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GEOCODES

the key to E-Government readiness

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Gordinates

Volume V, Issue 10, October 2009

THE MONTHLY MAGAZINE ON POSITIONING, NAVIGATION AND BEYOND

Is it curtains for Loran? Accuracy evaluation of DCPS RTK system in railway construction



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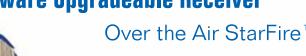
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The UN monitors E-Government through regular global E-Government Surveys.

The most recent Survey conducted in 2008 shows a wide range of E-Government Readiness in the Asia and Pacific Region. (Page 9)

E-Government initiatives are being taken in many countries.

E-Government Readiness can significantly be improved by deploying spatial enabling platforms.

And, spatial enabling platforms need geocodes.

However, in many countries such vital enabler are yet to be readily available.

Bal Krishna, Editor bal@mycoordinates.org

CHIEF ADVISOR Muneendra Kumar PhD, Chief Geodesist (Retired), US National Geospatial Intelligence Agency, USA ADVISORS Naser EI-Sheimy PEng, CRC Professor, Department of Geomatics Engineering, The University of Calgary Canada, George Cho Professor in GIS and the Law, University of Canberra, Australia, Dr Abbas Rajabifard Director, Centre for SDI and Land Administration, University of Melbourne, Australia, Luiz Paulo Souto Fortes PhD Associate Director of Geosciences, Brazilian Institute of Geography and Statistics -IBGE, Brazil, John Hannah Professor, School of Surveying, University of Otago, New Zealand ▲ GNSS

Is it curtains for Loran?

If the US decides to close Loran, will the rest of the World keep going with Loran?

The benfits of GPS

GPS has revolutionised positioning, navigation and timing (PNT) over the last twenty-five years. During this period, we have come to rely on GPS to an unprecedented extent and GPS has gone from being an interesting research and development topic, to a professional niche market maker, to becoming the fourth utility and now to today's mass market phenomenon.

One of GPS's greatest strengths is its ease of use and many of today's mass-market users neither care about nor understand the intricacies of GPS positioning. Because GPS is now embedded in so many consumer products, there is confusion about where GPS stops and the application starts. This confusion extends to GPS, on occasion, being blamed for "leading" car drivers many hundreds of miles off course.

At the same time, PNT based on GPS has become part of our critical infrastructure: finance, power, telecommunications, emergency services and transportation among others. GPS is often a small, perhaps overlooked, but very important component in the timing subsystem of a much larger system. GPS has produced a wide variety of both industrial and user benefits worldwide as a result of new applications and services.

A key cross-sector benefit has been manning efficiency savings arising from system integration and automation. In many cases, automation has resulted in a change of operational concept where reversion to the previous operational concept is almost impossible without increasing the number and skill of the people involved. This is most obvious in ship navigation, where many experienced mariners believe that reversion to visual/ radar fixing without warning, even for a ship travelling at speed in a crowded sea lane, in low visibility and with minimal bridge manning is unrealistic for many commercial vessels. However, it also applies to many control rooms that now rely heavily on automated processing based on location.

Emerging predators

As the benefits have grown so has GPS's value as a target.

Over the last twenty-five years we have experienced and catalogued GPS errors at system, signal and user levels. Perhaps the biggest development over the last few years has been the arrival of new predators: GPS jammers. We have always known that the low-power, high-frequency GPS signals are vulnerable to interference.

In the past, unintentional interference was the main concern and intentional jamming outside military theatres of operation was largely a theoretical problem. This is no longer the case. Low-powered transmitters are readily available over the Internet for as little as \$150 and can block civil and military GPS on both frequencies together with Galileo and GLONASS in a vehicle's vicinity. They can also block all mobile phone bands used in the area. Recently, much more powerful jammers have appeared on the market. Some of these are more powerful than the 1.5W jammers used in by the General Lighthouse Authorities in official UK maritime trials that denied GPS for up to 30km.

Resilient PNT: Today's requirement

GPS interference detection and mitigation (IDM) is an emerging industry with governments discussing databases, sensor networks and funding. Detecting and locating GPS jammers in a timely fashion is not straightforward as shown by US experiences at Moss Landing and San Diego among others.

The fall-out from GPS jamming can be severe and so we cannot afford to wait for IDM teams to be set up or the delay as they search for GPS jammers. If we want to secure the GPS-based benefits that we all enjoy, then our best strategy is to ensure that PNT is resilient in the face of GPS jamming. There are four real system requirements for the solution:

- it needs to build on GPS and be independent of it with very different failure mechanisms;
- it needs to have compatible performance and be interoperable so that we can keep our advanced, automated operational concepts;
- it needs to be capable of being brought into operation soon (e.g. in the next five years); and
- it should meet the requirements of many different users (maritime, aviation, land and timing) in order to share the costs and benefits.

Options for resilience

Twenty-five years ago, we would not have this problem. No single navigation system was used to the extent that GPS is today. Positioning (P) and navigation (N) were generally treated separately to time (T). The navigation sector was much smaller with niche professional markets and there was no mass-market. We could have had a lengthy discussion as we discussed the relative merits of systems like Omega, or Loran-C, or Decca, or Syledis.

Today, natural selection based largely on cost and benefit means that PNT options are much more limited. There are a number of Global Navigation Satellite Systems (GNSS) in existence (GPS, GLONASS) or under development (Galileo, Compass) but they all share common vulnerabilities at signal and user levels, for example to interference and jamming. Adding more GNSS systems does not increase resilience. The key is diversity. We need to augment GNSS with a solution that meets the four system requirements stated earlier. The only real option is Enhanced Loran.

Is it curtains for Loran?

So, to the exam question: is it curtains for eLoran?

This question has undoubtedly been prompted by activity in the United States of America and it is important to understand what has happened in recent times:

- In 2006, the US Departments of Transportation and Homeland Security commissioned an Independent Assessment Team (IAT) on eLoran that was led by Professor Brad Parkinson, the "Father of GPS", and comprising a high-level group of experts. This recommended unanimously to designate eLoran as primary backup for critical GPS applications, to fund its completion and to commit to 20 years of operations.
- In early 2007, there was a Federal Register Notice on Loran. This demonstrated extremely broad support for establishing Loran with potential markets in the maritime, aviation and timing sectors. Taken together with the IAT report, these remain powerful and compelling reasons for transitioning to eLoran.
- In February 2008, the US Department of Homeland Security announced that it was starting to implement eLoran as an independent national positioning, navigation and timing (PNT) system to complement the Global Positioning System (GPS) in the event of an outage or disruption.
- On 25^{th} February 2009, the US

Secretaries of Transportation, Defense and Homeland Security released the 2008 Federal Radionavigation Plan (FRP) which is the official source of radionavigation policy and planning for the US Government. This noted that in March 2008 the US National Space-based PNT ExComm endorsed the Department of Transportation (DOT) / DHS decision to transition the Loran system to eLoran and that DHS was working to clarify the operational requirements.

• Finally, on 26th February 2009, the US Office of Management and Budget issued the US budget proposal for 2010/11 that effectively announced its intention to terminate Loran.

From an international perspective, this may look rather confusing. However, at the time of writing, the World awaits the US Congress' decision on Loran and there is one key question to be answered: if the US decides to close Loran, will the rest of the World keep going with Loran?

This question has never, to my knowledge, been put formally to the 14 other nations that provide Loran services. However, I suspect that the majority including France, Japan, Norway, the Peoples Republic of China, the Russian Federation, Saudi Arabia, South Korea and the United Kingdom may see real benefit in system diversity and decide to keep Loran and transition to eLoran.

So, is it curtains for Loran? I don't think so but there will be a process of realignment if the US decides to close Loran.

This and other questions will, I'm sure, be discussed at the International Loran Association conference at Portland, Maine in mid-October.



Dr Sally Basker Director of Research & Radionavigation General Lighthouse Authorities of the United Kingdom & Ireland

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▶ YOUR COORDINATES

What is wrong with quoting Columbus?

Readers may recall the article of Dr Muneendra Kumar published in September issue of Coordinates. Here is Dr Peter H Dana comments:

What is wrong with quoting Columbus' strange views on the shape of the earth on the opening page of a chapter entitled, "The World is a Pear"?

Those lines are from Columbus' "Letter on his Third Voyage." Even Davis isn't using that as a description of the size and shape of the earth, just a cute vision from the often mistaken Columbus.

On page 62 Davis writes:

"You may have laughed when you read the words that open this chapter about his idea that the world was shaped like a pear.

Well the Joke's on you.

One of the things we learned when the Vanguard satellite, launched in March 1958, went into orbit was that the Earth is not a sphere as we learned in grade school – a "fact" we have accepted since the days of Newton. In fact, astronomer John O'Keef determined from Vanguard's orbit that the Earth I slightly pershaped with a bulge in the southern hemisphere – though not to the extent Columbus imagined."

Not geodesy to be sure but certainly not "astonishing."

Peter H Dana, Ph.D.

Research Fellow and Lecturer Department of Geography The University of Texas at Austin pdana@mail.utexas.edu

Geocodes - the key to e-Government readiness

The United Nations monitors E-Government through regular global E-Government Surveys. The most recent Survey in 2008 shows a wide range of E-Government Readiness in the Asia and Pacific Region



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Ian Williamson Professor *ianpw@unimelb.edu.au* Centre for SDIs and Land Administration, Department of Geomatics, The University of Melbourne, Australia E-Government (or Electronic Government) is described in Wiki as the use of information and communication technology to provide and improve government services, transactions and interactions with citizens, businesses, and other arms of government.

The United Nations notes, in its most recent E-Government Survey, that a trend towards reforming the public sector has emerged in many countries in recent years spurred primarily by the aspirations of citizens around the world. These clients of government are demanding top performance and efficiency, proper accountability and public trust, and a renewed focus on delivering better service and results. To accomplish this transformation governments are introducing innovations in their organisational structure, practices, capacities, and in the ways they utilise human capital, information and communication technology (ICT) and financial resources in service delivery to citizens.

The real benefit of E-Government, in the view of the United Nations, lies not in the use of technology per se but in its application to processes of transformation of government and society.In the developed world the E-Government agenda is most often less about changing the nature of democracy and more about improving the business of government via better customer relations. In contrast, much of the focus in developing countries has been on leveraging E-Government as a means to overcome traditional governance weaknesses, notably an absence of openness, excessive corruption and weak accountability to citizenries as a result.

At the same time as progress is being

made in E-Government implementation, the spatial community has been developing ways of deploying spatial enabling platforms across government to facilitate better government outcomes. This phenomenon is being referred to as the Spatial Enablement of Government, a component of a much broader trend, the Spatial Enablement of Society. The relationship between Spatial Enablement of Government and Spatial Enablement of Society is depicted in Figure 1.

A basic requirement for effective spatial enablement is the availability of geocodes. A geocode normally takes the form of a geographical coordinate, that is, the latitude, longitude and (sometimes) height of a point. Geocodes derived from cadastral and land administration systems are ideal for the purposes of spatial enablement because the source databases of land parcels and road corridors, street addresses and interests in land have integrity, are authoritative, are kept upto-date and are linked to a map base and a country's geodetic reference system.

Geocoded street addresses are perhaps the most useful derivative of cadastral and land administration systems in terms of Spatial Enablement of Government because street addresses are one of the most common elements in government databases. Geocodes provide the means of linking information held in databases in different organs of government, thus allowing the analysis of issues on a whole of government basis.

The ability to assess issues on a whole of government basis is crucial for governments to be able to effectively respond to contemporary global challenges such as sustainable development, clean water, population and resources, democratisation, global convergence of information technology, the richpoor gap, health issues, peace and conflict, the status of women, and transnational organised crime.

The E-Government readiness index

The United Nations E-Government Survey provides a comparative assessment of the application of ICT by governments of the 192 United Nations Member States. The fourth global Survey was undertaken in 2008. The Survey seeks to provide governments with a measuring tool that shows their respective areas of strengths and weaknesses within the E-Government Readiness domain.

Member States are at different phases of delivering E-Government services. Some of the developed countries are beginning to migrate beyond E-Government to I-Government (or Connected Government) (The Government of Singapore describes I-Government as Integrated Government) which provides the basis for the transformation from a bureaucratic government to a people-centred one. Some States are in the transactional phase of E-Government and still other States are at the initial phase of E-Government where very few services are delivered online. The conceptual framework of the E-Government Survey is based on a holistic view of development that incorporates human capacity, infrastructure development and access to information and knowledge. The overall results of the Survey for each country are presented as a single number, the E-Government Readiness Index. This is a composite index comprising a Web Measure Index, Telecommunication Infrastructure Index and Human Capital Index. As countries move upwards towards the stage of Connected Government they pass through five stages - emerging, enhanced, interactive, transactional and connected. The Web Measure Index provides Member States with a comparative ranking on their ability to deliver online services to their citizens. The Telecommunication Infrastructure Index is a composite index of five primary indices relating to a

country's infrastructure capacity as they relate to the delivery of E-Government services. These are: Internet users /100 persons; PCs /100 persons; main telephones lines /100 persons; cellular telephones /100 persons and broad banding /100 persons. The Human Capital Index is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrollment ratio.

Characteristics of countries with a high E-Government readiness index

The Survey provides an insight into the characteristics of E-Government in countries with a high E-Government Readiness Index. In these countries E-Government is being viewed as an enabler of organisational and democratic renewal rather than primarily a costsavings technique. There is a move from static websites to integrative portals where the perspective of government operations is based less on organisational charts and more on citizen usage and outcomes, and where integrated service offerings hide, simplify or transcend the traditional machinery of government. There is also greater centralisation of ICT management and functions, and a strong emphasis on collaboration across sectors to create networked government. The view of electronic and digital systems is changing back office support functions to a strategic and enabling architecture for most aspects of organisational performance.

Countries with a high E-Government Readiness Index are creating an information infrastructure both within the public sector and across society at large based upon reliable and affordable Internet connectivity for citizens, businesses and all stakeholders in a given jurisdiction. The new infrastructure is being leveraged within the public sector in order to better share information and bundle, integrate and deliver services through more efficient and citizen-centric governance models encompassing multiple delivery channels. There is a fostering of inter-jurisdictional partnering to the end that national reforms are being shaped by innovations emanating from the flexibility and nimbleness of smaller, sub-national governments.

One of the most important lessons to be derived from the experiences of developed countries, the 2008 United Nations E-Government Survey notes, is the importance of collaboration between governments, that is, adopting federalism as a key design principle. Even in unitary government systems, where central governments can more easily impose decisions on other, 'subordinate' public sector levels, leading E-Government countries have demonstrated that collaboration provides a better path. In more formal federalist structures, collaboration is essential in overcoming constitutional and jurisdictional boundaries that are not so different than borders

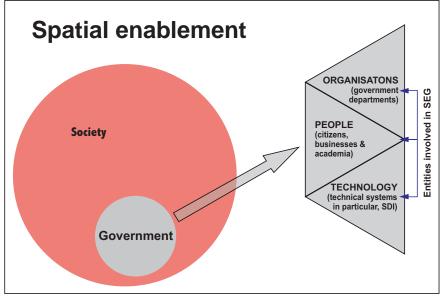


Figure 1: The relationship between Spatial Enablement of Government and Spatial Enablement of Society

Country	Web measure index	Infrastructure index	Human capital index	E -government readiness index	
Afghanistan	0.27	0.02	0.33	0.20	
Armenia	0.27	0.09	0.90	0.42	
Australia	0.75	0.69	0.99	0.81	
Azerbaijan	0.39	0.11	0.88	0.46	
Bangladesh	0.35	0.02	0.50	0.29	
Bhutan	0.41	0.02	0.49	0.31	
Brunei Darussalam	0.26	0.27	0.88	0.47	
Cambodia	0.20	0.01	0.69	0.30	
China	0.51	0.16	0.84	0.50	
Fiji	0.27	0.10	0.88	0.42	
India	0.48	0.04	0.62	0.38	
Indonesia	0.33	0.07	0.83	0.41	
Iran	0.26	0.17	0.79	0.41	
Japan	0.74	0.62	0.95	0.77	
Kazakhstan	0.32	0.13	0.98	0.47	
Kiribati	0.07	0.02			
Korea North	0.02	0.01			
Korea South	0.82	0.69	0.98	0.83	
Kyrgyzstan	0.30	0.05	0.92	0.42	
Lao	0.04	0.02	0.66	0.24	
Malaysia	0.68	0.30	0.84	0.61	
Maldives	0.29	0.20	0.86	0.45	
Marshall Islands	0.07	0.05			
Micronesia	0.08	0.08			
Mongolia	0.42	0.09	0.91	0.47	
Myanmar	0.11	0.00	0.76	0.29	
Nauru	0.01	0.06		-	
Nepal	0.29	0.01	0.52	0.27	
flew Zealand	0.64	0.59	0.99	0.74	
Pakistan	0.42	0.05	0.47	0.32	
Palau	0.18				
Papua New Guinea	0.09	0.02	0.52	0.21	
Philippines	0.51	0.10	0.89	0.50	
Russian Federation	0.33	0.25	0.96	0.51	
Samoa	0.18	0.05	0.90	0.38	
Singapore	0.61	0.59	0.91	0.70	
Solomon Islands	0.14	0.02	0.67	0.27	
Sri Lanka	0.39	0.07	0.81	0.42	
Tajikistan	0.04	0.02	0.90	0.32	
Thailand	0.51	0.15	0.85	0.50	
Timor-Leste	0.16	0.01	0.57	0.25	
Tonga	0.17	0.09	0.93	0.40	
Turkmenistan	0.05	0.04	0.90	0.33	
Tuvalu	0.04	0.09		0.00	
Uzbekistan	0.04	0.04	0.91	0.41	
Vanuatu	0.03	0.04	0.70	0.41	
Vietnam	0.03	0.02	0.82	0.25	

Table 1: 2008 E-Government Readiness Index in PCGIAP member countries

	Web measure index	Infrastructure index	Human capital index	
PCGIAP maximum	0.82	0.69	0.99	0.83
PCGIAP minimum	0.01	0.01	0.33	0.20
PCGIAP mean	0.30	0.14	0.79	0.43
World mean				0.45

Table 2: Variation and Mean of E-Government Readiness Index in PCGIAP member countries

between countries. The lesson here is that in a federated architecture model where power and decision-making authority must be shared across different governance layers, the willingness and the ability to collaborate are essential for positive transformation to occur.

E-Government readiness in Asia and the Pacific

The 2008 E-Government Readiness Index for countries who are members of the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) is shown in Tables 1, 2 and 3. PCGIAP members are the countries recognised as being members of the United Nations Economic and Social Commission for Asia and the Pacific. There is a large variation in the E-Government Readiness Index of countries. At one end of the scale 6 countries are in the top 35 globally and 2 of these are in the top 10. However most (75%) countries have an index below 0.5 and the average index for the region is no different to the global average of 0.45. These figures indicate that, from an Asia and Pacific perspective, E-Government needs will be different from country to country and strategies will need to be assessed on a case by case basis.

Geocodes and E-Government readiness

The effective implementation of E-Government in a country requires a whole of government approach, that is, all the organs of government working towards the common strategic objective of E-Government. In Australia, which has a relatively high E-Government Readiness Index, spatial enabling platforms are being deployed in government at national and sub-national levels as a means of supporting better decisionmaking in government and more efficient government operations, and to support the implementation of E-Government.

Examples of these spatial enabling platforms are the Commonwealth Spatial Data Integration initiative, the Western Australia State Land Information Platform, the Victorian VICMAP infrastructure, the New South Wales Common Spatial Information Initiative, and the Northern Territory Land Information System.

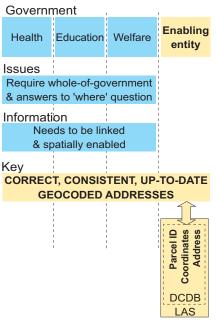


Figure 2: The use of geocoded street addresses to facilitate whole of government analysis of issues.

	E -government readiness index
Country index above 0.75	8%
Country index between 0.50 & 0.75	18%
Country index betvyeen 0.25 and 0.50	65%
Country index below 0.25	10%

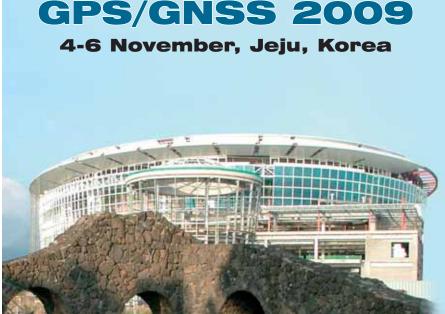
Table 3: Distribution of E-Government Readiness Index in PCGIAP member countries Work has also started on a Trans-Tasman initiative called the Australia New Zealand Spatial Infrastructure.

In each of these cases geocoded street addresses derived from government cadastral and land administration systems is playing a key role in the spatial enabling platforms. Australia is fortunate in possessing a national authoritative complete and up-to-date list of geocoded street addresses called the Geocoded National Address File (GNAF). GNAF is produced by a government-owned company, PSMA Australia Limited. GNAF is a reference dataset used in government, business and the community. The way in which geocoded street addresses allow whole of government analysis of issues in Australia is depicted in Figure 2.

Most of the countries of the world, however, are not as fortunate as Australia in this regard. They do not have ready access to country-wide digital geocodes of any form let alone a national geocoded street address database linked to cadastral parcels. In some cases political considerations such as national security prevent access to geocodes even if they do exist. The lack of availability of geocodes presents a significant technological hurdle to the achievement of spatially enabled government. As a minimum this technical challenge requires research into new and efficient ways of generating country-wide geocodes.

Notwithstanding this problem, cadastral organisations around the globe, and the geocodes embedded in their cadastral parcel databases, provide a key to effective deployment of spatial enabling platforms in government, and the key to improving E-Government Readiness in countries. In many cases this requires cadastral organisations to change the way they do their business. For example, they need to consider establishing and maintaining digital cadastral databases. These databases need to be visible and accessible, preferable on the Internet, in a way that is meaningful to users. Unique geocodes need to be generated for each digital cadastral parcel and where possible these geocodes applied to the street address of the parcel.

These basic measures could be supplemented by cadastral organisations providing geocoding training and services to government agencies that would allow agencies to validate and geocode their own digital databases. Further, cadastral organisations could facilitate partnerships between government agencies with the objective of integrating their web portals using geocodes as the linking mechanism. By taking these actions cadastral organisations could become more strategically relevant to their government.



The Korean GNSS Technology Council invites scientists, engineers, manufacturers, service providers and representatives of national organizations to the GPS/GNSS 2009 which will be held in Jeju, Korea on 4-6 November 2009.

gnssws@gnss.or.kr www.gnsskorea2009.org



Shunji Murai General Secretary, Asian Association on Remote Sensing

30 years of ACRS

ACRS: For Asian, by Asian and with Asian

On the occasion of the thirtieth anniversary of Asian Conference on Remote Sensing (ACRS) to be celebrated in Beijing, China, 18-23 October, 2009, I as General Secretary of AARS, would like to say some words about the review of ACRS.

The first ACRS was held in Bangkok, Thailand in November, 1980 without any institutional scheme. The ACRS was jointly organized by National Research Council of Thailand (NRCT) and Japan Association of Remote Sensing (JARS) with 159 participants from 12 countries.

The idea of the conference was from the talks among 19 Asian friends at a party by Asian remote sensing scientists who joined ERIM symposium held in San Jose, Costa Rica in April 1980. We wanted to organize Asian Conference on Remote Sensing in Asia rather than such far place like Costa Rica. I took responsibility for the organization of the first ACRS which was requested by Mr. Manu Omakupt from Thailand. Dr. Suvit Vibulsresth, Director of Remote Sensing Department, NRCT served as Chairman of Organizing Committee.

Chinese Delegate proposed to organize the second ACRS in Beijing, China in 1981. Mr Chen Weijang, Director of 3rd Bureau, State Science and Technology Commission of China approved the budget. Prof. Wang Daheng was Chairman of Organizing Committee. During the second ACRS held at Friendship Hotel, Beijing, China, those delegates from Bangladesh, China, India, Japan, Philippines, Sri Lanka and Thailand approved the Statutes of Asian Association on Remote Sensing (AARS) after three night talks and I was elected General Secretary. It was the birth of AARS. I am honored to be able to continue this position until the thirtieth ACRS. It is unbelievable how we could continue the ACRS without certain budget source. That is why I always repeat at Opening Ceremony; "Friendship First, Money After". This philosophy is still working well.

My basic policy was to organize ACRS for Asian, by Asian and with Asian with affordable registration fee even to developing countries/regions. The conference should be organized in Asian style but not Western style. Establishing human networks among Asian remote sensing scientists should be essential to be gained through the conference.

I have never organized ACRS in Japan because my intension was to encourage developing countries/regions in Asia for sharing scientific information and common problems which could be solved by remote sensing technologies. After the first two ACRS, everything had become smooth as Asian colleagues started to help each other. Now on the occasion of the thirtieth anniversary of ACRS as well as seventieth anniversary of myself, I am going to resign the position of General Secretary, AARS and hand over the position to younger generation for the future progress of ACRS/AARS.

At this 30th memorial ACRS, Prof. Tong Qingxi, Chairman, Organizing Committee and his team plan to confer Contributory Award to those persons who contributed to the past ACRS. In addition GISTDA Thailand plans to confer Dr. Boon Indrambarya Medal to outstanding remote sensing scientists. Prof Kohei Cho plans to distribute all participants a DVD including Geo-coded Satellite Images of Capitals in Asia using Asian satellites and others.

I thank Chinese Organizing Committee for the support of this cost. The celebration of the 30th anniversary would be exciting.

I thank all of you to have supported me to construct a very friendly Asian Conference on Remote Sensing for these thirty years. If I am allowed, I want to watch my junior remote sensing scientists through coming ACRS just like an old fashioned Asian senior person.

Conference connects GIS users worldwide

2009 ESRI International User Conference draws more than 12,000 attendees

"Thank you for attending this year," said President Jack Dangermond, ESRI, as he welcomed attendees at the 2009 ESRI International User Conference (ESRI UC). "Many things have taken place over the last year, and I'm particularly grateful you are here with us today. I know some of you came on your own money and traveled halfway around the world–I can't say how much I appreciate that."

Despite tight budgets and a bad economy, more than 12,000 members of the ESRI user community traveled to the San Diego Convention Center in California, July 13-17, for the ESRI UC-the largest geographic information system (GIS) conference in the world-to learn about the latest developments in GIS and network with colleagues. The conference theme was GIS-Designing Our Future, and the activities kicked off with an impressive Plenary Session that highlighted advances in GIS and the remarkable work going on in the GIS community. Before thousands of attendees, Dangermond honored the Special Achievement in GIS (SAG) Award winners and presented distinguished awards for exceptional use of GIS technology. Dangermond presented the Making a Difference Award to Dr. K. Kasturirangan, member (science), Planning Commission, Government of India, for his groundbreaking use of GIS in India's space program. "He makes a difference because of the integration of remote sensing into GIS and also the tremendous focus he's created on applications," said Dangermond. CenterPoint Energy, Inc., received the Enterprise Application Award for the organization's remarkable response to those affected by Hurricane Ike, and Governor Martin O'Malley of Maryland was awarded

the coveted ESRI President's Award.

Dangermond then shared his vision for ESRI. Staff showcased the capabilities available in ArcGIS 9.3.1 and offered a sneak preview of the soon-to-bereleased ArcGIS 9.4 highlighting its performance and usability enhancements. ESRI's Christophe Charpentier took the audience on a



ESRI president Jack Dangermond presents the 'Making a Difference' Award to Dr. K. Kasturirangan, member (science), Planning Commission, Government of India.



ESRI community members from more than 100 countries showcased their work in both print and virtual formats in the Map Gallery.

virtual tour of the wealth of content available through ArcGIS Resource Centers. ArcGIS Online product manager Rob Shanks demonstrated how attendees can begin using ArcGIS Online as a collaborative mechanism to find other people's content, share their own content, create groups, and grant access to those who want to join a specified group.

Later, attendees were encouraged to volunteer their time and expertise

to help students develop GIS skills by becoming a GeoMentor. The plenary concluded with muchanticipated Keynote Addresses from economist Hernando de Soto, biologist Willie Smits, and the United States Census Bureau's Timothy Trainor.

The week progressed with hundreds of user presentations, technical and industry sessions, and workshops. Special Interest Group and Regional User Group meetings organized by industry, field, region, or area of interest facilitated networking among attendees. Product demonstrations and conversations with ESRI staff took place throughout the ESRI Showcase, Attendees could meet with ESRI's Professional Services staff members to talk about specific projects. Additionally, more than 300 exhibitors were available in the Exhibit Pavilion to answer questions about their advancements and solutions.

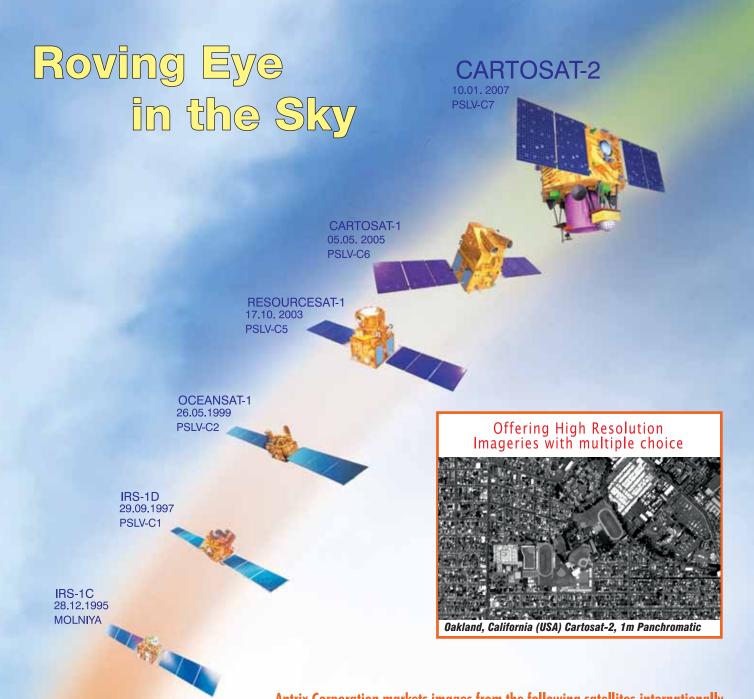
As in years past, attendee participation was a pivotal element in the ESRI UC experience. User work was highlighted throughout the Map Gallery, Virtual Map Gallery, and User Software Application Fair. Special displays from organizations such as the National Geographic Society and the State of Maryland illustrated how GIS is an essential tool in today's world. Attendees participated in Lightning Talks, which are new this year. These five-minutelong presentations demonstrated inventive applications based on ESRI Web and mobile technology.

Throughout the week, the GIS community formed new connections with one another and learned more about using GIS to support their activities. "This is a very exciting time," said Dangermond when addressing the large audience during the plenary. "It is a time when we can all leverage that reservoir of knowledge that you have built."

Caitlyn Mitchell

Marketing Communications, ESRI *cmitchell@esri.com*

INDIAN REMOTE SENSING SATELLITE (IRS)



Antrix Corporation markets images from the following satellites internationally through a network of **22** International Ground Stations and **20** Resellers • Cartosat-2 • Cartosat-1 • Resourcesat-1 • IRS-1C/1D • Oceansat-1

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Accuracy evaluation of DGPS

While most surveyors are aware of trilateration methods even so except for the National Survey Organizations other surveyors do not resort to trilateraties as routine



Vivek Bansal Sr. Manager Pan India, Gurgaon



Brig (Rtd.) M C Dhamija Former DDSG Survey of India & Consultant Pan India, Gurgaon



Prashant Joshi Software Engineer, Pan India Gurgaon There are generally 2 types of users of DGPS for professional survey one is the National Mapping Agency and other large govt. organization who undertake Survey projects and the 2nd category is comprising of private survey set ups most of whom are first time users of DGPS and use DGPS to cut down on the time and efforts Involved in surveying with ETS (electronic total station) along with spirit levels.

Conventional methods

National Mapping Agency e.g. Survey of India have their established base lines established by them and in use for decades. Their procedure to evaluate accuracy of DGPS is simple in which they ask the venders to measure the base line vector and compare it against their established value and the agreement between the DGPS measured vector and their known value is an acceptable method of evaluation. Similarly other government organization adopts the same procedure as they are in a position to acquire the base line data. Which is not available to private surveyors as a matter of government policy?

Private surveyors adopt a method where in they check repeatability of vector computed by DGPS or alternatively they measure a vector by ETS and compare the same with that obtained by DGPS.

Both the methods applied by private surveyors are subjective and in cases of disagreement private surveyors, who have implicit faith on ETS do not ever consider that ETS measurement could have observational error. More over ETS need a clear line of sight and is therefore restricted to a vector limited to 4-5 km.To overcome their subjectivity, we at Pan India resort to a Geometric Solution independent of comparison method as well as to obviate the requirement of known control points, so difficult & cumbersome to obtain.

Proposed method

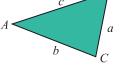
The principal utilized by us in simple term is solution called Trilateration. It is a well established geometric solution by which we can calculate internal angles of a closed figure such as Triangles & Rectangles When the vector length of sides is known. We have developed a small routine for this with due check by mollweids formula. Thus for evaluation purpose DGPS observation is made on the vertex of a triangle rectangle and vector length of sides is computed. With the vector lengths we compute the internal angles and sum up. For triangle the sum should add up to 180° any agreement with in \pm one tenth of second is considered satisfactory and thus indicates that the vectors by DGPS have the requisite accuracy stipulated in the system brochure, which is ± 5 mm + 1 ppm.

For verification we arbitrarily alter the length of any one side by more than 5mm + 1 ppm then recalculate the internal angles sum of internal angles does not come to 180° same procedure done by the competitors DGPS shows their quality and the customer can make objective judgment of the quality evaluation. This procedure when repeated with ETS will also show the accuracy achievable and procedural flaws if any in measurements taken by ETS. After internal angles have been computed we also do a run down of azimuth and the closing error in Azimuth is shown to be less them one tenth of a second which is the stipulated accuracy of the DGPS being marketed by us. We have performed these tests with both single and dual frequency DGPS and have found to be stable for both single and dual frequency DGPS with in the distance limits stipulated for both (15 km for Single Frequency & 80 Km for dual frequency DGPS). Almost all of our customers have appreciated the logic of this evaluation scheme and many controversies of DGPS vis-à-vis ETS have been obviated.

Trilateration

While most surveyors are aware of trilateration methods even so except for the National Survey Organizations other surveyors do not resort to trilateraties as routine. Therefore we feel that a little elementary explanation of trilateratior will be helpful in appreciating the import of the procedure explained above. In trilateration we get all three sides of triangle and an oblique triangle is any triangle that is not a right triangle. It could be an acute triangle (all three angles of the triangle are less than right angles) or it could be an obtuse triangle (one of the three angles is greater than a right angle). Actually, for the purposes of trigonometry, the class of "oblique triangles" might just as well include right triangles, too. Then the study of oblique triangles is really the study of all triangles.

Let's agree to a convention for labelling



the parts of oblique triangles generalizing the convention for right triangles. Let the angles be labelled *A*, *B*, and C, and let the sides opposite them be labelled *a*, *b*, and *c*, respectively.

Solving oblique triangles

The trigonometry of oblique triangles is not as simple of that of right triangles, but there are two theorems of geometry that give useful laws of trigonometry. These are called the "law of cosines" and the "law of sines." There are other "laws" that used are but since the common use of calculators, these two laws are enough.

The law of cosines

This is a simply stated equation:

 $c^2 = a^2 + b^2 - 2ab \cos C.$

It looks like the Pythagorean theorem except for the last term, and if C happens to be a right angle, that last term disappears (since the cosine of 90° is 0), so the law of cosines is actually a generalization of the Pythagorean theorem. Note that each triangle gives three equations for the law of cosines since we can permute the letters as we like. The other two versions are then $a^2 = b^2 + c^2 - 2bc \cos A$, and $b^2 = c^2 + a^2 - 2ca \cos B$.

The law of cosines relates the three sides of the triangle to one of the angles. We can use it in a couple of ways.

First, if we know one angle and the two adjacent sides, then we can determine the opposite side. For instance, if angle $C = 60^{\circ}$, side a = 5, and side b = 8, then the law of cosines says $c^2 = 25 + 64 - 80 \cos 60^{\circ}$. Since the cosine of 60° is 1/2, that equation simplifies to $c^2 = 49$, so c = 7.

Second, if we know all three sides of a triangle, then we can use it to find any angle. For instance, if the three sides are a = 5, b = 6, and c = 7, then the law of cosines says $49 = 25 + 36 - 60 \cos C$, so $\cos C = 12/60 = 0.2$, and, with the use of a calculator, C = 1.3734 radians = 78.69°.

Note: When triangle is obtuse, the cos C is negative. Suppose the three sides are a = 5, b = 6, and c = 10. Then the law of cosines says 100 = 25 + 36 - 60 cos C, so cos C = -49/60 = -0.81667. As we can see in the graphs above, the cosine of an obtuse angle is negative. This is fine, and our calculator will compute the arccosine properly. we'll get C = 2.2556 radians = 129.237° .

The law of sines

The law of sines is also a simply stated equation $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Note that the law of sines says that three ratios are equal. Like the law of cosines, we can use the law of sines in two ways.

First, if you know two angles and the side opposite one of them, then we can determine the side opposite the other one of them. Second, if we know two sides and the angle opposite one of them, then we can almost determine the angle opposite the other one of them.

Mollweide's formula

In trigonometry, Mollwedie's formula, sometimes referred to in older texts as Molweide's equations, named after Karl Mollwedie, this formula describes relationship between sides and angles in a triangle.

Let a, b, and c be the lengths of the three sides of a triangle. Let β , and γ be the measures of the angles opposite those three sides respectively. Mollwedie's formula states that

$$\frac{a+b}{c} = \frac{\cos\left(\frac{\alpha-\beta}{2}\right)}{\sin\left(\frac{\gamma}{2}\right)}$$

and
$$a+b = \frac{\sin\left(\frac{\alpha-\beta}{2}\right)}{\sin\left(\frac{\alpha-\beta}{2}\right)}$$

$$\frac{a+b}{c} = \frac{\sin\left(\frac{a-p}{2}\right)}{\cos\left(\frac{\gamma}{2}\right)}$$

Each of these identities uses all six parts of the triangle – the three angles and the lengths of the three sides. Mollwedie's formula can be used to check solutions of triangles.

Evaluation of elevation specs.

The known manufacturer of professional DGPS specify the elevation accuracy generally as double the horizontal accuracy specified e.g. if an OEM specifies horizontal accuracy as ± 5 mm + 1ppm, their elevation specs generally are ± 10 mm + 2 ppm. All DGPS output elevation as ellipsoidal elevation and often the values are large and many times as (-) this causes ambiguity in appreciation of results. Most processing software that come with DGPS have an inbuilt programme for conversion of ellipsoidal elevation to optometric elevation using a geoid model EGM-96, which is not very reliable for India. Survey of India is developing a geoid model for India and even when it is ready its availability in public domain remains uncertain. Like assassin the horizontal specs, the elevation specs are best evaluated when precise elevator Benchmarks (BM) are available which at present are in a classified category and

not easily available. One of the other conventional practices of evaluation is repeatability. A number of points are considered and repeat observation of elevation is computed with DGPS data and mean and standard deviation is calculated to arrive at the accuracy obtained which should be in accordance of the accuracy specified in the technical specification of DGPS by the OEM. However it is our experience that usual customers are generally do not feel comfortable with such a laborious exercise and large volume of computational data which necessarily involves a meticulous study by the customers for which normal customers neither have time nor patience and many are not conversant with statistical methods used for the exercise.

We at Pan India have therefore devised a simply and self evident procedure for evaluating the specified elevation specs of the OEM mentioned in the technical brochure of the product. This procedure in brief is as given below:

A base station in set up as suggested by the customer and an arbitrary elevation value of customers choice is assigned to the base station ground point a reccee of the area around base station is undertaken and a few points are selected for rover observation.

These points are so selected that they should comprise of a pillar / parapet / distance stone so that the measurement is possible both at ground level as well as at top of such a stone / parapet etc. A series of observations are carried out with rover DGPS at the ground level as well as the top of such pillars / parapets etc. and the data is processed using the assigned elevation of base station and EGM-96.

After the data is post processed. The difference in top and ground elevation of these points are tabulated. The actual difference of top and ground of these points is carefully measured using a standardized steel tape. The tape measured value is then compared with

the DGPS computed value and max and mini variation is recorded. These this gives the customer a verifiable and physically evident value of the accuracy of elevation measurement by DGPS.

The results so for have always been such that the maximum disagreement between the DGPS measurement and tape measurements has been well with in the accuracy specified in technical brochure of the DGPS. The customer is always encouraged to get this exercise repeated with competitor DGPS and arrive at this own evaluation.

Concluding remarks

We have utilized these procedures for extension of control for a large project of ONGC in field of Geophysical exploration. However, instead of triangles we observed a network comprising rectangles one diagonal of each rectangle. 📐

WALIS INTERNATI ONAL FORUM 2009 PERTH CONVENTION EXHIBITION CENTRE

WALIS International Forum is a well-established and popular event held approximately every 18 months - it has long been recognised as one of the best spatial events in Australia.

In 2009, WALIS International Forum will continue with its high standard of keynote speakers, interesting workshops and

showcasing the latest trends and projects. The program has been carefully structured to increase opportunities for discussion and learning amongst participants in specific thematic areas, including Utilities, Data Management, 3D and Visualisation and IP/Innovation. WALIS 101 and the popular Teacher's Stream will return again this year.

The Asia-Pacific Spatial Excellence awards recognise the excellence, innovation and service of both individuals and organisations engaged in the spatial information industry across the region. This year the Awards Presentation will be held in conjunction with the WALIS Forum Dinner on Thursday 12 November 2009.

The forum venue, Perth Convention Exhibition Centre, is ideally situated in the CBD overlooking the magnificent Swan River and within walking distance to many hotels and restaurants.

Contact WALIS for more information: walis@walis.wa.gov.au or visit www.walis.wa.gov.au/forum





Generati

PRELIMINARY FORUM PROGRAM

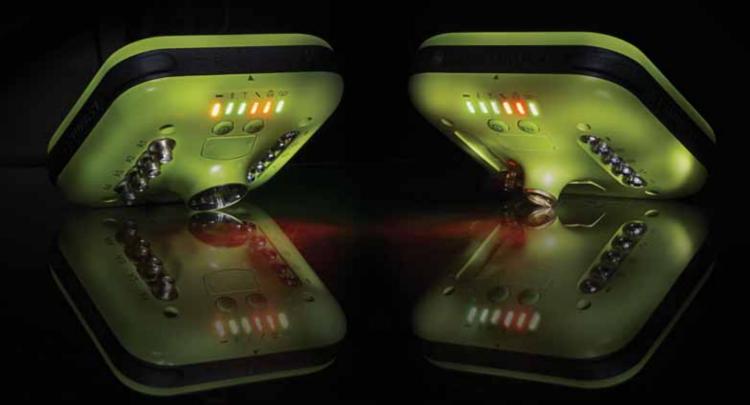
IS NOW AVAILABLE

please visit the WALIS Forum website http://www.walis.wa.gov.au/forum



TRIUMPH 1 TRIUMPH – 4X 216 channels

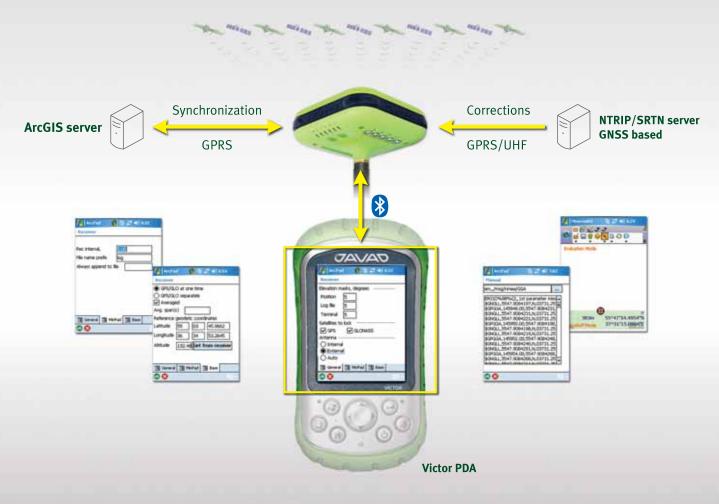
JAVAD ArcPad Extension in focus



JAVAD ArcPad Extension

In response to a long-standing request from ESRI, JAVAD GNSS is pleased to announce that ArcPad users can now communicate directly with ESRI ArcGIS Server via our Triumph receiver so no additional devices (external radio) or settings are required. Real-time centimeter-level positioning is now possible in the field for ArcPad users.

- JAVAD ArcPad Extension enhances the spectrum of ArcPad's surveying capabilities by adding state of the art JAVAD GNSS solutions. JAVAD ArcPad Extension provides a full range of functions to control the GNSS receiver and manage the surveying process.
- JAVAD ArcPad Extension establishes a connection to the receiver via serial, USB, or Bluetooth and configures the base station parameters that govern the RTK and UHF radio setups, and GSM modem settings.



- Quality control of real-time positioning results are assured in the field. The JAVAD GNSS Victor PDA displays the status/process progress continuously via the Bluetooth connection to the receiver.
- Advanced RTK accuracy and ArcPad vector/raster map visualization capabilities deliver reliable object positioning and a new level of job control in the field.
- JAVAD ArcPad Extension is an optimal ESRI-compatible solution for a wide variety of civil engineering or cartography tasks where centimeter level accuracies are required. At the core of this solution lies highly integrated JAVAD GNSS technology optimized for use with ESRI's GIS software.

Please see www.javad.com for details.

Actual size

5

- 1. Guard Bumper
- 2. Bluetooth/GSM Antenna
- 3. GNSS Receiver, Power Board, GSM/Bluetooth and Memory
- Rechargeable li-lon Battery
- 5. GNSS Antenna Connectors

GISmore stand-alone or

inside the hat

Bluetooth wireless connection to GISmore

3

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

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

GPS + GLONASS + Galileo

TRIUMPH 1

One base—one rover, one baseline

R

RTK with TRIUMPH – 4x is based on 16 baseline calculations instead of one. See details in www.javad.com.

4x4... ALL WILL DRIVE... RTK!

TRIUMPH-4x

In

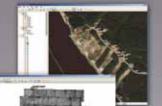
355



4 base – 4 rover, 16 baselines

Please see www.javad.com for details

Software solutions for all tasks



Justin

A comprehensive Survey and GIS software

Justin has integrated native tools to use ESRI or MapInfo cartography windows.

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

Victor

Victor is pre-loaded with our Tracy field software. When turned on, Victor automatically connects to TRIUMPH-1, TRIUMPH–4X or GISmore via its internalBluetoothandguidesyouthroughfield operations. It manages the GNSS receiver and modem operations automatically.

- Lightweight (17 ounces; 482 grams) magnesium case with easyto-grip over-molding
- Operating temperature -22°F to 122°F (-30°C to 50°C)
- Connectivity via built in Bluetooth, USB Host and Client, plus 9-pin RS-232 and optional WiFi and Modems
- Rechargeable, field replaceable, Li-Ion battery It operates for more than 20 hours on one charge (3 to 5 hours of charging time)

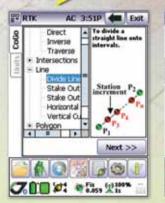
Tracy

A versatile and powerful field software

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

Giodis Full-featured office post-processing software





Support for survey and stakeout projects



Static, Fast Static and Stop&Go surveying

1	Event / PPS	3
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Events Ports	State	Reference Time -) GPS () UTCus) GUNS () UTCsu) Receiver iset, ms Offset, ns
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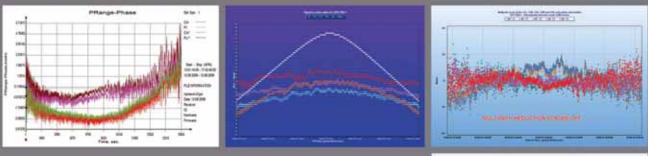
Configuration of all hardware

Javad eliminates GPS SVN 49 anomalies

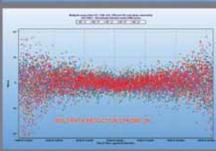
The anomalies in the recently launched SVN49(PRN1) was a chance to demonstrate the advanced multipath reduction capabilities of JAVAD GNSS Triumph technologies.

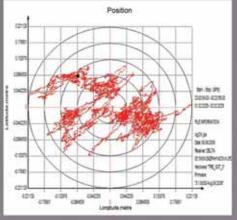
Figure below shows SNV49 (PRN1) code-minus-phase plot for usual correlator (magenta - C/A code, brown - P/L1 code) and for "mpnew" (red - C/A code, green - P/L1 code), which shows almost all anomalies and satellite multipath are removed.

Figures below also describe the multipath performance of a pair of Triumph-1 receivers we ran in a zero baseline test. The left figure depicts the code multipath errors of the GPS PRN1 pseudoranges measured by the receiver with the 'normal' strobe enabled. The right figure shows the code multipath as estimated for the second receiver, where the optimized multipath reduction strobe was enabled. The center screenshot displays the signal-to-noise ratios and elevation angles of GPS SVN49 over the time interval analyzed.



The optimized multipath mitigation technique implemented in our Triumph technology allows nearly complete compensation for the satellite-induced multipath anomalies that would otherwise badly affect GPS SVN49 measurements. The same multipath reduction capabilities which removed the SVN49 multipath anomalies can remove the multipath effects which are a major source of error in precision positioning.





JAVAD GNSS receivers tracked all current and future Galileo satellite signals

JAVAD GNSS receivers successfully tracked all Galileo satellites from Spirent simulator and produced Galileo-only and triple satellite (Gps+Glonass+Galileo) positions. Up to 27 satellites were tracked simultaneously.

The experiments were performed jointly by Spirent and JAVAD GNSS.

Sat	(Fn)	81	λs	C/A	P1	P2	TC	Count	F_C/A	F_P1	F_92	Use
Gps	1	29		46	0	0	63	3818	0x3153			¥1 01
Gpa		24		67	0	0	86	6996	0xA153			¥1 0)
Gps	6	27		46	0	0	84	4986	0x3153			Y(0)
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Ops	16	78		49	0	0	86	4996	0xA153			¥1 01
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Gin	10(2)	75		82	. 0	0	87	4986	0xA153			Y1 01
Gin	11(3)	44		50	0	0	81	4911	0x3153			YI 0)
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Gal	79	30		49	0	0	85	4986	0x3153			¥1 01
Gal	83	23		48	0	0	6.9	3572	0x2153			¥(0)
Gal	84	70		42	0	0	04	4904	0x2153			¥(0)
Gal	85	58		60	0	0	84	4306	0x3153			¥(0)
Gal	86	15		49	0	0	86	4986	0xA153			T(0)
Gal	8.9	33		60	0	0	85	4986	0xA153			¥(0)
Gal	90	35		51	0	0	86	4986	0xA153			Y(0)
Gal	91	11		51	.0	0		4986	0x2153			Y(0)
Gal	97		-	\$0	0	8	29	1747	0x2183			Y(0)

Other Receivers



ALPHA

- INTERNAL BATTERY
- CHARGER
- GSM
- BLUETOOTH

FOR: TR-G3, TR-G2T, TR-G3T



000

Front panel connectors:

Power Input + serial port A + USB + Antenna

Back panel connectors:

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

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

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

DELTA

FOR: TRE-G2T, TRE-G3T,

OUATTRO-G3D

Duo-G2, Duo-G2D,



63.00

Front panel connectors:

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

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

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

Back panel connectors:

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

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

SIGMA



- CHARGER
- MODEM
- GSM
- BLUETOOTH



FOR: TRE-G2T, TRE-G3T, Duo-G2, Duo-G2D, QUATTRO-G3D



Front panel connectors:

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

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

Back panel connectors:

Can have SIM door and GSM Antenna connector and up to 4 connectors of 1-PPS A-1-PPSB-EventA-EventB-Antenna-IRIG-Modem Antenna · Bluetooth Antenna

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



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Application of RTK system in railway construction

The article introduces the field work flow for railway design and construction, using detailed application of RTK GPS system and railway-design software



Figure 1: Work flow

Haitao Xu Senior technical engineer Beijing UniStrong Science & Technology Co., Ltd., China

G is divided into several sections, and each section is finished separately. Firstly, we need to collect the existing information of one section, such as map and control points. Then, survey the topography of the working area, select position of control points, set the control point network, and produce the control points by GPS static survey. After control points are surveyed, we need to get the aero photograph of working area, draw 1:2000 relief map to provide base data for railway designer.

enerally, the entire railway line

Besides the survey of control points, there are several steps that need the RTK system.

- There is no coordinate information in aero photograph. In order to add coordinates to features after vectorization, photo-control points are needed to induct coordinates.
- There is not enough information in relief maps that are vectorised from aero photograph, such as the direction of underground drain and feature

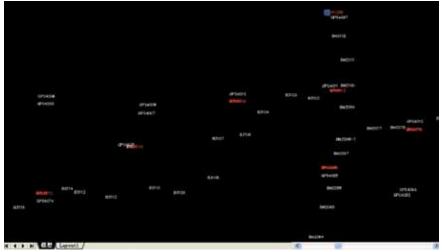


Figure 2: Control Network, a pair of GPS control points every 8 km and one bench mark every 2 km

details, for these supplementary survey in the field is needed.

- In order to survey the soil quality along the railway, drilling sites for geological sampling should be selected and surveyed.
- The distribution and height of existing railway should be surveyed.
- Pile stakeout should be done, which means to layout the designed railway coordinates to actual position in the field.
- Transect which reflects the topographic changes along the railway should be surveyed.

The entire flow of railway design can be depicted in a flow chart as:

Control point

According to the survey principle of 'Overall first, parts second, control first, detail second', first the survey work for control points is done. After the designer has collected the existing information of one section, such as maps and control points, he will survey the topography of the working area, select position of control points, set the control point network, and produce the control points by GPS static survey.

In this process, RTK system is used to collect static raw data for post-processing. As the RTK system records dual frequency raw data, the post-processing accuracy is higher than single frequency GPS receiver. The data format is 'RINEX' which is compatible with other survey systems and makes the work much more convenient



Figure 3: Base station can transmit RTK differential data and record static raw data at the same time



Figure 4: If there is no easy to identify point on the ground, a building can be used.



Figure 5: Drilling site stakeout: set out the site to the actual position, the two workers at the back mark the drilling site position with a wooden pile and red cloth.





and efficient.

Photo control point

Photo control point is a kind of control point that is used to

calibrate the aero photograph. In railway design, aero photograph is used to generate 1:2000 relief map by vectorization. In order to add coordinates to features after vectorization, photo-control points are needed to induct coordinates. Generally, some feature points that are easy to identify are picked as photo control points, and then the points are surveyed in the field.

In actual field work, since aero photograph with a scale of 1:10000 is used the features in the photograph are not exactly as the actual objects and sub-meter accuracy of photo control points is enough. Besides, the photo control points are distributed widely. So working with GPRS communication mode is advisable for long distance RTK survey. In this mode, the working distance is longer (up to 20~30km). Additionally, base station can record raw static data simultaneously while transmitting differential data. If there is no GPRS signal or bad GPRS signal in some regions, the working mode can be turned to 'fast static' (static survey every 15 minutes). Thus, the results can be obtained by post-processing. The two kinds of working modes ensure the field work is smooth and at no risk.

Supplement features and existing railway line

As the required relief map with a scale of 1:2000 is more detailed than the aero photograph with the scale of 1:10000, the relief map converted from aero photograph will lack some of the detailed information about features. This information should be supplemented by surveying in the field. Existing railway line information in working area is a kind of the supplementary information required.

The points for supplement information and existing railway line can be surveyed with the function of 'point survey'. In some places that are not covered in detail, the points can be obtained by 'offset survey'. With the 'Railway-design' software, we can add attributes to the points. Adding a specific code to each kind of object, the points can be joined automatically into a graph according to the code after the file is imported into AUTOCAD program.

Drilling site

'Drilling site' is used for geological sampling to gain information about the geological conditions along the railway line. There are three steps which have to be followed at the drilling site.

•

- Select the drilling site: according to the designed coordinates of railway, select points on the central line of the railway as the drilling sites.
 Designers select the sites in the field, mark them with wooden piles and record the positions with handheld GPS receiver. These positions are used for navigation in the future.
- Survey the drilling site: survey the coordinates of selected drilling sites. 3D coordinates are required and accuracy should be within 50cm.
- Drilling site stakeout: according to the coordinates designed, find the sites in the field.

As the required accuracy of drilling site survey and stakeout is not high and the distribution of sites is wide, therefore the combination of GPRS communication mode and fast static survey mode is also ideal for these two steps.

Pile stakeout and profile survey

Pile: set a pile every N meters along the railway line, to control the direction of railway.

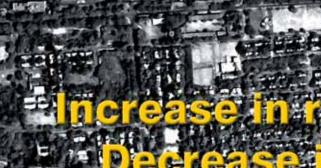
Profile: vertical section that cuts along the center line.

Pile mileage: the distance between the pile and the start point of line. Offset: the distance between projection point of RTK instruments and the center line of railway.

Based on the coordinates of intersection, mileage of intersection, easement curve length, circular curve length and distance between piles, the mileage and coordinates of piles can be calculated. Then the piles can be set out in the field with the stakeout function of railway-stakeout software.

There are two ways to stakeout:

• Coordinates stakeout: according to the coordinates of pile, the software will prompt the setover from current position to pile position.



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Part of Hyderabad viewed by

NRSC Data Centre

National Remote Sensing Centre Indian Space Research Organisation Balanagar, Hyderabad - 500 625 Phone: +91 40 2388 4422, 4423, 4425 Fax: +91 40 2387 8158, 8664 Email: sales@nrsc.gov.in Website: http://www.nrsc.gov.in

• Mileage stakeout: setover of '0' means current position is on the center line of the railway. Go forward or back along the center line, when the mileage shows the same as the calculated mileage of the pile, current position is the right position.

Survey profile: along the center line of railway, survey the topographic points (such as ridge, wire, and canal).

Using RTK system in this process

The design of railway is quite simple and fast. Railway-design software is quite advanced when designing a railway. For example to design a 40km long railway line, we only need the coordinates of intersection, distance between points of intersection, easement curve length, circular curve length and pile mileage. The main work is to arrange these elements in certain order and build a road file, and could be finished in 2 minutes. User-defined feature function. The function of user-defined features makes the inside and outside work much simpler. When surveying the profile, if there is some topography point (such as the scarp), one needs to record the name and attributes of this point in a notebook, and then input this points details into the computer once back in the office. But, with Railway-design software, the engineer can input attributes directly in the field and save time.

Transect

Transect reflects the topography situation on both sides of the railway.

After confirming the position of a pile, measure the topographic points along the transect direction to record the transect condition.

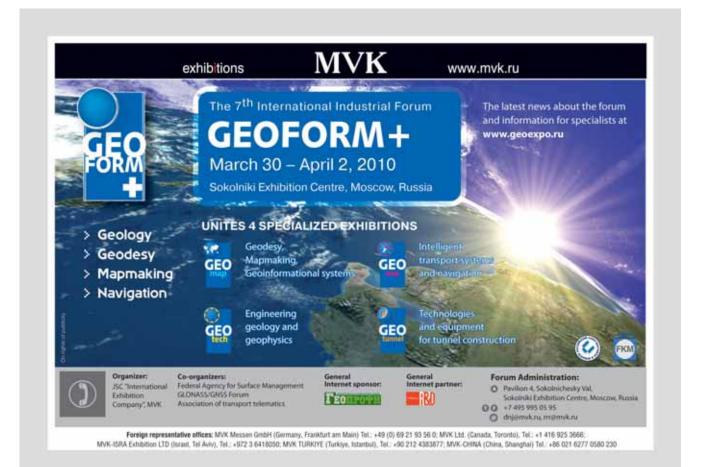
There are many advantages of using RTK. Graphic is intuitionistic: when measuring transect, the departure distance from midline can be seen directly in the controller. It is more accurate than traditional visual method.

Auto name: when measuring the profile, the system names the first point as d1, the second point as d2, etc.

Add point: If the designed pile is on a bridge, transect of this pile cannot be measured. In this situation, 'Add point' function is used. Add pile before or behind this pile, and measure transect of added pile.

To improve working efficiency and reduce measurement mistakes caused by operation misplay, a lot of work can be done indoors: like making file for site calibration, making line file, making stakeout file, etc.

RTK is applied in the railway industry quite early. It is widely used in the design and other aspects of railway construction. With the use of RTK GPS system, the working efficiency of railway construction is significantly improved.







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"The infrastructure community is facing the relentless pressures of a difficult economy"

Malcolm Walter, Bentley's chief operating officer, and Christopher Liew, Bentley's territory executive, Asia South explain the advantages and benefits of using Bentley software and the role Bentley plays in helping the company's many users in the region

Bentley has introduced the 'Be Employable' initiative. Can you explain what it is designed to accomplish?

Malcolm Walter: Worldwide, the infrastructure community is facing the relentless pressures of a difficult economy, and the downsizing of design and engineering organizations has become widespread. Bentley's mission of 'sustaining infrastructure' encompasses the need to 'sustain the professions' that design, build, and operate our infrastructure, and the Be Employable program is dedicated to doing just that.

Be Employable is an innovative addition to Bentley's Be Careers Network, which is our program for academic institutions dedicated to helping students graduate with market-ready technology skills. Be Employable helps outplaced architectural, engineering, construction, and geospatial professionals update and upgrade their technology skill sets, giving them a significant competitive edge in today's challenging job market. The Be Employable initiative provides free access to Bentley's comprehensive software portfolio and training as well as the ability to earn learning units from the Bentley Institute, Bentley's training organization.

By taking advantage of these offerings, Be Employable participants will be better positioned as top candidates for employment opportunities across a broad spectrum of projects. Moreover, once back in the workforce, these infrastructure professionals will be able to deliver greater value to their new employers.



Malcolm Walter

initiative to help transitioning infrastructure professionals overcome these challenges by giving them the opportunity to advance their software know-how for advantage in the job market. To extend its reach we will encourage downsizing user organizations to make outgoing colleagues aware of the Be Employable opportunity.

The economic slowdown this year is an opportunity to innovate and experiment. Please comment?

Christopher Liew: India. like the rest of the world, has been negatively impacted by the global economic downturn. At the same time, infrastructure development is a bright spot in terms of the world economy. Improving and building infrastructure has a tremendous economic return, especially when accompanied by the type of digital infrastructure information modeling provided by Bentley software. Armed with these tools, India can go very far in its infrastructure development and in sustaining its economy.

In alignment with this strategy, we

enthusiastically look forward to growing the use in India of Bentley's comprehensive V8i software portfolio for infrastructure. Launched in Q4 2008, V8i leverages and extends core capabilities of its new interoperability platform to provide the breadth and depth of technology needed for fully integrated project delivery.

Christopher Liew

Another innovation that we launched in 2009 is our Be Connected online seminar series, which this year takes the place of our annual user event called Be Conference. Be Connected gives architects, engineers, builders, geospatial professionals, and owneroperators a chance to learn about applying information modeling from some of the world's leading infrastructure practitioners - free of charge, in both live and OnDemand formats.

You have an 'innovative subscription program' for licensing your software. Would you like to explain it?

MW: To help facilitate investment in the software needed to efficiently design, build, and operate infrastructure, Bentley offers our users easy, costeffective access to our solutions and products through our subscription programs. Among these programs are Bentley SELECT and our Enterprise Licensing Subscription (ELS).

With SELECT subscription, а software licenses are deployed from SELECTserver, which allows subscribers to access shared licenses or take advantage of mobile, sitebased or home-use licenses. Licenses are accessible via a server, and any user can be granted access regardless of the number of users working at the same time. To streamline software costs for subscribers, SELECTserver uses innovative reporting technology to capture the license usage on each desktop. Users then only pay a fixed annual fee per license.

Our ELS helps large, multi-office and global organizations gain significant operational and competitive advantage, reduce annual software costs, and enjoy unrestricted access to a comprehensive software and learning portfolio - all for a single annual fee. An ELS provides unlimited access to more than 200 software products for GIS, design, analysis, and collaboration. ELS subscribers pay only for the software licenses they use.

In addition to these innovative and popular programs, Bentley offers a Bentley LEARN training subscription, which provides organization-wide learning for a fixed annual fee. It eliminates training-related travel time and cost, reduces scheduling headaches, and helps organizations create a culture of continuous learning to gain a competitive advantage and maximize the return on investment for their training and software.

What is the latest offering from Bentley for infrastructure professionals?

MW: As mentioned, Bentley's V8i software portfolio leverages and extends core capabilities of its new interoperability platform to provide the breadth and depth of technology needed for fully integrated project delivery - and all of the workflow improvements, reduced project costs, and shortened delivery times associated with this innovative approach.

Using V8i's intuitive design modeling tools, project teams can easily take designs from concept to completion in the same software environment. Conceptual design tools make it easier to intuitively sculpt solids and surfaces and GenerativeComponents makes it easy to iterate through design alternatives. Together, these design modeling tools help teams increase design productivity, improve information quality, and reduce project rework.

With interactive dynamic views, MicroStation V8i leapfrogs competing software by enabling users to work in 2D or 3D views and see both update dynamically. With interactive dynamic views, users can save time coordinating plan sets, improve the quality of deliverables, and simplify the 3D modeling experience.

Additionally, the Luxology rendering engine, now built right into MicroStation and all MicroStationbased products, allows users to eliminate translations between model creation and visualization environments, enjoy seamless transition for design modeling and visualization to workflows, and spend more time creating designs and less time reworking them.

Moreover, with Delta File Transfer (DFT), V8i solves the "big file" problem that has traditionally slowed productivity across distributed project teams. By transferring only the changes to files, rather than the entire file, ProjectWise V8i becomes the "killer app" for project team collaboration.

With the Future Cities India 2020 competition you have forayed into the Indian education scenario. What are your plans to take this 'training/ learning' exercise further?

CL: Future Cities India 2020 was inspired by the U.S.-based National Engineers Week Future City Competition, which reaches 30,000 students annually. Bentley sponsors the Future City Competition and also serves as chair of its Leadership Council.

In October 2006, our CEO, Greg Bentley, met with Shri. Kapil Sibal, the Honorable Minister for Science & Technology & Earth Sciences. Minister Sibal is a great supporter of the initiative, and he provided us with a vision that we then worked jointly with the Ministry of Science and Technology to define. The results are three successful Future Cities India 2020 competitions.

Bentley is also addressing the need to foster the next generation of engineering professionals in all infrastructure disciplines through its Be Careers Network. Its mission is to help students graduate with marketready technology skills. Bentley's collaboration with the Ministry of Science & Technology to engage more students from India in the field of infrastructure and enhance their skills through Future Cities India 2020 is a Be Careers Network initiative. In addition to training India's young minds, Bentley also recognizes that growing the skills and education of engineering teams is of paramount importance to the infrastructure community. That's the focus of the Bentley Institute, which offers virtually unlimited blended learning, including instructor-led distance learning and a full complement of OnDemand eLearning.

How do you see India as a market for Bentley products?

CL: Infrastructure practitioners in India use Bentley solutions and products to help design, build and operate infrastructure. A quick look at Bentley's Year in Infrastructure 2008 project yearbook of Be Award nominees reveals a host of projects in this region that have relied on Bentley's comprehensive portfolio to save time and money, enhance project quality. increase collaboration. improve workflows, and increase productivity and profitability.

These projects represent many of the solution communities served by Bentley, including roads, bridges, rail and transit, campuses, factories, buildings, power generation, mining and metals, oil and gas, water and wastewater, electric and gas utilities, communications, and cadastre and land development.

Among the many organizations in India benefiting from the innovative features of Bentley software is Scott Wilson India Pvt Ltd. This organization used Bentley MXROAD and STAAD. Pro extensively during the detailed design process to optimize outputs in preparing the Detailed Project Reports (DPR) for 1,447 kilometers of Phase IA road of Kanataka state highways improvement project-II. The project consisted of 443 bridges, 2,623 culverts, and six railway crossings. It was completed six months ahead of schedule and saved Rs. 166 crore.

Another user of Bentley software in India is Bechtel Corporation. Bechtel employed ProjectWise, Bentley's collaboration system, on the massive \$7.5 billion Jamnagar Refinery project. Using ProjectWise, Bechtel connected a 3,000-member project team located in 10 offices spread across three continents. It also used ProjectWise to manage its engineering CAD files and more than 50,000 drawings, which helped improve quality, reduce rework, and meet project deadlines.

One final example among the long and growing list of Bentley software users in India is Maharashtra Jeevan Pradhikaran, a major utility that supplies potable water to residents of Maharashtra.

Maharashtra Jeevan Pradhikaran used Bentley's WaterGEMS to design a hydraulic model of existing and proposed pipelines when the water supply source for Badlapur was severely damaged in 2005. The software helped transform an intermittent water supply to a 24-by-7 system, which reduced nonrevenue water loss by 427 million liters a year, producing considerable cost savings.

Future Cities India 2020

The Ministry of Science & Technology, Government of India and Bentley Systems on August 26th 2009 launched the 2009-2010 Future Cities India 2020 design competition. Currently in its fourth year, the competition is designed to actively engage the students in the 11th grade from the Delhi and NCR region schools to develop solutions to real world infrastructure challenges and issues. This year's competition challenge focuses on the "Redevelopment of Chandni Chowk area" in Delhi. Students must create 3D conceptual design models using Bentley software describing how they envision the redeveloped Chandni Chowk area. Mr. Christopher Liew, VP and Territory Executive, Bentley and Dr. R. Sivakumar, CEO NSDI & Head NRDMS, DST announced the final 15 schools who will present their 3D concept model at the final presentation in January 2010. www.bentley.com

CONFERENCE

ESA International Summer School on GNSS 2009

Milestone in satellite navigation education

The ESA International Summer School on GNSS 2009 was held from July 20th to 30th in Berchtesgaden, Bavaria - Germany. After the great successes in 2007 and 2008 the European Space Agency adopted the International Summer School on GNSS which itents to educate Satellite Navigation in an intersdisciplinary way and give a comprehensive overview on the design and development of satellite navigation systems and its applications. Bernd Eissfeller, leading organizer and director of the Institute of Geodesy and Navigation of the University FAF, Munich was plesed about this change. "Not only ESA is now part of this international activity concerning GNSS education", he pointed out, "but also many high ranking universities which supported the Summer School for the first time." The 2009 organizing committee consisted of Eissfeller`s institute, the Stanford University (USA), the Institute Supérieur de l'Aéronautique et de l'Èspace (France), Aalborg University (Denmark)

and Graz University of Technology (Austria). 47 participants from all over the world joined Summer School 2009, i.e. Russia, China, Australia, etc. that GPS was developed only in a few months without having really enough time for validation. Other given lectures titled "Galileo, EGNOS and Evolution",



Gaylord Green & GPS

The inauguration lecture 2009 was given by Gaylord Green, one of the famous original GPS innovators. His lecture was titled "Some Untold Stories on the Development of GPS" where he revealed some interesting details on the making of GPS. Nobody would have thought "Frequencies, Signals and Signal Processing", "Reconfigurable GNSS Receivers", "GNSS in Business Terms", "Entrepreneurs in GNSS and Beyond".

Student Project Work

The students also had to perform a student project work.

segment) has begun. IRNSS satellites will transmit ranging codes and navigation data in S and L-5 bands. The navigation software and user receiver specifications are being finalized.

The IRNSS constellation will have seven satellites – three in Geostationary Orbit (GSO) and four in Near-GSO. The spacecraft configuration has been finalized and all the satellites of the constellation are being configured identically. A massive procurement strategy has been formulated and procurement of components and strategic materials for ten spacecraft has been initiated.

The spacecraft is basically configured with I-1K Bus to be compatible for launch The objective of this competition was to create a GNSS application with a technical development schedule and a business plan. The presentations were a remarkable mixture out of creativity and technical fundamental knowledge. The best ideas were awarded with GPS receivers and high quality textbooks.

Summit as next...

The International Summer School on GNSS and the Munich Satellite Navigation Summit are both famous Satnav events organized in charge of the Institute of Geodesy and Navigation. Maybe already in some years some of the Summer School students will be among the high ranking speakers of the next Munich Satellite Navigation Summit. Save the date of the next Munich Satellite Navigation Summit 2010: March 9-11, Residenz München – Munich, Germany.

Heike Haas heike.haas@unibw.de 📐

onboard PSLV. However, detailed analysis based on a study found that it is possible to launch two numbers of inclined orbit satellites in one flight of GSLV.

GSAT-4

In the past year, main structure of GSAT-4 was delivered and North, South and equipment panels have been realized.

Disassembled mode IST and assembled mode IST has been completed and the spacecraft is undergoing thermovac test. GSAT-4 is planned for launch by GSLV later this year and will be positioned at 82 deg E longitude.

Excerpts from ISRO Annual Report 08-09 📐

ISRO updates

GAGAN

The final operational phase of the Indian SBAS - GAGAN was initiated in June 2009. The system is expected to be ready for testing in about 18 months.

The Technology Demonstration Phase for GAGAN was successfully completed in August 2007, as part of which eight Indian Reference Stations (INRES) were installed at eight airports around the country. The INRRES are linked to the Master Control Centre (MCC) near Bangalore from where the Indian Land Uplink Station (INLUS) transmits correction signals to the space segment having GAGAN navigation payload, which translates these signals to the GPS for reception by a GPS SBAS receiver.

The first navigation payload is being fabricated and it is proposed to be flown on GSAT-4 which is expected to be launched later this year. Two more payloads will be subsequently flown, one each on the geostationary satellites, GSAT-8 and GSAT-12

IRNSS

IRNSS is expected to be implemented in the next five to six years. The management structure for system implementation has been established and work on the detailed system definition (space segment and ground

Magellan RoadMate 1700

Magellan unveiled the new Magellan RoadMate 1700. It is designed to better meet the needs of consumers who are seeking larger-sized displays and easyto-use electronics. The 7-inch WVGA full-colour display provides 4 times the standard screen resolution for better readability and increased safety on the roads. www.magellangps.com

NAVTEQ's production centre in Mumbai

NAVTEQ has established a Global Production Centre at Mumbai in India with a current workforce of over 400 and expects to employ 600 when fully staffed. The centre supports both local and global production projects. This is NAVTEQ's first Production Centre in Asia Pacific and is the largest worldwide. The majority of employees at the centre will be geocoders. Employees will work on local regional and global projects and will focus on Maintaining and updating NAVTEQ maps in 77 countries and territories. Also, the company has expanded its coverage for India to 84 cities enabling its customers to provide navigation solutions in high density areas. www.navteq.com

Nokia to ship GPS-enabled Netbook

Nokia released Nokia Booklet 3G. This mini-laptop based on a Windows OS weighs 1.25 kgs, measures slightly more than 2cm thin, has a 10-inch display, a 12 hours standing battery life and 3G/HSPA, Wi-Fi, Bluetooth and A-GPS. "A-GPS *www.nokia.com*

MapmyIndia's navigator with bluetooth

MapmyIndia Loaded (VX140) is a new navigator loaded with maps of 401 cities with complete details of streets, localities, sub-localities and OIS's. It has a wide, 4.3" flat screen and Bluetooth features that allow it to be paired with mobile phones to receive and make calls. It's also equipped with multimedia features, turning it into an entertainment box, playing videos, music and games. http://news.pluggd.in

China TransInfo launches real time traffic site

China TransInfo Technology Corp. recently launched China's first multi-city, real-time traffic website called PalmCity, covering Beijing, Shanghai, Chongqing, Chengdu and Wuhan. *www.chinadaily.com*.

Twitter to get geolocation

Twitter will soon include geolocation in standard in its SMS. Along with the option to geo-tag updates, users will be able to search for nearby tweets and view the geo metadata in user timelines. www.twitter.com

SatNav device with worldwide maps

SatNav Technologies launched a navigation product that will work all over the world, with current map options of India, USA, Canada, Eastern and Western Europe. This is the first time an Indian GPS service provider has launched a single product that empowers the buyer for all multiple regions.

Reliance launches 'BIGMaps' service

Reliance Mobile, India launched "BIGMaps" service on its GSM network. It allows subscribers to search across Business, Directions, Events and Movies by organising local information on a pan-India basis. This service is available in RWorld for customers to download. With this launch, the company intends to offer a local search platform for India, with maps data across 15 zoomlevels and real-time landmark based routing. www.reliancemobile.com

iPhone App locates infectious diseases

A new iPhone application created by researchers at Children's Hospital Boston, USA in collaboration with the MIT Media Lab, enables users to track and report outbreaks of infectious diseases, such as H1N1 (swine flu), on the ground in real time. The application, "Outbreaks Near Me" builds upon the mission and proven capability of HealthMap, an online resource that collects, filters, maps and disseminates information about emerging infectious diseases, and provides a new, contextualized view of a user's specific location. www.childrenshospital.org

Muslim Pilgrims get navigation app

Horizon Navigation in USA has released Hajjmate, a navigation software for Windows Mobile Smartphones specifically designed to assist Muslim tourists travelling to Mecca for the Hajj Pilgrimage. It includes features to help navigate when travelling to Mecca and Medina in addition to all of the features of Horizon's NavMate navigation software for pedestrian or in-car usage. www.horizonnav.com



MISCELLANEOUS

- "GIS Learning CD" for GIS teachers and learners by SuperGeo Technologies
- RapidEye has joined the ESRI® Business Partner Program.
- Directorate of Town Planning and Survey, Sharjah, UAE, has deployed Bentley's fully integrated cadastral solution..
- ► ABI Research expects LBS revenues to grow at 156% from \$1.7 billion in 2008 to \$2.6 billion in 2009.
- DigitalGlobe WorldView-2 remotesensing satellite has arrived at Vandenberg Air Force Base
- ► The OGC first two national chapters in the Asian region, in South Korea and India.
- Landsat 5 is back to nominal operation.
- Anritsu Corporation has selected the NavX-NCS Standard from IFEN GmbH for its A-GPS test system for developing mobile terminals.

Galileo update

EU's satellite system to fine-tune GPS

The European Union launched a free satellite navigation network that could help pilots, drivers and blind people by fine-tuning the accuracy of the US GPS to around 2 meters. The EGNOS system will use three satellites and 34 ground stations to narrow the horizontal accuracy of GPS from around 7 meters previously and improve its vertical accuracy to help pilots during landings. Farmers could also benefit from improved precision for spraying fertilizers, and new applications could emerge on roads, such as automatic tolling and pay-per-use car insurance. The system was pioneered by the Commission, the European Space Agency and aviation safety authority Eurocontrol. www.reuters.com

EGNOS Open Service Operational Capability

The European Commission (EC) expects to declare operational use of the Open Service of the European Geostationary Navigation Overlay Service (EGNOS) in October, marking the start of its exploitation phase. This milestone signals the maturity of the development and qualification of EGNOS. For several months, EGNOS has demonstrated excellent signal quality throughout Europe, with augmentation of GPS reaching accuracies of 1 to 2 meters at an availability level greater than 99%, according to the EC. The EC will state upon Open Service availability in

October that this level of performance is available, that it is here to stay for the long term, and that it can be used for free. The service is accessible to any user equipped with a GPS/SBAS compatible receiver within the EGNOS Open Service area in Europe. No authorization or receiver- specific certification is required. This opens the doors for receiver manufacturers and for application developers to benefit from the performance improvements offered by EGNOS, at no additional cost. www.ec.europa.eu

GIOVE-A satellite orbit raised

GIOVE-A, the first Galileo test satellite in orbit, has been moved to a higher orbit to ensure that it does not cross the operational Galileo constellation's orbits for more than 100 years. Launched on 28 December 2005 from Baikonur, with an expected lifetime of two years, GIOVE-A is still in perfect condition after almost four years in space. During that time, it has achieved all of its objectives. It has validated key technologies, such as the new rubidium clocks, and all elements are working largely as expected. It has secured the Galileo frequency filings with the International Telecommunication Union (ITU), facilitated the experimental reception of navigation signals from Medium Earth Orbit (MEO) – using two transmission channels in parallel – and transmitted data to characterise the MEO environment using two different radiationmonitoring instruments. www.esa.int



At a Glance

Mergers, Acquisitions and Partnerships

- GISTRAIN, Yemen and Datum Ingeniería Limitada, Colombia are official ERDAS distributors.
- Australian Integeo and Integeo China to promote, distribute and support Integeo's Map Intelligence platform in greater China.
- Vexcel Imaging has selected Imagemaps Pte. Ltd. as its sales representative for the PR China, Taiwan, Australia, New Zealand and ASEAN.
- PCI appointed SuperMap as a reseller of its ProSDK and ProPacks for PR China.
- CDR Group has become Licensed Partner of Ordnance Survey.
- OMNIX international is value-added distributor in Saudi Arabian market for Autodesk
- ► Ubisense partners with Black Hills Corp. to unify geospatial information..
- ► NAVTEQ acquires Acuity Mobile.
- RAMTeCH Software Solutions acquires Tier 3, Inc.

FINANCIAL RESULTS/ IMPLICATIONS

- ► u-blox first half of 2009 sales is US\$32.4M, a 15.4% decline than 2008.
- ► COWI's operating profits increased by 12% in H1 2009.
- ► GeoEye,Inc. 112% increase in revenue.
- ► EADS Astrium increase in revenue of 30%.
- Automotive Navigation Data net profit rises by 13% in the first half of 2009.

CONTRACTS AWARDED

► The French SIA has awarded a contract to ESRI France, and French aeronautical technology companies Thales and CGx AERO in SYS (CGx)

-Solutions Japan

BGPS™ instant positioning w/o network

ReplicatorsTM

GNSS L1 recording and playback



http://www.ip-solutions.jp e-mail: info@ip-solutions.jp Real-time GNSS software receivers - USB front ends with API - source code access

Professional services and customization

PCTEL GPS antennas in GAGAN

PCTEL will deploy its WAAS ground station GPS antennas in India's GPS-Aided Geosynchronous Augmented Navigation (GAGAN) system. These antennas are currently deployed for the North American WAAS system and Japan's MSAS. The land-based WAAS antennas enable highly precise navigation and tracking of aircraft and covers L1, L2, and L5 GPS frequencies.http://investor.pctel.com

GLONASS-M Satellites head to pad

The Russian Reshetnev Company has sent the first of three GLONASS-Ms satellites to the Baikonur spacedrome and launch pad in Kazakhstan. A second set of three Glonass-M are to be launched in December, thus providing 6 more satellites to enlarge the constellation. Barring further on-orbit failures, this could yield 99.97 percent global availability of three-dimensional positioning effectively full operational capability (FOC) status - earlier than the planned date, end of 2010. Another two group launches in 2010, of three GLONASS-M satellites in September and two M and one K in December, would achieve FOC of 24 spacecraft. http://en.rian.ru

GPS IIR-21(M) Satellite operational

The last in the series of eight modernized GPS IIR satellites, GPS IIR-21(M), was declared operational for military and civilian users worldwide. GPS IIR-21(M) will join the constellation of 30 operational satellites on orbit providing global coverage and increased overall performance of GPS service. This IIR-M satellite provides improved accuracy, enhanced encryption, antijamming capabilities, and a second civil signal to provide dual frequency capability and improve resistance to interference. *www.losangeles.af.mil*

PRN01/SVN49: GPS Satellite anomaly

From monitoring at the University of New Brunswick and elsewhere around the globe, it appears that normal signals from the L1 and L2 transmitters on the GPS satellite PRN01/SVN49 were unavailable for more than two hours on the morning of September 4 from about 12:00 to 14:11 UTC. The L5 test signal continued to be tracked by some receivers but not others. *http://sci.tech-archive.net*

PerkinElmer contract for Next Generation GPS

PerkinElmer, Inc. has been awarded a contract for \$15 million from ITT Corporation Space Systems Division to support the GPS Block IIIA Space System program. It will design and implement several engineering advances into its heritage GPS Block IIR and Block IIF RAFS, as well as qualify and deliver flight units for the first two satellite vehicles by March 2012. Lockheed Martin, operating under an initial \$1.4B contract, is the program's Space System prime contractor for this next-generation system, and ITT is the provider for the cutting-edge technology navigation payload designed to provide improved position, navigation and timing services. www.perkinelmer.com

Partnership to find missing children

MapQuest and the National Centre for Missing & Exploited Children® (NCMEC) launched a new widget on MapQuest Local that includes valuable missing child alerts and information from NCMEC. It features pictures and information about children who are missing from the geographic area for which the MapQuest Local page is set. Also included is the ability to search for missing children by name and link directly to NCMEC's homepage. www.mapquest.com

Web maps from Ericsson Labs

Ericsson Labs have launched Ericsson Web Maps with APIs, web components and documentation to enable developers to bring dynamic maps into web sites or web applications. It uses Idevio's patented map technology RaveGeo to distribute and visualise the map. www.ericsson.com

NEWS REMOTE SENSING

JAXA and DLR co-operation

JAXA and the German Aerospace Centre (DLR) signed a letter of intent concerning mutual cooperation for satellite disaster monitoring. Both parties confirmed a mutual intention to use JAXA's ALOS and DLR's TerraSAR-X – both of which carry a SAR instrument – to improve response to disasters. They will exchange data as required on requests for emergency observations. They also agreed that will start collaborative research related to disaster monitoring. *www.jaxa.jp*

USGS adds NASA's EO-1 satellite imagery

USGS has expanded its free web-enabled archive of earth observation data by including over 83,000 additional satellite images from NASA's Earth Observing -1 (EO-1) satellite. Both the existing and all future EO-1 imagery will supplement the USGS archive of free, land remote sensing imagery resources. EO-1 sensor data can be previewed and downloaded at no charge via the EO-1 website. www.usgs.gov

Applanix introduces RapidOrtho 2.0

Applanix released RapidOrtho 2.0, a software enhancement for the Digital Sensor System (DSS). It is a complete airborne digital imaging system for first responders and geospatial professionals who need to deliver rapid, highly-accurate ortho-rectified imagery without timeconsuming and expensive ground surveys. A new utility allows to import and convert readily available DEM datasets – including Lidar data – into the RapidOrtho format; this means first responders can utilize any locally-available elevation data for rapid delivery of orthophotos. *www.applanix.com*

UltraCamXp Wide Angle

Vexcel Imaging GmbH has released UltraCamXp Wide Angle, a new version of the UltraCam large format digital aerial camera system that features a wideangle lens with a shorter focal length. It allows lower-flying airplanes to collect NEWS GIS

data at the same ground sample distance (GSD) as higher-flying planes carrying the UltraCamXp, while delivering comparable image quality. *www.microsoft.com*

New aerial images of Australia online

Fugro released a new on-line aerial image service for professional business users such as surveyors, engineers, architects, planners and developers. High resolution imagery of selected areas of Australia can be viewed and purchased via the website www.fugroworld.com and downloaded as a jpeg or ecw file to the desktop. These images are orthorectified to enable customers to display added features like street names and mapped boundaries etc. www.fugro.com

NASA Lunar Satellite

NASA reported that its Lunar Reconnaissance Orbiter, or LRO, has successfully completed its testing and calibration phase and entered its mapping orbit of the moon. The spacecraft already has made significant progress toward creating the most detailed atlas of the moon's south pole to date. Scientists released preliminary images and data from LRO's seven instruments. www.nasa.gov

Vietnam's RS satellite model completed

Vietnamese engineers have completed the technical model of the country's first remote sensing satellite. The Pico-Dragon satellite is expected to be launched between 2010 and 2011. The launching of the satellite, whose functions include taking highresolution photographs of natural resources, aiding weather forecasts and monitoring phenomenon like storms, will be a test of Vietnam's ability to make its own satellites. Made by STI in cooperation with Japan Aerospace Exploration Agency, Pico-Dragon weighs less than two kilograms with 10x10x10 centimetre dimensions and will have a life expectancy of around six months. www.vnbusinessnews.com

Digital mapping of Chinese cities by 2015

286 cities in China will complete digital surveying and mapping to facilitate planning and management by the end of 2015, the State Bureau of Surveying and Mapping said. The digital database will serve as the sole authoritative geographical information source for each city. All the databases will be nationally networked so governments at national, provincial and municipal levels can share information. *http://news.xinhuanet.com*

Xinjiang bans classified topography map trading

Authorities in northwest China's Xinjiang Uygur Autonomous Region have released a joint notice to ban the online and offline trading of classified topography maps.



The notice banned trade and collection of topography maps with "classified" titles and required people to report to the authorities if they find such trading or collection. Any government department which loses classified maps will be punished and any website involving classified topography map trading will be closed. http://news.xinhuanet.com

Australia creates Research Centre

The Australian government has dedicated funding to a domestic spatial information research centre, setting aside \$32.3 million (Australian) under its Cooperative Research Centres (CRC) Program. The centre is the Cooperative Research Centre for Spatial Information (CRCSI-2). One of the goals set for CRCSI-2 is to create a coordinated national network of satellite system reference stations to permit real-time positioning to two centimetre accuracy and establish a fully functioning market place for spatial information, the Australian Spatial Marketplace. *www.crcsi.com.au*

MoU for base mapping of Haryana

An MoU has been signed between Survey of India and Haryana Space Applications Centre "HARSAC" for base mapping of Haryana towns using High Resolution satellite data. Digital Base Maps for all the major towns of the State will be prepared to effectively address urban planning issues. *http://pib.nic.in*

NHS Lothian access to OS Survey data

NHS Lothian has signed the One Scotland Mapping Agreement with Ordnance Survey, giving it access to the Ordnance Survey mapping data to aid the delivery of patient services. The One Scotland Mapping Agreement means publicsector organisations can not only use mapping to support their own work but also easily share information with others. www.ordnancesurvey.co.uk

ASPRS guidelines for mapping services

The Board of Directors of the American Society for Photogrammetry and Remote Sensing (ASPRS) has approved the "Guidelines for Procurement of Professional Aerial Imagery, Photogrammetry, Lidar and Related Remote Sensor-based Geospatial Mapping Services." A copy of the Guidelines is available online at www. asprs.org/guidelines. www.asprs.org

OGC announces Learning Resources

The Open Geospatial Consortium (OGC®) announces new set of public resources for learning about, developing and implementing interoperable geospatial capabilities. The OGCNetwork "Learn" page (www.ogcnetwork.net/learn) is part of OGC Network TM, a window onto the dynamic, constantly changing Geospatial Web as described by the OGC Reference Model. *www.opengeospatial.org*

Leica ScanStation C10, builder total stations

Leica Geosystems announced the new Leica ScanStation C10, a laser scanner for as-built and topographic surveys. It provides users with a combination of greater versatility, reduced cost of ownership, and even higher productivity for scanning.

With the Leica Builder, Leica has designed a tailored measuring tool for anybody on or around a construction site who needs a simple, intuitive yet innovative and powerful measuring tool. From simple tasks to professional all-day use, it offers a scalable product family that meets the needs for almost any construction job. www.leica-geosystems.com

Autodesk support for Education Community

Autodesk, Inc. announced it is expanding its support for students and educators as they return to campus. It is offering faculty and institutions complete multidisciplinary suites that group the 2010 releases of the latest technologies used by industry professionals around the world. In addition, educators have access to training resources, including instructor guides, student workbooks, data sets and videos that reinforce key concepts. www.autodesk.in

Sokkia DT20 series Digital Theodolites

Sokkia released a new digital theodolite series, the DT220, DT520, DT520A and DT620, with an improved power-saving technology. The DT620, recently set a world record for continuous operating time of 220 hours. *www.sokkia.com*

Spectra Precision introduces new Portfolio

Spectra Precision has introduced its Spectra Precision® FOCUS® line of optical survey solutions. The FOCUS 30 is a robotic total station providing high speed, accuracy and precision in measurement. It is available in 2", 3" or 5" accuracies and is controlled by the Spectra Precision Survey Pro[™] field software using an onboard Windows CE touchscreen interface. www.spectraprecision.com

Hemisphere GPS XF102[™] receiver, A220[™] and A221[™] antennas

Hemisphere GPS' XF102 is ideal for professional GIS applications and surveying, and is specifically designed to work with the popular TDS NomadTM handheld GIS data collection device. The new A220 and A221 smart antennas are rugged, portable with all-in-one enclosures to deliver centimeterlevel positioning accuracy for precise guidance, machine control and survey applications. It is capable of supporting RTK, SBAS and OmniSTAR® HP/XP corrections. www.hemispheregps.com

Novatel FlexPak[™] GNSS Enclosure and low cost receiver

NovAtel introduced the FlexPak-G2 enclosure which easily integrates and supports NovAtel's OEMV-1, OEMV-1G and OEMV-2 line of high-precision GNSS receivers. It provides metre to centimetre-level positioning, depending on the receiver card selected. Independent I/O connectors and USB ports simplify cabling for application developers. Standardized DB-9 connectors allow low cost cables to be quickly and easily built, and lowers the overall system weight.

It also launched new single frequency GNSS receiver. The low cost, 14 channel, L1 OEMStar is only 46 mm by 71 mm in size and consumes just 750 mW of power when tracking both GPS and GLONASS signals. *www.novatel.com*

SuperField 3 released

SuperGeo Technologies introduced SuperField - a set of 'lightweight' mobile GIS software that facilitates field workers to process basic data collection, measurement, GPS position, etc. www.supergeotek.com

Pacific Crest introduces advanced Data Link for field communications

Pacific Crest introduced the new ADL Vantage, an advanced, high-speed, wireless data link. The 0.1-4.0 Watt radio modem transceiver utilizes Advanced Data Link technology while remaining backward compatible with existing Pacific Crest, Trimble and other GNSS/RTK positioning products. www.PacificCrest.com

Zoombak announces upgraded Tracking Features

ZoombakT announced significant upgrades to the tracking history features of all Zoombak devices, at no additional charge to users, as well as increased browser support. www.zoombak.com

Septentrio launches inertially aided GNSS solutions, dual-frequency heading receiver

Septentrio launched AsteRxiTM multisensor GNSS receiver which processes high-quality GNSS measurements with IMU-measurements to generate an enhanced integrated position.

AsteRx2eHTM is a single-board dualfrequency GPS/GLONASS dual-antenna heading and position receiver. It's designed for machine control, marine survey, photogrammetry, antenna pointing and other multi-antenna applications. It provides reliable heading measurements without being susceptible to magnetic interference, or requiring constant recalibration to maintain its accuracy. www.septentrio.com

Version 2.0 of the Microsoft[®] Virtual Earth[™] Server

Vexcel Corp. launched version 2.0 of the Microsoft® Virtual Earth[™] Server, the on-premises intranet mapping platform based on Microsoft Bing Maps for Enterprise (formerly known as Microsoft Virtual Earth). Virtual Earth Server is designed for those customers who are interested in using Bing Maps, for example defence/intelligence customers or first responders (police, fire, etc), but have concerns about a dependency upon, or connection to, the internet in order to access this service. *www.vexcel.com*

RDAC[®] Software Suite

IP Systems International LLC's RDAC® (Rapid Dynamic Analytical Capability) Software Suite is a dynamic, high-speed analytical platform that automatically analyzes geospatial data to provide an array of capabilities for training, planning, assessment, operations and response. The software is stand alone and web-based, so it can be accessed from anywhere in the world. www.ipsysi.com

Intergraph introduces Roadway solution

IntergraphR new geospatial Roadway Information Management Solution enables transportation agencies protect their roadway infrastructure more efficiently. The solution hall help transportation agencies streamline operations, maintain compliance with federal regulations and improve safety and driving conditions for motorists by quickly addressing potential issues through faster, more informed decision making. www.intergraph.com

Construction Software for Topcon GRS-1 Rover

The Topcon GRS-1 handheld RTK GNSS receiver now supports Pocket 3D software. Pocket 3D Version 9.0 is a Windows Mobile 6.1 release intended only for use with the GRS-1 and is designed to be used as part of a GPS network solution. www.topconpositioning.com

u-blox launches u-blox 6

u-blox upgraded its core CMOS technology to u-blox 6. Products based on u-blox 6 will have dramatically reduced power requirements. With the extension of the acquisition engine to over 2 million correlators, the new chip exhibits stronger acquisition capability of weak signals and a shorter time to first fix. It is also future-proofed for the upcoming GALILEO. www.u-blox.com

Trimble expands the reach of its VRS, introduces Trimble Access

Trimble launched Trimble® VRS Now™ service in the Czech Republic as well as in the state of Mississippi. It provides surveyors, civil engineers and geospatial professionals with instant access to RTK GNSS corrections without the need for a base station.

Trimble® Access[™] software is used for Spatial Imaging, a new addition to Trimble's Connected Site[™] solutions. It is a streamlined field and office solution for surveyors and geospatial professionals that expedites spatial imaging data collection, processing, analysis, and project information delivery. www.trimble.com

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November 2009

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

NAV09

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

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

INCA 2009 25-27 November Kolkota, India www.incaindia.org

ISPRS (Geospatial Data Cyber Infrastructure) 25-27, November 2009 Hyderabad, India www.incois.gov.in/isprs

GPS/ IGNSS Symposium 2009 30 November-01 December Tokyo, Japan www.gnss-pnt.org/symposium2009

December 2009

IGNSS 2009

1- 3 December Gold Coast, Queensland, Australia www.ignss.org

Middle East Spatial Technology Conference & Exhibition 7 - 9 December Kingdom of Bahrain

rizwan@mohandis.org www.mest.bh

March 2010

Munich Satellite Navigation Summit 9-11 March Munich, Germany www.munich-satellite-navigationsummit.org GEOFORM+'2010 30 March –2 April Moscow, Russia www.geoexpo.ru

April 2010

XXIV FIG International Congress 2010 11 - 16 April 2010 Sydney, Australia www.fig2010.com

Geo-Siberia 2010 27-29 April Novosibirsk, Russia www.geosiberia.sibfair.ru

June 2010

Toulouse Space Show 2010 8 - 11 June Toulouse, France contact@toulousespaceshow.eu www.toulousespaceshow.eu

July 2010

ISPRS Centenary celebrations 4 July Vienna, Austria www.isprs100vienna.org

ESRI International User Conference 12–16 July San Diego, USA

www.esri.com

September 2010

ION GNSS 2010 21-24 September Portland, Oregon, USA www.ion.org

October 2010

INTERGEO 5 - 7 October Cologne, Germany www.intergeo.de

GSDI-12 World Conference 18-22 October Singapore www.gsdi.org



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