed for other reasons other than privacy grounds.

Policy Perspectives

Various countries around the globe are toying with ideas of legislation protecting privacy. Courts in the UK and EU for example are more willing to treat private activities carried out in the public gaze as part of one's right. The famous 'celeb' cases bring to mind Naomi Campbell who sued successfully after pictures of her were published by a newspaper. Princes Caroline of Monaco was successful as was JK Rowling who sued on behalf of her infant son. It is may not be the picture that is offensive but the context of where the picture was taken that has won the day in each of the cited cases. Similarly, the Formulae One boss Max Mosely was successful in defending his rights to privacy even though the pictures published by the newspaper were those of a sadomasochist sex party.

Some claim that in certain jurisdictions, legislative devices already available are sufficient to protect one's privacy including defamation laws, trespass laws, racial vilification laws and that newer forms of legislation such as the proposed American and Australian 'tort of privacy intrusion' may not be necessary. Really it may decant to the fact that there may be some things that are "self-evidently private" and that one can harbour a reasonable expectation of privacy. Hence, one man's home can be his castle. But that seems so archaic in the electronic age. One can't hide from the gaze of electronic cameras of the CCTV kind or the electronic eye in the sky.

Get over it, get on with it or get out of it!

The society of the 21st C will learn how to get over the loss of privacy and get on with it as a fact of life. The key is to try to get on with it as best as one can and hold on to what might be left. It also seems that it is not possible to get out of it, try as one might, because our location and the things we bring with us give us away to the world at large. It appears that privacy is dead and buried and that electronics and cameras are everywhere to trace our movements every day. Can you think of an instance where you can do something invisibly in your daily life? The odds are that you either can't or can but with great difficulty. Think about it.

Conclusion

Privacy it seems is not an absolute right. It has important limits and one's privacy should be protected against unwanted invasion and intrusion while at the same time tempered by legal guarantees so that public interest is afforded some 'air' time. But it remains a 'no, no' to interfere with an individual or the family. It is a 'no, no' for someone to be subject to unauthorised surveillance. It is a 'no, no' also to either gather or release sensitive facts relating to

an individual's private life. But location is no longer a private matter these days.

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Surveyors are caught in the crossfire

Economy – These are challenging economic times for surveyors. Many surveyors depend on land development and other economic activity for their businesses. With planned commercial construction at record lows, surveyors are caught in the crossfire.

Aging workforce – The average age of surveyors continues to rise. We are creating fewer surveyors than are retiring. This combined with the increased skills needed for the new technology savvy surveyor will create challenges with other professions beginning to perform functions that may logically be the surveyor domain.

Technology – Technology is moving very quickly and surveyors are working hard to keep up, some successfully, some not so successfully. The slow economy gives the practicing surveyor a little more time on their hands as compared to a boom time. This is a unique opportunity to retool, retrain, and engage in new technologies. GIS presents one of those new technologies that gives surveyors new markets and new revenue opportunities as well as new technology to help them better manage their work.

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Geomatics education: from specialist to generalist

Geomatic education – as education in any other domain – should prepare the students for the job market. With their acquired competences they should be well prepared not only for recent requirements but also for those in the near future. At least the education should give a good basement, on which the graduates can build their career by training on the job and life-long learning concepts.

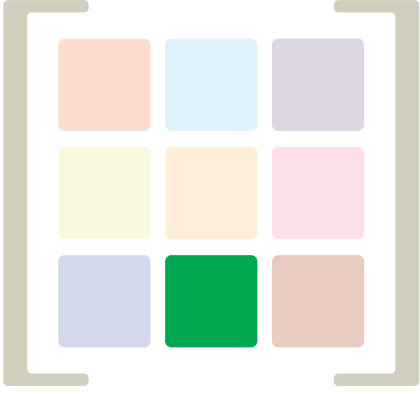
So what are the recent or emerging requirements of our profession?

Looking at my own background as geodetic engineer let me first focus on technology. For data capturing, sensor integration is getting more and more important. This holds not only for airborne methods with combined digital camera and Laser scanning supported by GNSS and INS, but also for terrestrial data capturing with the new type of integrated total stations with the possibility of standard coordinate data capturing but also 3D point clouds and even images.

What is the implication of these developments for education? Good background on the all the different methods is needed and how they can be combined in an efficient way to produce high quality data. Not just pushing the button of a black

box - but a good background for the interpretation of the results is needed.

Besides capturing coordinates the generation and the dissemination of high quality products are important as well. With systems like Google Earth or Virtual Earth more and more people are getting used to spatial data. But still most of economic decisions are not based on this type of data. Spatial data infrastructures are needed for the dissemination and easy access of actual and reliable geo data, for supporting economic and political decisions. The implication for education is, that our students should have a good background main IT concepts, distributed systems, Web 2.0, etc. and how these concepts can be used to the advantage of Geomatics.



But just to focus on our classical field of geo data capturing and geo data dissemination will be not enough in the future. Our graduates should be prepared for consulting in many different fields, where the spatial data can be used effectively, as they will be the experts for geo data. This ranges from land management to urban and rural planning, forestry, environmental sciences, just to mention a few. Here an interdisciplinary approach in education is needed to make our graduates fit to communicate with people from many different fields. Thus social skills to deal with other people and their way of thinking will be another important issue.

To summarize my point of view, what in Geomatic education is needed is an interdisciplinary approach with well trained generalists and less specialists.

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Geomatics in India - A Proposed Agenda

Geographical Information System (GIS) has taught us that all surveying and mapping projects in the future have to be dependent on multi-disciplinary surveys with accurate ground control points provided by the national surveying organisations. This leads us to think that an appropriate structure/interconnection of the various organisations presently entrusted with the surveys should be brought together. Example, topographical surveys, geological surveys, forest surveys, soil and land use surveys etc. The present attempt is to propose a concept of structure which will provide the necessary linkages along with some future objectives.

National Spatial Data Infrastructure

The Ministry looking after the NSDI should be the overall in-charge of ALL surveys, as mentioned above. The chief coordinator will, in real sense, be the Surveyor General of India. The present Surveyor General of India, the Head of Survey of India should have a new designation.

The revamped NSDI will lay the performance objectives of the constituent organisations under it.

NSDI: Additional Duties/Charter

- Applications of Satellite Imagery and Remote Sensing technology to be made more intensive and should form the basic inputs on laid out production norms of surveying and mapping. Department of Space should enhance its program on applications as compared to the Technology.

- Cadastral Surveys: There is a wide gap in technological practices in cadastral/revenue departments of the various states. NSDI should have a special Division exclusively for assistance to the states for upgradation of their standards. It should also run and recognize Training, R&D, Publications and Fellowships for the benefit of the state personnel.

Formulation of Policies regarding Geomatics

NSDI should be the nodal organisation to advise other Ministries - e.g. Defense on the impact of the policies like restriction etc.

Education and Training

Survey Training Institute, Hyderabad and Indian Institute of Remote Sensing, Dehradun are two premier education and training organisations. These should be merged and redesigned towards becoming a Surveying University. This university should also be engaged in R&D, and Publications. NSDI should provide the necessary 'extension' services to this University.

Chairs in Geomatics

Professorial 'Chairs' should be established at IIT (Roorkee), Anna University, Chennai, IIRS Dehradun and Survey Training establishment at Hyderabad under the budget of the Central Government.

Balance between Government and Private Sector in Geomatics

NSDI should oversee that the private sector is well represented in Geomatics Sector in India. In Summary, stress in the future should be on the applications of technology, efficient Geomatics products and services with international outlook and marketing practices.
My earlier paper should be seen for further ideas on this subject.

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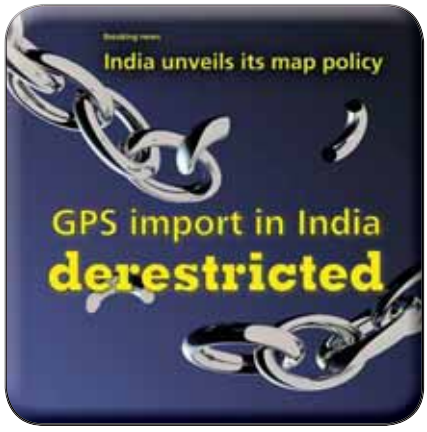


50th Issue
Adding dimensions to the domain

GPS import in India was derestricted in Jan,04 - *Bal Krishna, june'05*

If we go strictly by rule that exists on paper, making a GPS operational without a license from WPC is not allowed – *P. K. Garg, July'05*

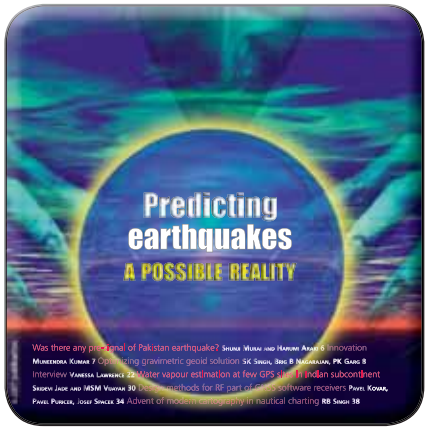
If GPS needs a license to operate in India then what is the procedure for obtaining that license - *Sudipto Roy, Jan07*

The National Map Policy

Hope that guidelines will be comprehensive, clear and fair. *Ajay Lavakare - July'05*

It stands as a pale shadow of the original proposal - *Amitabha Pande Aug'05*

The concept of the Map Transaction Register sounds to be too rigid - J G Krishnayya, Jun'06



Muneendra Kumar Speaks

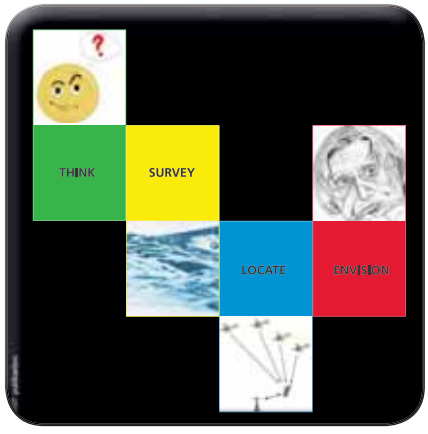
If you have GPS, who needs a Geodesist? - *Dec'05*

"The usage of GPS surveyed accurate ellipsoidal heights will be significantly cost effective and time saving for any project."- *Jan'06*

"Any ITRF does not constitute a geodetic system. It is adopted to define the system"- *June'07*

It was easy to have detected Sumatra Offshore Earthquake from GPS - *Shunji Murai and Harumi Araki, July'05*

Rapid data acquisition and information services have contributed greatly to the rescue work and disaster relief efforts in Wenchuan Earthquake - *Deren Li, July'08*



SiReNT - Positioning Singapore for the future - *Singapore Land Authority,- Aug'06*

MyRTKnet has been successfully implemented with the establishment of a Network of Ref Stations - *JUPEM, June'06*

A unique reference frame for the American continent was established by geodetic observation campaigns, SIRGAS95 and 2000 - *May'06*

I believe it is a myth that Galileo will give Europe independence of the US - *David Last, Feb'07*

The market will move away from pure navigation to also-navigation – *Alden Lee, May'07*

Indian customers want cheap and best - *Amit Prasad, Nov'08*

India is locked in wrong and outdated datum - *Munnendra Kumar, Aug'06*

We need Everest2007 soon!! - Lt Gen S P Mehta (Retd), Late M N Kulkarni and N K Agrawal, Feb'07

Survey of India took a conscious decision to switchover from Everest co-ordinate system to Geocentric co-ordinate system (ITRF) - Brig (Dr) B Nagarajan & *R K Sawhney, April'07*

There is a need for surveyors that want to grow in GIS and GIS people who have survey inclination - *Jack Dangermond, March'07*

There is threat to both professions unless it is recognised that the whole is greater than the sum of the parts. - *Craig Roberts, June'07*

We should build this bridge and should aim at integrating these two areas - *Stig Enemark, June'07*

Time to inject more realism into the Galileo Programme - *Miguel Romay Merino, Sep-07*

Galileo is daunting technologically, frightening financially, and maddening by the complex layers of intra- European political hurdles - *F. Michael Swiek, Sep-07*

Is certification of Galileo a bureaucratic overhead? - *Martin Grzebellus, April'08*

Methodologies have to be evolved and institutional framework should further be strengthened - *Dr K Kasturirangan, July'06*

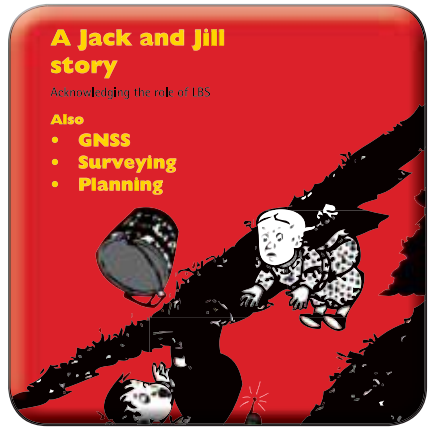
In ambitious programmes, it takes time to reach consensus. *V S Ramamurthy, Jul' 06*

Make SDI happen now… or else there will be a good Indian spatial database from outside soon - *Mukund Rao, Aug' 07*

A close cooperation of universities with industry is necessary in satellite navigation - *Günter W Hein, March' 07*

Students need to know capabilities and limitations of GNSS - *Deok Won Lim, Jan'09*

Geomatics industry in India has been primarily catering to the demands of set trends - *S. Ghosh & S. Biswas, Jan'09*



The future will see the combined use of GPS and other GNSS – *Ian Dowman, Nov'05*

If the US withdraw GPS signal, the GAGAN system will collapse - *K Ramalingam, Jan'06*

GPS cannot be selectively turned off - *Michael Shaw, July'07*

Biggest GPS market in Japan is car navigation - *H Nishiguchi, Mar'06*

It is a time to talk about Asian satellite navigation system - *Gyu-In Jee, Oct' 06*

Market needs will decide a nation's geospatial policy - *Matthew O'Connell*, *June' 07*

With slashed products prices, we will see improved web based services - *V Jayaraman, Jan' 09*

Continued innovation is a primary driver for us - *S Berglund, May' 09*

Future convenience and high value of GNSS data and applications will have a revolutionary impact - *Keith D McDonald -Jan' 08*

The most promising technology will be made by the digital convergence of WLAN, RFID and UWB - *Sang Jeong Lee - Jan' 08*

New signals, new applications, lower prices, more accuracy. All points to the acceleration of the navigation and positioning revolution - *John Pottle -Jan' 08*

Map the earth to enrich the globe - Dr A P J Abdul Kalam, Dec'06

Errors by operators during vector capture from 3-D models require extensive rework - B Chintalapuri, V. Raghu Venkataraman, March'08

Neither the goals nor the procedures of 3D mapping are clearly defined yet. The available technologies require a fresh approach to mapping"- A Gruen, K Wolff, July' 08

Growth driver of LBS after 2005, was the development and availability of assisted-GPS technology - *R Challamel, Sep'08*

There is significant market potential for mobile navigation in India - *Steve Brazier, May'08*

Mobile spatial information service for pedestrians must provide useful instructions to the individual's - *Alexandra Millonig, Aug'08*

Authoritative data are closest to the source, authentic and accurate for the functions that they are intended for - *L J Khoi, Feb'09*

NMOs use their own traditions in map-making. It is difficult to hold them- *P Nag, Feb'09*

Chandrayaan-1 is India's first mission to moon for remote sensing and mapping of the lunar surface - *P K Srivastava, B Gopala Krishna and Amitabh, Apr'09*

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GPS + GLONASS + Galileo

TRIUMPH 1

Actual size

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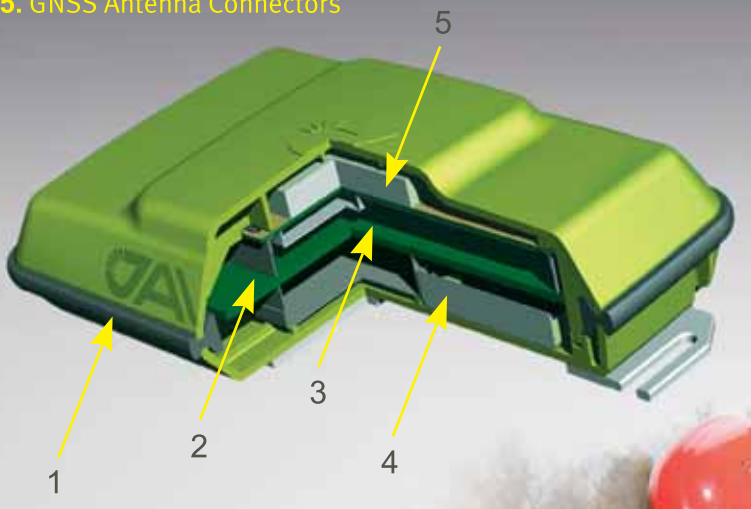
2. Bluetooth/GSM Antenna
3. GNSS Receiver, Power Board, GSM/Bluetooth and Memory
4. Rechargeable li-Ion Battery
5. GNSS Antenna Connectors



GISmore

stand-alone or inside the hat

Bluetooth wireless connection to GISmore

- GPS L1
- Galileo E1
- GLONASS L1
- 100 Hz update rate
- 100 Hz update rate
- RAIM
- WAAS/EGNOS
- Rechargeable Li-Ion Battery
- GNSS Antenna
- GSM Module
- Bluetooth® Interface
- Bluetooth/GSM Antenna

GISmore receiver is based on our TRIUMPH Technology implemented in our TRIUMPH Chip. For the first time in the GNSS history we offer very powerful GIS field mapping receiver with up to 100 Hz RTK, 216 channels of single frequency GPS, Gallileo and GLONASS in a small attractive, sturdy, and watertight box.

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Tracy field software

Tracy – as easy as 1-2-3

Software for Windows Mobile OS to control receivers, automated GNSS post processing surveying tasks (Static, Fast Static, Stop&Go, Data Acquisition), and to perform RTK survey and stakeout tasks.

- **All complex GNSS survey with Tracy by just 3 buttons on one screen**
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  Horizontal and vertical localizations
- **Increased productivity and reliability**
- **Data acquisition with feature codes**
- **Built in COGO routines**

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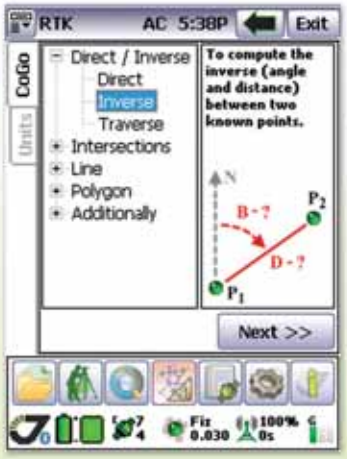
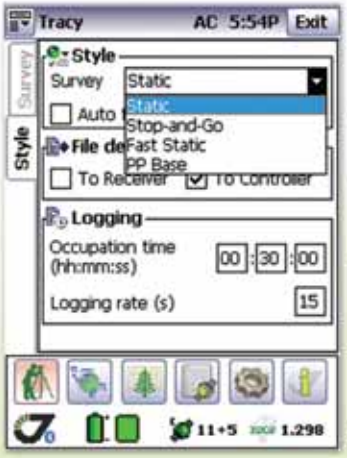
Victor is rugged, powerful, waterproof, shock-proof and versatile. It meets IP67 and Mil-Std-810F standards for drop, vibration, altitude, immersion, humidity, sand/dust, and operating temperature.





RTK (Real Time Kinematics) SURVEY AND STAKEOUT

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PPK MODULE

Data Collection for Post-Processing

CONTROL DEVICE UNIT

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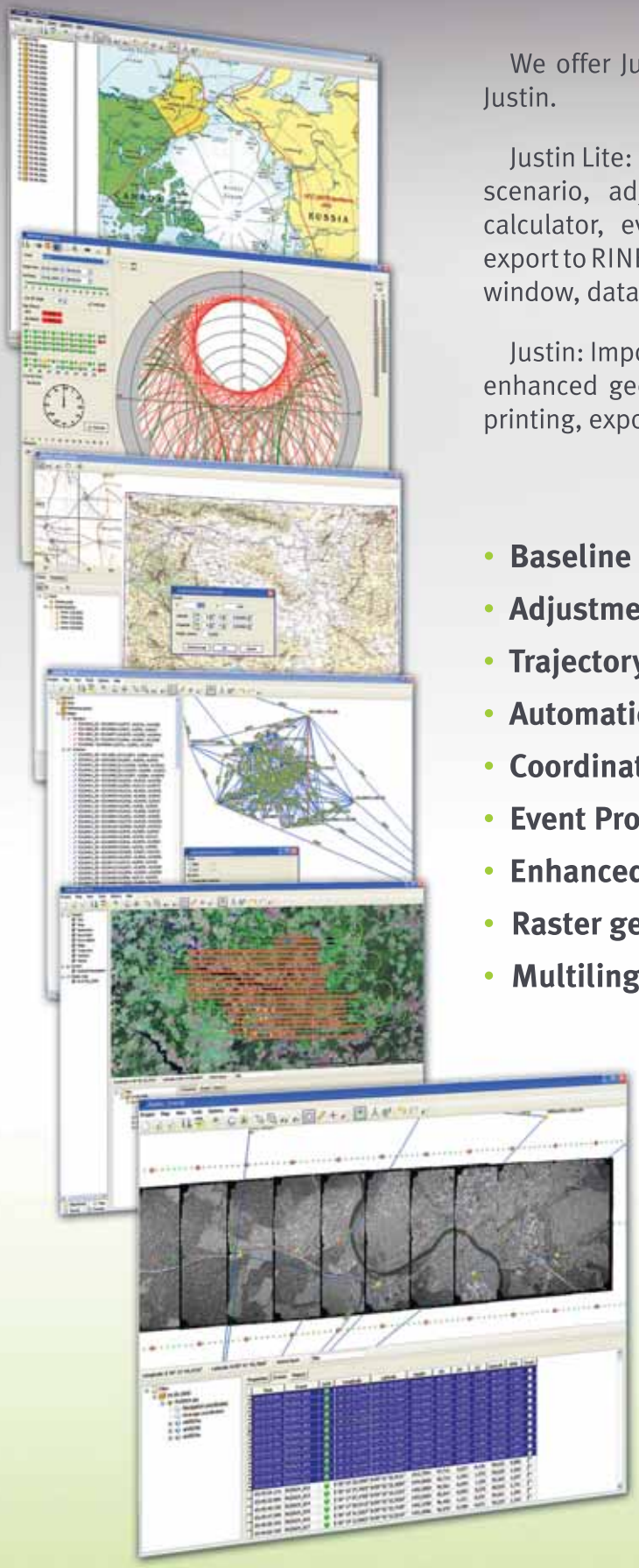
Justin survey and GIS software

Full range of features for geodetic and surveying tasks



We offer Justin software in two versions - Justin Lite and Justin.

Justin Lite: GPS&GLONASS baseline, trajectory processing, scenario, adjustment, observation manager, coordinates calculator, event editor, global geoid, mission planning, export to RINEX, points manager, vertical profile, cartographic window, data visualization, antennas, report.

Justin: Import GNSS data, virtual station, datum calculator, enhanced geoid model, vector maps, raster manager, map printing, export map, data analyser, data interpolation.

- **Baseline processing up to 1000 km**
- **Adjustment geodetic networks up to 3000 sites**
- **Trajectory adjustment for multibase solutions**
- **Automatic data processing with Scenario**
- **Coordinates, Datum, Localization calculator**
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- **Enhanced Geoid Model**
- **Raster georeferencing**
- **Multilingual**

Justin can import data files as well as whole folders. Justin employs a special techniques to process high rover data rates (up to 100 Hz) using low base data rates. Other features include single epoch static solution, manual postprocessing with time line chart, using vertical profile to filter out suspected data and scientific data analysis and viewer.

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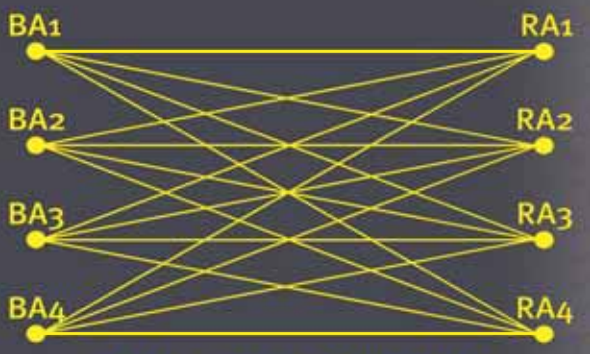

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Front panel connectors:

Power Input + serial port A + USB + Antenna

Back panel connectors:

Can have up to 3 connectors of 1-PPS • Event Marker • IRIG • GSM Antenna (without Bluetooth antenna).

When Bluetooth antenna is installed only one extra connector can be installed.

Example 1: BT Antenna + GSM Antenna
Example 2: 1-PPS output + Event Marker + GSM Antenna

DELTA

for: TRE-G2T, TRE-G3T, Duo-G2, Duo-G2D, Quattro-G3D

Front panel connectors:

Option 1: Power Input + Serial A + Serial B + Serial C + Antenna

Option 2: Power Input + USB + Serial A + Serial C + Antenna

Options 3: Power Input + USB + Serial A + Serial C + Ethernet

Back panel connectors:

Can have up to 4 connectors of 1-PPS A • 1-PPS B • Event A • Event B • Antenna • CAN • IRIG B

Example: 1-PPS A + 1-PPS B + Event A + Event B

SIGMA

- Internal battery
- Charger
- Modem
- GSM
- Bluetooth

for: TRE-G2T, TRE-G3T, Duo-G2, Duo-G2D, Quattro-G3D

Front panel connectors:

Can have Power Input • Second Power Input • USB • Serial A • Serial B or C • Ethernet

and up to 4 connectors of 1-PPS A • 1-PPS B • Event A • Event B • Antenna • CAN • IRIG • RS422

Back panel connectors:

Can have SIM door and GSM Antenna connector and up to 4 connectors of 1-PPS A • 1-PPS B • Event A • Event B • Antenna • IRIG • Modem Antenna • Bluetooth Antenna

Example: GSM Antenna + SIM door + 1-PPS A + 1-PPS B + Event A + Modem Antenna

Malaysia precise positioning

An ionospheric delay model was developed using modified Jones 3-D ray tracing program to accurately determine the difference in ionospheric delay expected over a short baseline so that a more accurate differential GPS correction could be made

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Global Positioning System (GPS) is currently one of the most popular global satellite positioning systems due to global availability of signal and performance. GPS employs two carrier frequencies which is L1 and L2 allowing receivers equipped with dual frequency operation to be used. Due to the inhomogeneity of the propagation medium in the ionosphere, the GPS signal does not travel along a perfectly straight line [1,2]. In addition, from Figure 1, the effects of the ionosphere can cause range-rate errors for GPS.

The Earth's ionosphere plays a crucial role in GPS accuracy because this layer represents the largest source of positioning error for the users of the GPS after the turn-off of Selective Availability (SA). In order to provide ionospheric corrections for positioning and navigation for single-frequency GPS receivers, the ionosphere needs to be mathematically described by a given ionospheric model. A good model for the equatorial region has become more important because of the need of higher accuracy GPS positioning. This means that further work on the equatorial area is essential when the ionosphere has become the most critical error source for GPS positioning. Accurate correction for the ionospheric error is necessary for increased accuracy, however the complexity of the model used should be consistent with the required accuracy. Meanwhile, precise ionospheric modelling is also important for other space-based observation systems as well as communication systems and space weather studies.

The ionosphere over Malaysia is unique because of its location near the equator line. The purpose of this work is to develop an accurate ionospheric model that best suits the equatorial region and that could get differential ionospheric delay in sub-centimetre accuracy.

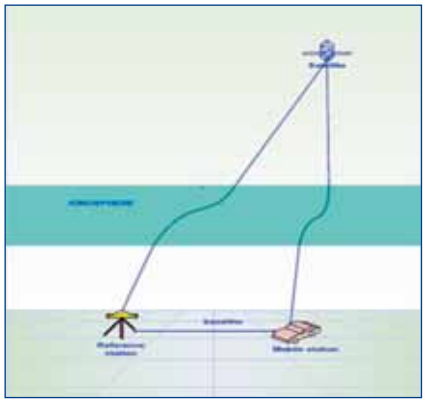

Figure 1: Exaggerated view of GPS signal in the ionosphere

Corrections and ionosphere models

Application of GPS for ionospheric sensing is now the subject of worldwide interest. In addition to this application, it has also been used widely in ionospheric study to model the electron content whilst the GPS signals propagate through the ionosphere. In this work, the ionosphere-induced errors in dGPS for short baseline are first determined. After that the method of modelling and correcting these errors are provided. Very precise ray paths for both groups and phases were determined utilizing a modified Jones 3-D ray tracing program, which includes the effect of the geomagnetic field together with a Nelder–Mead algorithm to home in precisely on the satellite to earth station path [3].

Ionospheric error correction using modified jones 3d ray-tracing

The 3D Jones ray-tracing program is numerical complex used to investigate the ionospheric effect for both carrier phase and group delay in transionospheric propagation. The minimization function was run to find the satellite location at GPS altitude for every set of initial azimuth and elevation angles that were chosen for simulation. The ionospheric delay is a function of elevation angle so its variations are the main parameters to be consider in the modelling. The difference in ionospheric delay between paths to the reference and mobile stations for differential GPS has been quantified for equatorial region.

Ionospheric profile using nequick model and exponential layer

The ionospheric model used in the ray tracing is determined by fitting a number of exponential layers to realistic ionospehric profile. In this work, the electron density

profile was fitted with exponential layers and as input to improve the ray-tracing program. Figure 2 shows the process of fitting the NeQuick ionospheric profile by 40 exponential layers and the vertical total electron content for this profile, which is for equatorial, is 31 TECU.

NeQuick electron density profile has the electron concentration that can be calculated along an arbitrarily chosen-ray-path and the resultant profile is smooth (continuous first-order spatial derivatives) which is important in ray tracing.

Ionospheric error correction on GPS signals due to the direction of mobile station base on reference station in DGPS

To obtain the LOS, the receiver and satellite positions should be known, and there are several methods to obtain them. The difference in the delays (Δtd) between the paths can be found from the difference in delays between the reference and mobile stations.

$$\Delta td = td_{ref} - \Delta td_{mob} \quad (1)$$

The difference in LOS (ΔLOS) can be found from the difference in LOS between the reference and mobile station as eqn. (2). The real time satellite position is sufficient in this application and the precision of LOS is not so crucial compared to other parameters in the model.

$$LOS = LOS_{ref} - LOS_{m} \quad (2)$$

where

LOS_{ref}: line of sight at reference station

LOS_{m}: line of sight at mobile station

The relation between Δtd and the difference in true range (ΔLOS) for a given satellite position and their ratio as:

$$Ratio = \frac{\Delta LOS}{\Delta td} \quad (3)$$

The ionospheric error for two closely separated stations can be evaluated and corrected. Calculations were performed for both reference and mobile stations located at equatorial region to investigate the ionospheric effect for both the carrier phase and group paths for L1and L2. Since the ionospheric delay is a function of elevation angle, its variations are the main parameters to be considered in the modelling so the variation of azimuth and baseline direction will be investigated. The TEC and profile shape also will be investigated because it also influenced by ionospheric error.

Figure 3 showS that the difference in ionosphere-induced delay for South-North (S-N, 0˚) baseline direction for baseline length of 10 km.. Three azimuth angles (α=20˚, 60˚ and 80˚) were investigated for these baseline directions for 30 elevation angles ranging from 5˚ to 89˚ with an ionospheric profile of 72 TECU. Δtd is largest at lower azimuth (α=20˚) and lowest at higher azimuth (α=80˚). At 20˚ azimuth it has a maximum of 2.4 cm at 13˚ elevation, decreasing to 0.5 cm at 60˚ elevation angle. At 80˚ azimuth, it is less than 0.5 cm for any elevation angle.

Figure 4 shows the different in LOS, ΔLOS between paths to the reference station and mobile station. Due to Figure 4, for the S-N baseline direction, ΔLOS is larger at lower azimuth as well as lower elevation. It is about 9.5 km at 20˚ azimuth and 5˚ elevation

The ratio for the S-N direction is almost constant with azimuth at lower elevations but slightly dependent on azimuth at high elevations as shown in Figure 5. Δtd is actually higher at 20˚ azimuth at elevations less than 40˚ but so is ΔLOS.

Results also show that the ratio is independent of orientation of the baseline and azimuth angle. The above baselines located at equatorial region show a similar variation of the ratio with elevation and dependence on the TEC value.

Modelled the ratio using polynomial function

The ratio for S-N direction was modelled for the range of β up to 60˚ by fitting the obtained relationships with polynomial functions, f (β) as defined in Eqn. (4). It should not be extrapolated outside this range to higher elevation angles (80 to 90˚). The baseline was 10 km length and it used 16 elevation angles.

$$f(\beta) = 8.1 \times 10^{2}\beta^{10} - 3.7 \times 10^{3}\beta^{9} + 4.5\times 10^{3}\beta^{8} + 2.7\times 10^{2}\beta^{7} - 4.7\times 10^{2}\beta^{6} - 8.1\times 10^{3}\beta^{5} + 1.4\times 10^{4}\beta^{4} - 3.2\times 10^{4}\beta^{3} + 5.2\times 10^{4}\beta^{2} + 2\times 10^{5}\beta + 4.8\times 10^{5} \quad (4)$$

Differential ionospheric delay model

Currently ionosphere modeling using GPS data is a useful effort. As a function of elevation angle and TEC, this model is applicable at equatorial region and only requires a single frequency receiver provided the TEC over reference station is known. The difference in ionospheric induced error between two stations can be expanded as:

$$\frac{1}{Ratio} = \frac{\Delta td\,(TEC)}{\Delta LOS} = f\,(TEC)$$

$$\Delta td\,(\Delta, TEC) = \frac{\Delta LOS}{f(\Delta)}\; f(TEC) \quad (5)$$

where

TEC : total electron content

ΔLOS : differential in line of sight

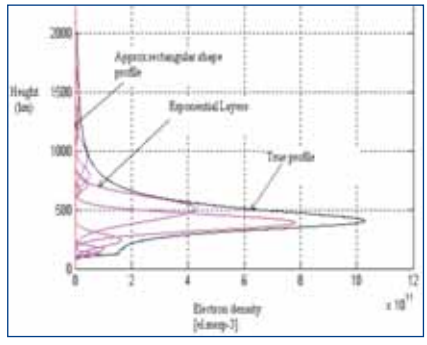

Figure 2: Ionospheric profile constructed from NeQuick Model and Exponential Layers

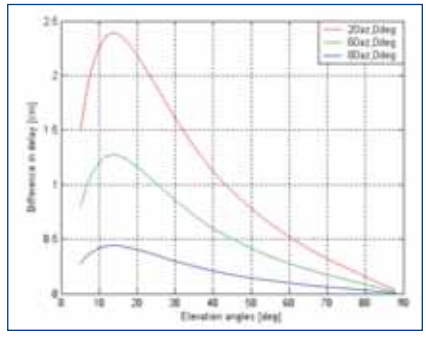

Figure 3: Differential ionospheric delay, Δtd for the S-N baseline

Without Correction	With Correction	
	PRN 23 & 19	PRN 23, PRN 19 & PRN 01
03:39:00	03:35:45	03:31:00

Table 1 Ambiguity resolution success rate for short baseline

β : elevation angle at reference station

Δtd : differential delay, in metre

For accurate result, the carrier phase was primarily used instead of code pseudorange measurements. However, the integer ambiguity needs to be resolved. The influenced of the model can be examined by looking into its effect on the quality checking and on the carrier phase ambiguity resolution.

Employing the ionospheric delay model and ambiguity resolution

The integer ambiguity is the unknown integer number of whole cycles between satellite and receiver. The receiver can determine only the fractional part of the wavelength but not the integer, so the ambiguity resolution is essential for precise range determination [4]. The goal of ambiguity resolution is to resolve phase ambiguities, i.e. to obtain the correct integer numbers (ambiguity fixing), which is possible at the DD level due to the elimination of instrumental biases etc. So a good ionospheric model is essential in order to get unambiguous results or reduce time to resolve for the ambiguities. After the ambiguities are resolved, the variance ratio is larger and the reference variances are smaller.

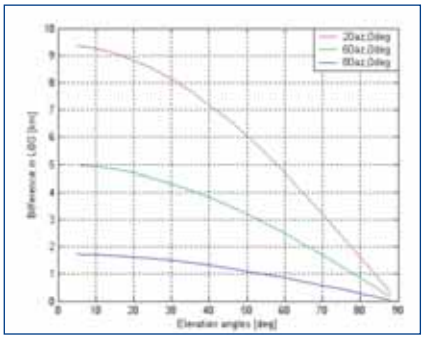

Figure 4: Different in LOS for S-N baseline at different azimuths

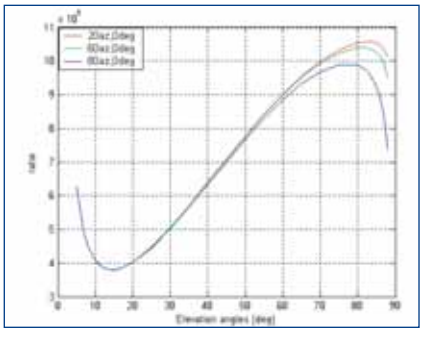

Figure 5: Ratio for S-N baseline at different azimuths

In order to illustrate the contributions of the correction ionospheric model, a shorter time (less than one hour period from 03:00:00 to 03:59:45) for KTPK station and UPMS station which is 19.75 km was chosen to see how the correction influenced the ambiguity resolution where the observed satellites PRNs are 01, 03, 19 and 23 from both stations were selected. Float solution non integer ambiguity estimate is produced when the processing cannot resolve the ambiguity. On the other hand, when the processing can resolve the ambiguity to a correct integer number, it results in a fixed solution.

Table 1 illustrates that with these 4 satellites, (uncorrected data) the ambiguities were resolved with the occupation time of 03:39:00. By applying the correction model to PRN 23 and 19, ambiguities were resolved at 03:35:45, which is 00:03:55 earlier corresponding to uncorrected data and when the correction model was applied to PRN 23, PRN 19 & PRN 01, ambiguities were resolved at 03:31:00 which is 00:04:45 earlier corresponding to corrected data with PRN 23 and 19 only and 00:08:00 earlier compared to four satellites (uncorrected data).

Conclusion

The work presented here has shown promising results based on the utilisation of carrier phase observation for precise positioning. The model is mostly suitable for short baseline. Simultaneously the model could also be preferably used among the single frequency users. The results show an improvement in the correction of the differential ionospheric error over short baselines. By applying the ionospheric model the ambiguity resolution success rate is faster even when only correcting one satellite seen at low elevation angles.

After the ambiguities are resolved, the variance ratio is larger and the reference variances are smaller. From the model we can get differential ionospheric delay in sub-centimetre accuracy.

Acknowledgements

We are grateful to Jabatan Ukur dan Pemetaan Malaysia (JUPEM) for providing the GPS data. The authors also would like to acknowledge Dr. H. J. Strangeways and Dr. R. T. Ioannides of Leeds University for permission to use a part of the ray-tracing program.

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SPATIAL needs political champions

says The Hon Gary Nairn, Business Consultant and former Australian Special Minister of State & e-Government Minister at GSDI 11 World Conference – Rotterdam 15th – 19th June 2009. Here are the excerpts.

Almost 20 years ago, as a Surveyor in private practice, and as someone who had a passing interest in politics, I presented a paper at a surveying conference, titled "Surveying the Political Landscape.

At the time I had no ambition to stand for political office as I was more than fully occupied with my Surveying and Mapping business which was busy adopting new technologies such as Geographic Information Systems and Global Positioning Systems. However in hindsight my paper at that conference may well have been the start of a process that saw me elected to the Australian Parliament in 1996.

During my almost 12 years in Parliament I was one of only about half a dozen out of 226 Members and Senators that could boast a truly practical science background such as surveying or engineering, a fact that had its positives and negatives.

As a Member of Parliament, I saw my role as having three main aspects – representing the people within my electorate in the Parliament; helping to deliver better services to them; and, working to improve their standard of living, which in my view covers their social, economic and environmental circumstances. In fact that last aspect is really what government is all about. And I might add that it is those three issues that the GSDI organisation has identified would be improved with the establishment of national and global SDI's.

I mentioned it wasn't easy explaining this to some of my political colleagues however, personally, I adopted the technologies to assist me in managing and holding the very marginal electorate I represented. Well it worked for 4 elections at least!

In my first re-election campaign I produced localised maps of the various regions of my electorate and overlayed the many projects I had been working with the community on to highlight the funding gained and the various achievements. In political terms, a picture that demonstrates achievements is always so much more convincing than a page of words.

When I became Parliamentary Secretary to the Prime Minister my major responsibilities were Water Reform and coordinating R&D related to domestic counter terrorism. Both responsibilities gave me opportunities to promote the importance and benefits of spatial information at the very highest level of government. Water reform required cooperation with the States and Territories which highlighted the many problems in spatial data, such as completeness, standards and interoperability.

But as Special Minister of State I was able to push spatial information a lot harder. In this role one of my major responsibilities was e-government on a whole-of-government basis. In Australia between 80 and 90% of our legislation has a spatial element, so developing e-Government in isolation to spatial information would be counter-productive and would in fact be a very poor use of taxpayers' funds. So to me, it was not possible to achieve efficient e-government without the involvement of spatial information. Spatially enabled government (SEG) was a key input for e-government.

As standards and interoperability were key issues that needed to be addressed to develop a national Australian Spatial Data Infrastructure, a key requisite for achieving a spatially enabled government, I instigated projects aimed directly at getting common standards across all jurisdictions and for interoperability. The National Address Management Framework (NAMF) was one such project I instigated.

Let me explain that achieving a spatially enabled society through e-government is "a political imperative". But to flesh out further those objectives of government let's look at what the historical role of Government is.

One can go back literally thousands of years and you find that not a lot has changed. The universal business of government generally comes back to such things as property ownership, taxation, defence and the delivery of services, or facilities management. And that's been the case for a long time. The big difference between then and now is that we use computers rather than stones to record that information. For government today, the major roles include such responsibilities as defence, the economy, environment, delivery of services – not much different from 1500BC really.

Also in today's world, what are the most political sensitive issues? Twelve months ago if you took a street poll you would probably come up with climate change as the number one issue that people wanted government to do something about. However, today it would undoubtedly be the financial crisis. But climate change will still be there. As will things like the environment, border security, employment (and read into that

industry and trade), health, welfare and transportation. And probably a few others.

The financial crisis is impacting worldwide. Businesses are going bankrupt and people are losing their jobs and their houses. Experts are saying it shouldn't have happened – the signs were there. Hindsight is a wonderful thing. But the experts are right – it could have been avoided or at least better contained if the United States had a better land administration system that was truly spatially enabled.

What was the root cause of the problem? Sub-prime loans – loans to people who didn't have the capacity to repay; loans of 100% or even greater of what the property being mortgaged was worth; and these loans bundled up with other more credible loans on-sold as a package. The problem started when crunch time came for the dodgy loans and the package started to unbundle.

So where does spatial information fit?

As Professor Ian Williamson from Melbourne University argued at a forum in Malaysia, this could have been avoided by a nation-wide cadastral register and minimum details of the credit worthiness of mortgage holders, neither of which exists in an accessible form in the US.

Imagine real-time feeds to the Reserve Bank (or the Federal Reserve in the case of the US, or the equivalent in other countries) of all land transactions and mortgages linked to land use, owner status (i.e. first home buyer) and land values. Such a process and information would have sent warnings bells a long time ago if it had been in place in the USA.

Governments might understand the importance of cadastral information to government processes such as taxation but they have not understood just what a powerful tool it would be if it was made central to an SDI and therefore effectively be ubiquitous or transparent in all government processes and transactions.

Just like the saying with respect to spatial information, "capture once, use many times", the same can be said for a full integration of the cadastre, land administration and an SDI making government spatially enabled. I would then say, "establish once, use constantly".

And it would be used constantly in all those other politically sensitive areas. Climate change – the ever increasing complexities in this space, whether it be measures to address the causes of climate change, to deal with the consequences of climate change (sea level rise, temperature rise, change in snow and rain patterns, etc) or to implement and manage a carbon trading scheme, necessitate the use of spatial information. So one system on a national basis will ensure consistency of data and apples are compared with apples rather than oranges.

The environment is no different. Whether it be the protection of the environment or using the environment for the benefit of society an SDI will always be the most efficient. With an SDI as a backdrop for government decisions not only gives government the confidence the decisions are the best decisions but will form valuable evidence if a country's environmental record is challenged globally.

The management of health and welfare systems are two other political sensitive areas that can be better managed in a spatially enabled government environment. For those of you who saw the English comedy "Yes Minister" will probably remember the episode when the government built the most efficient hospital in the health system – the one with no patients! Well the increase in costs of health services caused by an ageing population and exponentially developing technology means government needs every possible aide when deciding the location of facilities. Location is the common denominator when one starts to integrate the abundance of social and demographic data required to make those decisions.

And the final political sensitive area I'll cover is transportation. This is just one transportation problem I've come across during my travels in Europe – getting home Sicilian style!

In an increasingly instant world, where time is money, and money talks all languages, the provision of efficient transportation by government is highly desirable. Technology in your car is telling you how to get from point A to point B. So it is just not the engineering associated with the planning of roads, rail and other transportation infrastructure that needs spatial information it will be the whole operating and management system.

Good responsive politicians, who want to remain politicians, should be grabbing every possible opportunity so that they can deliver better outcomes to their constituents. An SDI and a spatially enabled government are the essential tools to do just that. More timely and better decisions will result. It's a political "no brainer", it's a political imperative.

Many of you will also know that in the UK, at the instigation of the Cabinet, their policy is now moving to make public geospatial information

data sets more accessible and affordable. This is a substantial change in government policy however the Cabinet is of the view that the economic activity that would be generated by such a change will be substantially more beneficial than the income forgone. You will all be very aware of the European INSPIRE Directive that provides for harmonising spatial information in and between European Union member states.

And in the Netherlands you have released a three year strategy titled "GIDEON" - a strategy is to establish the "technical and organisational infrastructure in which spatial data from public authorities – and on request from industry – are accessible and interoperable". The central organisational principle for GIDEON is 'record once, use many times'.

I think the European INSPIRE directives and Netherland's strategy are particularly instructive and represent excellent examples of where the world is heading with respect to the importance of geospatial information. And I congratulate the politicians who had the good sense to listen, understand and make these decisions.

The takeout from much of what is happening globally is that the modern economies have realised that SDI's are now about facilitating the use of geospatial information rather than just managing it, that is, the building and managing of data sets. The leading countries of the world have also identified "champions" at the senior political level.

In Australia, the frustrating aspect is that literally hundreds of billions of Australian dollars are currently being thrown at these issues and with an investment of only a few hundred million dollars these challenges could be addressed far more quickly and efficiently.

Here is just one example. Partly in response to the global financial crisis, the Australian Government established an organisation called Infrastructure Australia. Its role is to consider national infrastructure projects and make recommendations to government as to which ones should attract government funding. The projects put forward include everything from major road and rail upgrades and developments to port facilities and communication networks - all eminently suitable and needed for Australia's future development.

But a project to accelerate the development of a National Spatial Data Infrastructure was considered by Infrastructure Australia "not to fit the criteria for being an infrastructure project"!! How could that be?

Basically, in my view, there is no understanding at senior political levels that infrastructure doesn't have to be "hard". They seem to think that it has to have concrete or bitumen or steel to be infrastructure.

But the reality is that "soft" infrastructure such as a NSDI will in fact facilitate the efficient development of the "hard" infrastructures. So what is missing? It is political "champions" who can overcome such irrational decisions. Unfortunately such "champions" have been in short numbers globally and it is incumbent on those in the profession and industry to find and "educate" some "champions". But that "education" will only be effective if it is done in "political terms". Politicians understand politics best and developing national spatial data infrastructures is good politics – they will assist in addressing those major challenges that governments face; they will assist in overcoming such issues as social exclusion, climate change and financial crises; and they will help facilitate economic development thus improving the lives of citizens.

And it is a political imperative that "champions" are found globally. The standards and interoperability projects that are needed within a country are also needed globally as we work on the challenges the earth faces. One country alone can't solve the earth's problems, the world in unison must do that. And global spatial data infrastructures can and will play a vital role.

But political decisions will have to be made to make that happen so global "champions" are needed to argue that a spatially enabled society is a political imperative.

"The betterment of societies through spatial enablement"

Emphasizes Associate Professor, Abbas Rajabifard, Incoming President, GSDI Association on 19 June 2009 at Rotterdam. Here are the excerpts

This conference is a milestone in our GSDI journey. The huge size of the conference program points to the relevance and level of interest in the subject areas of the conference partners. The conference has shown, once again, the essential requirement for the Association to partner in order to delivering credible outcomes, with INSPIRE and Geonovum at this event, as we did with FIG in GSDI 9.

The conference has presented material covering a multitude of topics: Societal challenges; Convergence and collaboration (GEO/GEOSS, GEOSS/OGC/GSDI, the UNSDI, and, government, business and the scientific community); SDI development (national, regional, continental -INSPIRE, and in the marine environment);SDI applications; Technical issues (data interoperability and harmonisation, …); Research and development; Policy and governance (SDI assessment, data sharing, return on investments; business models); and Capacity building (GSDI knowledge network, regional newsletters, future spatial skills, International Geospatial Society, Rotterdam Geo Youth Capital 2009; Master Classes).

Our activities are dedicated to international cooperation and collaboration in spatial data infrastructure development to address the social, economic, and environmental issues confronting the world. We regularly offer conferences such as this one to enhance communications among practitioners as well as among the leadership of other geospatial organizations. We purposefully take our conferences to different parts of the globe in order to serve all parts of the planet.We publish monthly newsletters within and for various regions of the globe in multiple languages in order to keep all geospatial specialists aware of opportunities to become engaged and participate in their own regions.We offer a regular small grants program in furtherance of SDI development in developing nations. We are expanding support of our working committees that are actively addressing technical, legal and socioeconomic, social impact, and communication issues. An important priority for us is to enhance our inclusivity so that we better respond to the individual needs of members, are open and accommodating to the ideas of others, and draw people from different backgrounds into our Association. The creation of an International Geospatial Society which is an individual Arm for our Association and this is an excellent example of this strategy.

I believe the essence of what we do in the Association is help to create an enabling environment that enhances outcomes in societies, economies and the global environment. The betterment of societies through spatial enablement is one of my goals as President.

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Study GIS at Hong Kong Polytechnic

The Department of Land Surveying and Geo-Informatics at the Hong Kong Polytechnic University is now accepting applications for Master of Science/ Postgraduate Diploma in Geomatics (GIS/ Surveying). It is the longest running postgraduate program in GIS and the only one in Geomatics (Surveying) in Hong Kong. *www.lsgi.polyu.edu.hk*

Mobile Navigation Development

SuperGeo has introduced a mobile GIS application, SuperGIS Mobile Tour, which features customizable map layers that support .geo, .shp, and .jpg files. Users can create a complete mobile navigation system after setting the map layers and guide data. It supports route selection and auto-display of pictures of scenic spots etc.Various GPS functions are also supported. *www.supergeotek.com*

MODON turns to GIS system

MODON signed a GIS contract with the Saudi Consolidated Engineering Company. The project aims to design a GIS for MODON, develop applications and display information of the industrial cities throughout the Kingdom on the Internet. *www.zawya.com*

Rwanda to harmonise GIS data

The National Land Centre (NLC) of Rwanda, is set to harmonise all GIS data streamlining access, ease in sharing and reference amongst all its users. *http://allafrica.com*

Azerbaijan Property Registration

Azerbaijan's State Committee of Land and Cartography is carrying out an aerial photography and satellite survey. ERDAS' LPS photogrammetry software is used to generate digital orthophotos covering almost 70% of the territory. The project aims to develop a property registration system for the country. *www.dtxk.gov.az*

Asia's largest slum for redevelopment

GIS has been used to map each and every structure and household in the 590-acre slum enclave of Dharavi, Asia's largest slum in Mumbai, India. As part of the Rs 15,000 crore Dharavi Redevelopment Project, the 18-month-long survey was carried out by Pune-based NGO Mashal, appointed by the Slum Redevelopment Authority.

The GIS-based biometric and socio-economic baseline survey will allow a user to at-the-click of a button find a particular structure and get complete information about its occupant *http://timesofindia.indiatimes.com*

New system to speed land selection in South Korea

The Korea Land Corporation will provide companies with a computerized consulting service - the Spatial Information Knowledge System for Industry, or SPINKS_INDY, a cutting-edge GIS. The aim is to facilitate business activities in line with current efforts by the government to stimulate the ailing local economy, the corporation said. *http://joongangdaily.joins.com*

Geomajas version 1.4.0 of OS, web-based, editable GIS Software

A team of GIS developers from Belgium have released Geomajas version 1.4.0. It is an open source GIS software enabling geographical editing and support for complex relation models in the web browser. *www.geomajas.org*

ESRI on-site training options

ESRI trains GIS professionals at their workplaces by providing on-site training, coaching, and video teleconferencing, in addition to self-study classes over the Internet. It recently added two new training options -Client Coaching Coupled with Client-Site Training/ Mobile Lab and Instructor-Led Remote Classroom Training. *www.esri.com*

China Navigation Map Market Report

According to China Navigation Map Market Report, 2008-2009, the Chinese car navigation market is in its early stage. In 2008, the market penetration rate of car navigation in China was only 4.56%, far lower than the 60% of Japan, and 20%-30% of both Europe and U.S.A. In 2008 a total of 3.1 million navigation devices were sold, more than double than that in 2007. *www.pr-inside.com*

iPhone Spy Software unveils Stealth GPS Tracking

Mobile Spy version 3.0 by Retina-X Studios, Apple iPhone spy technology, users can now track GPS locations, SMS messages and calls of children or employees inside an SSL secured online control panel. Mobile Spy runs in total stealth mode and no mentions of the program are shown inside the iPhone. *www.retinaxstudios.com*

LG ships first feature phone with off-board navigation

LG GT505, is the first feature phone to offer GPS and turn by turn navigation. "Wisepilot for LG", powered by Appello and deCarta is a turn-by-turn navigation software for cars and pedestrians. The solution features several additional services available free of charge. *www.lge.com*

Broadcom launches "PND-on-a-chip"

Broadcom's "PND-on-a-chip" (BCM4760) embeds a GPS baseband, RF circuitry and low noise amplifier (LNA) as well as an ARM11 processor an OpenGL ES

1.1/OpenVG 1.0-compliant graphics processor. It also integrates an audio codec, touch screen controller and USB 2.0 controller with high speed transceiver, all on a single die. *www.broadcom.com*

Location-based store locator on mobile web pages

Useful Networks and 1020 Placecast shall soon provide mobile advertisers with a store locator service tied directly to the consumers' real time location. It will help provide a location-customized landing page, which could include a map, directions and local phone number for consumers clicking on their banners on the mobile web. *www.useful-networks.com*

SiRFatlasIV unveiled

SiRF introduced SiRFatlasIV a low cost equivalent of the SiRFPrima platform which provides GPS and high multimedia performance on the same die. *www.sirf.com*

TechnoCom Launches SpotOn GPS

SpotOn GPS by TechnoCom is a mobile advertising and marketing content delivery platform that provides comprehensive turn-by-turn navigation, search and mapping. It leverages advertising with the utility of navigation. It is a hosted solution that delivers fully-customizable interactive and location-aware advertising. *www.spotongps.com*

BorgSolutions offers free Starter Edition of Borg Fleet

BorgSolutions shall soon be offering a free version of its flagship fleet maintenance management software Borg Fleet Starter Edition. It allows customers to manage the maintenance and repair schedules of their fleet, as well as plan their fleet resources using web-based platform. It will offer features including: asset management, work order management, employee management, maintenance scheduling, supplier administration, and reports. *www.borgsolutions.com*

Microsoft unveils Bing Travel

Microsofts new search destination for travelers -- Bing Travel -- will help consumers make smart travel decisions through a variety of innovative tools and features. *www.bing.com*

Navman selects Navteq as its map supplier in Australia

NAVTEQ announced an agreement that Navman will utilise the NAVTEQ map of Australia in its entire range of PNDs. It will be the preferred map supplier for MiTAC, Mio and Magellan in Australia. *http://corporate.navteq.com*

Safe Navigation in Korea

In Korea, the Ministry of Land, Transport and Maritime Affairs shall soon provide small ships off the coast of the Korean peninsula with differential GPS information through mobile phones and other personal devices. Until now small avoided using professional equipment because of the price of the hardware. *http://english.mltm.go.kr*

Operational Glonass Satellites go up

The number of operational satellites in Russia's Glonass grouping has been increased to 17, according to Russia's Federal Space Agency Roscosmos said. Two Proton-M launch vehicles are expected to lift off this year to put six more Glonass-M satellites into orbit. *www.roscosmos.ru*

GPS shoes for Alzheimer's patients

Aetrex Worldwide, a footwear manufacturer and a technology company, GTX Corp is teaming up to develop footwear with a built-in GPS device that could help track down 'wandering' seniors suffering from Alzheimer's Disease. Embedding a GPS device in a shoe was important because Alzheimer's victims tend to remove unfamiliar objects placed on them but getting dressed is one of the last types of memory they retain. *www.gtxcorp.com*

U.S. Customs OKs 'redesigned' GPS chip import

U.S. Customs and Border Protection has determined that GPS chips redesigned by SiRF Technology Holdings, Inc. fall outside an exclusion order issued by the U.S. International Trade Commission. The approved redesigned SiRF products, and products that contain the SiRF chips, are now allowed to be imported for sale in the U.S. The ITC had previously ruled that SiRF had infringed on three of Broadcom's GPS patents. Reuters

Forest guards get trained to use GPS

Forest guards in Himachal Pradesh, India are being imparted training on GPS. The main purpose of using the system was to plan the movements of forest guards well in advance and it would be easier to put in place a better guarding system. *ANI*

Error in GPS coordinates- Wrong house demolished

A demolition crew in Georgia in the US has taken GPS error to new levels - demolishing entirely the wrong house on the basis of its GPS co-ordinates. A team from Forestar Group Inc used GPS co-ordinates to destroy the house of Mr Al Byrd, 150 yards away and on the opposite side of the road from their intended target. *http://abcnews.go.com*

GPS & compass on key ring

IDC Design Corp has announced a tiny GPS system that can be mounted on a car key ring and act as an 'electronic breadcrumb trail' back to a particular location - the car for instance. Guidance is simply by an arrow and distance readout - there is no mapping. *www.idcgps.com*

US National CORS programme adds GPS satellite base stations

Three additional GPS satellite base stations owned by eGPS Solutions are now being processed into the National Geodetic Survey (NGS) Continuously Operating Reference Stations (CORS) program. These base stations are part of the eGPS Real Time GNSS Network. *www.egps.net*

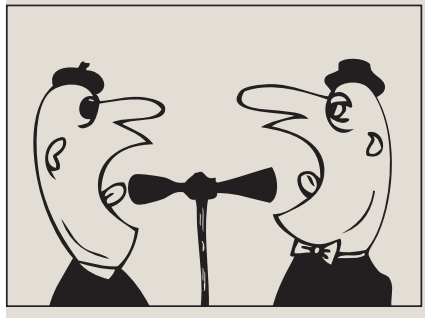
Russia to launch two GLONASS Correction Relay Satellites

The Russians will launch two multipurpose relay satellites in 2010-2011 for providing GLONASS correction data. Loutch-5A will be launched in December 2010 and Loutch-5B in December 2011.

Russia and Ukraine to hold joint experiments on ISS

Russia and Ukraine intend to form a common navigation space based on GLONASS system, and hold a number of scientific experiments on the International Space Station. "We have worked through the issues related to the formation of a single navigation-and-time space of Russia and Ukraine basing on the GLONASS system and other global navigation systems," Federal Space Agency Roscosmos head Anatoly Perminov said. *www.roscosmos.ru*

Coast Guard directed to maintain and upgrade Loran

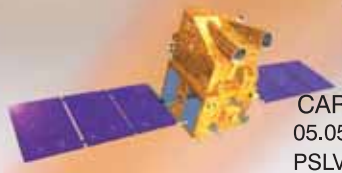


The U.S. Senate directed the Secretary of Transportation to maintain the current Loran-C navigation system and prepare for modernization to eLoran, and authorized $37 million per year for 2010 and 2011 towards that purpose. Similar action is also currently pending in the House. The significance of Congressional intent, if carried through, will be continuous longterm commitment to Loran as an essential, integral back-up to GPS. Without such a demonstrated commitment from the U.S. government, OEM manufacturers have been reluctant to design and produce integrated Loran/GPS chips or receivers. *www.loran.org*

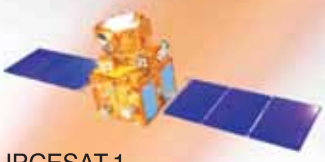
INDIAN REMOTE SENSING SATELLITE (IRS)

Roving Eye in the Sky

CARTOSAT-2
10.01. 2007
PSLV-C7



CARTOSAT-1
05.05. 2005
PSLV-C6



RESOURCESAT-1
17.10. 2003
PSLV-C5

OCEANSAT-1
26.05.1999
PSLV-C2

IRS-1D
29.09.1997
PSLV-C1

IRS-1C
28.12.1995
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Galileo update

Galileo IOV launch services contract signed

ESA and Arianespace signed a contract for the launch of the first four operational Galileo satellites on two Soyuz launch vehicles from Europe's Spaceport in French Guiana. ESA's Director of the Galileo Programme and Navigation-related Activities, Mr René Oosterlinck, and the Chairman and CEO of Arianespace, Mr Jean-Yves Le Gall, signed the launch services contract in the presence of Mr Paul Verhoef, Programme Manager of EU Satellite Navigation Programmes at the European Commission. The Galileo In-Orbit Validation (IOV) Launch Services Contract covers the launch of the first four operational Galileo satellites using two Soyuz launch vehicles that will lift off from the Guiana Space Centre (Centre Spatial Guyanais – CSG), Europe's Spaceport in French Guiana. Following the successful launch of the GIOVE-A and GIOVE-B satellites, the signature of the IOV Launch Services Contract marks an important milestone for the Galileo programme as it progresses towards the operational deployment of the satellites of the Galileo satellite navigation system. The four IOV satellites will be placed in a circular orbit at an altitude of 23 600 km by the end of 2010. *www.esa.int*

ESA and OHB/SSTL sign contract

The European space agency ESA and the bidder consortium led by OHB-System AG and Surrey Satellite Technology Ltd. (SSTL) have signed a contract for sourcing long-lead items for satellites for the future European Galileo navigation system. The EUR 10 million contract is carried out under a program initiated and funded by the European Union. Through this contract, OHB and SSTL are able to place orders for satellite technologies which require considerable lead times for development and sourcing ahead of the award of the actual contract for the construction of the satellites. The Galileo System customers, the European Union and the ESA, are thus ensuring that the schedule for implementation of Galileo can be maintained. OHB and SSTL are one of two consortia bidding for the development and construction of 28 satellites for Galileo. By allowing dual sourcing for the spacecrafts for this significant undertaking, ESA is ensuring that the full operational capability can be put in place as soon as possible and at best value to the EU. www.ohb-system.de

EC seeking support for Galileo standardisation

The EC's DG for Energy and Transport has launched a call for tenders for supporting EGNOS and Galileo standardisation. The aim is to carry on the standardisation process for the European Geostationary Navigation Overlay Service (EGNOS) and Galileo in key application areas. It is expected to cover specific aspects of:

1. Aviation (SBAS L5)
2. Location-based service (LBS) communities (terrestrial trunked radio (TETRA)
3. Worldwide interoperability for microwave access (WIMAX)
4. Digital video broadcasting (DVB)

Successful tenderers will also be required to make relevant progress in the rail, road and multimodal transport domains. *http://ec.europa.eu*

At a Glance

Mergers, Acquisitions and Partnerships

- Topcon, Sokkia create New Survey Business Unit for Americas.
- Trimble acquires NTech Industries to extend its Precision Agriculture Solutions Business.
- Wallingford Software acquires InfoStream
- Fugro acquires Tenix LADS.
- Geomatics Data Solutions Partners with IVS 3D.
- AvMap extends relationship with Tele Atlas
- Azteca Systems. and CartoPac Field Solutions announced an alliance
- Tele Atlas gets map data deal signed with ALK.

Contracts Awarded

- Argon ST awarded next phase of DARPA Robust Surface Navigation Program.
- Magellan Aerospace awarded contract for RADARSAT Constellation Mission.
- OSI Geospatial signs US $2.5 Million of R&D contracts with U.S. Army.
- Infotech Enterprises signs a Multi-Year Partnering Contract with iTEC of Malaysia.
- SAIC awarded $13 Million contract by U.S. Department of Agriculture, Farm Service Agency.
- NAVTEQ LocationPoint Advertising selected by Centrl.
- Maptel has secured a five-year; $600 million contract to digitise data collection for US authorities.
- July 14 is RazakSAT's new launch date

Chandrayaan-1 completes mission

The Indian Space Research Organisation has completed all the primary objectives of the Chandrayaan-1 lunar reconnaissance mission. The scientific objective of the spacecraft was remote sensing of the Moon in visible, near infra-red, low energy x-ray and high-energy x-ray regions. The intention is to prepare a 3-D atlas of both the near and far side of the moon, with a high spatial and altitude resolution – down to five metres in the optical. *www.isro.org*

Monitoring Indonesian forests

The European Space Agency has awarded a contract worth €100,000 for tropical forest monitoring in Indonesia. The project will demonstrate the benefits of a multi-sensor approach for systematic wide area monitoring of tropical forests at high resolution. It will exploit the capabilities of the Disaster Monitoring Constellation (DMC) and synthetic aperture radars. The project will be undertaken by DMCii, the University of Leicester and the World Resources Institute (WRI). *www.dmcii.com*

Antrix looks to expand business

Antrix Corporation, the commercial arm of ISRO is eying at contracts worth $100-150 million. High demand for its low-cost space solutions is not only from the US and Europe, but also from like Algeria, Chile, Brazil, Argentina, Kazakhstan and Middle East. "We hope to clock 8% growth and touch revenue of Rs 1,000 crore. We have a backlog of orders worth Rs 3,000 crore which will be completed in the next 3-4 years," Antrix managing director, KR Sridhara Murthy said. Antrix has more than 150 customers in the telecommunication and broadcasting sectors and 40 customers in remote sensing and imageries.

Satellite Imagery for disasters

UN's Office for Outer Space Affairs has activated the International Charter on Space and Major Disasters in Tajikistan, Afghanistan and eastern India. Under the charter, satellite operators provide imagery from their satellites to disaster response organisations for free. *www.oosa.unvienna.org*

Applanix introduces the POSTrack 410

Applanix introduced the POSTrack™ 410. It is a flight management system for airborne cameras with a built-in POS AV GNSS-Inertial Navigation System for direct georeferencing of airborne images. *www.applanix.com*

50% off on IRS & IKONOS mosaics

From June 1, IRS-1C/1D/P6 and IKONOS imagery mosaics of kosmosnimki.ru geoportal Internet-shop are available at a 50% discount. The virtual shop has simplified access to these high resolution imageries covering the Russian and CIS territory. On-line purchasing of mosaics is done in JPEG format for lower prices as compared to data in professional GeoTiff format. *www.scanex.ru*

CARTOSAT-2 data capture in Russia

ScanEx RDC shall now receive CARTOSAT-2 data. According to agreement between ANTRIX Corporation Ltd and ScanEx RDC, the latter is allowed to upgrade its UniScan ground receiving stations with the CARTOSAT-2 data reception hardware, thus enabling to streamline access of the users to Indian satellite data covering Russian and CIS territories. *www.scanex.ru*

ERDAS and DG join hands to educate end users in India

Digital Globe & ERDAS joined hands to educate and cater to the needs of geospatial users in terms of data through a series of seminars across India. The first seminar in the series was organized in Patna. The seminar showcased Digital Globe, with its imagery solutions, and ERDAS, with its tools like LPS and Apollo server, to provide a complete solution. *www.erdas.com*

Roadside assistance with SPOT satellite GPS messenger

SPOT Assist Roadside combines GPS and satellite communications technologies to deliver location-based messaging regardless of cellular network coverage. The "Help" button on the handheld SPOT Messenger can instantly alert a national roadside response centre of their location and need for roadside assistance from virtually anywhere in North America. The program includes five roadside tows per year, up to 50 miles per tow, as well as auto-accident assistance, fuel delivery services, tyre repair etc. *www.spot.com*

Bentley extends efficiencies

Bentley Systems has extended the functionality of Bentley Expert Designer V8i to include water, gas, and communications infrastructure. The software merges network design and work management in a single environment, integrating network modelling, design engineering, and detailed design cost data for a wide range of utility infrastructure. The software's architecture is GIS and work-management system (WMS) independent, enabling integration into existing GIS and graphics environments. *www.bentley.com*

McMurdo selects u-blox' GPS solution

McMurdo has chosen u-blox as its supplier of embedded GPS receivers for its newest "FAST FIND" personal location beacon. The device benefits from u-blox' built in 50-channel GPS positioning engine to transmit a highly accurate location via the global COSPAS SARSAT 406MHz search and rescue satellite communication system. *www.mcmurdo.co.uk*

CHC wins contract for GPS receivers

CHC, Shanghai has won a contract to provide 30 of its X90 GPS receivers to a survey project in Nei Mongol, the autonomous region of the People's Republic of China.

Autodesk India announces new Infrastructure Modelling Software

Autodesk India has recently announced new Infrastructure Modelling software products for utilities, telecommunications organizations and government agencies. It includes AutoCAD Map 3D 2010, AutoCAD Raster Design 2010, Autodesk MapGuide Enterprise 2010, and Autodesk Topobase 2010. *www.autodesk.com*

Leica Geosystems announces the launch of SmartNet Europe

Leica Geosystems announced the launch of SmartNet Europe. Powered by Leica GNSS Spider, SmartNet is a GNSS network RTK correction service that has now been adopted in many European countries including UK, Ireland, Denmark, Norway, Italy, Lithuania and parts of Spain. *www.leica-geosystems.com*

IntergraphR advances Enterprise Geospatial Product lines

IntergraphR has enhanced its open geospatial technology portfolio. Intergraph GeoMediaR can be used for in-depth analysis on spatial data and for accessing and distributing the data in various formats across the enterprise and to key external stakeholders. *www.intergraph.com.*

Hemisphere GPS Guidance and Automated Steering Technology

Hemisphere GPS and Stara S.A. Industria de Implementos Agricolas announced the launch of Stara's newest self-propelled sprayer, Gladiador, which comes standard equipped with Hemisphere GPS precision agriculture guidance, automated steering and boom control technology. *www.stara.com.br*

DAT/EM System's presents Single Panel 3D Stereo Viewing

DAT/EM Systems Summit Evolution™ stereoplotter and Landscape™ LiDAR processing packages is a single 120-Hz-refesh-rate LCD monitor providing crystal clear stereo image viewing and clean panning. *www.datem.com*

Garmin recalls marine charts

Garmin has globally recalled its 2009 issue of BlueChart g2 and g2 Vision electronic charts due to inaccuracies in depth contours and areas - resulting in depiction of water depth as deeper than actual under certain display conditions. The users will be given a replacement traditional BlueChart card or g2 Vision card v2008.5 (dated July 2008) free of charge and will also receive the 2009 card free of charge when it is re-released. *www.garmin.com*

GeoEye's new distribution model

In a new arrangement GeoEye will allow its customers outside the US to resell data collected by the satellite to the US military and Google. Another important change is that GeoEye will retain the rights to the actual images. It will be able to resell the imagery to customers like the US government, even when local partners have exclusive territorial sales rights. *www.geoeye.com*

PCI Geomatics receives funding

PCI Geomatics has recently received funding from the Going Global Innovation (Going Global) for its project on finalizing and generating new partnerships in China. PCI Geomatics has recently opened a Beijing corporate office and supports research partnerships and market development in the environmental sciences and technologies, natural resources and ICT areas. *www.pcigeomatics.com*

Pitney Bowes adds support to MapInfo Professional

Pitney Bowes Business Insight (PBBI) has unveiled version 10 of MapInfo Professional, adding a redesigned intuitive user interface; access to PostGIS, an open source database; and built-in support for layered PDF generation. It will have enhanced data access for users to tap into more data than before including Microsoft SQL Server 2008.*www.pbbusinessinsight.com*

Contex unveils Wide Format Copier

Contex has introduced SD4430 MFP, a wide-format office copier; and the HD3650 MFP, a colour reprographics system designed for a high-productivity workflow environment. *www.contex.com*

Topcon GRS-1 partnership for faster access to GIS Field Data

Topcon has partnered with GeoAge to create a real-time, field-to-office data exchange for GIS. Users can now connect to a server, download data forms and upload information, including photos, from the field. No additional hardware is required. It features a dual-frequency GNSS receiver, Windows Mobile 6.1 operating system, high-speed processor, digital camera, and integrated cellular modem. *www.topconpositioning.com*

Blom completes 40 3D models of cities

Blom has completed the production of the first 40 high quality 3D models, Blom3D, of European cities. The Blom3D models have been delivered to Tele Atlas for integration into navigation; LBS and mapping solutions. *www.blomasa.com*

Blue Marble Desktop release

Blue Marble Geographics has released Geographic Calculator 7.3 and Geographic Transformer 6.1 via the Blue Marble Desktop 2.0, the all-in-one geospatial data management platform for Blue Marble's data transformation tools. *www.bluemarblegeo.com*

ERDAS APOLLO powers mobile geospatial data provisioning system

ESG Elektroniksystem and Logistik-GmbH (ESG) has released a new

version of mobile geospatial data provisioning, based on ERDAS APOLLO. It organizes and delivers geospatial data via a geoportal offering massive amounts of raster, vector and terrain data. It will be used by customers in defence, security and emergency response situations. *www.erdas.com*

Bricscad gains distribution into North America and India Markets

Bricsys NV and Global Force DIRECT have reached an agreement granting Global Force DIRECT licensing rights to market and sell the Bricscad product and applications across North America and India. *www.bricscad.com*

DeLorme extends GPS capabilities to ESRI users

ESRI users will now be able to view their ArcGIS Desktop projects on the DeLorme Earthmate PN-40 GPS receiver. *www.delorme.com*

NovAtel wins US Federal Aviation Administration contract

NovAtel Inc has been awarded a contract by the US Federal Aviation Administration (FAA) to develop the next generation Wide Area Augmentation System (WAAS) reference receiver (the "GIII" receiver). The total value of the contract is $9.7m US. WAAS is a space-based system that broadcasts corrections data and information to improve the overall accuracy and integrity of GPS satellite signals.

Following are the comments by Michael Clayton, NovAtel's Director of Aviation Programs regarding usefulness of WASS and GIII receiver

How does WASS help to improve the GPS satellite signals?

The goal of WAAS is to improve the accuracy, integrity and availability of GPS for Aviation users. It uses a network of ground based reference stations to measure the GPS satellite signals in the western hemisphere. The reference stations send these measurements to master control stations, which post processes the data and then generates corrections and integrity information that is forwarded to geostationary WAAS satellites. These satellites then broadcast the signals back to earth, where WAAS enabled GPS receivers utilize the data to determine the integrity of the GPS signals and to improve positioning accuracy of the resulting position solution.

How will the 'GIII' receiver be different from the current generation of receivers?

The third generation WAAS Reference Receiver will be a technology refresh for the WAAS network to support the "modernized" GPS signals. In addition to the legacy L1 C/A and L2P(Y), this receiver will support the new L1C, L2C and L5 signal structures. This WAAS-GIII Ground Reference Receiver is expected to be start to be integrated into the WAAS network in late 2012 with full cut-over in the 2014 timeframe.

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www.bentley.com/BeConnected

August 2009

SEASC 2009,
4-7 August
Bali, Indonesia
www.bakosurtanal.go.id/seasc2009/04

2009 IMTA Asia Pacific Conference & Trade Show
7-8, August
Darwin, Australia
http://www.maptrade.org/events/upcoming.php

September 2009

2nd GNSS Vulnerabilities & Solutions Conference
2- 5 September
Baska, Krk Island, Croatia
http://twitter.com/BaskaGNSS2009

ISDE 2009
9-12 September
Beijing, China
www.digitalearth-isde.org

INTERGEO 2009
22-24 September
Karlsruhe, Germany
www.intergeo.de

ION GNSS 2009
22-25 September
Savannah, Georgia, USA
www.ion.org

October 2009

European Navigation Event 2009
6 October
Houten, The Netherlands
www.navigationevent.com

ILA 2009
Week of October 12
Portland Maine USA
www.loran.org

ACRS 2009
19-23 October
Beijing, China
http://www.aars-acrs.org/acrs

7th FIG Regional Conference
19-22 October
Hanoi Vietnam
www.fig.net/vietnam/

18th UNRCC-AP
26-30 October
Bangkok, Thailan

13th IAIN World Congress
27-30 October
Stockholm, Sweden
www.congrex.com/nnf/iain2009/

November 2009

International Symposium on GPS/GNSS 2009
4-6 November
Jeju, Korea
gnssws@gnss.or.kr
www.gnsskorea2009.org

NAV09
Maritime: 10 November, Southampton
Positioning & Location: 12 November, Nottingham
Land: 19 November, Teddington
Timing: 20 November, Teddington
Air: 25 November, London
www.rin.org.uk/news-events/events

WALIS International Forum 2009
11-13 November
Perth Convention Exhibition Centre, Australia
www.walis.wa.gov.au

24th International Cartographic Conference
15-21 November
Santiago, Chile
www.icc2009.cl

December 2009

IGNSS 2009
1- 3 December
Holiday Inn Gold Coast, Queensland, Australia
www.ignss.org

Middle East Spatial Technology Conference & Exhibition
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