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Coordinates

Volume IV, Issue 1, January 2008

THE MONTHLY MAGAZINE ON POSITIONING, NAVIGATION AND BEYOND

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Columns

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Nano effects

A historic moment.

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Tata unveiled small car Nano with a price tag of US$ 2,500.

When this 'car for masses' was promised, many did not believe.

Now it is a reality.

A revolutionary innovation.

An innovation that may change the life of millions.

GNSS technology too has this potential.

For imaginative applications and wider reach.

And a pricing challenge.

GNSS players may have a look at nano issues.

For mega impact.

Bal Krishna, Editor
bal@mycoordinates.org

GNSS: What next?

It is a fascinating time for GNSS. The US is set to modernize GPS and Rissia is making steady progress on GLOSNASS. Despite the intricacies involved, Europe is determined to realize Galileo. Not surprisingly, the industry is introducing imaginative and innovative applications built around these technologies. The technology providers face the additional challence of meeting the evolving needs of the users. We asked Mr Mike Sweik, President, US GPS Industry Council, to moderate the discussion.

Preserving the seeds

F Michael Swiek
Executive Director
United States GPS Industry Council

In looking ahead at what milestones we may expect to see during 2008 in the world of GPS and GNSS it is easy to be caught at one of two extremes. The first extreme would be to make the mistake of the shortsighted person who in the late nineteenth century proposed that the US Patent Office should be closed because everything conceivable had already been invented. The other extreme would be to look ahead at the promise of new constellations, signals and capabilities and claim that the door is only just beginning to open on the full wonder of the utility of satnav technology, and that myriads of amazing and unexpected applications and benefits will continue to spew forth in unbounded torrents from the creative fountainheads of the global satnav community.

To be sure, it is a bit difficult to expect or imagine truly revolutionary developments in the actual hardware of satellite navigation. GPS engines and chip sets are now available at commodity prices and in sizes and configurations small enough to allow full satnav capability to be built into almost any appliance or device. In some ways, satellite navigation has become more of a feature to be incorporated or even expected in a wide range of devices, rather than a stand-alone piece of equipment in the mass market. So, while revolutionary developments in hardware are not likely to be major milestones in 2008, we no doubt can expect to see a continuing impressive evolution of satnav hardware, bringing improved performance in signal processing, interference rejection, power consumption and a host of other metrics, required by the ever increasing demands of integrating satnav capability with a growing array of other technologies and systems in a wide variety of applications.

Now don't get me wrong, evolutionary development in satnav capabilities can be quite exciting. One of the most exciting frontiers and biggest challenges is integrating the actual satnav function with other technologies and sources of communications, data and information to forge truly unique and revolutionary "milestones" in applications. As we see in the other articles addressing the topic of milestones in this issue of Coordinates, individual companies are continuing to pour resources into R&D efforts that will bring some very interesting and valuable products to market in the coming year. The industry and market are dynamic and vibrant, the breadth of applications is stunning, and the prospects exciting. There will undoubtedly be impressive and even astonishing new applications emerging, some from unanticipated directions. This is the most thrilling aspect of satnav: vitality that knows no bounds, and the freedom to incorporate or adapt satnav capability into almost any area. The limits seem to be bounded only by imagination, creativity, financing to a degree, and in some cases, the laws of physics. The laws of man, and their regulations have placed few, if any, obstacles or barriers to this dynamic global effort.

Another strong possibility in the coming year is that we will see some tangible milestones in the progress, and perhaps even initial deployment of new satellites with new capabilities. This may take place as existing operational systems such as GPS and GLONASS continue to update and modernize. We may also see emerging and proposed systems such as GALILEO, Japan's QZSS, India's GAGAN and China's COMPASS move closer to reality. Any milestones reached by these systems during 2008 are likely to raise further questions of just how they will contribute to the global satnav mix of options, and whether they will prove to be valuable commercial assets.

One of the key questions as these new systems approach reality is whether their technological milestones will contribute and add to the

innovative vitality and global commercial success that GPS has provided to the worldwide satnav community. For over 20 years, the GPS model of open technical standards, license free access to information, and fee-free market development has stimulated adoption of satnav technology in almost every conceivable aspect of public infrastructure and consumer life with revolutionary results. Technological milestones have been impressive, many, and truly global. The pressing question now is not whether the new systems will reach their milestones, but instead, as they do achieve their technical, and more importantly their administrative and political milestones, will they continue the open environment for technological development and global acceptance of satellite navigation.

LBS and car telematics

Miguel Angel Martínez Olagüe
Director of Corporate Business Development, GMV

So far GNSS mass market applications and services have grown much slower than it was initially forecasted; only car navigators have penetrated significantly in consumer's life. If we look at market forecasts produced by most consultancy firms by the end of last century, killer consumer market applications such as personal LBS and car telematics should have penetrated much more strongly in our every day routines. It seems that in 2008 there is new chance to see major breakthroughs in both cases.

On the one hand A-GPS, high sensitivity receivers and software receivers will at last facilitate the implementation of GNSS receivers in most mobile phone handsets, even in the cheapest models. The combination of those three technologies allows for low consuming, high availability positioning in mobile devices at negligible production marginal cost. For sure once the base of mobile users equipped with a GNSS capability is large, telecom operators and service providers will start to exploit such capability to offer new, imaginative and low cost LBS.

On the other hand, three GNSS based car telematic services will experiment a major step forward during 2008. Firstly main insurance companies will launch pay per use car insurance schemes during this year. Secondly the park of users of driver assistance and e-call services will reach several tens of millions in the USA and will experiment a major growth in the rest of the world.

Finally and perhaps the most relevant milestone will be the confirmation in Holland for a plan of the first nationwide scale road charging scheme based on GNSS so far in the world. The combination of those three events will bring in 2008 expectatives of killer business cases that will boost car telematics growth. This context will motivate investment in combination of several of those services in the same on board unit and its integration at automotive OEM scale. During 2008 it can be expected the release of several multipurpose GNSS based on board units integrated in the car at OEM scale at extremely low cost.

GNSS further strengthened

Bruce Peetz
Vice President of Advanced Technology and Systems, Trimble

In 2008, China will likely release a user equipment interface specification for the Beidou system, enabling the design of commercial user equipment. Releasing a system specification early has worked well for European Global Navigation Overlay System (EGNOS), scheduled to be officially operational in 2008. The EGNOS milestone is significant for aviation from a regulatory point of view, however many commercial users have been successfully using EGNOS for years because of the availability of commercial equipment made possible by the early specification release.

Russia plans two launches in 2008, which could lead to as many as 22 orbiting GLONASS satellites, within range of a full 24 satellite constellation (21 broadcasting / 3 spares). This would provide a full measure of redundancy for GPS/GLONASS users and perhaps move GLONASS from an augmentation to an independent positioning system for the first time since 1995.

The GPS system plans to launch the remaining 3 block IIR-M satellites, and take delivery of the first IIF satellite in 2008, filling out more of the constellation with civilian L2 capability using the new signal. The block IIF delivery also sets the stage for third frequency, L5.

All this was made possible by the most important and overlooked milestone of 2007, the GPS architecture evolution program (AEP) ground control upgrade of September 14. This milestone was important because it put into place the capability of controlling the entire feature set of the remaining block II satellites, and overlooked because it changed over from an old mainframe and software to a distributed platform with new software without anyone noticing an operational transition. This demonstrates that maintaining operations during major upgrades is achievable.

A revolutionary impact

Keith D McDonald
Chairman, NavtechGPS

Recently, I came across an impressive statistic from the U.S. Department of Commerce in "Trends in Space Commerce" relating to the GPS (and GNSS) industry. It indicated that for the past few years over 100 Million GPS receivers have been sold annually with a value in excess of $20b!

This, to me, is indeed impressive but it also demonstrates that the design, technology and manufacturing advances in the production of GPS receivers has resulted in a dramatic reduction in their prices. When we consider that in-dash GPS units for automobiles are at about $1,000-2,000; receivers for commercial aircraft are about $5,000-15,000; equipment for survey and geodesy is about $5,000-30,000; it is somewhat surprising to find that the average price for a GPS receiver (from the DOC data) is at $200. This "skewing" of the data is because of the extremely large number of low cost GPS receivers in mobile phones for E911 and other location-based services. There is a virtual army of clever, competent engineering folks working very hard in a highly competitive industry to drive down the cost and improve the capabilities of GPS receivers. Many of these inexpensive units incorporate thousands to millions of correlators for reducing acquisition time; have sophisticated processing to improve operation in low signal conditions (such as indoors) and provide other techniques for enhancing overall performance. These technologies are becoming widely accepted and used.

At NavtechGPS, we waited a number of years (into the 1990's) until some GPS receivers reached the one to five thousand dollar price range before we took them on as viable products. It's a testament to the acceptance and rapid advancement of GPS and its related technologies that there are now some GPS units in production that (in quantity) cost about a dollar. As time progresses, the impact of GNSS devices and location-based services will escalate to be an even more significant influence in our lives. With the new, modernized GPS signals and the resurgence of international systems, such as GLONASS and Galileo, GNSS will play a larger role. It is likely that the future convenience and high value of GNSS data and applications will have a revolutionary impact on the way we manage ourselves, our relationships and our work.

The combination of the very low cost GPS position, velocity and time sensors, the improvements in related solid state devices, such as inertial sensors, and the increasing availability and use of map data bases will continue building in importance. The growth in the applications for these integrated systems appears unlimited.

Galileo is the driver

Bernhard Richter
Program Director GNSS Products,
Leica Geosystems

It is amazing to see the industry investing millions of dollars to provide Galileo capability without definite assurance that a signal will be in space anytime soon. The situation in the professional GNSS markets has become quite strange. Customers ask for products for which their full potential can only be realized in 2012 or later. Would anyo ne buy a car that would require fuel additives that are not available for another 4 years? I would guess the answer would be no.

I think we have to ask ourselves, how did the professional GNSS market get into this situation? For me the answer is simple. Galileo is the driver for modernization and this influences the buying behaviour. But there is too many powerpoint presentations, and no firm decisions within Galileo. I would like to use Frank van Diggelen's (Broadcom) provocative little study where he computed the ratio between powerpoint presentations and number of satellites. He simply googled for "Galileo.ppt" and all the other satellite systems. The outcome was that Galileo clearly had the highest ratio, followed by GPS, Beidou and GLONASS. GLONASS and Beidou have fewer political obstacles than Galileo, but they also have the money to fulfil their ambitious plans by the end of the decade.

The technological challenges for the professional GNSS market are obvious. The race has just started for chips with even more channels, less power consumption, tighter integration, support of at least 3 GNSS systems and higher accuracy. 72 channels will certainly not be enough for the future. We as a technology leader are obliged to design products with Galileo capability, even though the user will not benefit until at least 2012. Leica Geosystems is the only manufacturer that can already offer a compliance upgrade path to all four satellite systems (GPS, GLONASS, Galileo, Beidou) which is based on publicly available system definitions.

Digital convergence

Sang Jeong Lee
Chungnam National University, South Korea

The increasing demand for ubiquitous positioning and navigation requires sustainable mobility in market. Although GNSS and assisted GNSS will be the core of global location technologies, the most promising technology will be made by the digital convergence with other positioning technologies such as WLAN, RFID and UWB. One of the remarkable trends will be context-sensitive services via Internet. The next phase in Web 2.0 will require the location information for sustaining the mobility. In this regard, the standardization in the mobile terminal architecture can be expected. The Software Defined Radio can make the standardized receiver architecture (both in hardware and software) implemented effectively and accommodate the interoperable GNSS signals as well. The GNSS technology milestones should include the Software Defined Radio technology which will be accelerated by the digital RF technology.

DGPS reference network

Ir. Hans Visser
Technical Manager, OmniSTAR BV

GPS In 2008 GPS remains dominant with 32 nominal Satellites. At the same time local DOP holes will remain possible as the aging GPS constellation may have multiple unhealthy satellites. Standard GPS L1 accuracy improvement will slowly start degrading as the Ionospheric activity will increase to the next solar max in 2012.

SBAS In Europe EGNOS is maturing and will finally achieve it's in orbit validation (IOV). Working towards QZSS and Gagan will continue to operate.

Glonass Glonass will again launch 6 satellites in 2008, but at the same time the older generation of Satellites will become unhealthy leaving a 12 Glonass Satellites constellation at year's end.

Omnistar Omnistar will replace in 2008 most of its 100 reference stations with new Glonass capable reference stations. Omnistar will expand the DGPS reference network into new areas as India, Kazakhstan and China. Omnistar will in 2008 improve the broadcasting data format to be more compressed and allow more measurement data to be sent over the 12 worldwide satellite links. Omnistar HP converge time will again improve. Also in 2008 Omnistar's worldwide 10 cm accuracy system will improve gradually. Omnistar will add three new geostationary L-band correction satellites in America (AORW), Europe (AORE) and Asia (IOR). Omnistar corrections over cellular phone will start with pilot projects.

Industry consolidation

John Pottle
Director of Spirent Communications

Everywhere one looks, there is evidence that GNSS is hitting the mainstream. New signals, new applications, new lower prices, better maps, more accuracy… everything points to the acceleration of the navigation and positioning revolution. In 2008, we are looking forward to:

Galileo will the Galileo project forge ahead in 2008 or be tarnished by some of the organisation and funding issues that we have all read about recently? My prediction is that 2008 will be a good year for Galileo. Confidence will build and developers will start to seriously look at adding Galileo compatibility to receivers.

Compass the industry is hungry for more information about the intriguing Compass system. Perhaps it will become available during 2008? The Chinese have indicated their intention to make information available on the open Compass signal(s), something we all look forward to understanding more about.

GLONASS more launches recently, with more in prospect, and the potential for CDMA technology in future, make GLONASS a serious GNSS that is receiving increasing interest already. This looks set to continue through 2008.

Industry consolidation is likely to continue. Of particular note already are the emergence of Broadcomm (with the Global Locate deal) and Cambridge Silicon Radio (with the CPS and NordNav deals). A-GPS location applications growth: we have been waiting for cellphone-based location applications for many years. With a few exceptions (eg. Korea, Japan) we are still waiting. 2008 could be the year that this will change. The key enabler is the Secure User Plane Location technology that enables handset manufacturers and others to offer services direct to users in a network-agnostic way. Finally, is the increasing work ongoing on receiver and antenna technology. From GPS M-code user equipment projects in the USA to adaptive antenna technology, these developments are certainly moving forward and will improve still further the GNSS capabilities across all application areas.

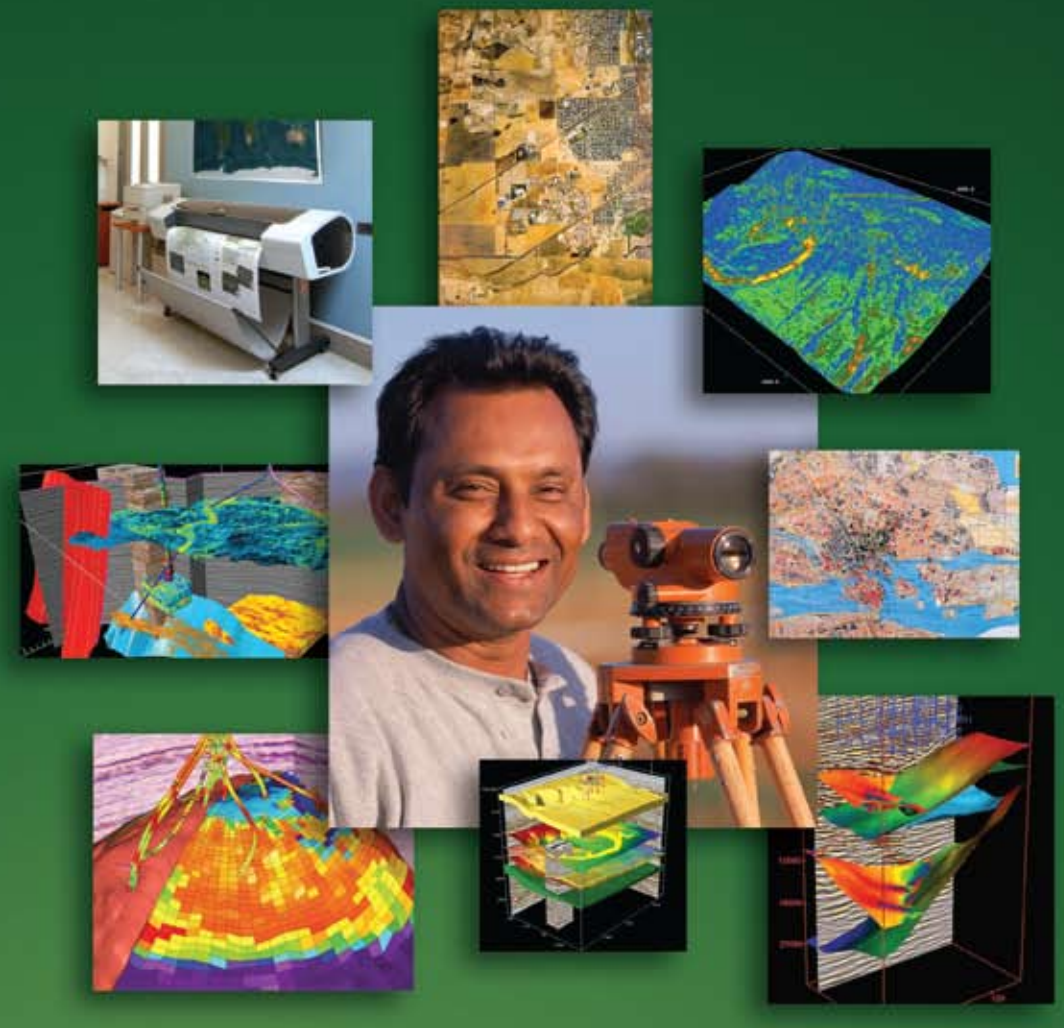
A myriad of different devices

Thomas Seiler
u-blox CEO

In mobile telephones, positioning information provided by GPS receivers has become as common as Bluetooth. The major trend in 2008 will be growth in GPS attachments in a myriad of different electronic devices. We anticipate significant breakthroughs in many areas of the consumer electronic market, resulting from falling costs in integrating positioning functionalities. This has made the price of GPS negligible. The industry has reached a level of maturity that makes the availability of positioning information of true value to users of handheld devices. Today maps, points of interest and other information are readily available, something that was not the case only two years ago.

The main drivers of the industry are identifiable. Firstly, continued improvements in mobile connectivity with the many different wireless communication technologies available make internet connection possible, almost anywhere. Modern mobile devices require accurate positioning information to be useful. Here wireless and positioning technologies play hand-in-hand in providing additional user benefits. Thus we believe that more and more mobile terminals will include an integrated GPS receiver.

Secondly, the economic benefits derived from navigation information boost the demand for GSP receivers and wider scopes of their application. Market penetration should continue to increase, with alone the sales of Personal Navigation Devices (PNDs) being predicted to double in 2008.When the promised modernizations of GPS and commissioning of the GALILEO satellite systems are finally realized, better signal quality will allow further expansion in the range of positioning applications. Current receiver technology has reached a very sophisticated and mature level so that innovation will again be accelerated by the new capabilities provided by the satellites.



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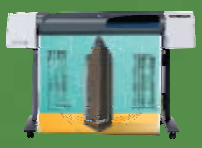

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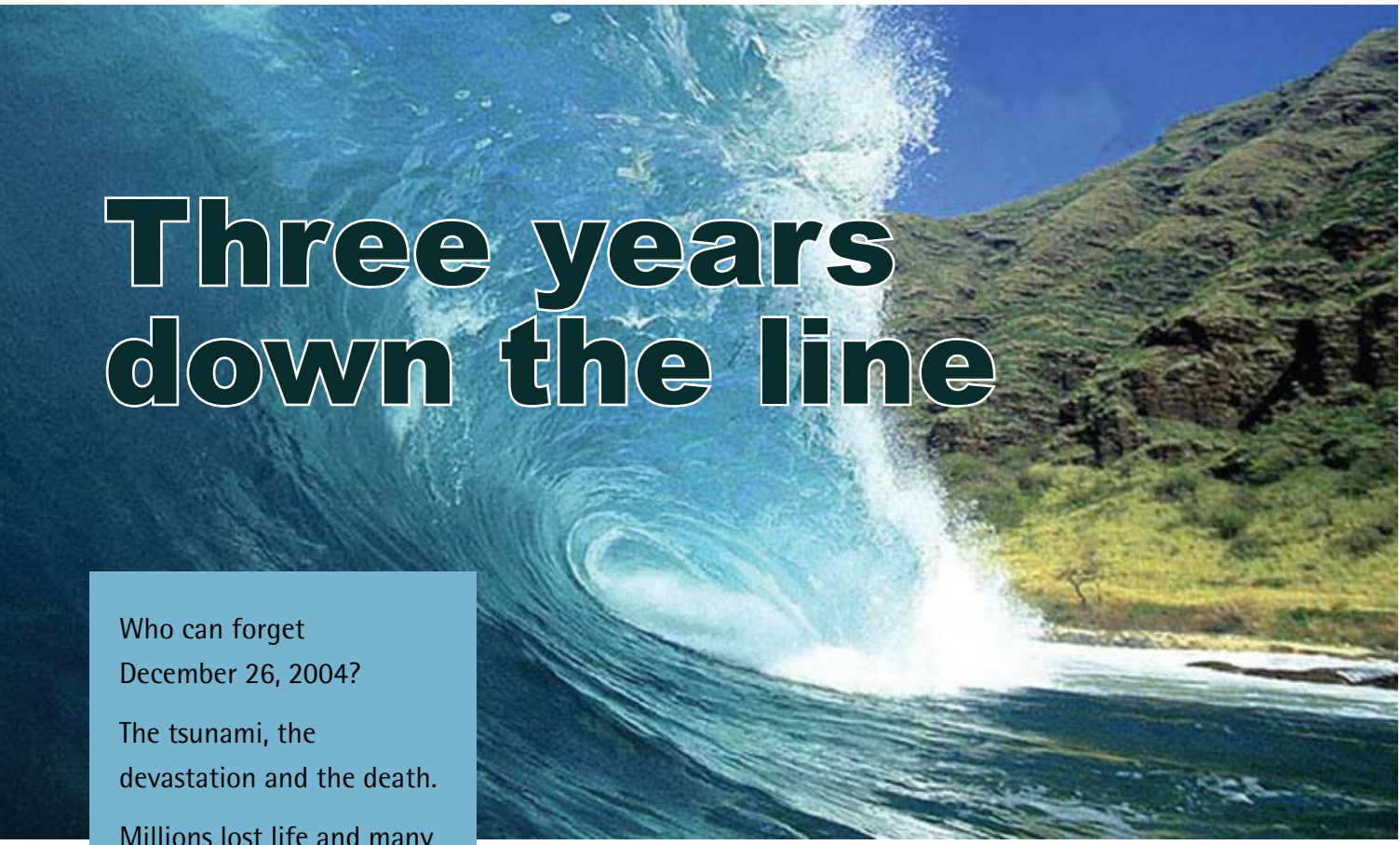

Three years down the line

Who can forget December 26, 2004?

The tsunami, the devastation and the death.

Millions lost life and many more lost the desire to live.

There was sympathy empathy and apathy.

Descriptions and prescriptions.

Reactions and responses too.

Many were 'moved' then life 'moved on'...

This tsunami tends to fade away in the pages of history...

Three years down the line, Coordinates visits those for whom the tsunami is still a possibility, a reality and a challenge.

"Everybody is committed to their task"

India has recently launched the National Tsunami Early Warning System (TEWS) established by Ministry of Earth Sciences. Coordinates discussed various aspects of the TEWS with Dr P S Goel, Secretary to the Government of India, Ministry of Earth Sciences

Do we have well-established tsunami evacuation procedures?

Mandates are divided across various ministries to do different things. As a science ministry, it is our mandate to issue warning for Tsunami and inform those agencies who are supposed to take care of the mitigation. It is largely the Home Ministry which is responsible, through their large access to paramilitary forces and other organizations to organize evacuation. The district administration reports to them. There are other authorities, such as Disaster Management Authority, who are making sure that such capacity building mechanisms come up in the country. However, I am also aware that the country has good preparation which you can see when the recent cyclone struck two months ago. A massive exercise of shifting people was undertaken by these arms of the government, and was done very well. When it comes to evacuating people, the method is not different whether you have to relocate because of cyclone or tsunami.

Prem Shanker Goel is Secretary to the Government of India, Ministry of Earth Sciences (MoES). He is also Chairman, Earth Commission.

TEWS has not undergone real-time testing. Please comment.

For an event, particularly in the Indian Ocean which happens once every 60 years, you obviously cannot have a frequent real-time testing. But if you look at it as a science, you don't need an earthquake or a tsunami of that magnitude to test the system. A system consists of various elements. In this case, we have sensors at the bottom of the ocean, various tide gauges, seismological equipment, and we are getting seismological data from across the world. Each of these individual systems is tested 24 hours. For example, we have placed the Bottom Pressure Recorders (BPR) at the depth of, say, 3km which gives a reading every hour. So we know whether the recorder is working or not. It is also highly accurate. We know how the variations take place with respect to the normal tides so we know exactly how the BPR is working because all these tides have a definite mathematical model. Similarly, the tide gauges are also tested. The seismological equipment is tested very frequently because there are so many earthquakes taking place at a low magnitude. When these work for low magnitude, they will also work for high magnitude. Most of the equipment is being tested and monitored by computers on a 24 hour basis.

What if the central processing unit of the BPRs fails?

The systems are planned with a sufficient amount of redundancy. We have established the system with six BPRs – four in the Bay of Bengal and two in the Arabian Sea. Our original configuration is actually for twelve BPRs to maintain very high level of redundancy. When it comes to the actual detection of the tsunami, one BPR on each side is sufficient. We have placed four. For data correlation, we will further multiply this redundancy.

The ocean is a very difficult environment. Maintaining the equipment is difficult, particularly when the sea is rough for about four months. Thus the complete chain of sensors has more than 100 per cent redundancy. Any one failure should not cause any problem with respect to the functioning of the system anywhere in the chain.

High level redundancy involves multiple players. Is accountability an issue?

As far as the availability of TEWS is concerned, the responsibility lies solely with MoES and its operational unit, Indian National Center for Ocean Information Services. We are not in the blame game as in who failed and who succeeded. If there is failure, then it is our failure. But I must say that the supporting organizations whether it is Indian Space Research Organization, or Ministry of Science and Technology or even other institutions which are in the forefront, like National Institute of Ocean Technology, are playing a very important role. Maintaining the observation system of the BPRs on the ocean bottom is the most difficult task in this exercise which NIOT is doing. Everybody is committed to their task.

Is the cadastral data available for evacuation routes?

We have very detailed information on the coastline and are in the process of updating that further with the help of Department of Space and National Remote Sensing Agency. They are using various platforms including the imaging capability of CARTO-1, which has a resolution of 2.5m, quite accurate for this kind of application. They are also using aircrafts with Airborne Lidar Topograhic Mapping System sensors for very accurate information to the measure of 0.3m. Survey of India has done some very good work. Similarly, even in the coastal region, we have a lot of useful information from the Indian Naval Hydrographic Department (INHD). Changing coastlines do not affect tsunami related issues. Firstly, the changes are slow. Secondly, when we look at tsunami, we look at inundation. Suppose we determine that the wave height is going to be 3m. Our maps will immediately show the areas likely to be inundated and we are more worried particularly around cities with high population density.

MoES seems more focused on atmospheric and oceanic sciences. Please comment.

Normally, one thinks that Earth means geology. We are trying to change that notion. The solid Earth, or geology, is being addressed by the Geological Survey of India (GSI) and other organizations. We focus on Earth systems to understand how the ocean, atmosphere and earth couple together. We also have the seismology division in the Indian Meteorology Department as a focal unit to support the overall coordination in seismology in the country. So these are the issues we are addressing right now. Our emphasis is lot more on ocean and atmosphere as a total system largely because this is where maximum scientific understanding is needed. When we are talking about new problems like global warming and climate change, they are ultimately related to the Earth.

How will local bodies translate the TEWS warnings into concrete actions?

This is one area which is very important and we need to do a lot. We have really not done much. Our next effort is to address this. Our unit INCOIS in Hyderabad is trying to coordinate with all concerned people, collectors and district officers in the coastal region. So this is one area where we really need to strengthen in the coming years.

Do you see MoES playing any significant role in NSDI?

This initiative originally started with the interaction of SOI and DoS. It has now become an institutionalized mechanism under the Department of Science and Technology (DST). There is a high level committee being chaired by the Honorable Minister of Science and Technology and Earth Sciences. Earth Sciences is represented by the Secretary, MoES, so we are part of it. Operationally, it is appropriate that DST is creating a separate cell from the SOI. Our role is related to coastal management and all the information which we need for our warning systems, inundation mapping, storm surges, cyclone warning – each of these requires correct and accurate information along the sea coast. We are also the provider of such information. Everything has to be part of NSDI. Thus, we are involved in the NSDI. This is the right mechanism because if everyone wants to lead, there will be chaos. It is a deliberate decision to let DST take the lead role in NSDI.

Rebuilding devastated infrastructure

FOLLOWING the Asian earthquake and tsunami on December 26, 2004, the Indonesian government created the Rehabilitation and Reconstruction Board (BRR) to manage all state and international aid for rebuilding the Aceh and Nias regions. The BRR's current mission is to provide housing for hundreds of thousands displaced tsunami victims and to rebuild destroyed infrastructure systems, including transportation, water and waste management, as well as communication systems.

Using Autodesk geospatial software, the BRR is able to:

- Reduce geospatial data development and implementation costs by 95%
- Share geospatial data twice as fast
- Create WebGIS framework two years early
- Import and work with multiple GIS formats

Coordinates presents the views of the representatives of BRR and Autodesk.

"WebGIS has significantly enhanced the flow of information"

Pak Mulyanto Darmawan, Head of the Geospatial Task Force at Rehabilitation and Reconstruction Agency (BRR) NAD – Nias on the need and importance of WebGIS

What is BRR's mission?

Following the Asian earthquake and tsunami on December 26, 2004, the Indonesian government created the Rehabilitation and Reconstruction Board (BRR) to manage all state and international aid for rebuilding the Aceh and Nias regions. As the executing agency, our vision is to build a reliable, dignified, prosperous and democratic Aceh and Nias. In the Indonesian Government's Master Plan for the rehabilitation and reconstruction of Aceh and Nias, we further have the mission to provide housing for displaced tsunami victims, and to rebuild destroyed infrastructure systems, including transportation, water and waste management, as well as communication systems.

Could you elaborate on the need for the WEBGIS framework?

BRR collaborates with all aspects of Indonesia's infrastructure reconstruction and works with government agencies, international donors, and more than 150 non-government organizations. With such a large network of partners, we faced a serious and increasingly important challenge: sharing information quickly efficiently to ensure everyone has the most current data. In the past, we could only distribute our extensive inventory of spatial data and maps offline or by providing hardcopy paper maps, but this was obviously time consuming and costly, but also highly frustrating for agencies and organizations waiting on the information. These constraints limited the use of our spatial resources, and as a result, the Aceh-Nias reconstruction efforts were impacted. We needed a way to effectively manage, access, and distribute up-to-date spatial data and to focus on designing and establishing the best possible systems for long-term application. We knew that a single Web-based system that allows stakeholders to download spatial information directly from our database would greatly help reconstruction efforts. The WebGIS is a Web-based system that enables BRR to effectively manage, access, and distribute the agency's extensive inventory of spatial data and maps to our partners involved in the reconstruction of Ache and Nias. It is a communication vehicle that provides a visual perspective of the land in the format of a map, which can then be used by our partners and stakeholders as reference materials to plan their reconstruction efforts.

How prepared is BRR in adopting such systems?

The BRR works with a large network of partners and knew that a single Web-based system that allows the BRR's stakeholders to download spatial information directly from the BRR database would greatly help reconstruction efforts.

One of the biggest advantages we have

Japan to start world's first GPS tsunami monitoring system

The Japanese government will start operating the world's first tsunami wave surveillance system with the use of the global positioning system in fiscal 2008, enabling detection of tsunamis up to 10 minutes before they hit the Japanese coast. The planned system will monitor sea wave motion every second using GPS-equipped buoys floated 20 kilometers offshore. *enews.mcot.net*

Tsunami re-building in Sri Lanka

A mapping programme using satellite pictures will help Sri Lanka's government do better planning and rebuilding in the tsunami-hit eastern and southern provinces, officials said. The French-funded GIS project using high resolution satellite imagery costs almost a billion rupees. *www.lankabusinessonline.com*

Geoscience Australia receives award for Tsunami modelling

Geoscience Australia has received the Asia-Pacific Spatial Excellence Award (APSEA) in the Spatially Enabled Government category for its work on Tsunami Risk Modelling for Emergency Management *www.ga.gov.au*

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found in working with Autodesk geospatial technology, is that our staff are familiar with the AutoCAD interface so there was a short learning curve with the new Autodesk WebGIS system. The user friendliness of the system also made it easier for our partners to understand the data available at a single glance as well. Autodesk also stepped in and provided free training for our team, getting them up to speed quickly so that the team could begin using WebGIS immediately.

What has been the response of the users and impact of this system?

The most important benefit we have experienced with the WebGIS is that it has significantly enhanced the flow of information to the relevant agencies and NGOs involved in the reconstruction project. Not only has the Autodesk WebGIS system significantly improved and standardized the quality of data available, users can also instantly download spatial data and high-definition maps directly from BRR's centralized database to get updated information on the status of the reconstruction project. This has helped save up to four hours of time a day – A stark contrast to our previous methods of disseminating hardcopy paper maps, which put serious constraints on our already limited resources.

"It is important to look beyond initial costs"

Rodger Soo, Government Sales Director, Industry Solutions Division, Autodesk Asia Pacific on user-friendliness and price of WebGIS

Do you think that the BRR case study can be replicated?

The BRR case study is a great example of how geospatial technologies can be leveraged to further the rehabilitation and reconstruction of disaster-stricken areas. The applications and lessons are certainly applicable in other contexts. Autodesk has provided its design technologies in the United States, after Hurricane Katrina devastated the Gulf Coast. Autodesk worked with Cleveland-based Adenium Systems and fellow sponsors McGraw-Hill Construction and Cisco Systems to give local architects and builders access to design tools for rebuilding New Orleans and the surrounding communities.

Developing countries being price sensitive, how to you "tailor-make" your offerings?

Public sector and government agencies across both developing and developed countries often face the challenge of balancing cost and performance. However, our customers who are interested in leveraging technology effectively do tend to look beyond the initial projects costs, towards the longer-term, sustained benefits of the solutions they implement. For example, by working closely with BRR to help them develop a Web-based GIS publishing system to efficiently and accurately share data with various stakeholders across the country, BRR was able to reduce their geospatial data development and implementation costs by 95%.

What about the user-friendliness of the solution?

The combination AutoCAD Map 3D and Autodesk MapGuide Enterprise used to develop the WebGIS system for BRR enables users to distribute complex, precision data online via an intuitive and easy-to-use interface to a wide audience of technical and non-technical colleagues and partners. Using FDO Data Access technology, an open source software tool that provides seamless data integration for multiple proprietary GIS formats, users have a single view of their information and save time by reviewing data directly from the map without the hassle of data translation or conversion.

The Indian Ocean Tsunami Warning System

An outsider's view

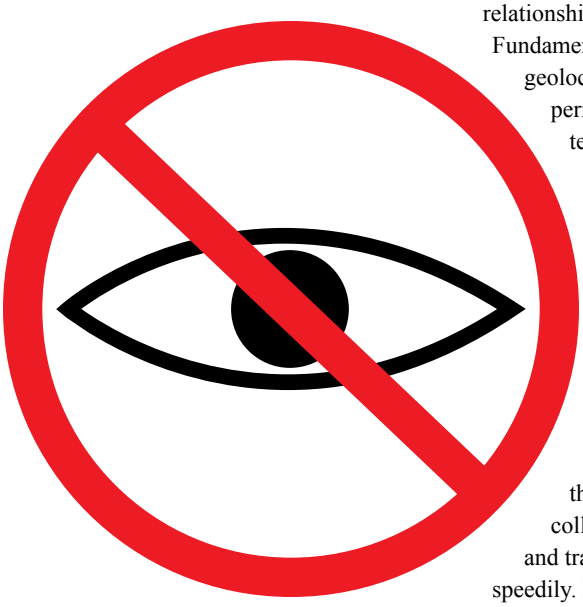
Prof Tad S Murty
Department of Civil Engineering, University of Ottawa, Canada

After the tsunami of 26th December 2004, which caught the world unaware and unprepared, India is among the few countries that moved quickly and positively to establish a world class tsunami warning system, which is now in operation. I congratulate India for this achievement in a relatively short period of time, which was only possible due to the dedicated hard work and discipline at various levels of the Central government, state governments, the governmental institutions and the academic and research institutions of India. I understand that ten ocean bottom pressure sensors are being located in the Bay of Bengal and two in the Arabian Sea to monitor in real time the deep water signature of the tsunami. It should be noted that, the three main sources of tsunamis that can affect India are the Sumatra region, the Andaman region and the Mekran region in the Arabian Sea.

With the upgrading and installation of new seismographs, new tide gauges, coupled with the ocean bottom pressure sensors, India is well prepared to meet any eventuality. While instrumentation is a basic component of any early warning system, just as important, is the software, or the numerical (computer) models that provide the intelligence on how to interpret the real time data in a very short time and make objective decisions. The full scope of the tsunami early warning system is much more than instrumentation, computer models and a tsunami warning Centre. It also encompasses, public education, raising of awareness, involvement of various levels of government and NGOs and long term planning. India is well on its way to address all these issues. Even though no two natural disasters are exactly identical, there are some commonalities and the knowledge and experience gained from natural disaster can be used to advantage. One of the topics that needs attention is the plight of physically challenged people during a natural disaster, especially when it involves evacuation.

Location and privacy issues

The very capabilities of geospatial tools in information analysis have raised a multitude of novel and interesting personal privacy issues



Professor George Cho
School of Resource, Environmental and Heritage Sciences, Division of Health, Design and Science, University of Canberra, Australia

THE tools of GI Science deal with geospatial information in which spatial relationships are the fundamental data. Fundamental data is that which relates to geolocation or spatial data that will permit the mapping of any object in terrestrial space. But, GI Science may also handle a diverse range of personal information from the truly 'personal' ones through to those of a more general nature – age, gender, height, home address, social security number, marital status, religion and so on. By its very nature, the tools of GI Science allow these kinds of information to be collected, manipulated, displayed, and transmitted cheaply, easily and speedily. But the very capabilities of geospatial tools in information analysis have raised a multitude of novel and interesting personal privacy issues.

The challenge

The challenge for geographers and geospatial scientists is to accommodate the privacy-invasive with the privacy-enhancing attributes of geospatial science as summarised in Table 1 below. If these are attempted in an ethical manner then it augurs well for geospatial information systems and the professionals who work in the industry. Dobson (1998) promotes the view that geo-information in combination with personal information clearly poses a privacy threat. However, the counter argument is that there is a tension between the two fundamental values of privacy on the one hand and the public's right to know on the other. For example, the differences between satellites monitoring a farmer's use of water and the public's acceptance of CCtv and video cameras in shopping malls, buses and taxis, city streets and in dorms and apartments.

Geospatial technologies and ethical use

Geospatial technologies include GIS as a mapping tool for decision-making through to those technologies that amass data by spatial attributes including global positioning systems (GPS), and transponders and other intelligent computer chips embedded in some devices that can report location as well as an identity. The latter are in a class of intelligent spatial technologies that can declare both personal information as well as locational and device-specific information in response to a poll by another device either in a pre-established relationship or to a new, soon to be established, relationship.

Geospatial technologies are in daily use and have heightened personal privacy concerns related to locational information. For instance, in using geospatial technologies, an apparent legal fallacy may have arisen, if only by accident. The idea is that if there is a legal right to do something then it follows that it must be the right thing to do. So, if it is legal to install CCtv anywhere, it is permissible to do so despite the fact that constructing too many of these devices might become too intrusive.

Also, if it is permissible to undertake data aggregation activities using a number of databases, then it is lawful to do so. But really, the issue is that the legal right must only be the starting point rather than the end point for justifying one's actions. The fact that something is legal does not mean it is either right or a wise thing to do. Thus, data taken out of context – acontextual data – and used in that sense may produce

results that may be highly unjust and totally incorrect in particular cases.

This is where ethical questions are raised and which should be foremost in the thinking and practice of GI scientists. Some would like to consider ethics as a continuum in which there is both a duality of a right and a wrong way of undertaking activities as well as ethics as a way of dealing with a right way and a better way of doing things. In equitable jurisdictions and civil cases there may be a claim to a right but it is the one who has the better claim that often wins out. Today the right to be left alone is being vigorously defended and there is resistance to increased surveillance in parts of our private lives. But it seems that the real threat is the creeping acquiescence to all sorts of intrusions without the accompanying public debate, information and education. It used to be that when a video camera was installed, say in the computer lab, the spectre of George Orwell's 1984 and "Big Brother is watching you" was raised (Orwell 1990).

GIS is not personal data intensive

Flaherty (1994) in relating his experiences with privacy protection and GIS in a national and provincial context has said that GIS technology is "not personal data intensive" and that information privacy issues are always solvable by applying fair information practices.

GIS has the power to integrate diverse information from multiple sources. Some of the data are of a personal nature where individuals may be identified or identifiable while others are of a spatial nature that may be used to locate individuals through geocoded data such as a home address. The privacy threat is from the new inferences that may be made by correlating geographic information with personal information.

Privacy

But what is privacy? Professor Arthur Miller of the Beckman Center for Internet and Society, Harvard Law School has described privacy as an intensely, perhaps uniquely, personal value. The word stems from a Latin root privare which means "to separate". To want privacy is to want to be separate, to be individual. Another meaning of the Latin is "to deprive", and privacy also means leaving something behind (See Beckman Center for Internet and Society and in particular the course syllabus for 'Privacy in Cyberspace' at http://eon.law.harvard.edu/privacy99/ syllabus.html).

Indeed Roger Clarke (1999) has identified four privacy interests – information, territorial, bodily and communications privacy. Information privacy relates to the interests of the individual in controlling the information held by others about that person while territorial privacy is the interest in controlling intrusion into aspects of behaviour especially in regards to sensitive issues. Bodily privacy is the freedom from interference with one's person while communications privacy is the freedom from surveillance and privacy of communications.

Location-based services

Location-based services (LBS) rely on the key ingredients of time and space. LBS may be considered to be no different from geodemographics, an information technology that enables marketers to predict behavioural responses of consumers based on statistical models of identity and residential location (Goss 1994, 1995).

LBS have become commonplace because of the use of geocodes and GPS and other mobile communication and tracking technologies. LBS inferentially involves the tracking of people through the use of credit card data that may result in profiling exercises, statistical modelling, and pattern analysis. More generally, GI Science using such technologies may give the game away as to who we are, where we are, and what we have been doing either by way of speech, purchases or simply being at a location. There is one view that without legislation to curb the (mis)use of such data there would be chaos. However, an equally compelling but opposing view is that there should be no legislation but rather just self-regulation by industry itself (Westin 1967, 1971).

Data aggregation and databases

Private sector commercial applications of both GIS and LBS are perhaps the fastest growing areas of business and this has fed the need for more data. For example, in order to maintain a competitive edge, marketers need good databases to make their decisions while simultaneously handling geographical data efficiently. Patterns, relationships, and trends become clearer when depicted visually in graphs, charts, and maps rather than just columns of numbers or text.

A database called EQUIS, developed by the US National Decision Systems, "maintains a database of financial information for over 100 million Americans on more than 340 characteristics including age, marital status, residential relocation history, credit card activity, buying activity, credit relationships (by number and type), bankruptcies, and liens. This information is updated continuously at a rate of over 15 million changes per day," (Curry 1992, p. 264).

In 1993, Equifax and National Decision Systems announced Infomark-GIS – a fully integrated GIS specifically designed for marketing applications and decision-making (Equifax National Decision Systems 1993). There are also other U.S. companies are also engaged in the collection, processing and storage of data pertaining to individuals (A search of those firms classified under the Standard Industrial Classification (SIC) code 7374 for companies engaged in marketing and business research services yielded approximately 50 companies). These firms obtain consumer information from credit bureaus, public records, telephone records, professional directories, surveys, customer lists and other data aggregators.

In view of the commercial market for data, databases and data aggregation services,

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Curry (1994) has suggested that the use of geospatial technologies will produce multi-faceted problems that would similarly require multi-dimensional solutions. The concerns raised include the fact that the technologies consist of and promote the widespread availability of unregulated data. This leads to the difficulty of regulating data matching that must take place if the geospatial tools are to produce meaningful results. Further, geospatial technology is inherently visual but this strength also exposes a major weakness in that it may produce map inferences that may be both statistically and ecologically fallacious. Finally, there is the altered expectation of privacy rights because the case law may promote an erosion of those aspects of life where a person can feel safe, secure from search and surveillance, and most importantly information kept private.

Geospatial technologies are said to do best at the intersection of location, time, and content. But each of these elements of location, time, and content tends to produce tensions of their own. For example, in regard to letting people know where they may be and to keep this fact hidden because they may not wish to be found. Here we have a technology that is employing the power of the 'place'. GIS-based geostatistical models using locations and space have been used to study the home range of animals, for instance. In an analogous way, geographical profiling may be applied to the "home range" of predatory humans who may have inadvertently patterned habitual routes when stalking potential victims.

Leipnik et al. (2001) reported on the important role of geospatial technologies in investigating and gathering evidence of a locational nature in order to convict a serial killer. When the serial killer Robert Lee Yates was arrested in April 2000 in Spokane County, Washington State, he is reported to have told his wife to "destroy the GPS receiver." This was because there were incriminating data on it showing the 72 waypoints associated with several journeys that had been used in disposing the bodies of the victims. Indeed, this example demonstrates the extent to which GIS and GPS technologies

Table 1 Privacy risk status and geospatial technologies.

Geospatial technologies related to	Applications	Privacy status
Location:		
Home address:	Utilities, benefit providers, licence administration	N/I
Fixed	Inhabitant registration systems	I
	White Pages, ex-Directory, silent numbers	E
	Reverse White Pages	E
Mobile	GPS / dGPS / AGPS	I
	Auto-reporting mobile devices	I
Movement		
Individual	Trans-border (passports)	N/I
	Credentialed building access	I
	Biometrics	I
	Transponders	N/I
Mass	CCtv	I
	Pattern recognition; pattern matching	N
	Intelligent Transport Systems and imposed identifiers (travel cards)	N/I
Transactions		
Financial	Cheque data with magnetic ink character recognition	N
	Turnaround documents with optical character recognition	N
Retail	Encoding, magnetic strips	N
	Bar coding	N
	ATMs, EFTPOS, Credit/debit cards	I
	Loyalty schemes	I
	Smart cards, stored valued cards	E
	Real-time locater mechanisms	I
Communications		
Fixed	PSTN traffic data, call records	I
	Real-time tracing, interception	I
Mobile	Mobile telephony, pagers, analogue / digital /satellite phones / PDA	N/I
	Personal phone numbers, ENUM	N
	Caller id, CLI, CND	I
Convergent Technologies		
Information Technology	Voice data TCPIP / VoIP	N/I
	RFID computer wear	I
	EPIB	I
Mobile, on person	Identity tags (prisoners, children)	I

Notes: Privacy status: E – enhancing; I – intrusive, N – neutral.

are permeating society and their use – both by law enforcement agencies as well as criminals. However, a court appeal could challenge the validity and use of the GPS data. The argument could be that using the GPS to track suspects without their knowledge might involve an invasion of privacy rights as well as not meet the legal test of finding the "least obtrusive means" for police to gather information about a suspect. But, in counter argument, it may be submitted that sometimes consent needs to be conspicuously absent in cases where suspicions of the 'quarry' are not to be aroused prematurely.

The question may be asked: Is there any special data protection or privacy issue associated with locational data? The answer is YES but its explanation must be given

indirectly. "Sensitive personal data" is regarded as data that identifies, among others, a person's ethnic background, religion, political affiliations or sexual habits. However, the location of a person is not considered sensitive personal data. Yet, when processing data on persons, especially when locations are involved, say in terms of visiting synagogues on a regular basis or particular areas of ethnic concentrations, it is arguable that sensitive data are being processed and unintended inferences are being made about a person's religion or ethnicity (Rowe and McGilligan 2001).

Location, tracking and dataveillance

Most geographers will understand location to mean the relative positions of entities in space and time and of events taking place. Locational information describes a person's or entity's whereabouts in relation to other known objects or reference points. In this context, tracking is meant the plotting of the trail or sequence of locations within a space that is taken by an entity over a period of time. The "space" within which the entity's location is tracked can be a physical or a geographical space. However, such a space can also be 'virtual' where that person may have had successive interactions in time with different people either simultaneously or at different times.

Data surveillance, abbreviated to dataveillance, is the systematic use of personal data in the investigation or monitoring of actions or communications of one or more persons. Conceptually there may be two separate classes. Personal surveillance is the surveillance of identified persons for various purposes. This may include investigation, monitoring or gathering information to deter particular actions by that person or particular behaviours of that person. Mass surveillance, on the other hand, is the surveillance of large groups of people, again for the purpose of investigation or monitoring and which may aid in the identification of persons of interest that a surveillance organisation has cause for concern (Clarke 1999a).

Geospatial technology applications: Home location

While geospatial applications based on remote sensing of the earth on regional scales, and the use of GIS in very small scale city planning are relatively well-known, the application of such technologies to home location are less prominent. In general, utility companies may use home location data to track usage of power, gas and water, whereas social security benefit providers and licence administrators may make use of street addresses to tag locations for administrative purposes.

Telecommunication services to the home via the double-twisted copper wire provide home location information to the Public Switched Telephone Network (PSTN) of a phone utility. All phone communications to and from the home address can be recorded, stored, analysed and made available to others. Telephone traffic data may be analysed as call records and have been used for billing and invoicing purposes. The data also give paired

locational information of the origin and destination of calls (dyads) that may be analysed for particular information.

More recently home telephone services have facilities such as caller ID, calling line ID (CLI), and calling number display (CND) that give information of a caller, the caller's phone number, and the time of the call. Caller, line, and number identifications are now generally available and have been used by telecommunication companies, law enforcement agencies and consumers as a means of screening calls.

Australia on Disk (AOD) is a directory of every residential and business phone number in the country. This comprises all 55 national phone directories giving a total of 1.3 million business listings and 6.9 million residential phone numbers in 2005. While there are obvious environmental benefits in not having to produce paper copies of telephone directories, there are equally potent privacy implications not to do so given that a disk containing residential information may be put to other than legitimate uses (Each year in Australia Sensis/Telstra produces about 55,000 tonnes of directories or 18 million sets of Yellow Pages and White Pages of which 80 per cent is recycled. But that still means about 11,000 tonnes go into landfills each year. See Lowe S 1994 'Indecent disclosures', The Sydney Morning Herald, 21 March, p. 47). The information obtained can then be used to individually address letters to be sent out or used in a phone marketing campaign. An additional product, the AOD Mapper presents data and maps with areas of interest colour-coded to show their relative importance. The maps could identify hotspots where the residents are most likely to match particular profiles, for example, the suit-buying yuppie, the private school targeting high-income earners with young families or health insurance companies looking for low risk, single, professionals.31

Tracking movements of individuals over space

The tracking of individuals over borders has normally been controlled and monitored at immigration counters by checking and stamping national passports and the use of identity cards. More recently such travel documents have electronic chips embedded in them that permit electronic scanning and automatically provide entry and egress at checkpoints. The data captured may yield patterns of entry and departure of citizens and visitors alike. At a micro-scale, movements within buildings may be monitored using video surveillance equipment. In combination with video evidence, movement over time and space within buildings, analyses using pattern recognition and/or matching algorithms may yield greater insights to movement patterns of individuals or groups of people and the most trafficked areas. However, while the system may provide greater effectiveness to the security of a particular building, the technology is highly intrusive of the privacy of its users.

In Malaysia, for example, the introduction of the Government Multipurpose Card (GMPC) or MyKad is a standard credit-card-sized plastic token with an embedded microchip. MyKad has been issued progressively since 2001 with the mandatory obligation that everyone in the population 18 years and over should have one. To date, it seems that this is the world's first national smart card scheme that stores biometric data on an in-built computer chip. The encoding is a copy of the owner's fingerprints. But there have been niggling misgivings, for example the practice of surrendering identity cards to security guards before entering certain premises or 'gated' communities would require close monitoring because of privacy concerns (Idrus 2003).

A layer of privacy protection has been installed with the passing of the Personal Data Protection Act (2002) with safeguards including the appointment of a Data Protection Commissioner. However, the Act has yet to come into full effect on the grounds that it will be a burden to businesses. There are no other safeguards against the abuse and privacy of data for MyKad. In general the Malaysian Constitution does not provide for the protection of privacy (The National Registration Act (1959) provides for the establishment and maintenance of a registry of all persons in Malaysia (s 4) and that every person in Malaysia be registered under the Act (s 5). The Register extends to all residents of Malaysia, including non-citizens who work and reside there). Article 5(1) of the Malaysian Constitution provides the fundamental guarantee that "no person shall be deprived of his life or personal liberty, save in accordance with law".

In Australia the Hawke government attempted to introduce the Australia Card in the late 1980s but there has been general resistance and outright opposition (see Davies 1996). A health card of sorts was also proposed in Australia which met with strong opposition by the population (see HIC 1985).

Elsewhere in Hong Kong, concerns about information privacy have been raised in terms of the HK Smart Id Card. This was because of the possibility that one card could bring together a comprehensive personal dossier from different sources relating to an individual. (See HK Privacy Commissioner 2000).

Tracking transactions

There have been a variety of methods used to capture transaction data. These include cheques that carry data in MICR – magnetic ink character recognition and turnaround documents with OCR – optical character recognition where the form has already been filled-in automatically for the client to authenticate and return. Other means of data capture are magnetic strips, embossed data codes, bar coding or a device with a location identity such as a phone socket in the home environment. The main applications are in financial transactions from deposits, to loan repayments, salaries, cash withdrawals at automatic teller machines (ATMs), use of credit/debit cards and electronic funds transfer-point of sale (EFTPOS) and others. These seemingly helpful and efficacious systems, however, turn previously unrecorded and/or anonymous activities into recorded-identified transactions. Even more important, the data are being aggregated in a far more intense manner than before and these data

have a location tag associated with it in the data trail. There are also real-time location mechanisms built into some of these electronic transaction tools so that passive monitoring and surveillance can now be re-purposed for law enforcement activities.

Tracing communications

While locational information and address tags may be readily available when using the PSTN, mobile telephony services including the use of pagers, personal digital assistants (PDAs), analogue/digital and satellite phones make the tracing of persons and locations difficult. With mobile telephony, the tracing of a device and its usage either in real-time or logged-in message banks is more difficult because its location is constantly changing.

Convergence of locational and tracking technologies

By far, the technology of most relevance for present discussion is GPS. This technology depends on a constellation of satellites to give positional information in four dimensions – latitude, longitude, altitude and time. With the Presidential edict of turning off selective availability (SA) – the purposeful degrading of positional information – users of GPS are now able to poll satellites for positional information and be given references to within a meter of their location (The White House, Office of the Press Secretary 2000 'Statement by the President regarding the United States' decision to stop degrading global positioning system accuracy', 1 May at http://www.ostp.gov/html/0053_2.html). Differential GPS (dGPS) uses the same technology except that locations are determined as a differential to the data received in addition to and relative to a surveyed point on the ground. Hence, the accuracy obtained by dGPS methods can be quite precise. Assisted GPS (AGPS) technology, on the other hand, has been developed in conjunction with information communication technology (ICT) which uses a server at a known geographical location in the network. This information reduces the time, complexity and power required in determining location.

RFID is an abbreviation for radio frequency identification, a technology similar to bar code identification. With RFID, the electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum is used to transmit signals. RFID systems can be used just about anywhere, from clothing tags to missiles to pet tags to food – anywhere a unique identification system is needed (See Webopedia definition of RFID at http://www.webopedia.com).

Conclusions

Analyses of geospatial applications with regard to home location, the tracking of individuals over space, tracing financial transactions and communications has identified privacy risks inherent in the use of such technologies. The identified privacy risks may be categorised as invasive, enhancing, or sympathetic as demonstrated in Table 1. The implications for user organisations is that geospatial technology applications is but one of the array of different kinds of surveillance and in particular that of dataveillance. Equally, technology providers should be reminded of these sorts of privacy issues and to genuinely strive for anonymity in the use of personal information when marketing their products.

The implications for policy makers including privacy and data protection commissioners is one where the tensions between economic rationalism and the social good is stretched and seemingly irreconcilable. But this need not be the case if governments are focused on both law and order, as well as striving for stability, consistency, and sensitivity that are supportive of privacy protection.

Geospatial technologies such as LBS may 'push' content but at the same time 'pull' in locational information. Use of these should not have a chilling effect on personal behaviours or actions. That effect may only be apparent where there is the danger of the acontextual use of personal information and data. Hence, it is imperative that the idea of a 'zone of privacy' around one's personal and private affairs should be fostered and encouraged so that the onus is on those who intrude into the zone to justify their conduct. This zone will then demarcate a boundary to a private and a 'public' area with a nebula in between where everyone can interact and relate with each other and for technology to be freely used. Privacy need no longer be "too indefinite a concept to sire a justifiable issue" (Tapper 1989, p. 325).

While technology will continue to be both a problem and a solution, technological advances such as LBS, geoinformatics and GI Science will continue to push the privacy envelope. But technological means alone cannot help manage and enhance privacy protection. Legislation, corporate policy, and social norms may, in the final analysis, eventually dictate the use of location information generated from tracking devices and geospatial technologies.

Fair information practices are the cornerstone of many privacy laws today. However, these practices may be found wanting especially when they have to deal with data manipulation using disparate databases joined together in geospatial technologies such as a GIS. The solutions may lie in a mix of international standards, self-regulation, legislation, and government policy. While the harmonisation of laws and regulations and getting consistency of privacy protection especially across all jurisdictions is very difficult to achieve, yet, international standards must, of necessity, emerge. One way forward would be to keep canvassing for a global convergence of privacy regulation. It is may be counter-productive for each country to impose a separate privacy regime. We are all responsible for keeping an eye on the world in order to prevent abuse of surveillance technologies not by government regulation but by a mutual, shared responsibility for the world in which we live and disdain for those who abuse and misuse the privilege (Waters 2000).

The paper with detailed references can be seen at www.mycoordinates.org

"A platform to exchange scientific knowledge"

Prof Chen Jun, Congress Director, 2008 ISPRS Congress on objectives and desired outcomes

What is the unique proposition of ISPRS 2008 Beijing?

The International Society for Photogrammetry and Remote Sensing (ISPRS) is a non-governmental organization established in 1910. The four-yearly Congress of ISPRS is the most important event in the ISPRS Calendar. This year, this congress will first be held in Beijing, China.

Beijing is an ancient city. With a history of about 3000 years, Beijing has been the capital of many dynasties and is rich in natural heritage such as The Forbidden City (Palace Museum) and Great Wall. Indeed, Beijing has a numerous number of historical spots of interest. Beijing is a cultural city of China, one could taste different types of food, music, dancing and performance. Here, "different type" means from different areas of China and from different countries.

As the capital city of new China, Beijing is also a modern city. It is the national center of politics and culture, as well as a transportation hub both nationally and internationally. Recently, Beijing has undergone great changes in its environment, transportation, and urban infrastructures. I hope all the participants will come to see Beijing and feel the development and achievement of China over the past 20 years. It is also worth mentioning that ISPRS 2008 Beijing will be held just one month before 2008 Beijing Olympic Games when the city will become the focus of world attention. Beijing is also an academic center of China, including a large number of universities and research institutes. We offer technical tours for participants to visit relevant institutions.

What are the major technical areas of ISPRS 2008?

The ISPRS 2008 Beijing mainly covers the topics related to the ISPRS, including photogrammetry, remote sensing and spatial information science. These three broad disciplines are subdivided into eight areas, i.e.Image Data Acquisition, Spatio-temporal Data Handling and Information, Photogrammetric Computer Vision and Image Analysis, Geodatabases and Digital Mapping, Close-Range Sensing Analysis and Applications, Education and outreach, Thematic Processing, Modelling and Analysis of Remotely Sensed Data, and Remote Sensing Applications and Policies. Technical sessions including oral and poster sessions are designed to cover these areas.

The ISPRS 2008 Beijing also encourages people to present inter-disciplinary research results within the ISPRS and multi-disciplinary research results with other sister organization. Theme Sessions are designed for inter-disciplinary and Special Sessions are designed for multi-disciplinary research. The ISPRS 2008 Beijing also emphasizes the interaction between academics and industry. Special user forums are organized for such a purpose.

What are the desired outcomes?

ISPRS 2008 Beijing congress will consist of 140 technical sessions, and 18 special sessions, with about 4,000 scientists and professionals from all over the world. This congress will provide participants a very good platform to exchange scientific knowledge and new ideas, to explore and discuss future cooperation. As ISPRS Congress Director, I believe the Congress will certainly promote and enhance the international cooperation in the field of photogrammetry, remote sensing and spatial information science.

How does the conference serve as a platform for the integration of allied technologies?

ISPRS 2008 Beijing congress has paid special attention to the integration of allied technologies, such as GPS, GIS and Internet technology. Five joint Working Groups has been set for such a purpose. For example, the ICWG I/V working Group encourages the combination of GPS, GIS and Photogrammetry for 'Autonomous Vehicle Navigation'.

As mentioned previously, some special sessions have been designed for the integration with other allied technologies.

Special workshops and tutorials will also help to integrate allied technologies.

Galileo BOC(1,1) Signal Tracking

A design and implementation of GPS/Galileo software receiver is discussed

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THERE are lots of needs for a unified platform that allows efficient GNSS (Global Navigation Satellite System) receiver development and testing for various applications. With the current functionality of the GPS constellation and the promise of the future Galileo constellation, many efforts have been focused on the 1575.42MHz L1 signals for the GNSS software receiver implementation. GPS (Global Positioning System) L1 or Galileo E1, particularly when coupled with SBAS (Space Based Augmentation System) such as WAAS (Wide Area Augmentation System) or EGNOS (European Geostationary Navigation Overlay System) are likely to fulfill the most navigation needs including accuracy and integrity. Particular interest to receiver researcher is the open service BOC(1,1) (Binary Offset Carrier) modulation format to be transmitted by Galileo at the E1 frequency. Recently MBOC(6,1,1/11) (Multiplexed BOC) is considered as base signal for both Galileo and GPS III. In preparation for mass product receiver before the transmission of the first Galileo signals from satellite, development of GPS/Galileo receiver, capable of tracking the basic BOC(1,1) signals, has been initiated. Bump jump (or known as Very Early – Very Late) correlator, Non-coherent processing in SSB(Single Side Band), Deconvolution correlator and correlator with dual discriminator are well known method to acquire and track correct peak.

In order to develop and test the GNSS signal processing algorithms such as signal acquisition and tracking, a generalized GNSS IF(Intermediate Frequency) signal generator has been designed. The signal generator is capable of processing the wide bandwidth necessary to the Galileo BOC(1,1) signal. This signal generator generates digital samples in the host computer for the software receiver test. Many GPS software receivers have been already implemented in C language by many research groups and they are capable of performing GNSS satellite acquisition and tracking on both real and simulated GNSS data [1]. In this paper, the design and implementation of GPS/Galileo software receiver is given. The GPS software receiver already working in our laboratory is extended to GPS/Galileo software receiver. The BOC(1,1) signal acquisition and tracking method and its performance are emphasized.

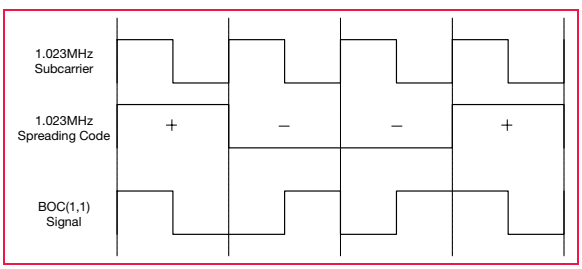

Figure 1. BOC(1,1) Signal Generation

GPS and Galileo signal characteristics

The GPS C/A code is a binary phase shift keying (BPSK) signal with a chipping rate of 1.023 MHz. The notation BPSK(f_c) is used to describe the signal, where f_c represents a factor of 1.023MHz[2]. The Galileo Open Service signal on L1 will use a BOC modulated signal. For BOC signals, the spreading code is mixed with a square wave at a given subcarrier frequency. The notation BOC(f_s,f_c) is used, where f_s represents the square wave subcarrier frequency in units of 1.023 MHz, and fc represents the chipping rate in units of 1.023 MHz. The generation of a BOC(1,1) signal is shown in Figure 1, where the top line is a 1.023 MHz square wave, the middle line is a 1.023 MHz spreading code, and the bottom line is the resulting BOC(1,1) modulation signal.

The normalized ideal autocorrelation function for a BPSK(1) signal is shown in Figure 2. The autocorrelation function for a BOC(1,1) signal is shown in Figure 3. Compared to the BPSK(1) autocorrelation function, the square wave subcarrier modulation used with BOC(1,1) causes the

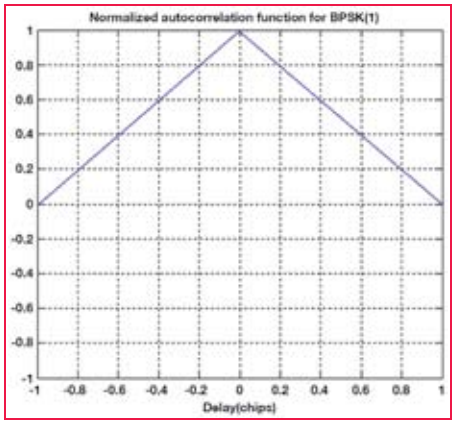

Figure 2. Correlation Function for BPSK(1)

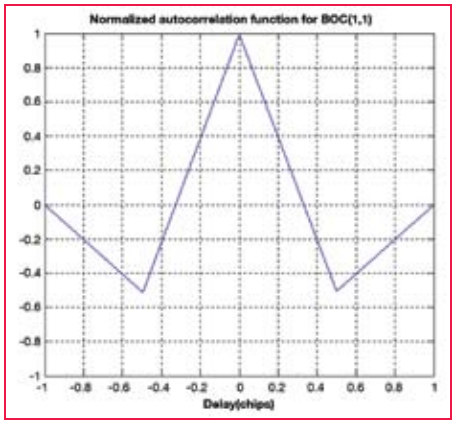

Figure 3. Correlation Function for BOC(1,1)

autocorrelation function to have a sharp main peak, and two smaller negative side peaks. The sharp main peak will result in improved code tracking performance for the BOC(1,1) signal, as well as improved multipath mitigation performance.

To generate the BPSK(1) and BOC(1,1) signals in software receiver, the GNSS IF signal generator developed by CSLab in Chungnam National University has been used. The power spectral density of generated GPS L1 C/A signal is shown in Figure 4. The generated GPS L1 C/A signal includes C/A code and navigation data messages. All available PRN number can be included in this signal and the navigation data derived from real receiver or a GPS simulator is applied to generate navigation message.

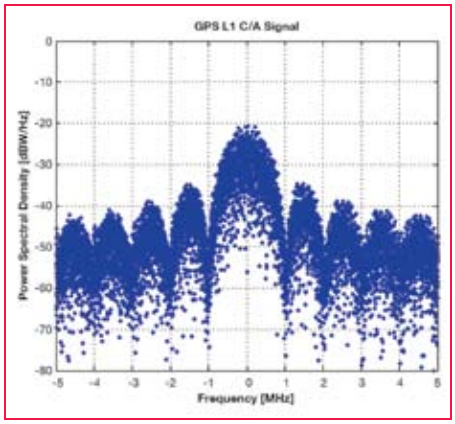

Figure 4. IF Signal Generator Output – BPSK(1)

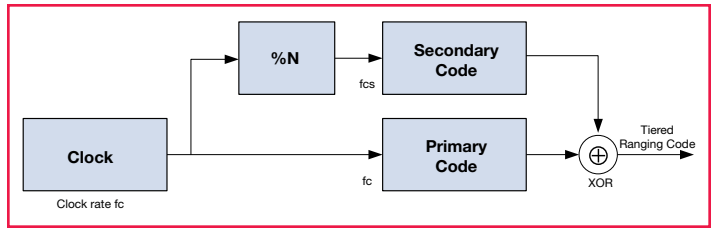

Figure 5. Block diagram of Galileo E1 signal generation

Table 1. Description of tiered code for Galileo E1 signal

Channel	Primary Code length(N)	Secondary Code length	Fc [MHz]	Fcs [Hz]
B	4092 chip	-	1.023	-
C	4092 chip	25 chip	1.023	250

Figure 5 shows a block diagram of tiered signal generation for Galileo E1 signal. At that figure, f_c and f_{cs} mean the primary and secondary code chip-rate respectively, and the relation, $f_{cs} = f_c / N$, is satisfied. The detail description for this signal can be found in Table 1 [3].

The power spectrum of generated Galileo E1 signal is shown in Figure 6. It includes ranging code such as primary code and secondary code, and subcarrier for BOC(1,1) modulation. 50 primary codes in the Galileo OS SIS ICD (Open Service Signal In Space Interface Control Document) are applicable to this signal, same as secondary code.

Software GPS/Galileo Receiver

Due to the conceptual similarity of Galileo and GPS, the high-level architecture of Galileo receiver is similar to that of GPS receivers. The essential new element of the new GPS/Galileo receivers is a generic channel, which is able of tracking all the possible modulation schemes including GPS C/A, L2C and Galileo BOC(1,1). The baseband chipset of future GNSS receivers will represent a matrix of generic channels. Future receivers built based on this concept, shall use flexible allocation schemes of channels to incoming signals.

The block diagram of the generic channel is presented in Figure 7 [4]. One of the main differences between the current C/A-code signal and the Galileo signals is the presence of a data-less pilot signals in parallel with the data-bearing signal. With the channel architecture shown in Figure 7 both the pilot and data components can be demodulated in parallel.

The demodulation works as follows. The residual carrier (Doppler) is removed by mixing the incoming signal with a digitally generated complex carrier in carrier mixer. The spreading codes for pilot and data are generated by two code generators, which can be configured to produce any Galileo or GPS spreading code. Thanks to the coherence between the pilot and data components, a single Code DCO controls the rate of both codes. This unit also can control the rate of the (flexible) sub-carrier needed for BOC modulation. The same sub-carrier can be used for pilot and data signal. In normal mode both locally generated signals enter two delay lines. The time-shifted signal replicas created in this way are correlated with the incoming signal, producing all correlation values needed for code and phase tracking.

To detect and track a correct-peak in the correlation function, the bump jump

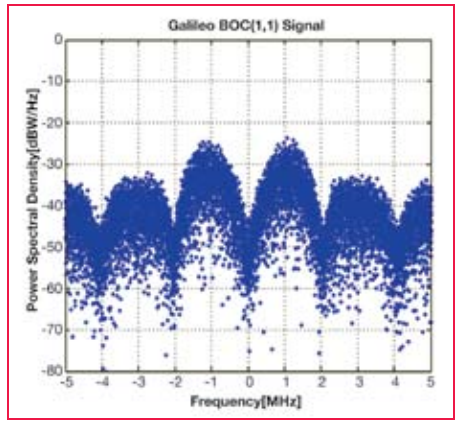

Figure 6. IF Signal Generator Output – BOC(1,1)

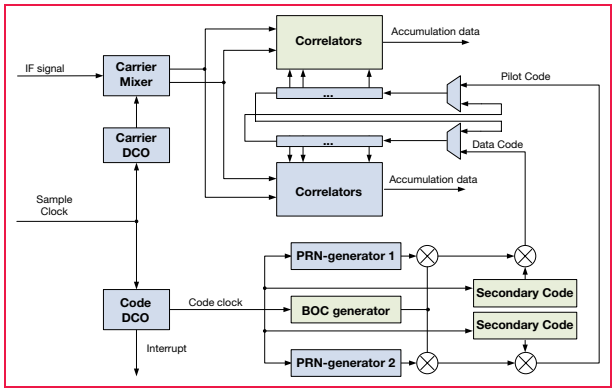

Figure 7. Generic Channel Architecture.

algorithm is added in receiver software. The algorithm assumes that the receiver processing includes a code tracking mechanism which accurately tracks some correlation peak whenever the signal-to-noise ratio is high enough. The purpose of this algorithm is to determine whether or not the peak being tracked is the correct one. This is done by comparing the amplitude of the current (prompt) peak with the amplitudes of the neighboring peaks. Thus, it is assumed that there are very early (VE) and very late (VL) samples separated from the prompt (P) sample by a time very close to half the inverse of the offset carrier frequency, i.e., one peak apart. If the VE or VL samples are consistently higher than the P samples, then the tracker will jump in the appropriate direction [5].

The implemented algorithm accomplishes the amplitude comparison with the help of a simple up/down counter as in Figure 8. After each integrate-and-dump period, the absolute values of VE, P, and VL in-phase samples are compared. If either the VE or VL sample is the largest, then the appropriate counter is incremented and the other one is decremented. If the P sample is the largest, then both the VE and VL counter are decremented. Neither counter is decremented below zero, when any counter reaches a particular threshold, T, the tracker is jumped to the new peak, and the counters are reset to zero.

Note that the algorithm described in the previous paragraph works by comparing the in-phase components of the VE, P, and VL integrate-and-dump outputs, i.e., I_{VE}, I_P, and I_{VL}. This is appropriate if it can be assumed that the code and carrier tracking algorithms using early (E), prompt (P), and late (L) samples are working properly and all the quadrature components are near zero. If that is not appropriate, then a comparison can be made among $I_{VE}^2+Q_{VE}^2$, $I_P^2+Q_P^2$, and, $I_{VL}^2+Q_{VL}^2$. If this is necessary, signal-to-noise performance may suffer degradation

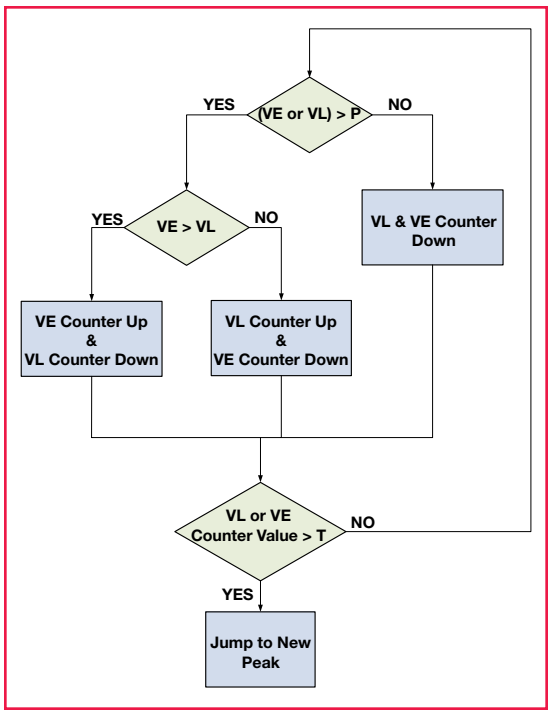

Figure 8. Flowchart of Bump-jump Algorithm

Test Results

Test has been done to evaluate the effectiveness of the GPS/Galileo receiver. Because the Galileo receiver does not perform navigation yet, performance of signal acquisition and tracking is examined, and noise performance of code tracking loop have been analyzed. Setup for these tests is given in Figure 9. Three modules are used to evaluate the performance; IF signal generator, software receiver in C++ and evaluation program in MATLAB.

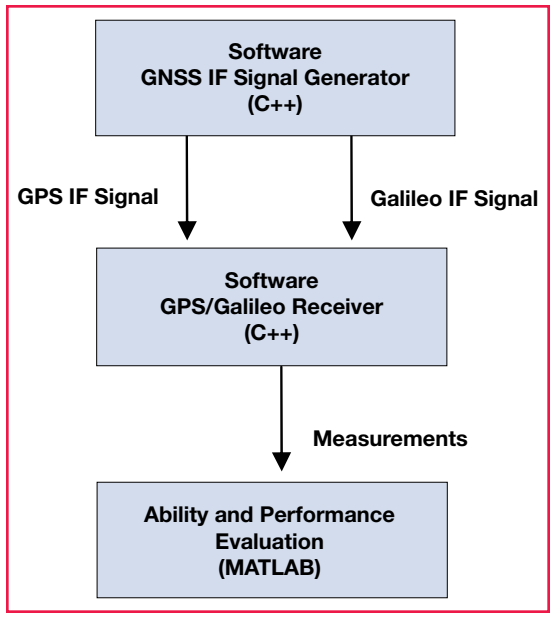

Figure 9. Tests Configuration

Signal Acquisition and Tracking

The performance for signal acquisition and tracking is confirmed by the signal power ($I^2 + Q^2$). As shown at Figure 10 and Figure 11, both signals had been acquired and they are tracked without interruption to the end of measurements.

Code Tracking Noise

In this section we derive an approximate expression to predict the code tracking performance that can be expected by using BPSK(1) and BOC(1,1) modulation scheme. The receiver implemented in the paper used a dot-product discriminator for the code tracking Delay Lock Loop (DLL).

The approximate expected 1-sigma code tracking performance of the BOC(1,1) modulation using a dot product discriminator is [1]

$$\sigma_{code} = \sqrt{\frac{1}{3}\frac{B_L d}{2C/N_0}\left[1+\frac{1}{C/N_0 T}\right]}(chips) \qquad (1)$$

where,

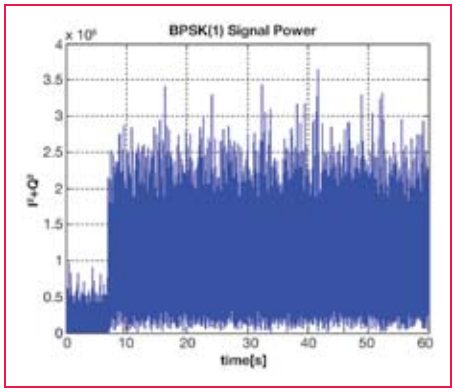

Figure 10. BPSK(1) Code Tracking Performance

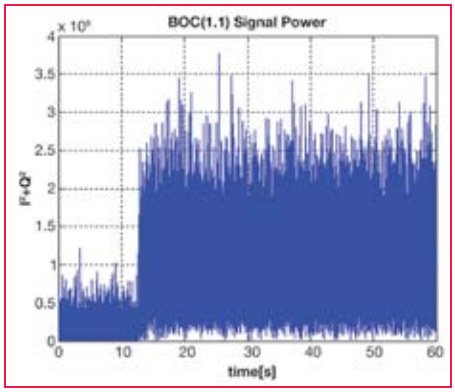

Figure 11. BOC(1,1) Code Tracking Performance

C/N_0 is the carrier to noise ratio in the predetection bandwidth 1/T [Hz]
B_L is the tracking loop bandwidth
d is the chip space.

For comparison, the expected 1-sigma code tracking performance of BPSK is [1]

$$\sigma_{code} = \sqrt{\frac{B_L d}{2C/N_0}\left[1+\frac{1}{C/N_0 T}\right]}(chips) \qquad (2)$$

The Galileo BOC(1,1) receiver, with a dot product discriminator as implemented in this paper, should offer a code tracking improvement of $1/\sqrt{3}$ over BPSK(1) (where 3 is the ratio of the slope of the BOC(1,1) main correlation peak to the BPSK(1) peak).

The signal generator and receiver were set to track BPSK(1) and the C/No was varied over time. The receiver was set up to output code measurements, which were logged by the host computer. The test was run once for the data channel only. Figure 12 shows the measured results from the receiver for BPSK Data along with the expected value calculated using equation (2). As can be seen from Figure 12, the measured results agree with the expected results very well.

A similar test was completed for BOC(1,1). The expected performance was calculated using equation (1). The measured and expected results are shown in Figure 13. Again, the measured results from the receiver agree very well with theory. The results from Figure 12 and Figure 13 are plotted together in Figure 14 to emphasize the performance improvement of BOC(1,1) over BPSK(1). The improvement in pseudorange code tracking performance is approximately a factor of $1/\sqrt{3}$, as predicted earlier. The results of experiments show that implemented signal generator and software receiver are correctly working.

Conclusions

In this paper, a design and implementation of GPS/Galileo software receiver is given. The exisitng GPS receiver which can perform every function of receiver such as acquisition, code and carrier tracking, navigation bit extraction, navigation data decoding, pseudorange calculations, and position calculations is extended to GPS/Galileo receiver. The combined receiver can handle GPS C/A, L2C and Galileo BOC(1,1) signal. A dump jump method to acquire and track the Galileo BOC(1,1) signal is implemented to avoid false tracking. The performance evaluation using GPS/Galileo IF signal generator and software receiver with BOC(1,1) signal tracking feature show that the implemented software receiver can be applied to GNSS receiver design and implementation. Currently, the navigation facility using Galileo signal and Galileo L5 signal processing are further researched by our group.

References

1) Neil Gerein, "Galileo BOC(1,1) Prototype Receiver Development," ION GNSS 17th International Technical Meeting of the Satellite Division, Long Beach, CA, Sept. 21-24, 2004.
2) IS-GPS-200, Navstar GPS Space Segment/Navigation User Interfaces, December, 2004.
3) European Space Agency, Galileo Open Service Signal In Space Interface Control Document(OS SIS ICD) Draft 0, 2006.
4) Andrew Simsky, "Galileo Receiver Development at Septentrio," ENC GNSS 2005, Munich, Germany, July 19-22, 2005.
5) Paul Fine, "Tracking Algorithm for GPS Offset Carrier Signals," Proceedings of the National Technical Meeting of the Institute of Navigation(ION-NTM '99), San Diego, California, USA, January, 1999.

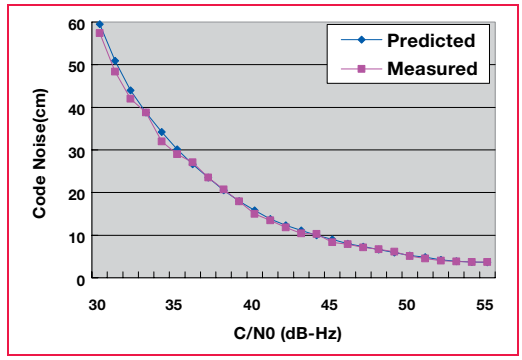

Figure 12. BPSK(1) Code Tracking Performance

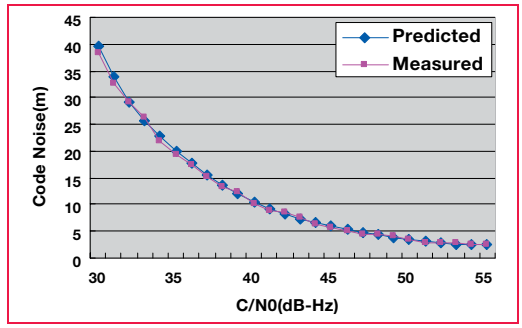

Figure 13. BOC(1,1) Code Tracking Performance

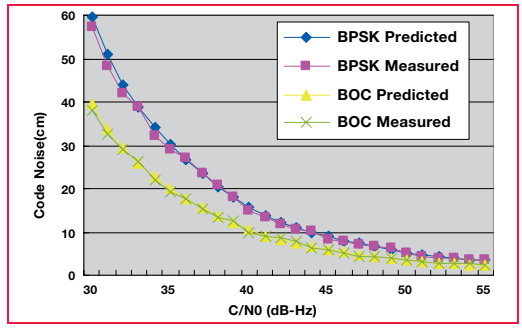

Figure 14. Comparison of Code Tracking Performance

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2005 **First** NATO STANAG 4572 GPS/Inertial test system
2005 **First** 7-element CRPA test system with GPS + coherent interference
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2007 **First** SDS M-Code test system
2007 **First** integrated GPS/Galileo/GLONASS system
2007 **First** 1 chassis GPS/Galileo constellation simulator

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"The customer should benefit"

Ajay Seth, Managing Director of Elcome Technologies on being acquired by Hexagon

What was the thought behind this acquisition?

The Indian market is growing very rapidly. From Hexagon's perspective as well as the Indian point of view, we need to grow faster and this requires investment. Hexagon could help us achieve this objective. As per Ola Rollén, CEO and President of Hexagon AB *"The acquisition of Elcome Technologies is an important piece in our global growth strategy in the emerging markets. India will certainly become one of the most important markets for measurement technology solutions, and with the acquisition of Elcome Technologies we are setting a strong foundation for Hexagon's further expansion and market leadership in India"*. In addition, Now that we are part of Hexagon, we (Elcome) have much better say in the design and features of the future products that are suited to Indian market requirement. In fact this is already happening and one of the prime example is the introduction of TPS801, which was specially designed and produced for Indian Market.

Would there be any change in the business model?

Our business model will remain the same. We are going to remain Elcome Technologies and our model has been to provide the vast product basket and turn key solution to the Indian customer community. We strongly believe in providing solution based on customer needs and not enforcing just what we have. We will continue to offer Leica, NovAtel and other products and solutions. The only change is that all the shares of Elcome have been bought over by Hexagon. Hexagon will now own 100 per cent of the company.

Are you going to diversify in R&D, manufacturing?

Elcome is looking very seriously at the Indian satellite program and we are working with NovAtel very closely in that regard. There are new technological developments – ISRO (Indian Space Research Organisation) is planning to launch IRNSS, which will have signals in L1, L5 and S band, which is completely a new design. Additionally, in L1 and L5, it is not the same frequency. And this has nothing to do with this acquisition since this was happening even earlier. However, this acquisition makes our life that much more easy because NovAtel and Elcome Technologies belong to the same parent company - Hexagon.

How organized is the construction industry in India?

Not yet but they are moving towards that. We can already see a very fundamental change in the last 3-5 years. If you look at the world scenario, approximately 1% of the total construction cost goes into the survey equipment. However, India is not there yet. If you compare with China, where the market for surveying equipment is touching $1bn. India is no where near this at the moment. India being a democratic country it is a difficult task to implement changes quickly. It was easy for China to implement quality. I think it goes back to fundamental issues. Everything is controlled by the consumer. The day the consumer becomes quality-conscious, builders will not have any choice.

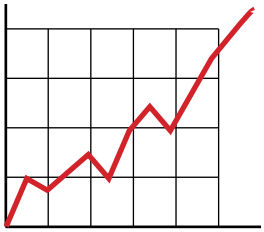
How significant is the duty aspect on GPS?

I think India has to reduce the duty to play on the world stage. The duty has to come down; the question is how fast will it. They have to get in line with the WTO. Last year it was 36 per cent, now it is 31 per cent. The problem in India is that they reduce custom duty but they increase something else. India is a price-sensitive economy. However, as soon as the customers look at the final result, they will make a different decision. If you look at the lifetime cost, the efficiency, the accuracy, you will make a different decision than just by looking at the entry cost only. In the tender business, these are subjective issues. How do you add them up to make them objective? In the foreign countries, they do provide certain percentage to certain technicalities, commercial viability, features, quality etc. and then they do a matrix and come up with a number. In India, any matrix becomes a subjective evaluation. I have been trying to promote an annual maintenance contract. And the purpose of the maintenance contract is to measure the lifetime cost. The tender only looks for the entry cost which is less important than the lifetime cost.

What advantage would the customer get out of this acquisition?

At the end of the day it is the customer who should benefit from it. We are very customer-focused and the customer is going to get much better support. Support does not mean just service. It also means our accessibility to the customer, our quality of equipment and services. We will open more offices, more service workshops, that means we are there where customer is and the turnaround time for the customer support will reduce. We would like to make our valuable customer more efficient, and this acquisition will fulfill this goal.

Price war eminent in PND market



The PND (portable navigation device) market in Taiwan is likely to set into a price war due to the planned importation of ultra low-priced GPS devices from China. GPS makers in China plan to establish a 'Triple Nine' alliance, aiming to push sales of PNDs at prices below 999 yuan (US$135) in the China market. Vendors of Garmin, TomTom and Mio – stated that they are not concerned about the price competition, and will differentiate from China-made products with improved quality and innovative software. *www.digitimes.com*

GPS beats Internet for mobile phone users

According to a survey by market researcher Leo J. Shapiro and Associates, among current cell phone owners, 24% would want their next cell phone to have GPS capabilities, while 19% says Internet access. Among current GPS owners, 51% report having a portable GPS device, 39% have a car-based device, and only 6% have a GPS-enabled cell phone.

Sony GPSCS1KA tracks your position for geo-tagging photos

It's a keychain looking stick with a GPS and a little bit of memory for tracking and storing coordinates as well as a date and time stamp. It matches up the date and time stamp from photos to give the geographical coordinates of the place and time. *www.slashgear.com*

Qualcomm announces availability of MobileView

Qualcomm has launched Mobile View product, which is a software application that remotely captures diagnostic data with GPS from mobile handsets, providing insight into handset and network performance. It is currently in trials with CDMA2000(R) and WCDMA (UMTS) network operators worldwide. *www.reuters.com*

GPS in NTT DoCoMo's 905i Series Mobile Phones

Seiko Epson Corporation announced that all the GPS-capable 905i series mobile phones being released by NTT DoCoMo, Inc. will have A-GPS (Assisted GPS) reception technology. *www.epson.co.jp*

GPS data logger with Bluetooth

The CD111 is the GPS data logger that offers simultaneous use of real-time GPS reception and data logging. It is capable of keeping up to 250,000 records or positions, including longitude, latitude, speed, UTC, and tag data. The location histories can also be exported to mapping softwares. *www.webwire.com*

RFID/GPS-based tracking for schools

AT&T Inc. unveiled its interoperable 802.11-based RFID and GPS-based mobile resource management (MRM) applications for the kids of kindergarten. The system use GPS technology, AT&T's wireless data network and specialized hosted and managed applications.

Outdoor Enthusiasts get GPS tracking software

Wayfinder has unveiled its free Wayfinder Active software, which is a GPS tracking and logging application for mobile phones. It records detailed statistics including maximum, current and average speed; distance; calories burned; altitude info; and current location.

SiRF creating end-to-end solution to optimize location awareness

SiRF TechnologyHoldings, to rapidly implement key end-to-end location-awareness features needed to enable mobile devices powered by the Android™ platform. SiRF has joined with Google and more than 30 other companies worldwide to develop and deploy Android, the Alliance's open and comprehensive platform for mobile devices. *www.huliq.com*

Just arrived

Toshibal launching 920T mobile phone in Japan

Toshiba is launching 920T mobile phones. It has 3G and 1-Seg wireless TV access in the way of wireless communications and GPS functionality too. *www.slashgear.com*

TomTom LINK 300 for TomTom GPS device

TomTom has launched TomTom LINK 300/TomTom WORK providing additional functionality on TomTom navigation device. It enables to select and read orders, exchange text messages with the head office, register working time/breaks. *www.mobilewhack.com*

Nokia N82 launched in India

Nokia N82, optimized for photography, navigation, and internet connectivity, is available in India. It has all the multimedia computer features common to N series handsets. *www.techtree.com*

Mio Combines GPS with Digicam, Media Player

Mio Technology has launched DigiWalker C720t, which combines turn-by-turn navigation with a 2MP digital camera, text-to-speech driving instructions and business card scanning software. *www.marketnews.ca*

MC70 mobile computer with GPS

Motorola's MC70 mobile computer now has a GPS. It allows organizations with field-based employees, such as postal and delivery companies, to track and manage dynamic real-time tasking and verify locations. *www.dcvelocity.com*

Fingerprint protected PND

The P4425 incorporates MEDION's new GoPal GPS with AuthenTec's slide fingerprint sensor for user identification. The software can save five different user fingerprints to the device. The technology renders the GPS device unusable if stolen. *www.gizmag.com*

Trimble technology for largest Road Project in Western Australia

Trimbles machine control systems and two-way data communications technology are being used for the construction of the New Perth Bunbury Highway—the single largest road project ever undertaken in Western Australia. The project is expected to be constructed over three years and will include the placement of approximately nine million cubic meters of soil to raise the road alignment. *www.trimble.com*

u-blox GPS technology powers Navigon Porsche Design PND

NAVIGON has introduced a navigation device, P9611 in partnership with Porsche Design, featuring u-blox' ANTARIS®4 SuperSense® GPS technology. Among host of other features, the device comes with Bluetooth. *www.u-blox.com*

TomTom to Tele Atlas Customers: No Worries

According to TomTom CEO Harold Goddijn, company's relationship with its digital map maker would remain exactly the same if the TomTom/Tele Atlas merger goes through. The European Commission initiating a "second-phase review" of the proposed merger between the two Dutch companies. While TomTom executives have suggested the review is just a matter of bureaucratic procedure, it is a rare step for the EC; in the past 10 years. The company is seemingly seeking to reassure not only Tele Atlas customers but EC regulators as well. *lbs.gpsworld.com*

Javad GNSS names VP

Javad GNSS Inc. has appointed Zdenko (Kuzo) Kurtovic, former CEO of GeoAstor and Swissat, as vice president of Machine Control & GIS, a new division of Javad GNSS.

Optech appoints General Manager

Optech Incorporated, a provider of advanced lidar survey instruments, has appointed Glenn Farrington as General Manager of Airborne Survey Products

DSSDI Project

Survey of India, and Government of Delhi joined their hands together and launched Delhi State Spatial Data Infrastructure (DSSDI) project. The project is an outcome of a pilot project by Department of Science and Technology, government of India on 3D GIS in Chandni Chowk area in Delhi in collaboration with Russian Academy of Sciences. As a part of the project a monitoring room was established to receive images from 10 cameras placed at vantage points to do the change detection on real time. According to Government of Delhi, the 3D database is immensely useful for various applications and it should immediately be created for entire NCT of Delhi and should be completed well before Common Wealth Games -2010. The project will cover a total area of NCT Delhi of approximately 1500 Sq. km.

Topcon GNSS instruments benefit from GLONASS launch

Three additional Russian GLONASS navigation satellites were recently launched into Earth's orbit. Satellite availability of Topcon Positioning Systems (TPS) receivers will increase.Topcon pioneered dual-constellation positioning technology (GPS and GLONASS) and has been utilizing signals for more than six years. *www.amerisurv.com*

Intermap to supply outdoor map data to Magellan

Intermap Technologies shall provide outdoor map content products for Magellan's line of handheld GPS devices. Its AccuTerra map products will provide data for 48 states and Hawaii. It is creating consumer mapping products using Magellan's Solution Developer Kit MapCreator software. *www.intermap.com*

U.S. Air Force exercises $50.7 million contract option with Rockwell Collins

The US Air Force has exercised a $50.7 million contract option with Rockwell Collins to complete the next phase of the Modernized User Equipment program. It will consist of receiver card development for ground and airborne applications, to include test and security certification for the next-generation GPS technology. The initial contract of $27.9 million was awarded in 2006 to the company to develop and demonstrate user segment receiver cards. *www.rockwellcollins.com*

PHOTOMOD Geomosaic v4.3 released

4.3 version of PHOTOMOD Geomosaic software is released. Main features includes new module for images radiometric correction - Image Processor, more Pan-sharpening algorithms, modern satellite sensors formats support: IKONOS, QuickBird, SPOT, CartoSat, Formosat, etc.

Hemisphere GPS acquires Steer-by-Wire Company

Hemisphere GPS has acquired all the outstanding shares of Australia's Beeline Technologies Pty. Ltd. for $21 million. Beeline is a privately-held, precision-guidance software developer providing GPS guidance and auto-steering applications for agriculture equipment and other machine control applications. *www.micro.newswire.ca*

MD, MapmyIndia, elected GPS Business Man of the year

With 53,6% of the 3813 votes, Rakesh Verma, managing director and founder of CE Infosystem/MapmyIndia has been chosen by GPS Business News readers as the personality of the year among the 10 personalities nominated by the editors of GPS Business News.

Navman slapped with $1.4m fine

Navigation equipment company Navman has been fined $A1.25 million in Australia for trying to stop retailers from discounting its products. Competition watchdog, the Australian Competition and Consumer Commission took the company to Federal Court for resale price maintenance, alleging "deliberate systemic conduct occurring over several years".

Galileo update

Galileo gets the go-ahead

Galileo finally got the go-ahead at the end of November when European nations involved in the project agreed to build the EUR 3.4 billion satellite navigation system. Thirty satellites will be placed in a mid-earth orbit and supported by ground stations in Italy and Germany. A third ground centre dedicated to civil protection, in particular in the area of maritime, air and rail security, will be based in Spain. This control centre is expected to take on further responsibilities as the Galileo system is developed. *www.djnewswires.com/eu*

EU lawmakers endorse '08 budget including Galileo funds

European Union lawmakers have endorsed the European Union's 2008 budget worth EUR120.3 billion and including extra funding for the bloc's Galileo satellite navigation network. Approval comes after European Parliament negotiators and EU member states reached an agreement in November to pump extra public money into the Galileo project, which risked collapse without it. The EU has agreed to inject an extra EUR2.4 billion into the program over the 2007-2013 period, with EUR1.6 billion coming from unused EU agriculture subsidies.

Lawmakers at the European Parliament also approved a sharp rise in spending on the E.U.'s Common Foreign and Security Policy, which will reach EUR285 million in 2008, EUR125 million more than this year.

The E.U.'s joint budget will be 4.15% bigger next year, in terms of payment appropriations, representing 0.96% of gross national income in the area.

Galileo signal reflections used for monitoring waves and weather at sea

Surrey Satellite Technology Ltd (SSTL) and the University of Surrey have succeeded for the first time in capturing a Galileo signal reflected off the ocean surface in orbit, demonstrating the potential for determining the weather at sea with remote sensing satellites. The pioneering GPS Reflectometry Experiment was launched onboard SSTL's UK-DMC satellite in 2003 to demonstrate the use of GPS reflections to determine the roughness of the ocean, using a method called 'bistatic radar' or 'forward scatterometry'. This experiment has now successfully detected a Galileo satellite navigation signal reflected by the ocean's surface. GIOVE-A, the first Galileo demonstration satellite, also built by SSTL, was commissioned by the European Space Agency and has been transmitting prototype Galileo signals since its launch in December 2005.

Dr Martin Unwin, Head of the Global Navigation Satellite Systems (GNSS) / GPS team at SSTL explained: "This is an important achievement in remote sensing and demonstrates the potential offered by Galileo for scientific purposes. A constellation of small satellites could be deployed at low cost to take measurements over the oceans where there are large gaps in forecast knowledge at present. An improved measurement system in space could be used to warn mariners of storms and to provide data for global climate change models - potentially even to detect Tsunamis." *www.surrey.ac.uk*

Real-time traffic information to reach more than 83 million users

According to ABI Research, real-time traffic information services will reach more than 83 million paid or registered users worldwide by 2012. It sees three elements to the puzzle of providing truly useful traffic data for navigation systems.

First, the traffic data collection ecosystem is very complex. Infrastructure measurement systems (road sensors, cameras, radar, or loop sensors) are expensive and hard to install. A second challenge is traffic data aggregation. As the basic data becomes more available, the complex data derived from floating-car probes or predictive modeling will become the differentiator. But such data are harder to integrate into navigation routing. A third factor is market landscape. ABI Research expects INRIX and NAVTEQ/Traffic.com to become the two players in traffic data. *www.gpsbusinessnews.com*

Report forecasts GPS market heading for US$ 30 billion

According to telecomsmarketresearch.com, with more and more affordable GPS receivers and components flooding the market, the global GPS market will reach a value of some US$ 30 billion by 2008. It suggests that people tracking and handset market segments under GPS will have the largest growth rate, of approximately 9%, by 2008. *www.reuters.com*

Beidou to be functional by the Olympics

The Chinese administration is determined to make Beijing shine for the Olympics next year. During Naviforum, it signalled a new willingness by the Chinese side to discuss - not only the current state of their positioning systems-but also their future plans for the network. It may by symptomatic that although initiated by China's military forces, the China Satellite Navigation Engineering Centre, a civilian organisation, will reportedly take charge of the research, building, and management of the new system.

Navigation in Indonesia

Indonesian wireless operator Indosat has launched its new i-GPS off-board navigation software program. It is based on Tele Atlas digital maps, which include more than 89,000 kilometres of roads in Jabotabek, Surabaya, Semarang, Bandung, Malang, Sidoarjo, Gresik and Bali. They will also cover the major road network for the whole of Java. *www.teleatlas.com*

People of Delhi, India may soon get GPS-fitted ambulance service

The Delhi Government shall be introducing GPS fitted ambulance service soon. The Government is considering a proposal to deploy around 180 GPS based ambulance vans in the initial stage. *www.expressindia.com*

Delhi Police gets GPS for better tracking

Delhi Police in India has decided to fix high-tech GPS on its 1,500 field vehicles. "The first phase for installation of GPS device is over. We have installed high-technology devices in 450 PCR vans for their wireless uplink with the central command room. These devices will ensure round-the-clock monitoring of the vans' whereabouts through a digitised city map and also facilitate inter-connectivity of vans for proper coordination among them," according to Delhi Police spokesman Rajan Bhagat. The installation been carried out by HCL India for Rs 4.8 crore. *www.business-standard.com*

Advanced GPS data collection improves railcar shipment monitoring

Bourque Data Systems, Inc. (BDS), announced that it has certified data file integration between its rail shipment management software, RAILTRAC(R), and the GPS and sensing devices of GE's VeriWise(TM) RAIL remote monitoring system. This will allow shippers the ability to enhance decision-making, asset management and regulatory compliance with regular data feeds and alerts on the location and condition status of railcars. *www.earthtimes.org*

Putin wants satnav collar for dog

Russian President Vladimir Putin is considering buying a satnav dog collar for his labrador, Koni, in case she gets lost, the country's deputy prime minister revealed.

"When can I get a system for my dog, Koni, so she can't go too far astray?", Putin asked Sergey Ivanov.

"Dog collars will be in the shops from July 2008," Ivanov replied in all seriousness, according to the news agency Itar-Tass.

GPS may improve air travel

The FAA, USA has unveiled a new air traffic control system, ADS-B, having GPS to more accurately track airplanes in flight. *www.pbs.org*

China Mobile to launch GPS service in 2008

China's largest mobile operator China Mobile will start GPS mobile guide service next year. It is at a trial operation stage now, while China Unicom, the second largest mobile operator in China, is also operating the same in 114 cities. *www.institutionalinvestor.com*

Australia to use GPS vests to stay ahead of competition

Australia cricket team will use GPS vests in its quest to stay ahead of the chasing pack in world cricket in the lead-up to the 2009 Ashes and the 2011 World Cup. Majority of the data from the GPS vests be kept secret to prevent rival nations gaining crucial intelligence. Analysis from the GPS devices is helping to determine how player workload should be managed and which players need to be rested to prevent burnout. Mike Hussey, Mitchell Johnson and Nathan Bracken wore the GPS equipment during Australia`s one-day series in India in October and Hussey and Andrew Symonds used it in the first Test against Sri Lanka in Brisbane.

Shielding GPS antennas from space radiation

In the European Space Agency's (ESA) 'Swarm' mission in 2010, GPS antennas will measure the Earth's magnetic field with extreme accuracy. Factors such as the right position on the satellite are particularly crucial. A new software program - jointly developed by Ericsson and others - can simulate complex antenna systems, saving time and money.

New Sun spot activity threatens GPS signals

A new 11-year cycle of heightened solar activity, bringing with it increased risks for power grids, critical military, civilian and airline communications, GPS signals and even mobile phones, showed signs it was on its way late recently when the cycle's first sunspot appeared in the sun's Northern Hemisphere, according to NOAA.

Russia launches GLONASS satellites

Russia has successfully launched a rocket carrying the last three satellites to complete a navigation system. A Proton-M rocket carried the three GLONASS from the Baikonur space center in central Asia's Kazakhstan. *www.presstv.ir*

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Mapping Center of Israel to launch Geography portal

The Mapping Center of Israel (MAPI) will soon launch a new national geography portal. The new site will have 120 information levels about land, outline plans, maps, trips, sites, aerial images, and historical maps. The maps on the site were created through collaboration with various ministries and will be free. *www.globes.co.il*

Indonesian health department to deploy GIS

Cadcorp, business partner in Indonesia, Transavia Informatika Pratama, (TIP), has been awarded a significant contract by the Indonesian Department of Health. It will supply a number of licences of Cadcorp SIS Map Modeller and Map Editor desktop GIS software to the Directorate of Community Health of the Indonesian Department of Health. It will also develop applications based on Map Modeller and Map Editor for use in mapping and analysing the distribution of health facilities and outbreaks of disease. *www.cadcorp.com*

Satellite imagery and GIS helps PowerGrid (India) to avoid forests

State-owned power transmission utility Power Grid Corp. of India Ltd (PGCIL) has started using satellite imaging and the GIS technology to avoid taking its transmission lines through forest cover. Currently, only 2% of the transmission firm's lines run through forests, down from 6% eight years ago. *www.livemint.com*

Nepal–India border mapping continuing

According to Ministry of Foreign Affairs in Nepal the scientific mapping of the Nepal-India boundary is underway on the basis of historic agreements and international law and principles since 1981. The joint technical teams from Nepal and India have just completed the scientific strip mapping of about 98 per cent of the Nepal-India border over the last several years. Both *www.gorkhapatra.org.np/content.php?nid=33138*

Traffic GIS for India by Mapunity

By harnessing telecom data provided by Airtel, its enterprise partner, Mapunity can apply the solution to ease urban traffic at a less cost. Bangalore was the first city in India to get its own traffic information system (TIS) in June this year on GIS platform by the company followed by Hyderabad and Chennai and Delhi shall be soon. The project allows cellphones to act as proxies for its users, whether they are on foot or in vehicles. The number of cellphones carrying Airtel's SIM cards gets logged in Airtel's towers which then denote the traffic movement. *www.rediff.com*

Better 'eye' in space for Malaysia

Weighing 180 kg and with a 2.5 m resolution, Malaysia's second remote-sensing satellite shall provide images every 100 minutes. The RazakSAT is expected to be launched into space by the middle of this year. The satellite was jointly developed by Astronautic Technology (M) Sdn Bhd and Satellite Technology Research Center Initiative Co Ltd, South Korea. The cost of the RazakSAT programme is RM60 million. *http://www.nst.com.my/*

Satellite survey of Nalanda ruins begins in Bihar, India

Scientists from the National Remote Sensing Agency (NRSA) are conducting the first ever ground-penetrating radar (GPR) survey in Bihar's in Nalanda district to trace the location of the buried ancient structures. According to officials of the Archaeological Survey of India, Patna circle, NRSA team comprise of five-member team of scientists for the work. *www.earthtimes.org/articles/show/162036.html*

Envisat captures crude oil leak off South Korea

More than 10 000 tons of oil from the tanker is reported to have leaked into the sea since colliding with another vessel on 7 December in the southwest of Seoul. The image was acquired on December 11, 2007 at 01:40 UTC by the Advanced Synthetic Aperture Radar (ASAR) aboard ESA's Envisat.

The presence of oil on the sea surface damps down smaller wind generated waves that reflect the radar signal back in the direction of the source. When they are damped, the reflected power measured by the radar is reduced, causing oil slicks to be seen as dark areas on an otherwise brighter sea. *www.esa.int*

National Geospatial Award for Excellence

Dr Prithvish Nag, Director, The National Atlas & Thematic Mapping Organisation was given the National Geospatial Award for Excellence 2006 in recognition of his outstanding life time contributions for introducing digital age – geospatial technologies and providing institutional leadership in the mapping organisations in the country. The award was given at National Conference on High Resolution Remote Sensing & Thematic Applications, Kolkata during 18-20 December 2007.

Dr Prithvish Nag (R) receives the award

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February 11 - 14, Barcelona, Spain
www.mobileworldcongress.com

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

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

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