RNI: DELENG/2005/15153
Publication: 15th of every month
Posting: 19th/20th of every month at NDPSO

No: DL(E)-01/5079/11-13
Licensed to post without pre-payment U(E) 28/2011-13
Rs.100

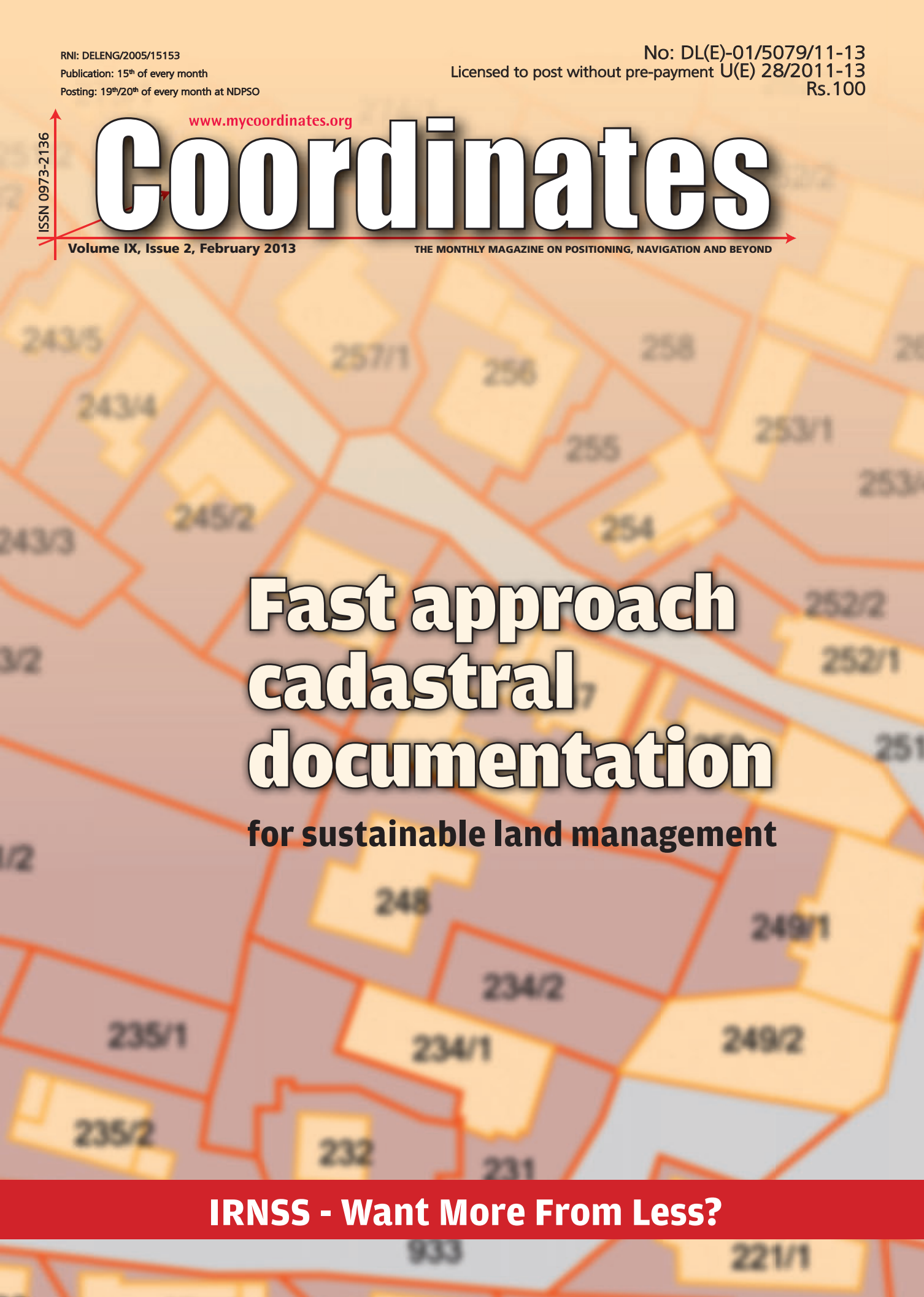
www.mycoordinates.org

ISSN 0973-2136

Coordinates

Volume IX, Issue 2, February 2013

THE MONTHLY MAGAZINE ON POSITIONING, NAVIGATION AND BEYOND



Fast approach cadastral documentation

for sustainable land management

IRNSS - Want More From Less?

THINK HIGH PERFORMANCE GNSS/RTK!
THINK RUGGED AND SMALL!
OK, NOW THINK BIG!

ABX SERIES: GNSS SENSORS FOR REAL-TIME, HIGH-ACCURACY, ABSOLUTE POSITIONING

ABX receivers are smart GNSS receivers built around the GPS/GLONASS/SBAS, single- or dual-frequency MB100 or MB800 board recently introduced in the market. Embedded Z-Blade™ technology in the board ensures powerful performance and a patented way to use multiple GNSS constellations for high-accuracy positioning solutions:

- Fast initialization and accuracy at long-range,
- Patented multi-constellation signal processing,
- Dependable Heading + Pitch/ Roll measurements ,
- Unique Z-Blade "GNSS-centric" technology for outstanding GNSS performance in harsh environments.

Built in a weatherproof, rugged and small-size unit, the ABX receivers can be operated in harsh environments while requiring a minimum of space for their installation.

HDS800: RUGGED AND COMPACT GNSS SYSTEM

The HDS800 is a rugged dual board GNSS system that delivers state-of-the-art RTK accuracy, including heading and relative positioning. Designed for seamless onboard system integration, it is available in a variety of configurations. Embedded Z-Blade™ technology ensures powerful RTK performance and a patented way to use multiple GNSS constellations for high-accuracy positioning and surveying solutions. See the full scope of Ashtech's GNSS sensors at www.ashtech-oem.com

ashtech™
A TRIMBLE COMPANY

www.ashtech-oem.com
oemsales@ashtech.com

In this issue

Coordinates Volume 9, Issue 2, February 2013

Articles

IRNSS – Want More From Less? Vyasaraj Guru Rao and Gérard Lachapelle 8 **Fast approach cadastral documentation** Dr Alexander Kohli 11 **Critical developments in land surveying** Brian J Coutts and Malcolm McCoy 22 **Improving disaster management practices** Dr Srikanth Venkatesan 26 **Solutions for open land administration** Neil Pullar, Andrew McDowell, Alexander Solovov, Elton Manoku and Maria Paola Rizzo 37 **Malaria transmission risk in India** M Palaniyandi 42

Columns

My Coordinates Editorial 6 **News** Imaging 48 GNSS 50 Galileo update 52 GIS 52 LBS 57 Industry 58
Mark your calendar March 2013 to September 2013 62

This issue has been made possible by the support and good wishes of the following individuals and companies
Andrew McDowell, Alexander Solovov, Dr Alexander Kohli, Brian J Coutts, Elton Manoku, Gérard Lachapelle, M Palaniyandi, Malcolm McCoy, Maria Paola Rizzo, Neil Pullar, Dr Srikanth Venkatesan and Vyasaraj Guru Rao and; and Ashtech, CHC, Effigis, Foif, Geneq, GGS, HiTarget, IFEN, Javad, Pentax, Navcom, NovAtel, NRSC, Racelogic, Rohde & Schwarz, Seafloor, Sensonor, Spectra, South, Trimble, and many others.

Mailing Address
50 A Pocket A
SFS Mayur Vihar Phase III
Delhi 110 096, India.
Phones +91 11 22632607, 98102 33422, 98107 24567
Fax +91 11 22632607

Email
[information] talktous@mycoordinates.org
[editorial] bal@mycoordinates.org
[advertising] sam@mycoordinates.org
[subscriptions] iwant@mycoordinates.org

Web www.mycoordinates.org

Annual subscription (12 issues) [India] Rs.1,200
[Overseas] US$80

Printed and published by Sanjay Malaviya on behalf of Centre for Geoinformation Technologies at A221 Mangal Apartments, Vasundhara Enclave, Delhi 110096, India.

Editor Bal Krishna

Owner Centre for Geoinformation Technologies

Designed at Spring Design (springdesign@live.com)

Printer Thomson Press India Ltd., B 315, Okhla Phase I, New Delhi - 110020, India

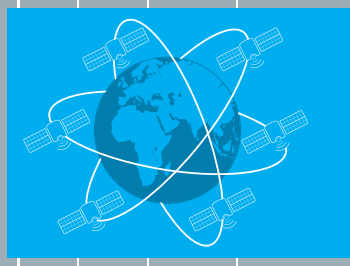
This issue of Coordinates is of 64 pages, including cover.

GPS/Galileo/Glonass simulation easier than ever.

The R&S®SMBV100A vector signal generator with GNSS software options

Expensive or inflexible simulation of GNSS scenarios is a thing of the past. Now you can easily and cost-effectively test your satellite receivers under realistic conditions.

- Realtime scenarios with up to 24 satellites, also in hybrid configurations
- A-GPS and GPS P code supported
- High dynamics for simulating very fast moving objects such as fighters or rockets
- Realistic signal modeling with moving profiles, multipath propagation, dynamic power control and atmospheric modeling
- Additionally the R&S®SMBV100A provides all relevant communications and broadcasting standards such as LTE, HSPA+, GSM/EDGE, HD radio™, and FM stereo



To find out more, go to
www.rohde-schwarz.com/ad/smbv-gnss

ROHDE&SCHWARZ

Think Tank

Though India has the fourth highest number of think tanks in the world,

But none among the global top 50.

Says 'Global Go To Think Tanks' report

By the University of Pennsylvania

Reflecting a poor state of investment in thinking institutions in India.

Incidentally, a Google commissioned report

Indicates that $ 3 billion was generated by Indian geo services industry in 2011

And assesses the impact of the geo services industry

Valuing it at approximately 15 times its own size.

These figures indicate a promising future

Which can further consolidate

With institutionalized thinking and

Right policy interventions.

The domain seeks a think tank.

Bal Krishna, Editor
bal@mycoordinates.org

Now With More Options

Now Offering NavCom FieldGenius & SurvCE Software Choices

We understand that to do the job right, you need all the right tools. No matter your software choice, NavCom's FieldGenius & SurveyCAD bundle or NavCom's SurvCE & Survey software bundle, you'll still have a complete land survey system that also includes full GNSS support, an online video training library, GNSS post processing software, all hardware & accessories, a three year warranty, and our 5cm global accuracy StarFire™ Network Included.

With StarFire Over IP Reliability

Our LAND-PAK complete survey system offers the power of RTK level accuracy with the added benefit of 5cm StarFire global accuracy when RTK corrections are not available. With StarFire Over IP delivery, LAND-PAK users can now have reliable, continued service even when the receiver loses communication with the StarFire satellite. StarFire Over IP delivery allows users to ride through comunication outages over extended periods, whether you're working in an urban canyon or high latitude conditions.

LAND-PAK
Your More Complete Survey System

www.navcomtech.com

NAVCOM
A John Deere Company

IRNSS - Want More From Less?

This research performed an analysis with different vectors (locations of satellites), deduced an optimal constellation with slots available to India and yet achieves 60% more coverage (w.r.t availability and thus accuracy) than the existing constellation

Vyasaraj Guru Rao
University of Calgary, Canada & Accord Software & Systems Pvt Ltd, Bangalore, India

Gérard Lachapelle
Professor of Geomatics Engineering, University of Calgary, Canada

Indian Regional Navigation Satellites System (IRNSS) is the world's first regional navigation system with its footprint primarily over the Indian subcontinent. The system is expected to have seven satellites in all, with three satellites in GEO stationary and four in GEO synchronous orbits (Kibe & Gowrishankar 2008). IRNSS is dual use and supports two frequencies on either service of operation. Amongst various design parameters, availability is a paramount requirement in any GNSS. Availability is defined as the period of time a system is usable or alternatively is the ability of the system to provide solutions over a specified region. IRNSS being a regional system, availability has to be highly optimized from an operational perspective.

Work till date has analysed and presented results achievable with the current IRNSS constellation. The basis for selecting the current constellation is not available in the public domain. This work explores the possibility of having an alternate IRNSS constellation which maximizes availability and thus achievable accuracies. In addition, the chosen constellation is constrained by slots (for satellite placing) available to the Indian Space Research Organization (ISRO), the agency responsible to design, develop and deploy the IRNSS satellites. A brief introduction on the GPS Aided GEO Augmented Navigation (GAGAN) is presented next, primarily to highlight its constellation. With this as an input, a simulation basis is then defined.

Table 1: GAGAN, Current and Proposed IRNSS constellation.

Constellation	Description	
	Geostationary Satellites	**Geosynchronous Satellites**
GAGAN	55°, 83° east	
Current IRNSS	34°, 83°and 132° east	55°, 111°east
Proposed IRNSS	55°, 83° and 111°east	55°, 111° east

Following this, the simulation results with a detailed analysis of the proposed constellation are presented emphasising its merits. Finally, the conclusion with pointers to future work is highlighted.

Gagan

The void Satellite Based Augmentation System (SBAS) foot-print between the EGNOS (Europe) and MSAS (Japan) is established by GAGAN. It primarily transmits the correction and integrity information for all the visible GPS satellites over the Indian subcontinent. The need and the contribution of SBAS are described in several other publications (Ganeshan 2012). However, the constellation is of relevance to this research. GAGAN will have three geostationary satellites when fully operational with the signal footprint spanning over the Indian subcontinent (Kibe & Gowrishankar 2008). Two of the GSAT satellites (GSAT-8 and GSAT-10) are already carrying the GAGAN payload and are in the testing stage. The constellation of the existing GAGAN satellites are 55°, 83°east,with no information on the third. With this as input, the following section presents the proposed coordinates of IRNSS.

Simulation vectors

Several documents have been published to describe the merits of a combined GNSS architecture from a user perspective [for example, IRNSS+GPS+GLONASS, (Rao et al 2011)]. However, this research attempts an analysis within the systems (optimization w.r.t satellites) and presents the availability/accuracies achievable. Towards this, several simulations were carried out and the most optimal locations

which are available (slots) to ISRO were selected for IRNSS as shown in Table 1. As is obvious from Table 1, two new locations are proposed for IRNSS GEO, which coincides with the GSO crossing of the equator. The following section presents the analysis/results w.r.t availability and accuracy. Alternatively, the GEOs on the existing configuration (34° and 132° east) are moved to (55° and 111° east).

Analysis

Figure 1 and Figure 2 provide the current IRNSS standalone visibility/PDOP (accuracy with an assumed UERE) performance (Rao et al 2011) in comparison with the proposed IRNSS constellation. It is evident that there is a significant improvement with the proposed system in availability and thus DOP performance as compared to IRNSS standalone.

The detailed analysis from assumption to improvements is explained (sequentially) as follows:

- The reason for assuming *111°* east for the third GEO is to have a common overlapped footprint with the existing satellites and improve availability.
- The availability with the proposed IRNSS constellation is as shown in Figure 1. The result is an improved (*wider) common footprint along with current IRNSS* geosynchronous satellites. The relative improvement (reasons) is as explained as follows:
  - The availability with existing IRNSS is as shown in Figure 1; in area "a", all seven satellites are visible. Outside this polygon on either sides (longitudinally), visibility to satellites *34° and 132° east* is lost on either side and thus availability drops to six satellites.
  - In contrast, with the proposed IRNSS constellation, area "b" in Figure 1 is wider due to the close spacing of the geostationary satellites *55° and 111° east*, which

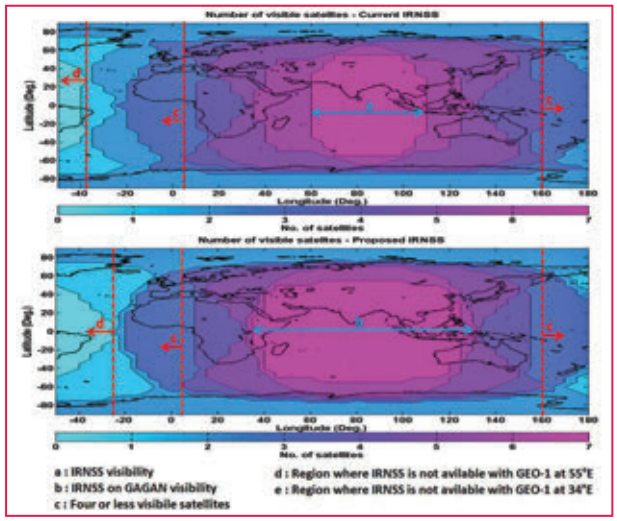


Figure 1: Satellite availability with current IRNSS and proposed IRNSS constellation

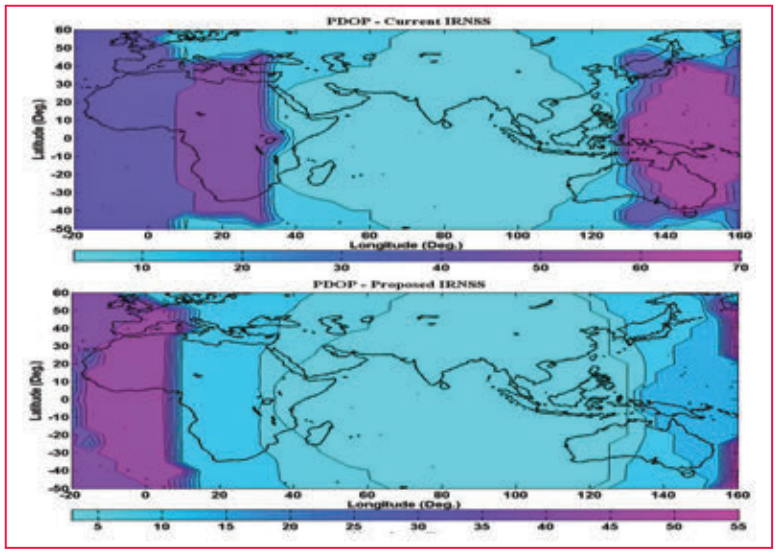


Figure 2: PDOP with current IRNSS and proposed IRNSS constellation

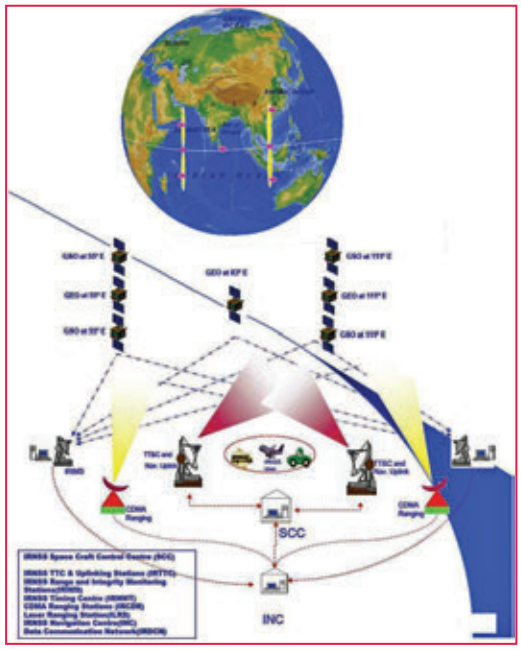


Figure 3: Proposed IRNSS constellation

results in a wider coverage area along with the geosynchronous satellites. Thus the significant improvement in availability area, which from a regional perspective is *greatly desirable.*

- The IRNSS objective is independent positioning and thus as a system objective it is imperative to maximize the coverage area where independent positioning can be established. A close examination of Figure 1 reveals the following: Availability west of line "c" remains the same and is less than 4. Thus the effective region of operation (independently) is east of this line for either configuration. The reason for this is that in either configuration visibility to the geostationary satellite (83° east) is lost, which is common to both configurations. A similar phenomenon exists on the right side of the "a" and "b" polygons.

1) ºOne possible reason for having the current IRNSS geostationary satellites at 34° and 132° east could be for extended coverage of the system. The merit of this argument is highlighted in Figure 1 and explained as:
   - To the west of line "d" and "e", the visibility is completely lost in both the proposed and existing IRNSS. This is attributed to the visibility from the geostationary satellites at 55°and 34° east respectively. Though visibility is established for an extended range of about 15° *(marginal areas)* with the current IRNSS constellation, it does not assist with independent positioning. A similar condition exist on the right side of the "a" and "b" polygons.
2) From an availability perspective, the improvement is significant w.r.t to the number of satellites over a wide region, which is of the order of 60% (seven satellite coverage) with that of the existing system.

Thus from an availability and accuracy (Figure 2) (considering only the available region) perspective, the proposed architecture is *more beneficial from a regional perspective* and the resulting constellation is shown in Figure 3.

Conclusion

One of the general approaches to enhance coverage is by having more satellites. This research performed an analysis with different vectors (locations of satellites), deduced an optimal constellation with slots available to India (ISRO) and yet achieves 60% more coverage (w.r.t availability and thus accuracy) than the existing constellation. From a regional perspective this is a significant improvement where *more coverage* **is** achieved with *less (without additional) satellites.* With this as reference, if additional satellites are added to this constellation in future, availability/ accuracy and in turn robustness (satellite failure) can be addressed. As a future activity, the synergy derivable from the proposed IRNSS and the existing GAGAN will be examined.

Acknowledgements

The first author would like to thank the management of Accord Software & Systems Pvt Ltd India for partially supporting his doctoral studies.

References

Kibe, S, V and Gowrishankar. D, *APRSAF -15: Space for Sustainable Development*, December 10th 2008, Vietnam

Rao, V. G., G. Lachapelle, and S.B. Vijaykumar (2011) "Analysis of IRNSS over Indian Sub-continent," in *Proceedings of the International Technical Meeting*, , San Diego, The Institute of Navigation, 13 pages

Ganeshan A S, GAGAN: Status and Update, Coordinates VOL VIII, Issue 9 September 2012

Fast approach cadastral documentation

The logical consequence of economic development–land consumption–substantiates the need for sustainable land management and cadastre

Dr Alexander Kohli
Vice-President
Swiss Land Management Foundation
c/o BSB + Partner, Consulting Engineers, Switzerland

Taking into account the various experiences of land management in developing, transitional, or developed countries the results are sobering: the main goals often could not be reached and the respective laws failed under implementation. The relevant discussions for renewal or development of law bodies ask for

- more powerful implementing governmental institutions,
- more transparency and monitoring on all levels of implementation,
- more rigorous interpretations of the existing laws, and a
- faster actualization of the documentation systems as a base for work.

Looking to Table 1-1 even with a land use planning and land management system that did not fulfill all of its tasks, at least coordination with services and care by utilities could be achieved to a very great extent. Service quality in developed countries such as Switzerland is high and the investments by utilities are worthwhile. In countries with random growth settlements the supply of utilities such as waste disposal, water, sewage and communication often is weak.

Table 1-1 Comparison of development stage, land management laws, sprawl and service quality.

Development Stage	Land Management Laws	Land Consumption/ Sprawl	Services / Utilities
Switzerland – Industrialized Country	1969, Article on spatial planning incorporated in the Federal Constitution for Spatial Planning at three levels (state, regional and municipal)	Huge – only 75% filling grade of construction zones – periodical extension of construction zones	++
Azerbaijan – Transitional Country	No clear legacy on Spatial Planning; Vertical integration of the planning process at different levels (state, regional and municipal) is missing; No proper horizontal coordination, and planning schemes are prepared by different bodies and institutions	Huge sprawl, illegal construction	+/–
Kosova – Post-Conflict and Transitional Country	No clear legacy on Spatial Planning; 2006, UN-Habitat Urban Planning Initiative on Municipal Level; Weak land administration	Unregulated sprawl, illegal construction, illegal occupation run rampantly etc.	–

The key question remains: How to achieve land management in a dynamic environment taking into account economic development, need for rising food and fiber production as well as preserving production capabilities and preventing land degradation? How to plan and manage all uses of land in an integrated manner such that land management becomes sustainable and supports wellbeing and good governance? – A possible approach shows the following truths:

Statement 1: Economic development consumes land.
Statement 2: (Sub-)Urban development sprawls on agricultural land.
Statement 3: Land consumption and sprawl cannot be stopped but guided and controlled.
Statement 4: Guidance of land consumption and sustainable land management (SLM) creates better conditions for development.
Statement 5: Sustainable land management (SLM) needs cadastre as a pre-requisite.

Economic development consumes land

As a basic rule it must be accepted that economic growth leads to the demand for

Photo: Sindre Lundvold

NORWEGIAN EXTREME ARTIST, ESKIL RONNINGSBAKKEN, ON A UNICYCLE AT TROLLVEGGEN, THE TALLEST VERTICAL ROCK FACE IN EUROPE. NORWAY, 2010.

AMAZING SKILLS OF THE WORLD

INSPIRE US ...

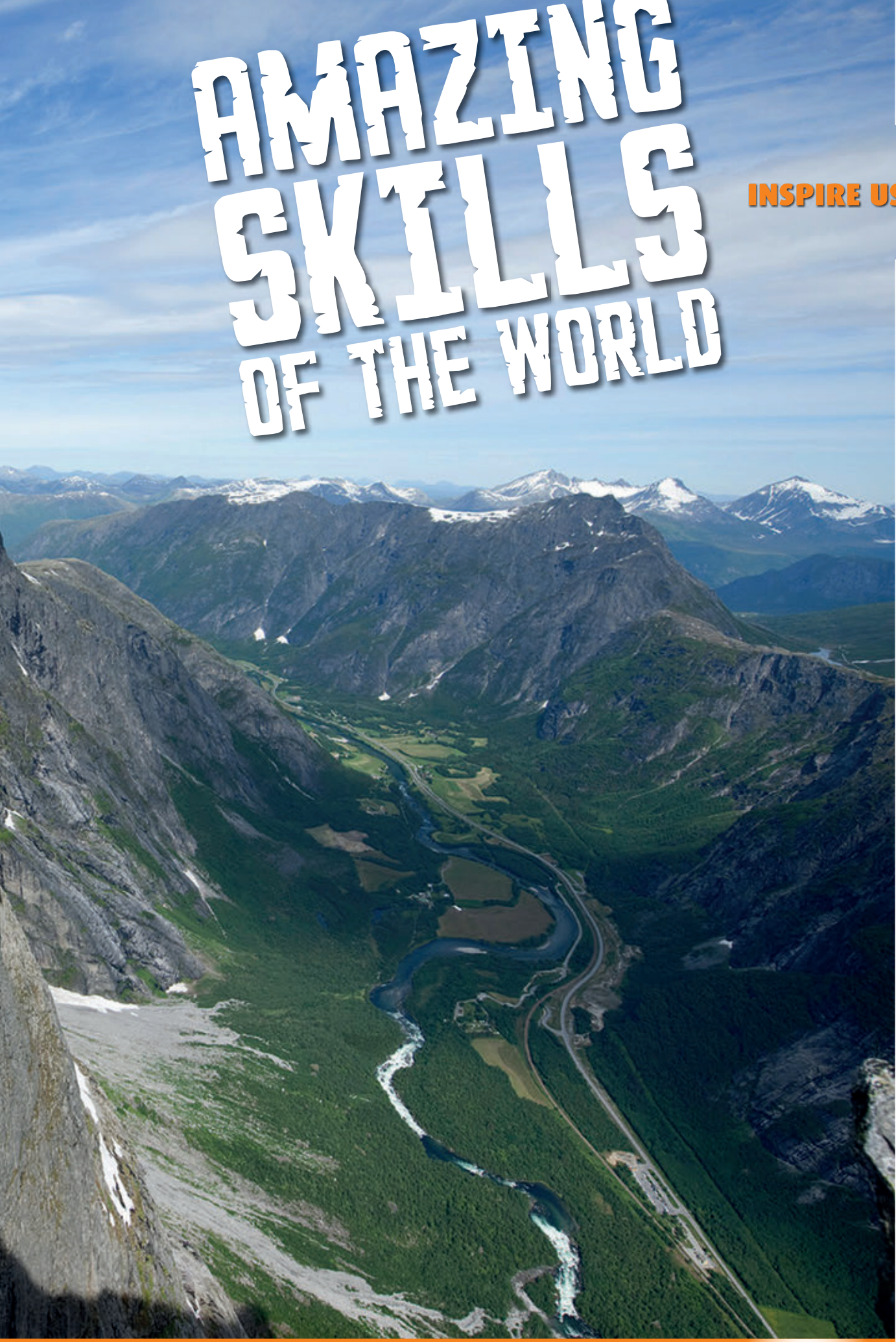


Figure 2-1 Construction hype in Azerbaijan (2008, left) and Ghana, Accra (2011, right).

land. This happens in agricultural-based as well as industrial economies. By 2009 economic growth in Switzerland resulted in one square meter of land (agricultural ~) being consumed by streets and buildings every second. With a well defined and permanently monitored land use planning system in place the consumption of land could not be hampered. Several towns had to integrate formerly independent villages as suburbs. Equal results can be found in the megacity of Baku, Azerbaijan and Accra, Ghana. There development combined with migration from the land produced a phenomenal construction boom (Figure 2-1).

(Sub-) urban development sprawls on agricultural land

On all continents, a relative decline in average urban growth rates has been observed for the last 20 or 30 years, compared to those of the preceding decades. This declining trend in demographic growth becomes more obvious if fixed perimeters are used, as a general process of spatial expansion is being seen everywhere. The advancement of urban sprawl along communication routes often precedes the type of sprawl where the empty areas are filled.

Aside from these general forms of urban sprawl, the patterns of peripheral expansion turn out to be very varied in terms of type of housing conditions, population pattern, means of protecting structures, construction type, and social categories. Despite geographical, socio-cultural and political situations differing greatly from one metropolitan area to another, the processes of urban expansion are similar.

In metropolitan areas of developing or post-conflict countries, the informal urbanization of the outskirts is a classic working-class practice. This happens in the form of clandestine housing developments that fail to comply with the planning regulations, or in the form of illegal occupation of sites without the owners' consent, with inhabitants constructing their own, often precarious, dwellings. This illegal occupation (e.g. Kosovo (UNCESCR 2008), *invasiones* in Latin America, *squats* or *squatter settlements* in Asia, *campements* in Africa) develops preferentially on available sites on the city's outskirts, often unsuitable for habitation, it may equally occur within the gaps in the urban area, including in central or peri-central zones.

According to Boret (2004) the centrifugal dynamics by no means affect only the poorer people and working classes, who are pushed towards increasingly off-centre locations. A dispersal of well-off households across the outer peripheral area is also in progress, facilitated, of course, by the rapid growth in car ownership. This oddity occurs as well in metropolitan areas in developing countries. Luxury apartments in Cairo, a long way from the city centre, the construction of vast luxury residential blocks of very low density in Sao Paulo, and luxury residential districts in Delhi's rural fringes are illustrations of this phenomenon.

The dispersal of city dwellers is, in some cases, driven by the search for a better living environment, which translates into a process of urban people populating the rural areas around the city. This is illustrated by the proliferation of *datchas* in the countryside and forests around Moscow, the conversion of farmhouses in the south of Delhi, or the *conjuntos cerrados* (secure residential blocks, gated communities) that are multiplying around the village centers in the Sabana to the north of Bogota.

In large metropolitan areas in industrialized nations, the phenomena of remote and discontinuous urban extension, linked to increased car use and home ownership, has also been commonly observed in France (Figure 3.2). The American metropolitan areas bring this phenomenon to its climax.

Urban development is related to the income situation of people. Prud'homme (2004) stipulates a direct link between the size of a city and per capita income. As a logical conclusion it can be stated that higher income people tend to realize the "desire for single family housing" (Boret, D. 2004). Households moving to the

Figure 3-1 Sprawl as a planned development for IDP's Gardabani near Gori, Georgia (left) or Gihembe IDP camp, Rwanda (right).

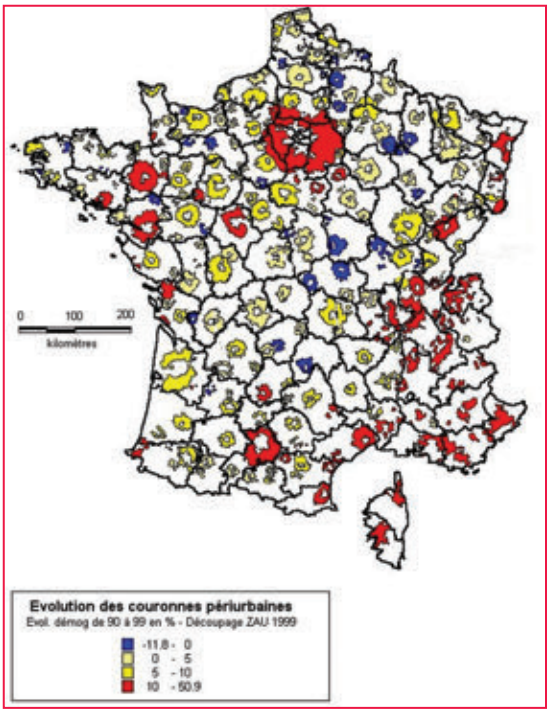


Figure 3-2 Evolution of sprawl in French urbanized areas from 1990 to 1999 (Guiet, Y. 2004).

outskirts of cities can be explained initially by the available property found there. In effect, going with improvements in transport people are always looking farther away for less expensive property. This factor, combined with a strong desire for property ownership, the role of accommodation as a social mirror, and the favorable image of single-family houses within our societies, strongly influences households' "desires" regarding housing type. The housing in dense districts against all planning efforts is less attractive. In an analogous way all over the world the new form of housing in gated communities is asking for more land in the outskirts of cities. Due to these facts it can be concluded that there is a strong sociologically driven force that causes sprawl.

Sprawl may also result from planned development, as demonstrated by detached housing developments and other residential programs produced by the capital investment sector or controlled by the public sector. Some projects may be on a very large scale: new districts corresponding to satellite sub-cities in Delhi, huge metropolitan projects in Bangkok, edge cities in Cairo, re-settlements of IDP's in Ramana (Baku, Azerbaijan), Gardabani (Gori, Georgia, Figure 3-1), or Gihembe (Rwanda, Figure 3-1), etc..

In industrialized countries construction zones were extended on repeated occasions or periodically as a stimulant for the development of municipalities. The land market dried up although the existing construction zones are filled only to 75% capacity. In Switzerland up to 25% of the areas still are not under construction due to land stockpiling or difficult ownership conditions. Therefore increasing density

Figure 4-1 Debris flow in the Bernese Alps, municipality of Brienz (2005, left), Switzerland and landslip in the eastern Jura Mountains, municipality of Wintersingen near Basel, Switzerland (1999, right).

by realizing unused construction zones through legal force is under intensive discussion (Bertschi, M. 2002 and Eggenberger, M., Stettler D. 2008).

Agricultural land in industrial countries is decreasing because of compensation for construction in forests or protected areas. In central Europe where rigid forest protection acts are in place, a further loss of agricultural land is the consequence.

Land consumption and sprawl cannot be stopped but guided and controlled

The sustainable treatment of land as a finite resource today is a mayor goal of space-oriented activities. Against the background and the requirements of a growing population the World Bank defined its sustainable land management (SLM) in 2006 as a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management to meet rising food and fiber demands. This should be achieved by sustaining ecosystem services (*Ecosystem services are the benefits people obtain from ecosystems. These include: - Provisioning services that provide necessities such as food, water, timber, and fiber; - Regulating services that affect climate, floods, disease, wastes, and water quality; - Cultural services that provide recreational, aesthetic, and spiritual benefits; - Supporting services such as soil formation, photosynthesis, and nutrient cycling. Source: Millennium Ecosystem Assessment 2005.*) and livelihoods. This definition mainly is focused on agriculture and rural development. When it comes to urbanized areas the water, environmental, and biodiversity aspects may have priority.

Bearing in mind Prud'homme (2004) the city itself, based on its economic role as a flywheel, is the moving force for sprawl. In cases where land use planning is in place sprawl happens in a periodical flow after extensions of construction zones (e.g. planning cycles of 10-15 years in Switzerland). The pressure to repopulate the outskirts by legally approved zoning is mainly dependant on economic reasons, as mentioned above. These processes are guided by risk based land use planning or prioritized public interest. Overall total stagnation seldom happens because economic pressure is strong enough. In non-industrial countries economic pressure often is overwhelming and dynamic so even guidance and control do not happen if the relevant instruments are not in place (see Table 1-1). Land consumption, however, declines right away if the economy shows signs of weakness.

Direction is successful especially if there is danger to be avoided by risk based land use planning measures. Hazardous areas such as floodplains, mud and snow slide areas etc. (Figure 4-1) are not feasible conditions for housing (Kohli, A. 1999). Even belated identification can be the reason for resettlement (*In the Swiss Canton of Nidwalden, Municipality of Oberdorf the destruction of a training center Hostetten-Wil was ordered due to the danger of flooding. Measures for damage prevention would have been disproportional. In future this area is restricted area for construction.*) or restricted areas. In such cases active land use planning becomes SLM and is an asset for the community by increasing security of life and of investments as well.

Figure 5-1 Urban investment project in Baku, Azerbaijan – Flame Towers, under construction (2008 – 2013, left) and urban development with evictions in Borei Keila, Cambodia (2012, right).

Guidance of land consumption and sustainable land management create better conditions for development

By applying strong SLM procedures including transparent land consolidation methods to rural and urbanized areas, amongst other things, investments in utilities become highly worthwhile and create more favorable effects than in sprawled areas. Efficiency

SOUTH

Target your success

Long Range

2013 New Arrival

TOTAL STATION

NTS-362R8M

- Sharp 3.5 " Color-Screen
- 800m Reflectorless Measurement
- Smart Temperature-pressure sensor
- Dual-axis Compensation
- Bluetooth Wireless (Optional)
- Laser Plummet
- Ultrafast Measurement

NTS-332R5

- Six-line Large LCD Screen
- Reflectorless Range: 500m Accuracy: 5mm+2ppm
- Single Prism Range: 5000m Accuracy: 2mm+2ppm
- Automatic Correction Of Temperature & Pressure
- SD Card and Mini USB Host

For More Details Contact Us:

India Headoffice

SOUTH PRECISION INSTRUMENT PVT.LTD.

Add: 1108-09-10-11, 11th Floor, RG Trade Tower,Plot No-B-7,
Netaji Subhash Place, Pitam Pura, New Delhi-110034
Tel: +91-11-49995999, 9999999255 Fax: +91-11-45605999
Http://www.southinstrument.com Http://www.southprecision.in

Customer Support Center

Delhi:	+91 9990561049	Ahmedabad:	+91 9971800986
Mumbai:	+91 9766329600	Kolkata:	+91 9007002404
Hyderabad:	+91 9573325063	Chennai:	+91 9650797606

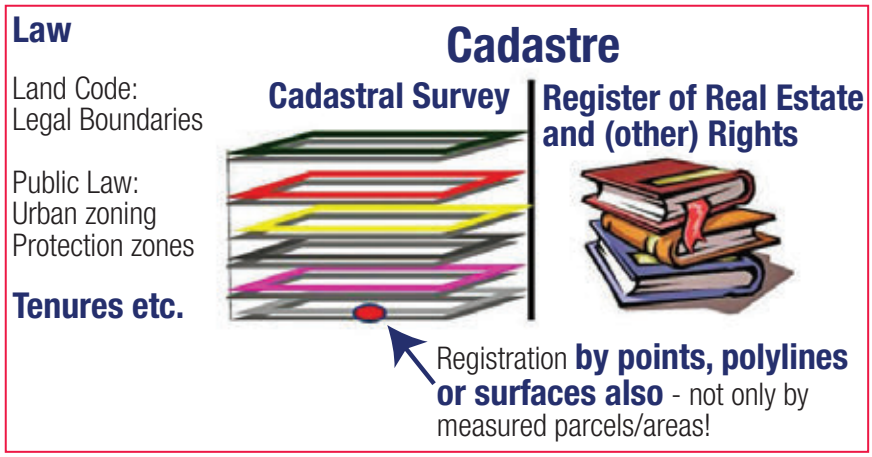


Figure 6-1 Cadastre 2014 data model approach for easy and fast registration of tenures and holdings besides legal boundaries.

rates increase and network planning for water or sewage make sense. Site developments as well may profit from available and easily connected utilities, as these effects can be realized by first agglomerating construction in abandoned areas, industrial wasteland, or gaps of settlements. A higher density of users creates better conditions as overall costs for citizens and capital investors decrease and service quality may increase.

In Azerbaijan, especially in Baku (Figure 5-1), continuing degradation of the urban environment is going on due to the lack of a modern spatial planning system, missing master plans, or detailed plans for urban areas. Consequently, new construction is carried out under the pressure of market forces, basically without proper planning regulations. Even forced eviction for town development is common. In addition it is not quite clear who is responsible for the preparation of plans and issuing of permission for changes in land-use and building permits. State planning authorities still try to oversee planning issues that might be handled at the regional or municipal level (UNECE, Committee on Housing and Land Management 2007). Easy to apply building permits would help to increase security of the property. Stable and transparent procedures with defined planning horizons create security amongst owners and readiness for dynamic developments – altogether factors for the well-being of a developing and an industrial community.

Sustainable land management needs cadastre as a pre-requisite

The fast approach cadastre as a central instrument of land management

Land management needs (in land reform, land consolidation, land use planning, etc.) as a pre-condition a sustainable base documentation of topology, topography, and property ownership or tenure. In cases where a reliable cadastre is missing, property remains unclear and SLM is hampered. So in the immediate aftermath of a conflict the securing, restoration, or setup of land records is crucial. The cadastre follows as a consequence of where land records are available (Augustinus, C., Lewis, D., Leckie, S. 2007). Bad examples are easy to find, such as Kosovo or other Balkan countries. Even if a form of a cadastre system is in place but reliability and maintenance do not properly work an unclear property situation makes SLM very difficult, as shown above in Azerbaijan.

Loss of property and investments because of lacking transparency of public planning and unreliable cadastre will produce distrust in cadastral documentation. Problems will be created by illegal development and construction in restricted or endangered areas. Since 2007 in Kosovo municipal authorities have tried to regularize and legalize illegal constructions as a first step back to reliable land management systems as the cadastre (UNCESCR 2008).

Today the call for new tools is being heard. FIG is starting new initiatives as manifested in the publication *Social Tenure Domain Model* (STDM) (Lemmen, Chr. 2010). Unfortunately the data model achieved under this initiative is even more complicated than others. A more promising solution is the simplified application of the Cadastre 2014 approach concentrating on the registration of independent topics for the actual state of tenures, properties or holdings (Figure 6-1). No surveying is required but only the identification of property or tenure based on points, poly-lines, or surfaces is needed. Efforts can be focused on the time consuming definition for regularization and legalization of informal and illegal tenures.

Comprehensive documentation in maintained digital cadastres of the actual existing legal situation of land following the principle of legal independence stated by Cadastre 2014 (Kaufmann, J., Steudler, D., 1998, page 18, Figure 3.18) will form a strong basis for SLM. The procedure for fast approach cadastre documentation (Figure 6-2) shall be defined as follows:

Step 1: Identification of property, house, or tenure on satellite or ortho-photo maps as point objects to create a preliminary land title. Definition of a surface description on a separate cadastre layer in the GIS by poly-lines accepting

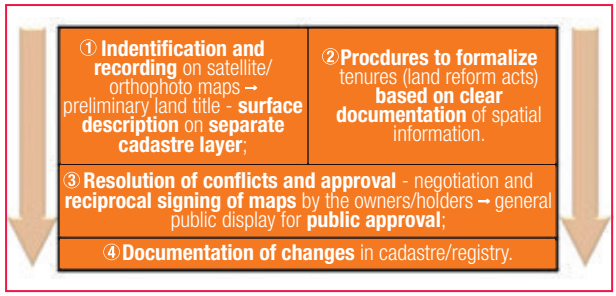


Figure 6-2 Fast Approach Cadastre Documentation to achieve basis for resolving pending land conflicts.

overlapping claims, rights, and disputes. The latter shall have a topological link to the point object forming the land title. The cadastre information obtained in such a way shall reflect the actual situation should it be legally approved or based on customary possession. It serves as a working base and needs stepwise improvement.

Step 2: Definition of procedures to formalize tenures based on clear documentation of spatial information. The procedures have to end up in a legally approved situation.

Step 3: Further steps focus on the resolution of conflicts and approval of the property and tenure situation reflected by the cadastre. As a very easy and effective procedure the negotiation and reciprocal signing of (ortho-) photo maps by the owners or holders shall be used. After this a general public display of the cadastral documentation achieved may lead to public approval.

Step 4: Having a clear documentation of the actual situation in the cadastre, the communal and state driven processes of formalization of ownership or holdings can start by legally approved land reform acts.

The cadastre of Public–Law Restrictions (PLR cadastre)

No one who owns land in most occupied areas of the world can simply use it as they wish. Owners have to comply with conditions laid down by governments and by other authorities. This means complying with a multitude of acts, ordinances and official restrictions – so-called public law restrictions on landownership rights (PLRs). These restrictions may be: Comprehensive development plans, zoning laws, building codes, impact fees and ordinances, lines of construction, lines defining the minimal distance to forests, cadastre of refuse dump locations, water protection zones, maps of hazard zones, etc.

Until now, it has not been particularly easy to obtain all the information relevant to a specific parcel of land. Because a variety of authorities may be involved in the restrictions, a time-consuming trek from office to office is often needed. For this trouble the PLR Cadastre offers a solution by displaying authoritatively summarized the most important restrictions that apply to each land parcel (Dütschler, P., Bigler, M. 2006). The cadastre is to provide actual, correct and precise data of property rights and restrictions, to give evidence of the changes coming from the implementation of a planning process, and to serve as a basis for the next 'dynamic planning cycle'. The reliability of property restrictions coming from planning periods has to be given.

Conclusions

The logical consequence of economic development–land consumption–substantiates the need for sustainable land management and cadastre. Successful attempts to direct or manage land consumption or land use can only run on a solid base of a well-maintained

digital cadastre which represents the actual situation of property and tenure holdings as well as the Public-Law restrictions (PLR) on land.

For exceptional situations in southern, transition, and in post-conflict countries fast approach cadastre information following the Cadastre 2014 principles can be a crucial asset to document the existing and to restore a rightful situation using the tools of sustainable land management. The flexibility of handling not only legally approved but also informal and temporary objects by the use of the independent layer technology leads to an easy adjustment of documentation systems to the needs for the resolution of land problems.

- SLM based on fast documentation in cadastre allows quick reaction time of procedures on dynamic developments and improves security of property.
- SLM based on maintained digital cadastre following the boundary concept allows transparent workflows in the sense of good governance.
- SLM and cadastre as well as PLR Cadastre should run in a symbiotic relationship for maximum effect.

The wrong placement of settlements in endangered or hazardous areas, the loss of value through decreased life quality near traffic or airfields, etc., can be avoided. It is a fact that most planning processes are very time-consuming with up to 75% being devoted to data acquisition and preparation. Only 25% is left for effective planning work. With the new cadastre this ratio can be reversed to 25%:75% (Kaufmann, J. 2008).

It will be a more demanding task of the surveyors to develop and implement sustainable land management activities pro-poor to help to resolve the social and environmental problems of the human community.

References

Andersson, B., Meha, M. 2003, *Land Administration in Kosovo – Practice in Cooperation and Coordination*, UN/ECE-WPLA and FIG Com3 & Com7 Workshop on Spatial Information Management (SIM) for Sustainable Real Estate Market 2003, Athens, Greece.

Augustinus, C., Lewis, D., Leckie, S. 2007, *A Post-Conflict Land Administration and Peace-Building Handbook, Series 1*, UN-HABITAT, http://www.unhabitat.org/pmss/getElectronicVersion.aspx?nr=2443&alt=1

Bertschi, M. 2002, *Dimensionierung der Bauzonen: Eine Standortbestimmung aufgrund der Umsetzung von Art. 15 lit. B RPG*; NSL – Network City and Landscape: DISP-Online, DISP 149 02/2002, SFIT Zurich, Switzerland – http://www.nsl.ethz.ch/index.php/en/ content/ view/full/96.

Dütschler, P., Bigler, M. 2006, *Integration of Public-Law Restrictions into Cadastre*, 23nd FIG International Congress, Munich, Germany.

Eggenberger, M., Stettler, D. 2008, *Nutzungsreserven im Bestand – Konzeptstudie*; Bundesamt für Raumentwicklung ARE, Bern, Switzerland (in German).

Government of the Republic of Kosovo, Ministry of Public Services 2008, *Summary of Findings of the KCA Functional Review*, Functional Review and Institutional Design of Ministries (FRIDOM) Project, Pristina, Kosovo.

Government of the Swiss Federation, Federal Directorate of Cadastral Surveying c/o Federal Office of Topography swisstopo, *PLR Cadastre in brief*, Berne-Wabern, http://www.swisstopo.admin.ch/internet/oerebk/en/home/topics/about.html.

Guiet, Y. 2004, *Le zonage des aires urbaines selon l'INSEE*, Académie de Limoges - Lycée R. Loewy - La Souterraine (23300), http://www.educreuse23.ac-limoges.fr/loewy/siglim/cartes_ZAU.htm.

Kaufmann, J. 2008, *The Boundary Concept: Land Management Opportunities for Sustainable Development Provided by the Cadastre 2014 Approach*, FIG Working Week 2008, Stockholm, Sweden.

Kaufmann, J., Steudler, D. with Working Group 7.1 FIG Commission 7 1998, *Cadastre 2014*, A Vision for A Future Cadastral System, FIG Booklet, http://www.swisstopo.ch/fig-wg71/cad2014.htm.

Kohli, A. 1999, *Measures to Prevent Scouring of Structures in Floodplains*, Wasser & Boden, 51/3, 40-45 (in German).

Kohli, A. 2002, *Renewal of the Network and the Realization of Orthometric Heights using GPS in Kosovo*, 22nd FIG International Congress and ACSM-ASPRS Conference, Washington DC, USA.

Kohli, A. 2004, *Reconstruction of a GIS-Cadastre in a developing Country*, GeoSpatial World 2004 Congress, INTERGRAPH, Miami Beach, Florida, USA.

Kohli, A., Hager, W.H. 2001, *Building Scour in Floodplains*, Proceedings of the Institution of Civil Engineers: Water and Maritime Engineering 148, Issue 2, 61-80.

Lemmen, Chr. 2010, *The Social Tenure Domain Model – A Pro-Poor Land Tool*, FIG – GLTN – UN-HABITAT, International Federation of Surveyors (FIG) Copenhagen, Denmark.

Prud'homme, R., Dupuy, G. and Boret, D. 2004, *The New Constraints of Urban Development*, Institut Veolia Environnement, Report n°1, Paris, France.

Swiss Association for National Planning (VLP-ASPAN) 2004, *Spatial Planning in Switzerland*, Fact sheet, http://www.vlp-aspan.ch/content/home/files/spatial_planning.pdf.

UN Committee on Economic, Social and Cultural Rights (UNCESCR) 2008, *Property Return and Restitution: Kosovo*, http://www2.ohchr.org/english/bodies/cescr/docs/info-ngos/COHREUNMIK.pdf

UNECE-Committee on Housing and Land Management 2007, *Land Administration Review: Azerbaijan*, Programme of Work 2008-2009, Geneva, Switzerland.

PENTAX | STATE OF THE ART MEASURING TECHNOLOGY

TI Asahi Co., Ltd.
International Sales Department
Tel.: +81-48-793-0118
Fax. +81-48-793-0128
e-mail: international@tiasahi.com
www.pentaxsurveying.com/en/

Pentax Distributor for INDIA
LAWRENCE & MAYO PVT. LTD.
274, Dr. Dadabhai Naoroji Rd.
Mumbai 400 001, INDIA
tel: +91 22 22 07 7440
fax: +91 22 22 07 0048
email: instmum@lawrenceandmayo.co.in
www.lawrenceandmayo.co.in

Compatible with EZSurv Software

PENTAX FIELDGenius

Critical developments in land surveying

Does land surveying profession require a paradigm shift in identity to maintain its relevance?

Brian J Coutts
School of Surveying,
University of Otago,
Dunedin, New Zealand

Malcolm McCOY
Former President,
Institution of Surveyors
Australia (ISA)
Vekta Pty Ltd, Australia

The methodologies of land surveying remained largely unchanged over hundreds, if not thousands, of years. Computational methods were enhanced with the use of logarithmic tables introduced by Napier in the 17th century, and supplemented by hand-powered rotational cylinder mechanisms for speed of calculation first introduced by Pascal, also in the 17th century. These were later to be electrified in the 20th century prior to the invention of the microprocessor, which introduced the electronic age in the 1970s. Advanced engineering allowed graduated circular scales to assist with angular measurement to a greater accuracy especially when in combination with a telescope, and linear measurement was carried out by using a variety of devices, often calibrated to a national standard, but the actual form used for a specific task was dependant on the accuracy required e.g. cloth tapes, steel bands. The invention of flight in the early 20th century allowed for photography to literally add a new dimension to the tools of the land surveyor.

Technology

While the first electronic measurement using radio waves occurred in the mid 1950s, it was not until the 1970s that electronic distance measurement (EDM), with the likes of the Wild DI10 and the HP3800, came into everyday use. While the early EDM were large and cumbersome, they quickly became smaller to the point of fitting inside angle measurement equipment. Combining the optical theodolite with small EDM allowed electronic measurement to replace the more traditional means. Glass scales in theodolites were then replaced by bar code readers which then allowed angular measurement to be made by the instrument itself, rather than requiring the operator to "read" the angular measurements. The integration of calculation into the electronics of the "total station" enabled direct read-out of "reduced" measurements, either horizontal, vertical or slope, and leading quite naturally to the data recorder.

Miniaturisation, starting with the invention of the transistor, also brought electronic calculators that could replace natural and logarithmic tables, and extended battery life allowed them to quickly replace mechanical calculators and books of natural and logarithmic tables, even in the field. At much the same time larger punch-card fed desktop computers were replacing the need for much of the time spent doing lengthy calculations in the office. Punch cards were replaced by magnetic strips, much simplifying the process again through the 1970s. However, further advances in miniaturisation made sizeable desk-top computers obsolete quite quickly, as hand-held calculators increased in power and capacity, as well as reducing in price.

Aerial photography developed in close association with the development of aircraft in the early 20th century and was an important aspect of the developing practice of airborne warfare. First used for reconnaissance purposes it quickly became an essential tool of warfare, and developed into the discipline of photogrammetry using stereoscopic images taken with precision cameras allowing the making of maps to be revolutionised. With the advance of satellite science since the late 1950s, the ability to gather data without the use of on-the-ground measurement has again changed the way in which maps are made using remote sensing technologies. Not only has the practice changed, but the uses to which remotely gathered information can be put have burgeoned.

Finding one's location on the planet was a considerable challenge to navigators until the invention of an accurate maritime clock by Harrison in the 1770s. The ability to establish accurate longitude enabled exploration in any part of the globe and brought accuracy to not only navigation but also to the mapping and charting of the newly discovered lands and seas. The reliance on accurate time for position finding has only diminished with the use of satellite positioning and the now ubiquitous use of global positioning systems (GPS) throughout the population along with its multifarious applications.

In the late 1970s the first desktop computers started to appear. Initially they were mainly used for word processing and spreadsheets, but other applications soon started appearing that were relevant to surveyors – there are now many surveying related software packages which are used and are compatible with the latest total stations and GPS equipment.

This new era of digitisation also saw the emergence of printers and plotting devices which ultimately have replaced hand drafting which had formed part of the specialist skills of surveyors for hundreds of years. With the advent of AutoCad, Microstation and other CAD packages, hand drafting has now gone the way of the blacksmith – used seldomly by a few specialised practitioners.

Traditional cadastral, or property maps, which had been used for tenure and taxation purposes for hundreds of years became electronic in the 1980s with the advent of Digital Cadastral Data Bases (DCDB) or Digital Property Maps. Finally, Google Maps and Google Earth have now put digital maps and digital aerial photography in the hands of everyone who has a computer, a mobile phone, a tablet or an iPod.

Government surveying

European settlement commenced in Australia and New Zealand in the early 1800s and this necessitated the "opening up of the land" by alienation of land from the Crown to private individuals. Accordingly, one of the first and most important establishments was a Lands Department and the appointments in these new territories or colonies of Surveyors – General. By the late 1880s the Torrens System of land registration had been established and subdividing "Crown land"on behalf of the government was under way. (Similar stories can be told in other parts of the world which were being colonised at this time) This continued right through until the Second World War, at which time there was an rapid expansion in surveying in these jurisdictions due to vast post war immigration. As a consequence, a vast expansion of these countries infrastructure, namely roads, rail, water, and electricity and gas networks was undertaken. New government or quasi government departments were established and the surveying sections were an integral part of the new order.

However by the mid 1980s much of the major infrastructure had been established and these departments moved into maintenance phases rather than capital expenditure and subsequently we have seen a decline or in some cases the abandonment

of the survey departments. The advancement in technology also meant that the number of people required to undertake surveys has vastly reduced, adding further pressures.

Private Practice

Again using Australia and New Zealand as examples, there has been a small but dynamic private surveying sector in existance for about 200 years. Like the government sector, it grew rapidly after the post Second World War immigration of the 1950s. Land subdivisions, planning and small topographical or mapping projects were the mainstays of the private sector and the firms would often get overflow work from the government sector. A number of aerial surveying and mapping specialist firms also emerged at this time.

The firms would often ebb and flow with the cycles of the economy, particularly the land development booms and busts. By the 1980s firms were diversifying their practices and providing surveying for major construction and infrastructure works, undertaking town planning and some began moving into what was originally referred to as Land Information Systems (LIS), but we now more commonly call GIS. More recently with the advent of GPS, laser scanners, Lidar and mobile mapping systems there is the potential for private sector firms to greater diversify into non-traditional areas of practice.

Education

The traditional method of preparing candidates for a professional career in surveying was for them to be contracted to an employer, to work as an assistant under a recognised practitioner, and at some stage be judged competent to practise on their own. This was common in most occupations in former times. Many surveyors were trained in the armed forces, for both terrestrial and hydrographic surveying, and carried their qualifications into private practice. Others came from a background of engineering, of which at least the measurement aspects of surveying were seen as a subset. As the standard of education improved, professional bodies were formed that would undertake the preparation and administration of examinations that would then lead to professional recognition. As standards of education have risen, so have the expectations of the general public with respect to the education of professional surveyors.

Many countries now base the recognition of professional surveyors on university qualifications, and while some have existed for some time, it is again the period from the 1950s that has seen the widespread establishment of surveying programmes around the world, and the recognition of them by professional bodies. While these programmes were, and have become widespread, recent indications have been that many are struggling to attract students and are consequently under threat of closure. In the meantime, there is anecdotal evidence that there may be a skill shortage of competent practitioners in many parts of the world, and while this may be disguised during a world economic recession, it is likely to become more obvious, if not critical, as development picks up through the period of recovery.

Additionally, some survey practitioners are redefining themselves as the ability to carry out many previously specialised surveying tasks is simplified by the ubiquitous nature of measuring or location devices in the hands of the general public, and standards of technical education improve to enable the understanding and use of them by the general public. University courses in Information Science, Information Technology and Geographic Information Systems are also eating into areas that were once the sole prerogative of the professional surveyor.

What is a "Profession"?

A profession has been described as "an occupation in which a professed knowledge of some subject, field, or science is applied; a vocation or career, especially one that involves prolonged training and a formal qualification. In early use applied specifically to the professions of law, the Church, and medicine, and sometimes extended also to the military profession." (Oxford English Dictionary Online, accessed 15 March, 2011).

The Australian website "The Good Universities Guide" (thegooduniguide.au.com) claims (though it does not quote its source), that an 'official definition' of surveying is "the determination and identification of the shape, contour, location and dimensions of land or water masses and their features, or planning and designing maps". The profession of surveying might therefore be expected to have a formal body of knowledge only available to its practitioners which is passed on through a "prolonged training and a formal qualification", and for the application to the current needs of society for such information.

Without going to the extent of defining the profession of land surveying further, not having a clear and succinct definition of the term (land surveyor) we are talking about, it is difficult to seriously discuss any topic in relation to what changes might have taken place that might impact on what a land surveyor is, at least in the opinion of land surveyors. It will also be difficult to test the boundaries of what may be a professional surveyor, as opposed to a technician surveyor. It is clear that there will need to be a body of knowledge that a land surveyor is expected to have, and that recognition of that body of knowledge is currently through a university education, followed by a period of "training" that is then tested after a period of practice. Finally, whatever the definition includes must meet some need or needs of the society the profession wishes to serve. The forgoing paper must therefore raise the question "have the significant changes that have taken place in technology, education and practice changed the definition of land surveying?"

Does any of the above change what land surveying is?

For a considerable time land surveyors have defined the core of their discipline to be measurement science. "The expertise of linear measurement has always served as a convenient identification of our role" (Robertson, 1980) indicates a view in the middle of the period we

are considering. As Vannozzi (2011) observes, in the USA at least, if asked what they do, most surveyors would answer "We render opinions on where boundary lines are, or they assure society that their boundary lines are mapped properly and when marked on the ground they are in the "right" place." While this comment has a cadastral orientation, and is parochial to the USA, as a generality it suggests there is the sharing of a common view over time that surveying is about measurement, and more particularly about land measurement.

As Vannozzi observes, much of what appeared to be the core business of the land surveyor can be carried out by technically competent assistants, and in many cases by the general public. As the ability to find topographical and other spatial information is simplified by tools such as Google Earth and Google Maps, the ability to find location in space is becoming an expectation of anyone who owns a mobile device, be it a phone or a tablet, and can connect to a network can define their own position and that of other objects. As the technology continues to provide greater accuracy, will the ability for the land surveyor to provide boundary information remain a societal need?

Is the value, respect and responsibility of surveyors different in various parts of the world? In a third world country what is the view of a surveyor and what can they bring to their society? Certainty of boundary location and an emerging land market probably would be high on the agenda. Even if it does vary, we know that the accuracy of spatial information continues to increase, that the cost of obtaining it continues to decrease, fewer staff are needed for data gathering and the skills needed to access spatial information are minimal.

With a long tradition of measurement and mapping, where does that leave the professional land surveyor? In emerging and first world nations is the role and nature of the surveyor the same? Will the new technologies make the surveyor less relevant in a nation that has a well established and defined property market with minimal boundary disputes? With new efficiences and shrinking markets where can the surveying professional find new opportunities?

The land surveying profession is left with the fundamental question – Has a paradigm shift already begun and it is not being recognised? Research will continue into these questions that are critical to the education, practice and continued existence of the professional land surveyor.

References

Oxford English Dictionary Online, accessed 15 March, 2011.

Robertson, W A (1980) *Professionalism.*Editorial, New Zealand Surveyor XXIX (256).

Vannozzi, A R (2011) *Perspectives on the Future of the Surveying Profession.* Available at *proceedings.esri.com/library/userconf/survey11/.../pap_3845.pdf.*

Improving disaster management practices

Major issues, best practices and way forward

Dr Srikanth Venkatesan
Victoria University,
Melbourne, Australia

Disaster management is a widely discussed topic around the world and more so in recent years because of large scale disasters experienced around the globe. Most discussions appear to be siloed to a particular field of expertise although it is well recognised that a coordinated effort is required amongst various stakeholders and an integration of multi-disciplinary skills. In this context a recent workshop (The Australia India Strategic Research Fund (AISRF) Workshop on improving disaster management practice through a spatially enabled framework, 21 – 24 January 2013) held at the Indian Institute of Technology Madras (IITM) and organised by the University of Madras and The University of Melbourne made an effort to bring in various stakeholders from India and Australia in one forum. This included government officials who were at the forefront of recent major disasters and recovery situations along with non-government agencies who were involved in relief situations along with academic experts in geomatics, earthquake engineering, flood modelling, fire and cyclone hazard. Views on the role of media were also included into the programme. The presentations from government and non-government officials centered on current practice with the view to identifying real challenges; presentations from academics centered on high level engineering inputs for the benefit of decision makers and the discussions centered on the way forward for improving current practice.

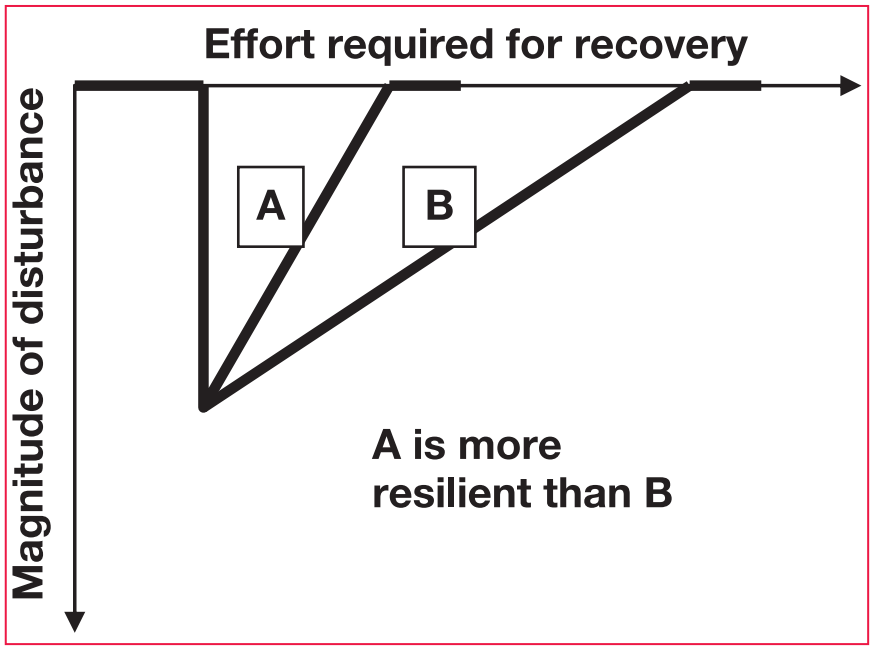


Figure 1: Measuring resilience – Dr Lam Pham, AISRF Workshop, 2013

Major issues

Dr J Radhakrishnan, IAS presented a very direct account of the challenges faced during the 2004 tsunami. He highlighted that the challenges in connecting with the community at the grass root level are quite significant. He also stressed the need for implementable plans and the need for capacity development. Commodore S Shekar (Retd), in his presentation mentioned that the initial understanding phase of a disaster is highly crucial to the activities and decisions that follow. He also highlighted the need for specific disaster management professionals qualified through multi-disciplinary education programs. Dr V Thiruppugazh, IAS officer who was directly involved in the restoration works in the aftermath of the Gujarat earthquake presented a different dimension to disasters noting that each disaster is an opportunity to rebuild better. He also acknowledged the conflict between building back better versus the community expectation of returning to pre-disaster norms. Dr. Manu Gupta from SEEDS India noted that resilience should

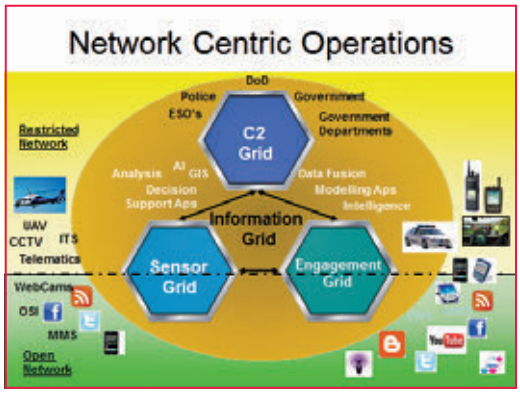


Figure 2. Network centric model – Mr Ged Griffin, AISRF Workshop, 2013

be developed not only against shocks but also against stresses. Interestingly he noted that the communities should be intergrally incorporatrd as part of the solution. Dr Lam Pham from CSIRO presented on the Disaster Resilient Framework from an Australian Perspective and pointed out that disaster resilience should be considered before emergency resilience. He flagged the difficulties in enforcing change especially in codes of practice and policy implementations. In addition to the above key points, all these presentations brought out the commonly known ground realities and challenges to be addressed in disaster management in both nations.

Best practices

Mr Ged Griffin from Victoria Police presented recent advancements in emergency response that can be achieved through a network centric model enhanced by contemporary information technologies. He emphasised the power of mobile phones and social media in reaching out to the community during emergency response and also for receiving information from those affected. Dr Lam Pham also presented a resilience model in terms of 'magnitude of disturbance' versus 'effort required for recovery' noting that resilience would be inversely proportional to the effort required. Mr Bal Krishna, Editor of Coordinates magazine provided a different perspective of the media noting that it can be used for effectively lobbying both upstream and downstream between governments and people. Dr V Thiruppugazh presented some of the community engagement models adopted in Gujarat such as training masons and involving women folk in the Participatory Rural Activity appraisal that are being explored at a national level. These presentations provided a general insight into means of improving current disaster management practice in addition to those presented at the technical sessions.

In terms of engineering input into disaster management practice, Dr Srikanth Venkatesan from Victoria University emphasised the power of simulation technologies drawn from case studies involving modelling of complex seismic source zones, flood modelling and blast damage. It was noted that simulation technologies would be useful in the planning phase of disaster management and also provide

a basis for developing a common language or the 'single voice' commonly mentioned during real time disaster. A/ Prof Nelson Lam from The University of Melbourne presented fast track methods of estimating structural damage induced by earthquake hazard based on the estimation of peak displacement demand and drift angle of the building which would be highly useful for rapid assessments. Dr S T G Raghu Kanth from IITM stated the challenges in arriving at a consensus decision amongst seismologists, engineers and policy makers in developing a seismic hazard map for the whole country and presented an in-depth view of the current map of India. Prof A Boominathan from IITM presented a comprehensive assessment of regional seismic hazard of Chennai city based on geotechnical considerations. The concept of site period mapping was presented as a useful tool in estimating the peak displacements induced on the structures by local soil conditions.

A/Prof Helen Goldsworthy from The University of Melbourne noted that current seismic designs focussed only on individual buildings but there is a necessity to consider the whole of region approach as evident from the Christchurch earthquake. She noted that it is buildings that kill people during earthquakes and therefore a community based approach to seismic design should also be considered. Following these presentations technical discussions focussed on the appropriateness of the seismological models for seismic hazard estimations and the appropriate return periods for seismic design and capacity based design approaches.

Engineering sessions were further complemented by the presentations of Dr M Ramalingam from Anna University depicting the recent advancements in aerial flood mapping derived from airborne laser technology for Chennai city and the implementation of real time weather stations providing direct information to local municipal authorities. Prof R R Krishnamurthy presented his work on disasters induced due to climate change and the erosion of the coastal area in recent years. He also provided a Climate Change Disaster Index which had been used to identify vulnerable areas within Chennai. Prof Subhash Yaragal pointed out that extreme value theory would provide a compromise between the requirements of earthquake resistant design and wind resistant design besides pointing out that cyclone induced disasters have nearly accounted for 1/3rd of total losses from major disasters.

Way forward

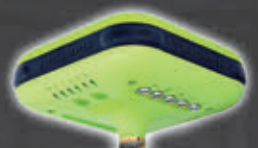
Prof Abbas Rajabifard from The University of Melbourne presenting a keynote highlighted the use of location to manage and deliver information as a viable fourth element of decision making. In depth view into data sharing protocols and improving data quality through AAA rating, were also noted. Significance of the spatial platform in empowering government, industries and citizens were clearly brought out in his presentation. Dr Murali Mohan from the Department of Science and Technology echoed similar views in his presentation and presented case studies where spatial enablement has helped in reviving the eco system and digital reconstruction of Hampi. In particular, the development of a spatial platform was seen as the major difference portrayed by this group as the key ingredient for improving practice. Based on further discussions, Dr Srikanth Venkatesan presented a holistic conceptual framework that could encompass three major drivers: Information grid, Sustenance grid and Community grid. All these grids can exist in a spatially enabled platform as presented by Prof Emad Gad from Swinburne University of Technology, Melbourne. This proved to be the first-cut approach of developing a meta-integrative framework that can cater for multi-disaster resilient society that connected people, governments and organisations. It was also noted that various work packages and projects can be drilled out of this integrative framework that will be useful for governmental considerations.

All participants agreed that government investment at a very basic level of funding into research, community engagement programs would provide vital gains during and post disasters.

Another significant highlight of the workshop was a site visit to one of the rural areas affected by the 2004 tsunami to gain a first-hand feedback from the restored community followed by a visit to the local government college in Nemmeli, Tamil Nadu.

JAVAD

TRIUMPH-1



TRIUMPH-VS, Fully integrated

- GNSS receiver,
- High precision Antenna,
- Controller & Software

Victor-VS
Controller &
Software

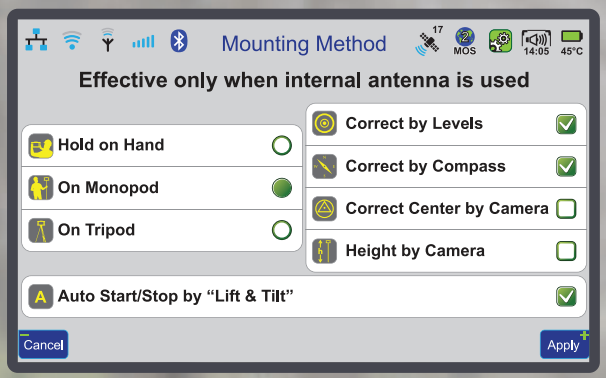
WWW.JAVAD.COM

Don’t Look! Don’t Touch! … Survey with Lift&Tilt

Many sensors, intelligence, and innovations inside TRIUMPH-VS bring this new revolution to surveyors.

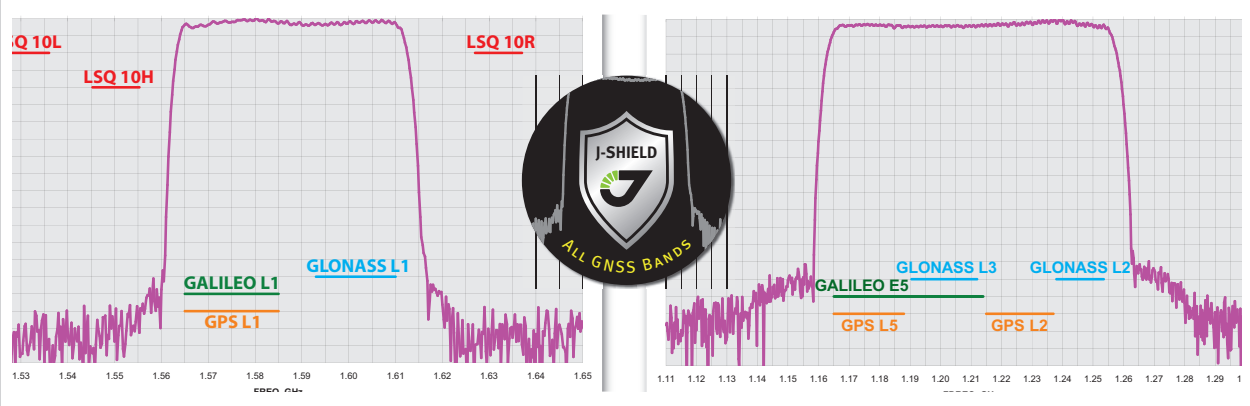
You don’t need to look.

You don’t need to touch.



J-shield

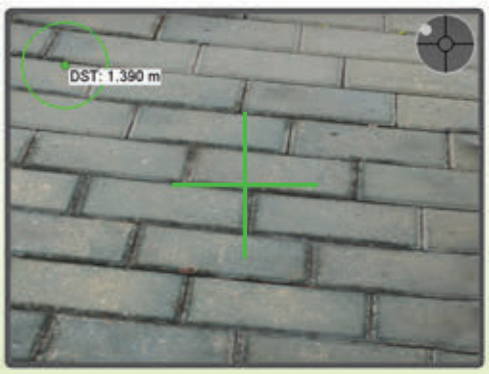
Our team has been bringing you the latest GNSS technology for the past 30 years.



Our J-Shield protects not only the GPS L1 band against Light-Squared, but protects all GNSS bands against all current and future near-band signals.

Visual Stakeout

View your target point on the TRIUMPH-VS screen and walk towards it to stake it.



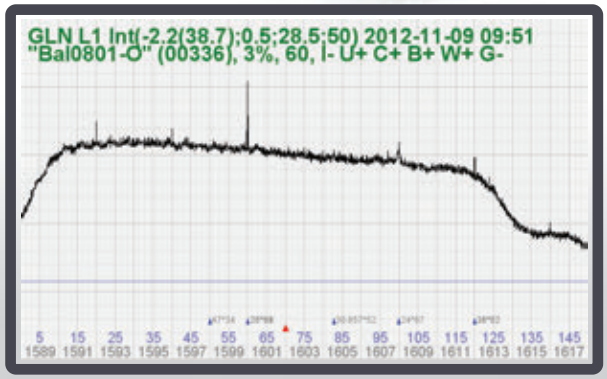
Six Parallel RTK Engines

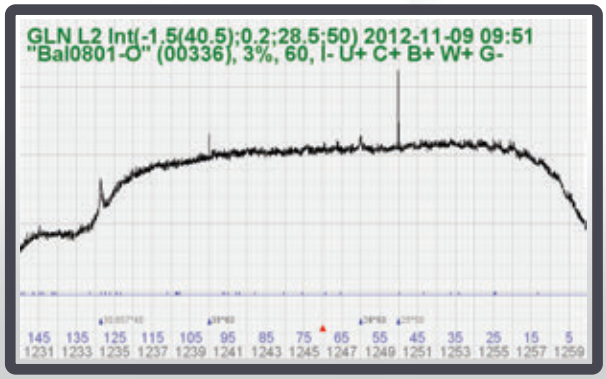
Each of our 6 parallel RTK engines employs different algorithms to calculate solutions and the weighted average of them provides the most robust, accurate, and fastest results.

This engine is behind the hood. This is why it is so easy to get the fastest and most reliable RTK solutions.

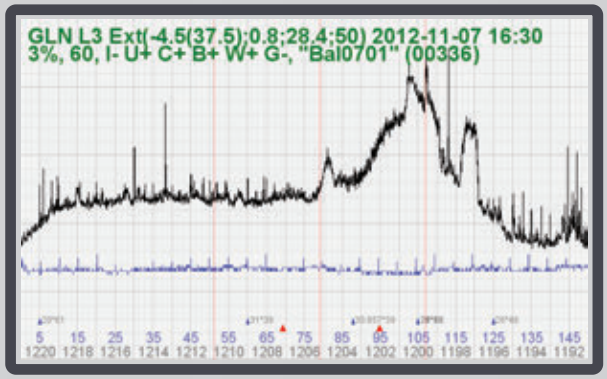
See who jams your GNSS

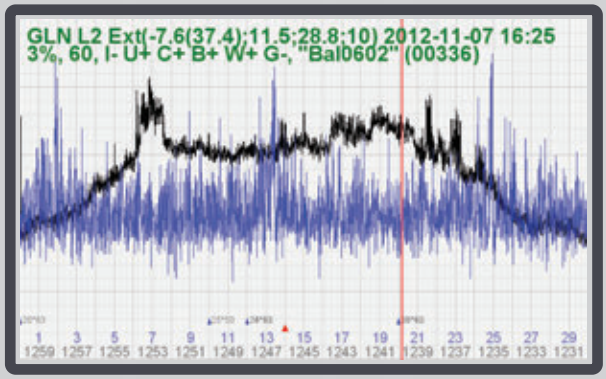
Now you can "view" interferences in your environment before starting your job and see if RTK is degraded.





Actual examples of clean GNSS environment



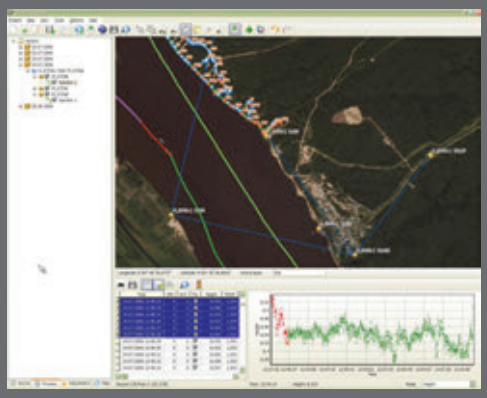


Actual examples of noisy GNSS environments. People could not use these satellites and did not know why.

Software

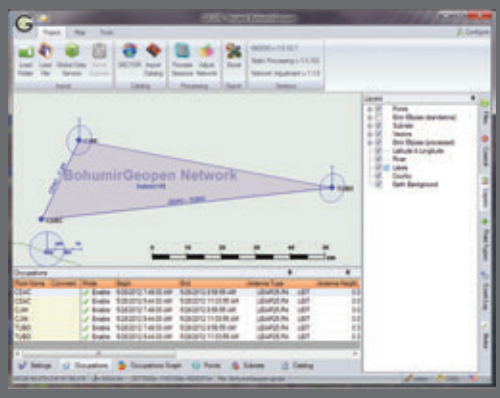
Complete software suite for survey, GIS and control.

Justin



Justin has full range of features for geodetic and surveying tasks.

Giodis



Full-featured office post-processing software for high-precision geodetic and surveying applications

NetView

Application to easily control JAVAD GNSS receivers.

NetHub

Windows® application for controlling GNSS receivers developed by JAVAD GNSS, INC.

See details at www.javad.com

The reason for our 8-page advertisements is that we want to substantiate our claims of excellence by explaining technical details. We provide the most accurate, the most features, and the easiest-to-use GNSS instruments, period.

We do not have any financial ties to Light-Squared. Our one technical project with LightSquared ended in 2011. We provide protection for GNSS bands and spectrum monitoring and reporting because we believe these are the right things to do. We do all these and all advertisements with our own nickel and dime. We have no relationship, no arrangements, and no dialogue with LightSquared.

Solutions for open land administration

Its aim is to make computerized cadastre and registration systems based on open source software more affordable and more sustainable in developing countries

Neil Pullar
NRC Land Tenure Team, Food & Agriculture Organization, Rome

Andrew McDowell
NRC Land Tenure Team, Food & Agriculture Organization, Rome

Alexander Solovov
NRC Land Tenure Team, Food & Agriculture Organization, Rome

Elton Manoku
NRC Land Tenure Team, Food & Agriculture Organization, Rome

Maria Paola Rizzo
NRC Land Tenure Team, Food & Agriculture Organization, Rome

The Solutions for Open Land Administration (SOLA) Open Source Software project is a 3 year trust fund project, funded through the Government of Finland and implemented by a project team within the UN FAO.

Its aim is to make computerized cadastre and registration systems based on open source software more affordable and more sustainable in developing countries.

A "customization" version of the SOLA software was released in March 2012 (*www.flossola.org*).

Software architecture

At a summary level, the SOLA software architecture (McDowell 2012) focuses on delivering a set of loosely coupled interoperable and extensible services consistent with the principles of Service Oriented Architecture (SOA).

The reason a web services based architecture has been selected is to provide the best alignment with the constraints, customization and integration needs the SOLA software will likely be subject to in the diverse environments it will operate in. Figure 1, the Component Model diagram, illustrates the layered architecture of the SOLA software along with the main components and their key dependencies. A two dimensional layering approach has been used for the SOLA software to structure the software firstly by responsibility and secondly for reuse.

Presentation layer of SOLA software

The Presentation Layer of the SOLA software includes two Java SWING desktop applications; SOLA Desktop and SOLA Admin. The SOLA Desktop is the primary client application of SOLA and provides case management and support for front and back office tasks that would normally be associated with cadastre and registration processes. It also includes the SOLA GIS map viewer which has been built around the Geotools open source GIS toolkit. Other open source tools that are also used by the SOLA Desktop include Jasper Reports, Java Help and Hibernate Validator which is a bean validation framework.

SOLA Admin is the second client application and it provides user management and general system administration capability.

Both client applications are deployed to end users with Java Web Start technology. Java Web Start is bundled with the Java Runtime Environment (JRE) and supports the deployment and one click installation of java applications via the web. It also includes automatic update capability minimising the overall deployment and configuration overhead needed to support future releases of the software.

Web services

The SOLA software includes eight SOAP (Simple Object Application Protocol) based web services implemented using the Java JAX-WS technology backed

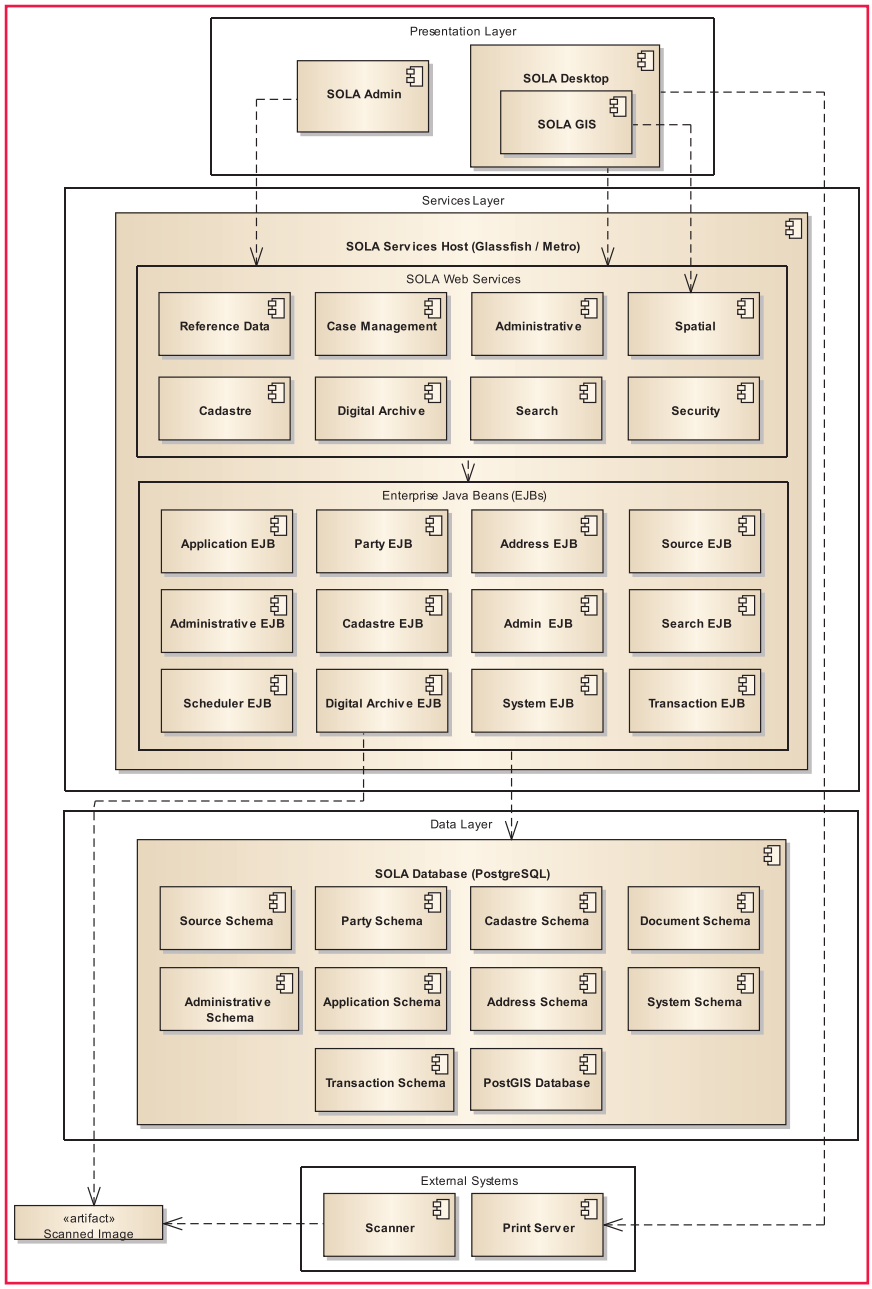


Figure 1 - Component View Model – SOLA software

by Enterprise Java Beans (EJBs) hosted using Glassfish application server and Metro framework.

All of the services are designed to be interoperable and available for reuse by other systems. Using the Metro framework makes the SOLA software compatible with WS-* standards and hence interoperable with Microsoft .NET Windows Communication Foundation (WCF) technology.

The EJBs contain the main business logic for the SOLA software and have been implemented using the EJB 3.1 specification. This specification provides several improvements over earlier EJB specifications and is intended to be light weight and functional. Declarative security is also used on each EJB method to provide fine grained role based access control to the SOLA's functions.

Although not illustrated on the Component Model View diagram, a Repository layer has been implemented using the MyBatis data mapper framework to separate data access logic from business logic and to consolidate and generalize database access routines. The Repository can be easily substituted with a mock implementation to allow targeted unit testing of business logic. It also ensures flexibility in the database technology used by the SOLA software. The open source PostgreSQL database is the preferred database technology for the SOLA software, however the Repository could be customized to support other database technologies.

A simple SQL based rules engine is also supported by the Services Layer. This engine allows selected business rules to be defined as SQL statements and supports updating the rules without the need to redeploy the application. Another feature of the SOLA Rules Engine is that rules can define the time frame they are applicable for. Land Administration, like many government functions, is closely tied to legislation and changes to legislation are often enacted on a specific day. Updated versions of rules can be loaded into the SOLA database along with the date they become applicable ahead of time so that SOLA can automatically reflect the changed legislation from the appropriate date without the need to deploy a new version of the software on the night before implementation.

There are also a number of base classes that have been implemented to simplify development of new web services, EJB's and entities and to ensure the services code base remains consistent.

SOLA database design

The SOLA database design is based on the Land Administration Domain Model (LADM) currently in the final stages of being adopted as an international standard (DIS 19152) by the International Standards Organisation (ISO) (http://www.isotc211.org). The decision to use LADM as a basis for the SOLA database design was in order to profit from the considerable international domain knowledge in land administration that has resulted from the prolonged discussion and consultation associated with its formulation and

HI-TARGET

ZTS Series Total Station

ZTS-120/120R

- Intelligent Calibration, USB Port&Bluetooth Optional
- Reflectorless Distance Measurement, Range Up To 350M
- Integrated Optical, Mechanical and Electrical Precision Ranging System, Accuracy: 2mm±2ppm
- High Efficient Absolute Encoder Angle Measuring System, Accuracy: 2″

Simply Powerful

Hi-Target Proudly Supports As Platinum Sponsor

See us at
12TH SOUTH EAST ASIAN SURVEY CONGRESS
To Be Held on June 18-20, 2013 at Philippine International Convention Center, Manila Philippines
www.seasc2013.org.ph

ZTS-120R

ZTS-120

CE

Hi-Target Surveying Instrument Co., Ltd

www.hi-target.com.cn
www.gnss-gps.com

ADD:10th Floor,Chuangxin Building,Tian'an Technology Zone, No.555, North of Panyu Road,Panyu District,511400, Guangzhou City,China Tel: +86-20-22883930 Fax: +86-20-22883900 E-mail:info@zhdgps.com

consideration by ISO. It has also been useful through creating a common vocabulary for the discussion of land administration concepts in the context of computerised land administration systems.

Adaption of existing LADM

The first adaption of LADM resulted from the need to port the UML Class Diagram definition of LADM (as it is defined), into a Relational Model in order to implement it in the most common form of current database technologies. For each package in LADM a schema is introduced in the SOLA database. The LADM Survey package was not ported because it was decided to directly use the Spatial Type extension provided by the relational database management system (in this case PostgreSQL with the PostGIS spatial extension).

Extensions

It became apparent at an early stage that the SOLA database would need further schema and data elements over and beyond LADM in order to support the generic cadastre and registration process and to meet the identified requirements for the SOLA software. These extensions include:

- Case Management
- Long Transaction Handling
- System Support
- Specialisation of LADM LA_SpatialUnit Object

GeoTools library (Spatial GIS components)

Handling of spatial information in SOLA software is required on both the server and client side. As with all spatial data within a GIS, it is necessary to be able to configure the visualisation of the SOLA spatial data and to be able to manipulate it (delete, insert, update).

Figure 2 describes the overall handling of spatial information within the SOLA software.

Server side GIS services

Various options for server side GIS solutions were investigated including GeoServer which offers WMS for visualisation purposes and WFS-T for manipulating spatial data.

The GeoServer option was not adopted with the SOLA software because it would have necessitated an external means of manipulating the spatial dimension of objects and a different means, internal within the SOLA software, for manipulating the non-spatial attributes describing the same object. If the GeoServer option had been adopted it would have introduced a complex overhead in making sure the two means of data manipulation were synchronised in terms of data commits and data rollbacks especially in the case of an interrupted data manipulation transaction.

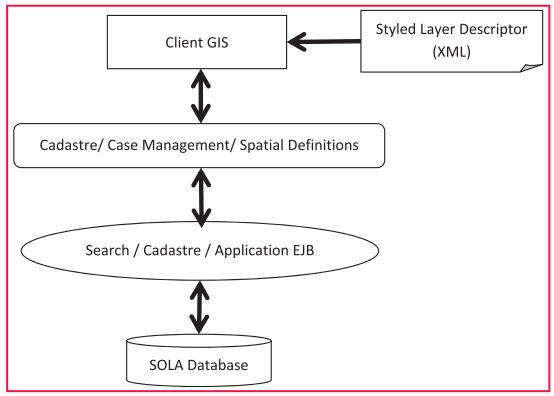


Figure 2 – Spatial Information Handling in SOLA software

In order to have one consistent way of handling information within the SOLA software, regardless of whether it was spatial or not, the spatial definition of objects is treated just like other attribute data belonging to an object. Through this approach it is possible to use the same elements within the SOLA software architecture to persist objects which have a spatial definition. Another advantage of this approach is that the business rules can utilise both alphanumeric and spatial conditions seamlessly when applied at the database level.

This decision meant that it was no longer necessary to utilise a WFS-T service external to the SOLA software to manipulate spatial information as this could more effectively be done within the SOLA software architecture.

Client side GIS

In investigating options for the client side GIS, it was decided the best solution was to use the open source Geotools library (*www.geotools.org*). This library offers a solution for rendering spatial data into images where it is applied to a defined symbology. The Geotools library integrates with the Java Topology Suite package (*http://www.vividsolutions.com/jts/JTSHome.htm*) and hence can be used for spatial operations.

As far as GIS user interface libraries, a drawback with Geotools is that it only offers a very basic map control and only a few basic tools. Because this library uses raw data to translate into spatial objects and from there it can render them by applying an open geospatial standard symbology definition (*http://www.opengeospatial.org/standards/sld*), the SOLA Client Side GIS (like the SOLA Server Side GIS) does not need external WMS services for rendering maps. The main extension to the Geotools routines made by the SOLA software deals with adding more sophisticated functionality to the user interface presentation of the map and a wider range of tools such as those for handling on-screen editing, snapping and creating a table of layers.

The SOLA Geotools based Client Side GIS could also be used to render WMS layers (in addition to spatial data sourced directly from the SOLA database) if the agency implementing the SOLA software chose to use WMS for rendering a range of spatial data including but not limited to the SOLA sourced data.

Customisation

Within the SOLA project, the SOLA software will be piloted in three FAO

member countries: Ghana, Nepal and Samoa. This pilot activity will involve two stages. Firstly the initial generic SOLA software will be adapted by local teams of software developers in each of the pilot countries for use in their countries. These adaptions will modify and potentially extend the software to support the cadastre and registration processes in that country taking into account local land records, practices, laws and regulations. Secondly, the customised software will be implemented in at least one land office in each country and the SOLA project will support this implementation along with the local SOLA software support arrangements.

As of the first quarter of 2012, software customisation has begun in Nepal and Samoa with Ghana planned to start in the second quarter. Later in 2012, the locally customised versions of the SOLA software will be piloted in land offices within these three countries.

Extension mechanisms

The SOLA software architecture has been specifically designed to enable the software customisation necessary in each country. Specific mechanisms in the SOLA software architecture which may be used in SOLA customisation work are:

- **New web services** can be added into the SOLA Services Layer to provide additional functionally.
- **WS - * Interoperability Standards** are supported to ensure compatibly with non java technologies. I.e. The SOLA Web Services can be integrated with .NET client applications while maintaining the SOLA security model.
- **Enterprise Java Beans** are used to implement the Entity, Control, Boundary (ECB) pattern within the web services.
- **User Interface Localization** is supported through use of Java Resource Bundles. This includes screen labels and all messages displayed as well as localization of reference data display values.
- **Repository** provides flexibility in the database technology used by the SOLA software allowing investments in existing database technologies to be used (instead of, or alongside of the SOLA PostgreSQL database).
- **Database Schemas** - Although the SOLA software utilises just one database, several schemas have been used to segment the data layer and ensure the separation of data based on the service that utilises the data. An example where this would be of benefit is where the organization has an existing Digital Archive. In such a situation, the Digital Archive Service could be updated to use the existing archive without impacting the other services provided by the SOLA software.
- **Rules Engine** - Business rules have been implemented using a custom SQL rules engine that allows the rules to be updated to change the behaviour of the application without requiring the compilation and redeployment of the entire SOLA software application.
- **Workflow Processing** - The SOLA software adopts the concept of services. Services are intended to identify broadly the actions the land office will take to process an application involving one or more land office services. It is possible for developers to create new screen flows for new services that "plug in" to the SOLA Desktop application management functions developed in the initial generic SOLA software. Similarly, new or modified business rules can be written to ensure applications only proceed through crucial stages when all the pre-requisites have been met.

Open source license

The SOLA software uses the open source "Modified Berkeley Software Distribution (BSD)" license. It is a very simple licence and one of the least restrictive in terms of what and how the software can be used. There are only three clauses:

- All source code must be redistributed with the original copyright notice
- All binaries must be redistributed with the original copyright notice in the accompanying documentation
- The names of the contributors and the copyright holder (in the case of the original software, this is FAO) cannot be used to endorse or promote products based on the software without prior written permission.

The reason for using a permissive open source licence is to encourage adoption of the SOLA software by both national land administration agencies and private software development companies.

Conclusion

In the publication "FLOSS in Cadastre and Land Registration" (Steudler et al, 2010), the comment is made that there was "little knowledge and experience yet available on the introduction of open-source systems in land registration and cadastral systems". The release of the initial generic SOLA software means that this deficiency has now been addressed.

References

McDowell, A. (2011). Software Architecture Document – Initial "Solutions of Open Land Administration" Software, NRC Land Tenure Team, FAO.

Pullar, N., McDowell A., Manoku E., Solovov A., & Rizzo M.P (2012). Solutions for Open Land Administration (SOLA) Software – Customising Open Source Software to Support Land Administration Services and Responsible Land Governance, presented at the World Bank Land and Poverty Conference, April 2012.

Steudler, D., Törhönen, M. & Pieper, G. editors (2010). FLOSS in Cadastre and Land Registration – Opportunities and Risks, published jointly by FAO and FIG.

This article is an abbreviated version of a paper with the same title presented at the "Annual world bank conference on land and poverty" The World Bank – Washington DC, April 23-26, 2012

Malaria transmission risk in India

The present study provides the information on the spatial agreement of association between the malaria disease transmissions, mosquito breeding habitats suitability of land use / land cover and weather determinants

M Palaniyandi
Digital Mapping Laboratory, Vector Control Research Centre, (ICMR) Indira Nagar, Pondicherry, India

The malaria endemic problem is major concern in the 14 States and Union Territories. The malaria endemic has been severe threaten to the people of highland areas of north eastern states and the eight other states in India, especially in the North-eastern states (Assam, Arunachal Pradesh, Manipur, Meghalaya, Nagaland), Orissa, Chhattisgarh, West Bengal, Rajasthan, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Uttar Pradesh, Haryana, Maharashtra, Tamil Nadu and Andhra Pradesh. Remote sensing and GIS have been widely used to research works in the developing countries like India where the malaria challenge was the greatest. The study of land use / land cover, climate determinants, the landscape ecology of mosquito breeding habitats and the malaria endemics in different parts of the world including India for the past 40 years (Bhattacharya S, *et al*., 2006, Dale PE *et a.*, 1998, Hay SI, *et al*., 1998). Remote sensing and GIS has essentially important role in studying the climate, landscape and the ecological determinants of malaria transmission with reference to space and time (Palaniyandi M, 2012, Liu J and Chen XP, 2006, Ceccato PS, *et al*., 2005, Sharma VP, *et al*., 1996, Wood BL et al., 1991 and 1992). The results obtained from the study were provided the information for gaining a better understanding of the spatial distribution of malaria parasitic disease transmission with site specifications at different time points.

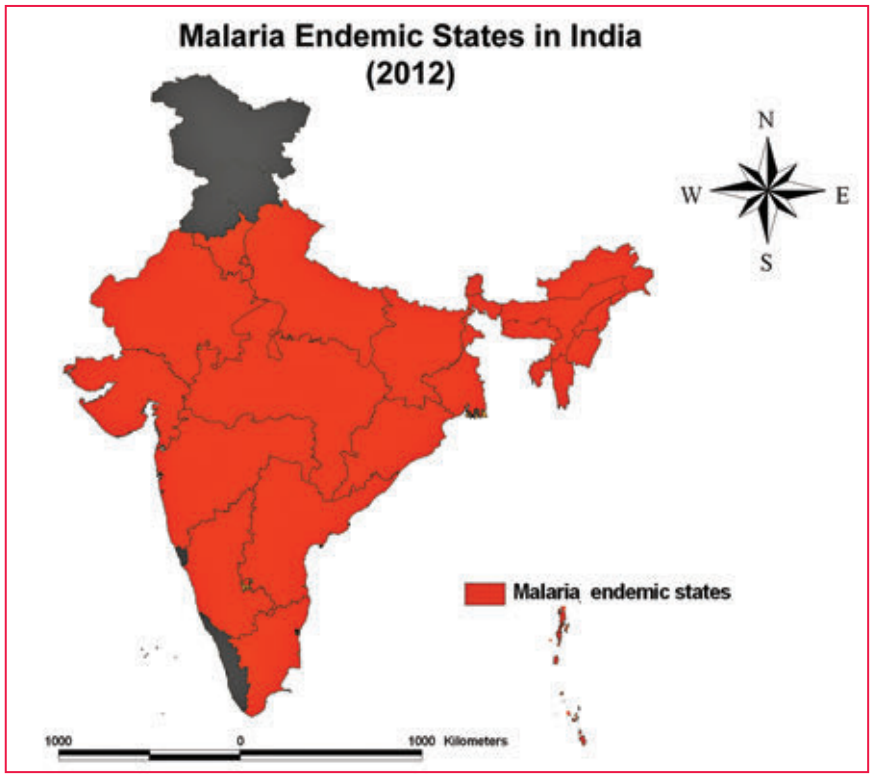


Figure 1: The malaria endemic states / UTs in India as on 2012

The significant studies were made to attribute the spatial relationship between the Land use / land cover changes, geo-climate variables, and the malaria disease transmission (Mushinzimana ES, *et al.*, 2006, Leonardo LR, *et al*., 2005, Rogers DJ, *et al*, 2000, Craig, M.H. et al. 1999, Hay SI, et *al*, 1998, Lindsay SW and Birley MH, 1996, Akhtar R. and Mc Michael AJ, 1996). The specific aquatic habitats with a particular plant communities support malaria vector mosquito breeding habitats (Thomson MC et al., 1996, Wood BL et al., 1991 and 1992). The Normalized Difference Vegetation Index (NDVI) values (-1 and +1) derived from the Multispectral Landsat TM satellite data (Liu J and Chen XP 2006) and, the Indian remote sensing of IRS LISS I and LISS II data were used to analyze the areas of suitability for malaria

GAGAN
COMPATIBLE

PRECISION IS OUR GOAL

High Accuracy GNSS Receivers

- 30cm Real-time Accuracy using GAGAN and other SBAS.
- Full DGNSS Solution that integrates GLONASS with GAGAN Corrections.
- Compatible with PDA's, Smartphones and Tablets.
- Supports EZSurv GNSS Post-processing Software.
- Rugged IP67 Construction. All Day Battery. 2 Year Warranty.

SX Blue II GNSS
by Geneq inc.

sxbluegps.com
info@geneq.com
+1 514 354 2511

Made in Canada

mosquitoes vector breeding habitats (Palaniyandi M, *et al*, 2012, Sharma VP et al, 1996). The remote sensing and GIS highbred techniques could provide the relevant surrogate information relating to the spatial variation of the climate variables, the malaria mosquito breeding habitats (Bouma M, *et al*, 1995, Tyagi BK, et al., 1995, and Wood BL, *et al*, 1991 and 1992) and the malaria transmission risk. The present study was designed for exploring the use of remote sensing and GIS techniques for mapping malaria transmission risk in India.

Spatial analysis of malaria transmission

The malaria transmission predictive models needs to improve with refining the existing models. GIS was used to construct the thematic maps, spatial analysis and the spatial modeling of malaria transmission risk as perennial, seasonal, bi-seasonal, sporadic epidemics etc., perhaps, GIS allow layers of information of malaria vectors and climatic variables (Temperature, relative humidity, saturation deficiency and rainfall). The indicator of malaria stability is the reproduction rate (*Ro*) of the disease: when *Ro* is less than this would be a Boolean situation, where climate is suitable (1) or unsuitable (0). Defining Boolean thresholds above which the temperature–rainfall combination is considered suitable and where malaria is expected to occur, or below which malaria is expected not to occur, would be ignoring natural gradients and inherent uncertainty. The digitally superimposed thematic maps of climate variables with the malaria epidemic cases for performing the spatial analysis to construct a spatial modeling for predicting malaria transmission risk in the endemic and non-endemic areas (Small *et al*., 2003, Craig, M.H. et al. 1999, Akhtar R. and Mc Michael AJ, 1996, Hay SI, et *al*, 1998, Lindsay SW et al., 1996 and 1998, Martens P, *et al*., 1999). The results were provided that the geographical distribution of malaria transmission and spatial diffusion are greatly influenced by geo-climatic variables.

Land use / land cover changes and malaria epidemics

Land use / land cover changes (dry land agriculture to irrigation wet cultivation) and the growth stage of vegetation types may perhaps play an important role in determining vector abundance. The irrigation rice cultivation fields have been provided breeding sites for *Anopheles gambiae* early in the growth cycle of the plants, these changes as the rice plants mature and form a dense canopy cover over the water (Wood BL, et al., 1991 and 1992). The combination of regional climate changes (temperature, rainfall, and humidity) and land use / land cover changes have been fueled to promoting the vector borne disease epidemics in newer areas (Bouma M, *et al*, 1995, Tyagi BK, *et al*., 1995). The recent years has been witnessed by growing incidence of vector borne diseases in different parts of our country, and more frequently in the districts where the irrigation water resource projects were brought out, and these factors have fueled for malaria vector mosquito abundance around of the buffer zone of 2.5 Km of the irrigation wet cultivation agriculture areas (Palaniyandi M, 2004, Tyagi BK, *et al*, 1995).

Weather determinants and malaria transmission

The meteorological variables (Temperature, humidity, saturation deficiency, and rainfall) were used for predicting the area in severity of malaria transmission risk (Bhattacharya S, *et al*, 2006, Singh N and Sharma V P, 2002, Craig, M.H. et al. 1999, Lindsay SW, *et al*, 1996, Martens P, *et al*., 1999, Akhtar R. and Mc Michael AJ, 1996). The conventional method of malaria transmission risk assessment based on the epidemiological data may cause error, however, the remote sensing, and GIS techniques, a malaria risk map could be prepared based on the geo-climatic variables provides the guidelines for designing strategic plan for control of malaria epidemics. Based on the previous studies, it was well established facts that climate determinants are being most important in limiting the malaria transmission.

Temperature and rainfall effects on malaria transmission

Temperature has been playing the most significant role in the determinants of the vector survival, parasite development, parasite incubation, and the malaria disease transmission. The optimal temperature range for *Anopheles* vector species of malaria development lies within 20°C to 30°C. However, transmission of *P. vivax* requires a minimum average temperature of 15°C and transmission by *P. falciparum*, requires a minimum temperature of 19°C. The effects of temperature on the transmission cycle of the malaria parasite *Plasmodium falciparum and Plasmodium vivax* has manifold, but it has specific and significant effects on duration of parasite development (*n*) and mosquito survival (*p*) are the most important (Bhattacharya S, *et al*, 2006). The spatial agreements and the association between the malaria vector abundance and rainfall is most complex and the predictable relationship does not exist. There is no clear relationship observed between the positive malaria cases and the annual precipitation alone (Bhattacharya S, *et al*, 2006). The amount of rainfall, the number of rainy days and the degree of wetness has no significant effects on malaria prevalence.

Relative humidity and saturation deficiency

The rainfall and humidity are important determinants of vector breeding and survival, parasite developments and the spatial diffusion of malaria transmission. There were many pioneers carried out studies on the influence of climatic conditions with respect to malaria transmission in the arid and semi-arid areas (Bouma M and Van Der Key HJ, 1995 and Tyagi BK, *et al*, 1995). Rainfall and humidity on vector populations and, the influence of sturdiness of precipitation on malaria transmission current scenarios was most associated with types of landscape environments (Singh N and Sharma VP, 2002). The climatic condition of relative humidity with range between 55 per cent and above 80 per cent could provide the suitable environment for malaria transmission (Bhattacharya S, *et al*, 2006).

The cumulative effects of climate variables on malaria transmission

The spatial relationship between the climate variables and the *Anopheles* genus malaria vector shows that the model fitted with statistically significant. The most *Anopheles* vector species of malaria, the optimal temperature range for their development take place within 20°C to 30°C. However, transmission of *P. vivax* requires a minimum average temperature of 15°C and transmission by *P. falciparum*, requires a minimum temperature of 19°C. It has been observed in India, that the *P. vivax* vector requires 15 to 25 days to complete its cycle if the temperature remains within 15°C to 20°C, the relative humidity for both species remains within 55 to 80% and its life cycle maybe get completed even within 6 to 10 days, if the temperature range remains within 25°C to 30°C. The relative abundance of the malaria vectors are directly controlled by the climate variables (Figure 2). The multivariate geostatistical model predicted accurately the spatial association between the malaria transmission and climate variables, and perhaps, supplementary tool for assessing the relative abundance of malaria vectors breeding habitats suitability in the country with accuracy of 85% and improved to 90% (Table.1).

The geostatistical analysis of linear multivariate analysis provides the strong relationship between the geo-climatic variables and malaria transmission. The longevity and survival of infected mosquitoes and the prevalence of the disease have been spatially associated and are definitely controlled by the geo-climatic variables. The malaria epidemics in India has spatially significant with the range of population density, it means the village settlement clusters within the range of population from 100 to 1100 was mostly affected by malaria transmission across the country (figure 3a and figure 3b). The multivariate analysis has statistically significant when the variables were analyzed simultaneously. The result was arrived to demarcate the boundary of the malaria risk zones in the country, based on the Malaria Transmission Risk Index (Figure 4). The predicted malaria transmission risk zones and the community of people at of malaria transmission could be datum of baseline for decision making and disease control in the country.

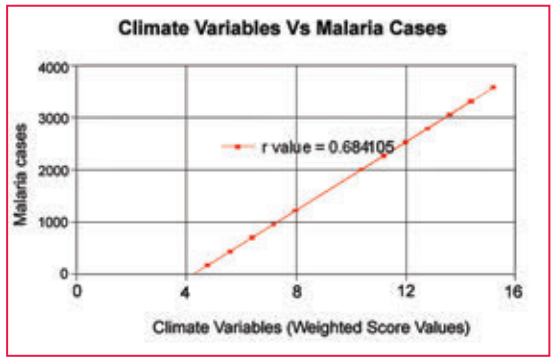


Figure 2: The spatial relationship between the climate variables and the occurrences of malaria epidemic cases across the country

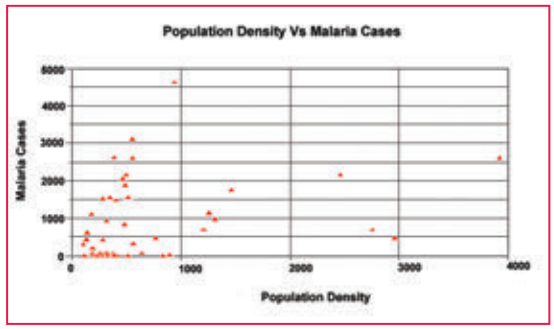


Figure 3a: The spatial relationship between the population density in the settlement clusters with range of 1000 to 4000 and the malaria cases in India

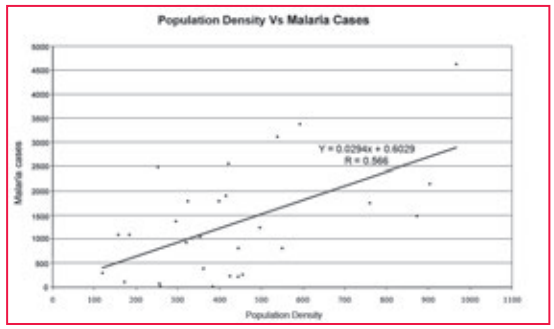


Figure 3b: The spatial relationship between the Population Density or village settlement clusters with the population range of 100 to 1100 and the malaria cases in the country

Remote sensing and GIS for mapping malaria transmission

Remote sensing and GIS has the important role in mapping the ecological aspects of *Anopheles* genus malaria vectors breading habitats. Remote sensing of IRS LISS I and LISS II data products were integrated into GIS for spatial analysis for classification and mapping of land use land cover categories and mapping the breading habitats of *Anopheles* genus vector mosquitoes (Palaniyandi M, 2012, Sharma VP, et al, 1996). The spatial relationship between the normalized differential vegetation index (NDVI) and the *Anopheles* genus malaria vector shows that the model fitted with statistically significant (Liu J and XP Chen, 2006). Subsequently, it helps to assess the people at risk of malaria epidemic in the different environments of geographical areas for delineating the malaria epidemics well in advance. The large data sets of climatic variables were integrated with remote sensing data for mapping the seasonality and the occurrence of malaria transmission

Table1. A multivariate geostatistical model for predicting the malaria transmission

Model Prediction				
Model	R value	R square	Adjusted R square	Std Error of the Estimate
1	0.631a	0.398	0.387	5.9753
2	0.683b	0.467	0.456	5.3264
3	0.684c	0.468	0.458	4.5432

a. Predictors (constant): Temperature, Relative Humidity (RH)
b. Predictors (constant): Temperature, Relative Humidity (RH), Saturation Deficit (SD)
c. Predictors (constant): Temperature, Relative Humidity (RH),Saturation Deficit (SD),Rain Fall (RF)

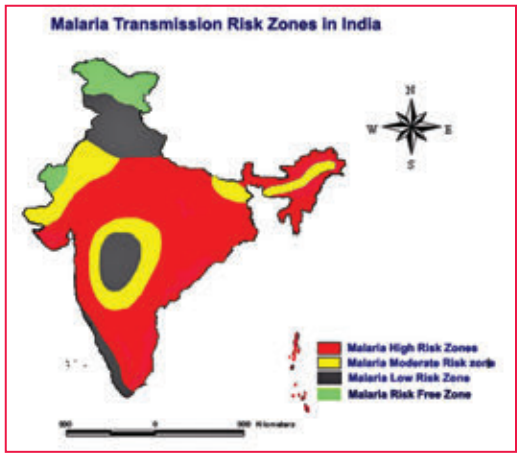


Figure 4: The malaria transmission risk zones in the country based on the climate variables

intensity. The Normalized Difference Vegetation Index (NDVI) derived from the satellite data ranges between the value of (-) 1 and (+) 1. The spatial agreement between the observed and predicted values of logistic regression model is r=0.76 sensitivity and specificity of 0.78 of larval index within a buffer around the trap location of rice fields (Wood BL, *et al*, 1991 and 1992). The higher NDVI values (correlated with high rice tiller densities) in the early growing season were found to have higher larval mosquito densities (Leonardo LR, *et al*., 2005). The remote sensing information was integrated with human settlements and livestock data in the linear multiple discriminant analysis enabled added advantage of mapping the host availability of *anopheles genus breeding* habitats suitability.

Conclusion

Remote sensing and GIS were used for mapping the malaria vector breeding habitats facilitate to estimate the people at risk of malaria transmission. The results show that spatial agreement was existed between the environmental variables and the malaria endemics. The remote sensing and GIS has been provided the guide lines for mapping transmission risk zones based on the information derived from the geostatistical analysis of environmental variables in the country. Thus, the techniques could be used as the datum of baseline for prioritizing the areas for taking appropriate prevents measure to the malaria transmission control in the country.

References

Akhtar R. and Mc Michael AJ, 1996. Rainfall and malaria outbreaks in Western Rajasthan. *Lancet*, 348: 1457–1458

Bhattacharya S, *et al*, 2006. Climate change and malaria in India, *Current Science*, 90(3): 369 – 375.

Beck LR, *et al.*, 1997. Assessment of a remote sensing-based model for predicting malaria transmission risk in villages of Chiapas, Mexico. *Am. J Trop. Med. Hyg.* 56: 99–106

Bouma M, *et al*, 1995. Epidemic malaria in India's Thar Desert. *Lancet* 346: 1232–33

Ceccato PS, *et al*., 2005. Application of geographical information systems and remote sensing technologies for assessing and monitoring malaria risk. *Parassitologia* 47(1): 81-96

Craig, M.H. et al. 1999. A climate-based distribution model of malaria transmission in sub-Saharan Africa. Parasitol. Today 15, 105–111

Dale PE, *et al.*, 1998. An overview of remote sensing and GIS for surveillance of mosquito vector habitats and risk assessment. *J Vector Ecol*, 23: 54-61

Hay SI, et *al*, 1998. From Predicting Mosquito Habitat to Malaria Seasons Using Remotely Sensed Data: Practice, Problems and Perspectives *Parasit. Today*, 14(8): *306 – 313*

Hay SI, et al., 1998. Prediction of malaria seasons in Kenya using multi-temporal meteorological satellite sensor data. *Trans. R. Soc. Trop. Med. Hyg*. 92, 12–20

Leonardo LR, *et al*., 2005. A study of the environmental determinants of malaria and schistosomiasis in the Philippines using remote sensing and geographic information systems. *Parassitologia* 47 (1):105-14

Lindsay SW and Birley MH, 1996. Climate change and malaria transmission. *Ann. Trop. Med. Parasit.* 90, 573–588 resurgence – reply. *Nature* 420: 628

Liu J and XP Chen, 2006. Relationship of remote sensing normalized differential vegetation index to *Anopheles* density and malaria incidence rate. *Biomed Environ Sci* 19 (2):130-2

Mushinzimana ES, *et al.*, 2006. Landscape determinants and remote sensing of *anopheline* mosquito larval habitats in the western Kenya highlands. *Malaria J* 5(1):13

Palaniyandi M and T Mariappan, 2012. "Remote Sensing and GIS for malaria control in the urban environment- a case study, Vizagappattinam City, India", Geospatial World, 27th Feb, 2012 Vol.8 Issue 9, PP1-9

Roberts JF, *et al*., 1994. Remote sensing as a landscape epidemiologic tool to identify villages at high risk for malaria transmission. *Am J Trop Med Hyg* 51(3): 271-80

Sharma VP, *et al.*, 1996. Study on the feasibility of delineating mosquitogenic conditions in and around Delhi using IRS satellite data. *Indian J. Malariology* 33: 107–125

Singh N and Sharma VP, 2002. Patterns of rainfall and malaria in Madhya Pradesh, central India. *Ann. Trop. Med. Parasitol.*, 96(4): 349–359.

Small J. et al., 2003. Climatic suitability for malaria transmission in Africa, *Proc. Nat. Acad. Sci.* USA, 100: 15341–15345

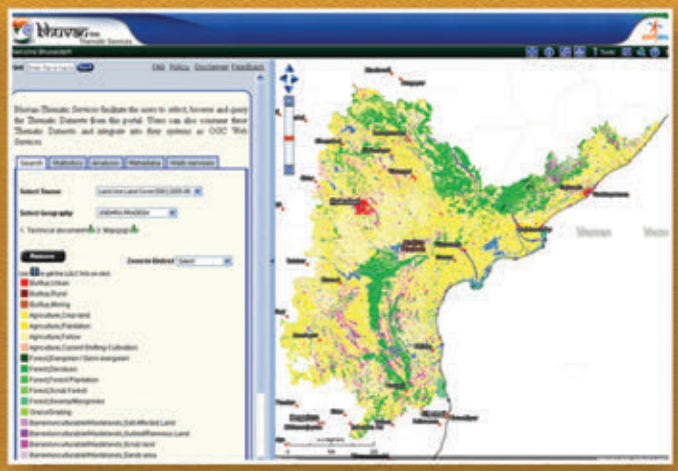
Thomson MC. *et al*., 1996. The ecology of malaria – as seen from earth-observation satellites. *Ann. Trop. Med. Parasit.* 90: 243–264

Tyagi BK, *et al*.,. 1995. Epidemic malaria in Thar Desert. *Lancet* 346: 634–35.

Wood BL, *et al.*, 1992. Estimating high mosquito-producing rice fields using spectral and spatial data. *Int. J. Remote Sensing*, 13, 2813–2826

Wood BL. *et al.*, 1991. Spectral and spatial characterization of rice field mosquito habitat. *Int. J. Remote Sensing* 12: 621–626

Bhuvan:Gateway to Indian Earth Observation



Thematic Services

Features

- Bhuvan 3D Visualisation
- Services - Land, Ocean, Weather, Disaster etc.,
- Pocket Bhuvan
- Multi-Lingual Bhuvan
- Rich Thematic Information
- Free Downloads - Carto DEM, AWiFS, LISS III

bhuvan *makes difference*

www.bhuvan.nrsc.gov.in

National Remote Sensing Centre, Balanagar, Hyderabad-500037. www.nrsc.gov.in sales@nrsc.gov.in

Pléiades 1B, captures its first images using e2v sensors

Pléiades 1B, the Centre National d'Etudes Spatiales (CNES) Earth observation satellite, has captured its first images using e2v high performance imaging sensors. *www.e2v.com/*

Pleiades 1B First Image - Lorient harbour, Brittany, France.

The OGC Wide Area Motion Imagery best practices document

The Open Geospatial Consortium (OGC®) has adopted the OGC Wide Area Motion Imagery Best Practices Document (WAMI BP) as an official OGC Best Practice. The OGC WAMI Best Practices Document recommends a set of Web service interfaces for the dissemination of Wide Area Motion Imagery (WAMI) products. It describes a performance centric, scalable grammar and schema that enable globally federated dissemination of WAMI products for high performance, high-speed consumption. *http://www.opengeospatial.org/*

Vietnam to launch first Earth observation satellite

This will be the third satellite invested in by Vietnam, after Vinasat-1 and Vinasat-2. While the previous two versions mainly serve telecom business and capacity leasing, the third will be launched for scientific research. Bui Trong Tuyen, vice president of the Space Technology Institute, informed the Earth observation satellite will be named VNREDSat-1A, and is scheduled for launch in April or early in the second quarter. *SGT*

China no longer reliant on satellite image imports

China's first high-resolution, stereo mapping satellite Ziyuan III meets international standards, ridding the country of its reliance on imports of satellite images. China used to import over 90 percent of its remote-sensing data. The launch of Ziyuan III has enhanced the country's capability to capture space remote-sensing images, bolstered state security and boosted the geo-information industry. China plans to build a remote-sensing mapping satellite system in 10 to 15 years. Three follow-up mapping satellites are already in the pipeline. *http://www.chinadaily.com.cn/*

EagleView and Pictometry announce merger

EagleView® Technologies and Pictometry jointly announced that they have entered into a definitive merger agreement under which EagleView and Pictometry have combined their businesses into a single entity. *pictometry.com*

Arianespace to launch VNREDSat-1A built by Astrium for Vietnam

Arianespace and Astrium have signed the launch contract for the VNREDSat-1A Earth observation satellite, on behalf of the Vietnamese Academy of Science and Technology. VNREDSat-1A will be launched during the second quarter of 2013 by the second Vega launcher, VERTA 1, performed by Arianespace at the Guiana Space Center, French Guiana, for the European Space Agency (ESA). The satellite will be carried in the lower position on the Vespa multiple launch structure used for this mission. *http://www.arianespace.com/*

DARPA reveals plan to use robots to recycle satellites

The Defense Advanced Research Projects Agency (DARPA) has an ambitious plan to service -- and even recycle -- satellites using robotics. Today, when a satellite fails, it is a total loss. The satellite either burns up in Earth's atmosphere or lifelessly orbits the planet until a replacement is launched. DARPA's Phoenix program is a plan to change that cycle by sending robots to scavenge parts from dead satellites and attach them to miniature "satlets" to reuse.

The main item of interest for DARPA researchers is how to reuse the antennae of functionless satellites. While most satellites are uniquely designed to serve their particular function, certain pieces of the spacecraft could be recycled - including the antennae and solar arrays. *http://www.cbsnews.com/*

S Korea launches first satellite into orbit

South Korea has successfully launched a satellite into space from its own soil for the first time, a point of national pride that came weeks after archrival North Korea accomplished a similar feat to the surprise of the world. The South Korean rocket blasted off from a launch pad in the southwestern coastal village of Goheung. Science officials told cheering spectators minutes later that the rocket delivered an observational satellite into orbit. *http://www.cbsnews.com/*

Japan launches satellites to spy on NoKor

Japan has launched two satellites to strengthen its surveillance capabilities, including keeping a closer eye on North Korea. One of them was a radar-equipped unit to complete a system of surveillance satellites that will allow Tokyo to monitor any place in the world at least once a day. The other was a demonstration satellite to collect data for research and development. From an altitude of several hundred kilometres, the radar satellite will be able to detect objects on the ground as small as a square metre, including at night and through cloud cover. *http://www.mb.com.ph/*

Iran to launch Zafar satellite this year

The president of Iran's University of Science and Technology says the Islamic Republic plans to send its domestically-produced

softmouse 3D™

Smooth, lightweight and accurate

SOFTMOUSE 3D-USB PHOTOGRAMMETRIC CONTROLLER

Experience unparalleled ease of use and comfortable two-handed operation with the softmouse 3D photogrammetric controller. If you require *precise digitizing and manipulation of elements in a 3D virtual environment*, softmouse 3D is the tool of choice. Smooth, lightweight and accurate, softmouse 3D is perfect for photogrammetric systems, for GIS and mapping applications, strategic military planning and many other 3D applications.

- Direct USB connectivity (no more interface box!)
- High-precision laser navigation (no more balls or encoders to clean)
- New high-reliability switches
- New, more comfortable silicone buttons
- Backward compatibility to existing software by means of serial port emulation
- Included in the package: high-performance Teflon® treated mouse pad
- Supports Windows 7 and XP in 32 and 64 bits
- Has been tested with the following applications*: Digi3D™, ImageStation™, Inpho's Match AT™ KLT Atlas™, PurVIEW™, Socet GXP™, Socet Set™, Stereo Analyst™, Summit Evolution™, LPS™, Virtuoso™, and others supporting the old Immersion™ mouse.

Exclusive offers available for Coordinates subscribers only!

Mention promo code COORDINATES when placing your order.

To learn more, visit **www.softmouse-3d.com**, email us at **softmouse3d@ggsnet.com** or call us at (US) **+1 303 223 4638**

GGS

GLOBAL GEO SUPPLIES, INC.

CERTIFIED USB

Compatible with Windows 7

*All product names are trademarks of their respective owners. Softmouse 3D™ is a trademark of Global Geo Supplies, Inc.

satellite Zafar (Triumph) into space within the next eight months. Saeed Jabal-Ameli told reporters that the satellite would be launched into space by the summer of the Iranian year 1392 (September 2013). He said that Zafar had better and more capabilities compared to its original version, Navid satellite. Iran successfully launched its first indigenous data-processing satellite Omid (Hope) into orbit in 2009. *www.presstv.ir/detail/*

Belarus creating core equipment for Egyptian satellite

Belarus is creating the core equipment for an Egyptian remote sensing satellite, BelTA learned from Mr Oleg Semenov, Chief Engineer of the enterprise Geoinformation Systems of the National Academy of Sciences of Belarus. The Belarusian core equipment will be used by the EgyptSat satellite, which is scheduled for launch in 2014. *http://law.by/main.aspx?guid=105843*

Astrium Services partnership with GAF

Astrium Services' GEO-Information experts have now signed up GAF AG, one of Europe's leading providers of Earth observation and geo-information solutions, as a channel partner for their satellite data and value-added products in Germany. *www.astrium-geo.com*

New command successor for GPS Directorate

Col. William T. "Bill" Cooley will take up the role of Senior Materiel Leader at the Department of Defense (DoD) acquisition office for developing and producing GPS satellites, ground systems, and military user equipment.

Cooley currently serves as the director of the Air Force Research Laboratory (AFRL) Space Vehicles Directorate and as the commander of the Phillips Research Site at Kirtland Air Force Base, New Mexico. *www.marinelink.com/*

Joint UK–US statement regarding GPS Intellectual Property

The Governments of the UK and the USA have reached a common understanding of intellectual property rights related to the GPS and will work together to address broader global navigation satellite systems' intellectual property issues. This understanding is part of a broader shared effort to advance compatibility and interoperability among civil satellite navigation systems and transparency in civil service provision. The two governments affirmed their joint commitment to ensuring that GPS civil signals will remain perpetually free and openly available for users worldwide. As part of this effort, the UK is dedicating all government held patents and patent applications relating to U.S. GPS civil signal designs and their broadcast from GPS and other global navigation satellite systems to the public domain. The UK has committed to not pursue or assert intellectual property rights over any aspect of these signals, now or in the future. *www.gps.gov/*

China's BeiDou system is GLONASS ally, not competitor – Russian expert

The beginning of the commercial operation and active development of China's BeiDou navigation system poses no threat to Russia's GLONASS, technical director of M2M Telematics holding group Alexei Kutsenko has said.

"No, the development of the Chinese satellite constellation poses no threat to Russia. The world now is moving to multisystem navigation equipment both on the market of professional equipment and on the consumer market," he said. He said that the consumer does not care how many navigation systems his navigation device supports. The main thing for him or her is reliable positioning. "The more systems equipment is going to support wherever it is produced - in China, Russia or Europe - the more all interested participants will gain," he said.

M2M Telematics is Russia's largest holding group comprising developers, manufacturers, system integrators and turn-key solution vendors in the market of vehicle telematics and satellite navigation based on GLONASS and GPS technologies. *http://rbth.ru/news/*

NYPD uses GPS to combat Painkiller Bandits

Police in New York City plan to combat the theft of painkillers and other highly addictive prescription medicines by asking pharmacies around the city to hide fake pill bottles fitted with GPS devices amid the legitimate supplies on their shelves. The New York Police Department believes the so-called "bait bottles" could help investigators track stolen drugs and locate suspects. *http://www.sci-tech-today.com/news/*

Roscosmos: Plans for GLONASS programme

Russia will build and launch 13 GLONASS-M and 22 GLONASS –K satellites between now and 2020, according to an outline of the nation's space program published on the Federal Space Agency (Roscosmos) website. The document, "Space activities of Russia in the years 2013–2020," described plans for the GLONASS program's 326.5 billion–ruble (US$10.77–billion) budget during those years. The programme has a stated goal of providing 1.4 meter positioning accuracy by 2015 and 0.6-meter accuracy in 2020. *http://www.un-spider.org/*

BeiDou now opened for public usage

China opened up for public use its home-built GNSS System, the BeiDou Navigation Satellite System (BDS). Currently BeiDou has 16 navigation satellites that offer coverage in the Asia Pacific rim, down to Australia. the China Satellite Navigation Office expects to provide worldwide coverage by 2020 with additional satellites. This public opening also materializes through the release of an Interface Control Document (ICD) for the Open Service. This document will finally allow international providers of GNSS chipsets to support BeiDou with their products along with the existing GPS and GLONASS constellation. *www.gpsbusinessnews.com/*

Russia and India join global satnav augmentation meeting

More than 50 of the specialists overseeing the world's five regional satnav augmentation systems met at Toulouse in southern France for the latest meeting of the Satellite-Based Augmentation Systems (SBAS) Interoperability Working Group (IWG). The gathering was the first to be attended by Russia's space agency and the Indian Bureau of Civil Aviation, to discuss their own SBAS systems. The meeting was jointly hosted by ESA's European Geostationary Navigation Overlay System (EGNOS) and SBAS Division with the French space agency, CNES. *http://www.esa.int/*

The GNSS market positions itself for the future

Frost & Sullivan analysis forecasts increasing prominence of Position, Navigation and Timing (PNT) data derived from GNSS) and associated Value Added Services (VAS) in the next 10 to 20 years. As US and European stakeholders continue to demonstrate growing interests in the region in collaboration with regional systems/service providers, APAC will continue to represent as the fastest growing region through 2021, as forecasted in a recent Frost & Sullivan Market Insight entitled: "Global Navigation Satellite System Market Assessment - In Pursuit of New Business Opportunities."

Frost & Sullivan forecast shows that the APAC market is anticipated to more than double in 10 years, from EUR22.10 billion in 2012 to EUR56.07 in 2021, with one of the fastest growth rates among regions at 10.9 per cent. The European market value is estimated to grow from EUR16.90 billion in 2012 to EUR28.54 billion in 2021. *www.frost.com*

GNSS charges by Russia – a cause of concern

It had always been ICAO's intent that civil user services provided by the global navigation satellite system (GNSS) should be free of charges or user mandates, except for certain optional applications such as fee-bearing accuracy enhancements with performance guarantees. Europe's Galileo is expected to offer such optional enhancements. But Russia has announced that it will mandate the carriage of receivers for its Glonass constellation in all aircraft on its civil aircraft register. GPS may also be used, but only when integrated with a Glonass receiver and its adjuncts. Publicly, ICAO has acknowledged that Russia's mandate is within its sovereign rights, but individual national representatives at the ICAO Air Navigation Conference in November'12 were unwilling to comment openly on the Russian position. Possibly, according to one representative, there is an underlying concern that Russia's action might encourage other GNSS constellation owners to impose mandates. The unnamed but most likely candidate is China, which is making rapid progress toward completion of its GPS-like Compass global system. *www.ainonline.com/*

Galileo update

Galileo's search and rescue system passes first space test

The first switch-on of a Galileo search and rescue package shows it to be working well. Its activation begins a major expansion of the space-based Cospas–Sarsat network, which brings help to air and sea vessels in distress. The second pair of Europe's Galileo navigation satellites – launched together on 12 October last year – are the first of the constellation to host SAR search and rescue repeaters. These can pick up UHF signals from emergency beacons aboard ships and aircraft or carried by individuals, then pass them on to local authorities for rescue. Once the satellites reached their 23 222 km-altitude orbits, a rigorous test campaign began. The turn of the SAR repeater aboard the third Galileo satellite came on 17 January. "At this stage, our main objective is to check the repeater has not been damaged by launch," explains ESA's Galileo SAR engineer Igor Stojkovic. Cospas–Sarsat system"The first day was a matter of turning the repeater on and checking its temperature and power profiles were as predicted. "The following day involved sending a signal to the repeater using the UHF antenna at ESA's Redu Centre in Belgium, then picking up the reply from our L-band antenna." *http://www.esa.int/*

Road and rail looking ahead to new satellite opportunities

Satellite-driven technology will make travel faster, smoother and safer in the coming years, and Europe's Galileo programme is speeding the changes, experts agreed at the European Space Solutions conference couple of months back. Michel Bosco, the Deputy Head of EU Satellite Navigation Applications and International Affairs Unit at the European Commission's Directorate General for Enterprise and Industry, underlined the variety of satellite services being developed for road users. Route planning is obvious, but other services include eCall, which sends an automatic message to emergency services when there is an accident, giving the precise location; road charging; tachographs; and the tracking of shipments, especially hazardous materials. Bosco noted that Europe currently only has a 20% of the worldwide GNSS application sector, and he warned that there was a risk of missing a big opportunity. Andy Sage, Director of technology consultancy Helios, outlined how GNSS had helped fuel the growth of Intelligent Transport Systems (ITS) with a wide selection of applications including roadside assistance, vehicle maintenance management, broadband and infotainment, and traffic management. Fiammetta Diani, Market Development Officer at the European GNSS Agency (GSA), said GNSS has also potential applications in fleet management and low density line signalling, which could offer significant cost savings. *http://www.gsa.europa.eu/news/*

Curtin University combines GPS with Galileo satellite

Researchers from Curtin University have discovered how to integrate GPS technology with the emerging multi-frequency Galileo. The research, funded by the Australian Space Research Program, is the first to be completed in Australia. Professor Peter Teunissen and Dr Dennis Odijk, from the Western Australian School of Mines (WASM), combined real-time data collected using high-grade multi-GNSS receivers from different manufacturers for baseline studies in Australia and the United States. *http://www.cio.com.au/*

$3 billion generated by Indian geo services industry in 2011

The Indian geo services industry generated $3 billion in revenue in 2011 alone while accounting for approximately 1,35,000 jobs, according to a BCG report commissioned by Google. The report said that the impact of the geo services industry is valued at approximately 15 times it's own size. In India, geo services help Indian businesses drive $40-45 billion in revenue, save $70-75 billion in costs and affect 8-9 million jobs in India.

The BCG report also found that Indian consumers are also willing to pay $1.5-2 billion more than they currently do for geospatial services such as online maps, navigation systems and local searches. *www.telecomtiger.com/*

Spatially enabling national sport and recreation data

A collaborative project between Centre for eCommerce and Communications (CeCC) and the School of Health Sciences at the University of Ballarat, in partnership with the Australian Sports Commission, Victoria University and VicHealth, which involves the development of a spatial ICT system of sporting and recreation data, is gaining much interest from peak sporting organisations in Australia.

The Sport and Recreation Spatial project, which is being lead by Dr Rochelle Eime, joint VicHealth Research Practice Fellow (Physical Activity) at the University of Ballarat and Victoria University, provides a national system for presenting spatial data about the sports industry. The spatial ICT system has wide application and appeal. Not only will it have the potential to offer a greater understanding of the current sport and recreation industry in Australia, but it will provide the industry with evidence to make informed decisions to systematically grow their sport participation in the future. In addition, Sport and Recreation Spatial will provide the capacity to investigate the 'value of sport' in terms of participatory health benefits via access to national health and well being measures. *h.thompson@ballarat.edu.au*

Use the Power of Flexibility
IFEN GNSS Test Solutions

Visit us at the China Navigation Satellite Conference 2013 | May 15-17, 2013

NavX®-NCS Professional Simulators

Flexibility | Scalability | Usability

Turning our test expertise into your success.

IFEN's GPS/GLONASS/Galileo/BeiDou/QZSS RF Constellation Simulators are pushing the boundary in flexibility, scalability and usability.

In co-operation with

WORK MICROWAVE

IFEN GmbH

www.ifen.com

NavX® - Leading Edge GNSS Test Solutions

OS MapFinder app launched

Ordnance Survey's first official mapping app is proving popular with nearly 40,000 downloads in the first two weeks. The app includes free overview mapping with the option of purchasing more detailed 1:25 000 and 1:50 000 mapping in small easily accessible 100km^2 tiles. For the first time, mapping will be updated for free for the lifetime of the app, meaning users will always be able to access the most up-to-date mapping on their mobile devices. *www.ordnancesurvey.co.uk/*

Oxera quantifies the benefits of Geo services to global consumers

Google has published an Oxera report that estimates the revenues from global Geo services at $150 billion to $270 billion per year. For context, these findings suggest that this growing industry is already larger than estimates of the size of the video game industry, and generates around one-third of the annual revenue generated by the airline industry. This study is one of the first to consider Geo services as an industry in itself, encompassing all digital mapping and location-based services. *http://www.oxera.com/*

Tracking crime with GIS

The Chandigarh police, India plan to turn to technology to gain an upper hand over criminals and check crimes. They will improve surveillance with the introduction of the GIS soon. Police said in phase one of the drive to prepare a record of accident prone areas, the GIS system will depend on the already maintained record of the police control room. A private firm has already been given the task for compiling data for the system. *http://articles.timesofindia.indiatimes.com/*

Malaysia determines suitability of project locations with GIS

The Economic Planning Unit of the Prime Minister's Office (PMO) in Malaysia will be launching a GIS application this year which will help government agencies better identify a suitable location for their projects. *http://www.futuregov.asia/*

SuperSurv 3.1 field data collector

Supergeo Technologies has unveiled the Android-powered mobile survey application, SuperSurv 3.1. It integrates with GIS and GPS technologies to help filed surveyors collect spatial data with ease. The mobile GIS application supports common vector layer format (GEO and SHP). *www.supergeotek.com*

Blue Marble Desktop merged into Geographic Calculator 2013

Blue Marble Geographics has released the Geographic Calculator 2013, merging the various modules of the Blue Marble Desktop into one software application. Blue Marble's geospatial data manipulation, visualization and conversion solutions are used worldwide by thousands of GIS analysts at software, oil and gas, mining, civil engineering, surveying, and technology companies, as well as governmental and university organizations. *bluemarblegeo.com*

China, UN cooperate in geological information development

The Chinese government and the United Nations (UN) signed an agreement in November to jointly promote geological information management. Known as the cooperation on geospatial information management capacity development, the Chinese government will invest 4 million U.S. dollars in a UN trust fund. The money will be used in projects to strengthen China and other developing countries' capacities of geospatial information production, management and distribution. The five-year program, to be carried out from 2013 to 2017, will be conducted in workshops, short-term consultations, medium-term training as well as visits and exchanges. *http://news.xinhuanet.com/english/*

The Philippines to introduce new topographic maps soon

The National Mapping and Resource Information Authority (NAMRIA) in partnership with the Mindanao Development Authority (MinDA) will be introducing a total of 227 topographic maps of Mindanao island at scale 1:50,000 by March 2013. Mindanao is the second largest island in the Philippines and currently the eight most populous island in the world with a population of approximately 21, 583,000. The island group of Mindanao is divided into six regions, which are further subdivided into 26 provinces.

Kashmir state of India to improve power distribution system using GIS

The Power Development Department (PDD) is working on two projects worth Rs 1100 crores to improve power distribution system in the State. "The first phase of project worth Rs 192 crore is in the advanced stage of completion. It will make the distribution system more automated and consumer friendly," according to PDD chief engineer Manzoor Ahmad Matoo."We are going to use Information Technology in our distribution system and we will have a live map of each user up to electric poll," said Mattoo. PDD is going to use GIS mapping, consumer service line mapping and asset mapping of PDD property in entire 30 towns. *http://www.risingkashmir.in/news/*

Sustainable Building Performance Monitoring

Autodesk and NASA Ames Research Center have announced collaboration to research and develop new technology that can monitor and optimize the operational life-cycle of high performance buildings. Researchers from Autodesk Research and NASA will implement Autodesk Project Dasher technology at the NASA Ames Sustainability Base, a 50,000 square foot office building and showcase for technologies enhancing efficient resource utilization, including those developed by NASA for its space and aeronautics missions. Autodesk Project Dasher is an experimental Building Information Modeling (BIM) based platform that can provide building owners and operators with insight into full life-cycle real-time building performance. *www.dexigner.com/news/*

NEW!

RTS010

1 "
angle measuring accuracy

1mm+1ppm
distance measuring accuracy

F50

F60

RTS350

RTS330

GTA1800

FOIF
Since 1958
It's professional
Suzhou FOIF Co.,Ltd.

For more information please visit our website:
www.foif.com
or email to: internationalsales@foif.com.cn

Please contact with FOIF Dealer in India
JANAK POSITIONING&SURVEYING SYSTEMS PVT.,LTD
E-mail:janakji@vsnl.com Website: www.janaksurvey.com
Tel: 011-23515400,23515399 Fax: 011-23682185

JANAK

NGIS for Sustainable Development

The NSDI-12 Annual Event on "National Geo-Spatial Information System (NGIS) for Sustainable Development" was organised by Office of the Registrar General & Census Commissioner, India during 20-21 December, 2012 at the Convention Centre, Auditorium - II of Jawaharlal Nehru University (JNU), New Delhi. The Event was inaugurated by **Shri Ajay Maken**, Hon'ble Union Minister for Housing and Poverty Alleviation on 20th December, 2012 at 10.00 am

During the event, the Atlas on 'Houses, Household Amenities and Assets 2011' prepared by the Office of the Registrar General, India was released by Hon'ble Union Minister. The Atlas is based on the data captured during the "Houselisting and Housing Census 2011". It contains the map on Administrative set up of the country as on 01-01-2010, thematic maps on condition of occupied Census Houses, Household Amenities & Assets possessed by the households at State/ UT and District level. It would be quite useful for policy formulation, planning and decision making.

The document on NSDI Content Standards - Soils was also released and the Survey of India's Suveykshan Portal was unveiled by the Hon'ble Union Minister.

An exhibition was also organised at this occasion which was inaugurated by the Hon'ble Union Minister. Various Central/State Government Organizations involved in generating geo-spatial database are participating and exhibiting their map/data products. The exhibitors include Census of India, Survey of India, Forest Survey of India, National Remote Sensing Centre, National Atlas & Thematic Mapping Organisation and National Spatial Data Infrastructure.

At the closing of the two days' Conference, the valedictory address was delivered by Dr K Kasturirangan, Hon'ble Member (Science), Planning Commission, Govt of India on 21st December, 2012.

China's first state key laboratory for GIE established

China's first state key laboratory for Geographic Information Engineering (GIE) was established on January 16, 2013 in a surveying and mapping institute affiliated to the General Staff Headquarters (GSH) of the Chinese People's Liberation Army (PLA).

It is reported that this is the only state key laboratory in the field of military surveying, mapping and navigation in China, mainly engaging in basic research and application research of global geospatial information with the focus on exploring and innovating space-time benchmark calibration and new theories and technologies related to navigation. *http://english.peopledaily.com.cn/*

GSI to buy Korean made vessel to conduct coastal survey

Geological Survey of India (GSI) will soon have a new state-of-the-art research vessel to carry out coastal survey. GSI deputy director general and head, natural energy resources, NR Ramesh told that the new vessel worth Rs 500 crore will have all modern gadgets to carry out research. "The vessel will have all facilities to go deep waters and conduct survey. It will find out polymetallic nodules and many other things. The work of vessel is progressing in Korea and it will arrive within six months," Ramesh. *http://articles.timesofindia.indiatimes.com/*

Uganda mapping out its municipal presence

Digital mapping services and solutions provider, mapIT has announced the launch of the National Postcode & Addressing System. Since joining hands in May 2012 with SatNav East Africa, the company has been working on the pilot project of the Entebbe SatCodes solution. This addressing solution allows for every property to have a unique "address" and enhance the performance of service. This includes GIS solution with five layers; the implementation of a National Property Identifier using SatCodes to provide address codes for "turn-by-turn" navigation; the placement of address placards on all houses in Entebbe as well as a marketing campaign to demonstrate and educate service providers on the benefits. *www.itnewsafrica.com/*

ITT Exelis nabs $2.2m contract for GPS augmentation

ITT Exelis has won a $2.2 million contract from the Air Force Research Laboratory for research in support of the current GPS program. It will research the development of a small satellite navigation payload, known as GPS NAVSAT, to augment this system. The GPS NAVSAT seeks to provide affordable capabilities to aid end-users located in difficult to access environments. *http://washingtontechnology.com/*

Car owners 'frustrated' by navigation systems, says report

According to the J D Power and Associates 2012 US Navigation Usage and Satisfaction study, the increasing complexity of navigation systems is beginning to impact how happy consumers are with their cars.

The study suggests that owners are becoming frustrated by the complicated nature of modern menu systems, voice control commands and the ways you input your destination. Researchers identified six factors that contribute to overall satisfaction levels: ease of use; routing; navigation display screen; speed of system; voice directions and voice activation. On average, consumers reported a satisfaction level of 681 based on a 1,000-point scale, which the firm says is a 13-point decrease from 2011.

Most notably, the ease of use category fell, which declined 25 points year-on-year. *http://www.smartplanet.com/blog/*

TomTom navigation HD traffic gains resolution

Dubbed HD Traffic version 6.0, this latest upgrade combines information from over 76 million live sources, including connected navigation devices, mobile phones, and real-time incident data. From this, TomTom dashtop navigators and smart-phone apps are able to provide route guidance informed by local road conditions and react to changing congestion patterns. TomTom has also announced a partnership with Telenav to offer traffic information to its mobile users through the free Scout nav app, available on Android, iOS, and Windows devices. *http://news.consumerreports.org/*

First Global Parking Navigation Service

INRIX® has launched the industry's first parking navigation service. It goes beyond static parking Points of Interest (POIs) to provide the current cost to park, real-time information on the number of available spaces and detailed location information for a continuously expanding and updated database of off street parking locations in North America and 36 countries throughout Europe. Kenwood will be the first consumer electronics manufacturer to implement INRIX Parking in its new in-dash DVD entertainment receivers. *www.inrix.com*

New app uses GPS to help blind move around independently

Students and lecturers from Ngee Ann Polytechnic, Singapore have developed the smartphone application that uses GPS technology to map out the shortest path that is safe for them. The app, which guides the user via audio instructions and alarm beeps, also factors in the weather, taking a sheltered route to the destination, if it is raining. The project aims to help the blind get around more independently as they often have to rely on passers-by or guide dogs to find their way around. Some visually-handicapped individuals also have a muted social life because of their inability to navigate new and unfamiliar paths. *http://www.straitstimes.com/*

Indian mobile firms lock horns with Government over LBS

More than 18 months after the Government made it mandatory for mobile companies to set up location-based services, the operators are yet to implement it. The Cellular Operators Association of India has told the Department of Telecom (DoT) that telecom companies will not be able to set up the system unless the Government bears the cost.

In May 2011, the DoT had amended the mobile licences making it mandatory for setting up location-based services (LBS). This was done at the behest of security agencies because this technology, when implemented, will allow law enforcement agencies to pin point the location of a mobile user. According to the order issued by the DoT, operators were supposed to build capability that would show the location of a subscriber with an accuracy of 50 metres. According to mobile companies, it would cost over a billion dollars to implement this technology. In addition, they say the technology does not allow achieving the accuracy levels required by DoT.

"The service providers have diligently worked and explored various options to meet DoT requirements. The available solutions have many aspects that do not meet the technical requirements and have many flaws, which would result in non-compliance of the requirement when implemented on ground leading to the potential imposition of onerous penalties," the COAI said in a letter to DoT. However, technology vendors claim that the accuracy levels suggested by the DoT are achievable. For example, Polaris Wireless, one of the vendors of LBS technology, has written to the DoT that it has conducted trials with two operators.

However, COAI said the technical solutions available are not cost efficient. "Since this is purely a security requirement, we believe that the project should be funded by Government," COAI said. *www.thehindubusinessline.com/*

Movea app provides accurate indoor navigation

Movea has demonstrated accurate indoor navigation through its new mobile app. Movea's indoor navigation system takes signals from a handset's accelerometer, magnetometer, gyroscope, pressure sensor, GPS, and Wi-Fi, and matches them against known maps.

To begin with, Movea's mobile app asks for the user's height in order to estimate one's step length. With every move the user makes, the phone's accelerometer registers the step and the app detects the movement. The app further uses the phone's magnetometer as a compass to determine which way the user is facing. *www.mobilenapps.com/*

Apple investigating location-based emergency app for iPhone

Apple has shown continued interest in offering easy access to local emergency services when traveling through the iPhone. The concept is detailed in a patent continuation published by the U.S. Patent and Trademark Office and discovered by AppleInsider. Entitled "Location-Based Emergency Information," the proposed invention is credited in part to Scott Forstall, Apple's former chief of iOS who was chased from the company late last year. *http://appleinsider.com/*

Hyundai and Kia team up with Google for better in-car navigation

South Korean car-makers Hyundai and Kia will integrate Google's Maps and Places with cars due to be released later this year. The news was announced in a Google blog post that the two car-makers have partnered with the internet giant, joining a line of other well-known auto brands which have adopted the technology.

NovAtel GNSS receivers provide BeiDou support

NovAtel has announced support for the BeiDou Navigation Satellite System on its OEM6 family and select OEMStar GNSS receivers.The long-anticipated BeiDou Navigation Satellite System (BDS) Interface Control Document (ICD) release is a significant milestone that facilitates global acceptance of BeiDou into the growing range of satellite-based positioning applications.NovAtel has a long-standing partnership with several Chinese GNSS system manufacturers. This partnership has allowed NovAtel to verify B1 and B2 signal tracking on its latest generation receivers. The company has been supplying GNSS receivers that include the BeiDou constellation since Q4 2010. *www.novatel.com*

Magellan SmartGPS

Magellan® SmartGPS is a game-changing GPS device designed to completely redefine personal navigation by integrating social, local and mobile content, including Yelp and Foursquare, through Magellan's revolutionary cloud-enabled Smart Ecosystem. It is the first, total-solution navigation device to wirelessly sync the user's navigation data, such as favorite places and contacts, with a smartphone or personal computer. *www.magellangps.com*

u-blox GNSS platform successful with BeiDou satellite signals

u-blox has achieved successful satellite positioning using China's BeiDou Navigation Satellite System. The technical achievement establishes u-blox as the first GNSS component vendor to demonstrate compatibility with all globally deployed positioning systems: GPS, GLONASS, Galileo, QZSS and now BeiDou. *www.u-blox.com*

Geoscience Australia deploys Altus

Geoscience Australia has taken delivery of six APS-3G high-precision satellite surveying instruments from Altus Positioning Systems. The Altus APS-3G GNSS RTK receivers are being

used primarily for rapid-response surveying operations in the event of natural disasters such as earthquakes and floods, as well as daily surveying applications. *www.altus-ps.com*

Helios joins Egis

On 25 January Egis Avia, the French-owned aviation and Navigation Company acquired UK consultancy Helios. Egis Avia provides aviation services and products around the world. It operates 12 international airports and provides turnkey solutions to others. Helios delivers award-winning consultancy services to transport businesses, governments and institutions across Europe, the Middle East, Asia and Africa. *www.askhelios.com*

Hexagon acquires Listech

Hexagon has acquired Listech, a software development company dedicated to increasing the efficiency, accuracy and productivity of professional surveyors and engineers. Founded in 1988, Listech offers software solutions that expedite data processing and streamline workflows in land management, construction and engineering projects. *www.hexagon.com*

Leica Geosystems wins European tender

Leica Geosystems B.V. and the Dutch Land Registry Office (Kadaster) have signed an agreement to deliver surveying equipment for the next five years. This agreement continues the long-standing relationship that Leica Geosystems has with the Dutch Land Registry Office. *www.leica-geosystems.com*

CARIS and EIVA partnership for offshore surveys

CARIS and EIVA have signed a Memorandum of Understanding (MoU) to collaborate on providing offshore survey organizations with a tightly integrated and streamlined solution. Both companies develop state-of-the-art software for the marine offshore market. *www.caris.com*

DEME group selects Septentrio GNSS receivers for its Dredging Operations.

Septentrio announced today that DEME, a world leading group of dredging and land reclamation companies, has selected the TERRASTAR-D® "Precise Point Positioning" service to work with its Septentrio GNSS receivers. The Belgian dredging and environmental group is exploiting the service using Septentrio AsteRx2eL GNSS positioning and AsteRx2eH GNSS heading receivers to support its nearshore dredging and construction operations worldwide.

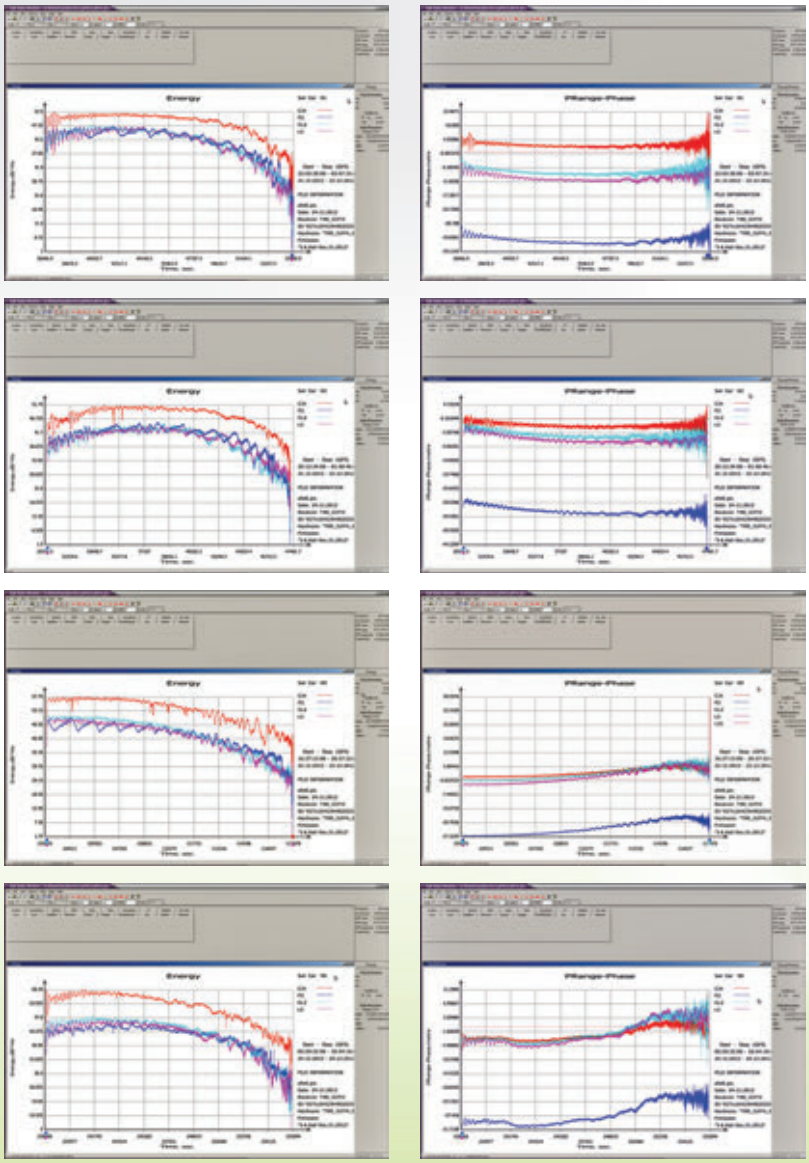
Swedish/UAE JV wins Abu Dhabi air navigation services contract

Sweden's air navigation services provider LFV and Global Aerospace Logistics (GAL) have signed a five-year agreement with Abu Dhabi Airports Co. (ADAC). The agreement will provide civil air navigation services at ADAC's five airports.

JAVAD GNSS announces Galileo E6 Signal Tracking

According to the JAVAD GNSS website "On December 21, 2012, we have tracked E6 B/C signal from all launched Galileo satellites, using TRE-G3T-E E6-band capable receiver.

"The following graphs shows SNR and 'code-minus-phase' combination of svn #11 (sat #81 on graph), svn #12 (sat #82) , svn #19 (sat #89) and svn #20 (sat #90). C/A stands for E1, P2 for E5B, CL2 for E6, L5 for E5A." *http://javad.com/*



Under the joint venture arrangement, GAL is the prime contractor for operations and LFV is responsible for the overall management functions of the air traffic control services. They will be employing a mix of local and foreign air traffic controllers, including LFV personnel. GAL will also be responsible for maintenance of the airport's communications and navigation equipment. *http://atwonline.com/*

MosaicMill releases EnsoMOSAIC v7.4

Finland-based MosaicMill Ltd. has released version 7.4 of EnsoMOSAIC photogrammetric software for small and medium format digital cameras. Camera self-calibration and GPS coordinate transformation and drift modelling have been added to assure high precision, with or without ground control. These are essential for most UAV flights and for unstable cameras. *www.mosaicmill.com*

ERDAS APOLLO 2013 Available as Part of Intergraph® Geospatial 2013

Intergraph® announces the release of ERDAS APOLLO 2013 as part of Intergraph Geospatial Portfolio 2013. ERDAS APOLLO 2013 is a comprehensive data management, analysis and delivery system allowing organizations to easily catalog, search, discover, process, and securely disseminate massive volumes of both file-based and web-enabled data.

Contex Scanner helps Harvard gain new insight from map archive

Contex, the world's leading developer of wide format scanning and imaging solutions, announced that the Arnold Arboretum of Harvard University recently scanned and archived a 50-year collection of nearly 1,800 maps using the Contex HD 4230 wide format scanner. The Arboretum's living collection of trees, shrubs, and woody vines is recognized as one of the most comprehensive and best documented of its kind.

ArcGIS for aviation improves aeronautical data management

Esri has released ArcGIS for Aviation, a new solution to support users in the aeronautical information management, air navigation service provider, and airport markets. This solution enables users to create, manage, review, and share aviation data. It includes ArcGIS for Aviation: Charting and ArcGIS for Aviation: Airports. Together, these products provide a comprehensive geospatial platform for aeronautical chart production and airport operations data management.

NEW

N71 GNSS Sensor
Set up your own Reference Station

Designed for seamless integration, the CHC N71 is a powerful 220-channel multi-applications GNSS sensor which delivers state-of-the-art positioning features in a rugged enclosure.

The CHC N71 is the most affordable high-end GNSS reference station solution for demanding system integrators, RTK network providers and Survey & Construction professionals.

Employing more than 450 people, CHC designs, manufactures and markets a wide range of professional GNSS solutions in over 50 countries.

Dealer Opportunities Available

www.chcnav.com

LabSat Record and Replay simulator now includes BeiDou

LabSat, the GPS simulator is now compatible with Chinese BeiDou constellation. It allows users to easily record raw satellite signals and replay them on the bench for testing GPS based products. Its low cost and ease of use has led to its wide acceptance by many leading OEM GPS chip manufacturers and integrators.

RapidStation photogrammetric software suite released

PIEneering Ltd has released a complete photogrammetric software system, RapidStation suite, for processing digital imagery acquired with Unmanned Aerial Systems (UAS), aircrafts and helicopters.

Surrey Satellite to evaluate small satellite approach to GPS

The Air Force Research Lab has selected Surrey Satellite Technology US LLC (SST-US) to investigate cost reduction and augmentation of the current GPS constellation through the application of the small satellite approach. SST-US will examine how constellations of smaller satellites could improve the overall system performance and resilience, including ways to deliver high-power signals and alternative architectures for rapid commanding. *www.sst-us.com*

Rockwell Collins and DARPA embedding GPS on smaller items

Imagine having GPS navigation capability embedded on something as small as a hummingbird-size unmanned aerial vehicle. That day may be coming soon, thanks to ongoing research and successful testing completed by Rockwell Collins and the Defense Advanced Research Projects Agency (DARPA). DARPA's Dynamics Enabled Frequency Sources (DEFYS) effort has created tiny electronic oscillators and Rockwell Collins has been testing the miniature clocks on GPS radios. *www.rockwellcollins.com*

MARK YOUR CALENDAR

March 2013

ASPRS 2013 Annual Conference
24 – 28 March
Baltimore, Maryland USA
www.asprs.org

April 2013

Annual World Bank Conference on Land and Poverty 2013
8 - 11 April
World Bank Headquarters,
Washington, D.C., USA
www.landandpoverty.com

The Eighth National GIS Symposium in Saudi Arabia
15-17 April
Dammam, Saudi Arabia
www.saudigis.org/

7th Annual GNSS Vulnerabilities and Solutions Conference
18 - 20 April
Baska, Krk Island, Croatia
www.rin.org.uk

UN/Croatia Workshop on GNSS Applications
21 - 25 April
Baska, Krk Island, Croatia
www.unoosa.org/oosa/SAP/gnss/index.html

Pacific PNT
22-25 April 2013
Honolulu, Hawaii
www.ion.org

35th International Symposium on Remote Sensing of Environment
22 - 26 April
Beijing, China
http://www.isrse35.org

European Navigation Conference ENC 2013
23 -25 April
Vienna, Austria
www.enc2013.org

The 7th International Satellite Navigation Forum
24 – 27 April
Moscow, Russia
http://www.expocentr.ru/en/events/glon

May 2013

Intergeo East 2013
2 – 4 May
Istanbul, Turkey
http://www.intergeo-east.com/

The 8th International Symposium on Mobile Mapping Technology
1-3 May
National Cheng Kung University, Tainan
http://conf.ncku.edu.tw/mmt2013/

FIG Working Week 2013
6–10 May
Abuja, Nigeria
www.fig.net/fig2013/

The 4th China Satellite Navigation Conference
15-17 May
Wuhan, China
www.beidou.gov.cn

June 2013

Hexagon 2013
3- 6 June
Las Vegas, USA
http://www.hexagonmetrology.us

The Munich Satellite Navigation Summit 2013
18 – 20 June
Munich Germany
www.munich-satellite-navigation-summit.org

12th SEASC – Geospatial Cooperation towards a sustainable future
18 - 20 June
Manila, Philippines
www.seasc2013.org.ph

TransNav 2013
19 - 21 June
Gdynia, Poland
http://transnav2013.am.gdynia.pl

RIEGL LIDAR 2013 International User Conference
25 – 27 June
Vienna, Austria
www.riegllidar.com

July 2013

GI Forum 2013
2 – 5 July
Salzburg, Austria
www.gi-forum.org

Survey Summit
6 – 9 July
San Diego, USA
www.esri.com/events/survey-summit/index.html

Esri International User Conference
8 – 12 July
San Diego, USA
www.esri.com

International Geoscience and Remote Sensing Symposium (IGARSS 2013)
22-26 July
Melbourne, Australia
www.igarss2013.org

August 2013

8th International Symposium on Digital Earth 2013 (ISDE 2013)
26-29 August
Kuching, Sarawak, Malaysia
http://isde2013.utm.my/

September 2013

ION GNSS 2013
16 – 20 September
Nashville, Tennessee, USA
www.ion.org

For Success in Today's Wild World, You Need to be Productive

FOCUS® 30

The Spectra Precision FOCUS 30 is a robotic total station providing high speed, accuracy and precision in measurement.

Like a hungry bear locking onto the flash of a darting salmon, the FOCUS 30 latches onto the prism and won't let go. No matter the conditions, you can rely on the trusted and proven LockNGo™ tracking technology to keep you working productively all day long.

Combined with Spectra Precision Survey Pro field software, the FOCUS 30 robotic surveying system offers world-class field productivity. Packaged in a modern, sleek, and streamlined design, it is easy-to-use, affordable, and tough.

Features

- Spectra Precision Survey Pro™ field software
- GeoLock™ GPS assist technology
- 2", 3", and 5" angle accuracy
- StepDrive™ motion technology
- LockNGo™ advanced tracking technology

FOCUS 30: Simply Powerful

AMERICAS

Spectra Precision Division
10355 Westmoor Drive, Suite #100
Westminster, CO 80021, USA

+1-720-587-4700 Phone
888-477-7516 (Toll Free in USA)

EUROPE, MIDDLE EAST AND AFRICA

Spectra Precision Division
Rue Thomas Edison
ZAC de la Fleuriaye - BP 60433
44474 Carquefou (Nantes), France

+33 (0)2 28 09 38 00 Phone

ASIA-PACIFIC

Spectra Precision Division
80 Marine Parade Road
#22-06, Parkway Parade
Singapore 449269, Singapore

+65-6348-2212 Phone


MAKE EXACT POSITIONING A SIXTH SENSE
SPAN®. Your positioning superhero.
SPAN is the world's most reliable OEM GNSS/INS technology, with the ability to provide continuous position, velocity and attitude. So an unprecedented mission—like landing an unmanned helicopter on a moving marine vessel—no longer stands in the way of success. Imagine how this kind of sensory superpower will help you rule in your world. As always, we'll keep your identity secret. To find out more, visit novatel.com/span or call you know who.
NovAtel
Integrate success into your