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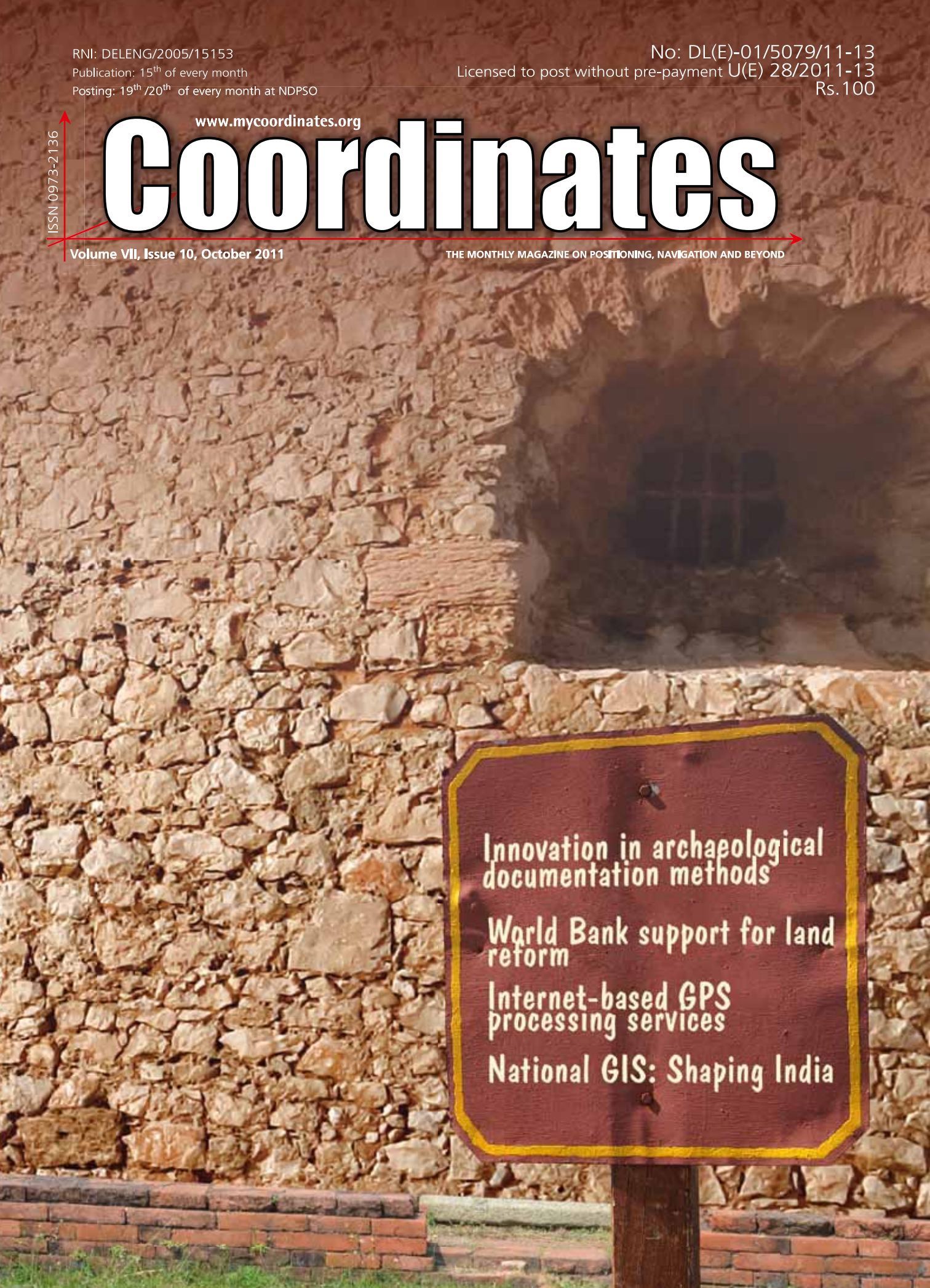

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Four Constellations in Four cm

Reference

4 cm

+

Rover

4 cm

=

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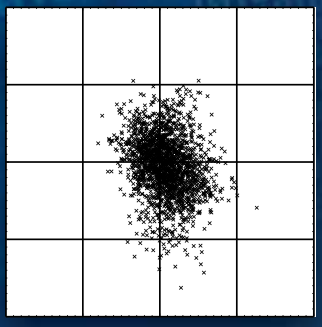

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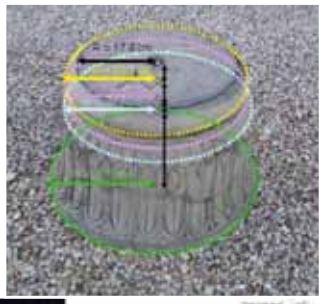

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Articles

Columns

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Land reforms

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It could also be playing a more apt role

If it is allowed to become a tool that empowers,

The poor and the landless,

Who deserves to be benefitted the most

Bal Krishna, Editor
bal@mycoordinates.org

Experiences from world bank development support for land reform

This paper discusses the World Bank support for sustainable land reform, focusing on the East Asia Region, with particular emphases on initiatives in land governance, land development investment, tenure security, NSDI, e-government, land tax, spatial planning, disaster response and mitigation. We present here the first part of the paper

Keith Clifford Bell
World Bank, East Asia Pacific Region
Washington DC, USA

The World Bank, with the support of development partners and civil society organizations (CSO), are continuing to support the implementation of land administration and management projects throughout the world. From the World Bank side, specific support to the land sector has been provided for the past three decades. These projects have varying degrees of emphasis on social equity and economic development. In post-conflict countries, tenure security and access to land are major factors in providing long-term stability. There are many complexities, dimensions and themes associated with land administration. Securing land rights is particularly relevant to vulnerable groups such as the poor, women, orphans, displaced persons and ethnic minority groups, especially after disasters or conflicts. Fees and taxes on land are often a significant source of government revenue, particularly at the local level, and often underpin the sustainability of decentralization. In most societies, there are many competing demands on land including development, agriculture, pasture, forestry, industry, infrastructure, urbanization, biodiversity, customary rights, ecological and environmental protection. Most countries have great difficulty in balancing the needs of these competing demands.

Reform of land administration in any country is a long-term prospect requiring decades of sustained commitment. It is a major investment of capital and human resources and requires strong, consistent, transparent and accountable leadership, in order to achieve effective, sustainable outcomes. Dealing with each and every one of these can contribute to achieving the challenges of the Millennium Development Goals (MDG). Reform is often inhibited or even undermined by poor governance. Good land administration is often as much related to land administration issues as it is to the quality of the civil service, especially its transparency and accountability. Investment in land administration systems should also explicitly see the development of the spatial data infrastructure and the spatial enablement of the government as part of overall reform, which facilitates an expanded agenda including land governance, social development, sustainable management of natural resources and the environment, disaster prevention, climate change, carbon monitoring and so forth. However, such investments need to be calibrated for the specific country requirements, including capacity and sustainability.

World bank support for the land sector

Overview

The World Bank has been directly engaged in supporting the land sector for more than thirty years. Over the past twenty years, the Bank has supported 76 dedicated land administration projects in 48 countries totaling an investment of around US$3.6 billion, and in addition, a further 228 projects (in 78 countries) had a secondary focus in land. Currently, the World Bank is providing funding of around US$ 1.5 billion for around forty-six projects which are classified as land administration and management projects. Projects with a secondary focus in land may fall under natural resources management, agriculture, forestry, urban development, housing and infrastructure sectors. Furthermore, the World Bank is also providing significant funding for land-related cross-sectoral analytical and technical assistance interventions globally, regionally and nationally. (Deininger and Bell, 2010).

Of all the development sectors supported by the World Bank, land is amongst the most challenging, complex and controversial, and it directly or indirectly, impacts the achievement of each of the eight MDG. However, it is also one of the most fundamental sectors, with land issues underpinning multiple other sectors. Land issues are deeply rooted in countries' histories and cultures. At its most extreme, land issues have been identified as cause of civil and international wars, and even genocide. Furthermore, land issues are often highly politically sensitive, implying that attempts to address them need to be solidly grounded in empirical research, often building on carefully evaluated pilots. The risk matrix for all land-related interventions is indeed high, and such risks run far more deeply than reputational risks to donor institutions, as the lives and the livelihoods of individuals is very much affected. The continuing legacy major natural disasters has emphasized the critical importance of land and property rights in reconstruction and rehabilitation. Table 1 presents a summary of World Bank supported land administration projects in the East Asia Region since 1984.

Table 1: Summary of World Bank Supported Land Administration Projects in East Asia

THAILAND	
1984–2002: Three Phases – Land Titling Projects I, III and III	
Program Focus	Tenure security and building a sustainable land administration system. Support provided for land titling, valuation, capacity building, training, education, institutional strengthening.
Achievements	9 million titles were distributed to land owners (no gender disaggregated data) Strong capacity – institutional, technical, service delivery Strong land and property market High public awareness Sustainability: very sustainable program still running. Annual operating costs of Thai Department of Land about US$150 million. Income generated about US$ 1.5 Billion Strong, sustainable education programs.
LAO PEOPLES DEMOCRATIC REPUBLIC	
1997–2009: Two Phases – Land Titling Projects I and II	
Program Focus	Tenure security and building a sustainable land administration system. Support provided for land titling, valuation, capacity building, training, education, institutional strengthening
Achievements	Approximately 400,000 land titles issued (37.5% of titles issued to women–compared to 23.4% to men) Strong capacity – institutional, technical, service delivery, implementation in all 17 provinces Strong public awareness High gender mainstreaming Sustainable land administration educations programs

INDONESIA	
1994–2001 and 2004–09: Two Phases – Land Administration Project; Land Management and Policy Development Project	
Program Focus	Institutional strengthening and capacity building, policy development, titling, local government land management
Achievements	Approximately 4.3 million titles distributed (no gender disaggregated data for Phase 1, 20% of the 2.3 million titles under Phase 2 issued to women) Training, capacity building & education, 3 x LAM education programs Institutional strengthening & policy development High levels of participation of women in public awareness campaigns Approx 1,000 local government personnel trained in LAM.
INDONESIA (disaster response)	
2005–2009: Reconstruction of Aceh Land Administration Project	
Program Focus	Tenure security in the reconstruction of Aceh after the tsunami and civil war – titling, institutional development and capacity building, policy.
Achievements	222,628 land titles distributed (28% distributed to women or joint owners) More than 300,000 land parcels community land mapped to support reconstruction Titles issued for 120,000 newly constructed houses Joint Land Titling Policy adopted : RALAS was designed to be the first program to systematically formalize hitherto women's customary land rights Institutional strengthening and policy development Strong public awareness Very high civil society engagement.
PHILIPPINES	
1999–Present: Two Phases – Land Administration and Management Project I and II	
Program Focus	Land administration reform including policy development, institutional strengthening and capacity building, land valuation and taxation.
Achievements	Key legislation for titling and valuation introduced Strong land administration service delivery Modest titling outputs as country has large proportion of first tilting completed High gender mainstreaming Land sector development framework, endorsed as the approach to reform and the national medium development plan, includes NSDI Valuation standards fully operational after extensive development and testing Fiscal reform in progress Strong partnerships with LGUs Key agreement with Indigenous Peoples established and under implementation.

CAMBODIA	
2002–10: Land Management And Administration Project	
Program Focus	Land policy development, institutional strengthening and capacity building, land titling, land dispute resolution and land management.
Achievements	1.2 million titles distributed Strong systematic land titling capacity developed in project provinces Dispute resolution procedures under cadastral commissions Strong land administration and surveying education programs established.
NB. A further program in Cambodia, Land Allocation for Social and Economic Development, has been under implementation, since 2008.	
VIETNAM	
2008 – Present: Vietnam Land Administration Project	
Program Focus	Tenure security (issuance of land use rights certificates –LURC), institutional strengthening, service delivery.
Achievements	Target of 5.1 million LURC to be issued (work in progress); 72% expected to be in joint ownership) Joint ownership introduced Single certificate covering land and building introduced Outsourcing of surveying and land certification All land offices in 9 provinces to be modernized, services standards, capacity building.

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Since the early 1980s, land administration programs have evolved from being more narrowly focused on titling, institutional strengthening and capacity building to address any number of the following:

- Institutional and policy reforms
- Capacity building in government and private sector
- Education
- Applications of information communications technologies (ICT) including computerized records management, geographic information systems (GIS), electronic data capture, web-based applications, satellite position systems (GPS/CORS), national spatial data infrastructure (NSDI), e-governance
- Service Delivery
- Land valuation and taxation
- State land management
- Land management
- Good governance and civil service reforms.

"Breaking News" – Land remains a high priority for World Bank support

During the first months of 2011, the World Bank's senior management have strongly affirmed the institution's support to agendas of the land sector. Firstly, in January 2011, the World Bank President, Mr. Robert Zoellick, in an interview with Newsweek, advised that the biggest challenge facing the developing world was food security and there was a need to give priority to property rights (Schneiderman, 2011). In April, 2011, Mr. Zoellick further drew attention to food security and the importance of land and property rights as well as the concerns of foreign direct investment (FDI) in land for agri-business.

More recently, Ms. N. Okonjo-Iweala, World Bank Managing Director, in opening the Bank's 2011 Annual Conference on Land and Poverty, advised:

"*Agriculture and food are back on the agenda for development agencies – and increasingly also the private sector. But to maximize investment in the sector and ensure that it yields benefits for local people, attention to land tenure is critical. .....*

….Increasing farmer's tenure security , ensuring that they can transfer land to better uses and join the non-farm economy in the context of structural change, and possibly allow them to use it to access credit . ……

In most developing countries, women's rights to land and girls' ability to inherit are weak. ...

…Land is critical for how cities expand. Opportunities to expropriate land from farmers at little or no cost lead cities to expand horizontally rather than vertically. This makes services costly to provide pushing the poor into far-flung informal settlements and increasing commuting and pollution.

Thus, while sources of tenure insecurity differ across regions - loss of land to urban growth is very important to Asia – consequences are similar. The main one is a failure to put a valuable resource to its best use and make it contribute to the local economy rather than rent-seeking and conflict. ……

…..In response to our clients we are fully committed to expand our commitment to address the challenges in this sector – especially as recent events have made doing so more urgent. …."

to be continued next issue

Analysis of Internet-based GPS processing service

In this study, the accuracy performance of internet-based online GPS processing service is analyzed

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Istanbul Technical University, Department of Geomatics Engineering, Istanbul, Turkey

Reha Metin Alkan
Professor
Istanbul Technical University, Department of Geomatics Engineering, Istanbul, Turkey


OPUS solution : Yali310e.08O 000036916

Figure 1: OPUS Service Result File

Positioning with GPS can be realized two main ways: i-Single Point Positioning (SPP), ii- relative positioning. When the high accuracy is required, the accuracy obtained from SPP is not enough and for those applications relative positioning method have to be considered. However in this method, there should be at least two receivers to collect the data and software to process these data.

In order to use the GPS Processing Software, their license price must be paid and users should take a training. For the users who do not have an experience to process GPS data with this software may sometime leads to the results that are wrong. Although it removes some of these problems to a certain degree with the usage of the network RTK systems named CORS- TR (TUSAGA Active), ISKI-UKBS in Turkey, it is still necessary to use traditional approaches when these systems are not considered to be enough or high accuracy is needed.

In recent years as an alternative to the traditional processing method, internet-based on-line GPS processing services have been started to be used widely. With the help of these services, collected GPS data are sent to the mentioned system and then the coordinate of the stations can easily and practically be obtained. In processing, the International GNSS Services (IGS) or fixed station data of CORS networks are considered as a reference and hence the coordinates of the stations are estimated with the relative method.

The most important advantage of these services is that the users can process their data just using a web browser and an e-mail without any GPS processing software knowledge. The usages of these systems are for saving both time and workforce by removing the needs of fixed station and software.

In this study, the accuracy performances of the internet based GNSS processing services are analyzed.

Internet-based GPS processing services

Traditionally, GPS surveys are conducted at least with two receivers, i.e. reference and rover receivers and the collected data is processed with the GPS processing software in the office. In this approach, the users need to do both surveys with at least two GPS receivers and also use the GPS processing software. These drawbacks can be removed by using the internet-based GPS processing services (Sanlioglu and Inal, 2005). Several internet-based automatic GPS processing services are put into service in the world. Today, there are five internet based GPS processing services that can be widely used for free of charge:

- Online Positioning User Service (OPUS) operated by United States National Geodetic Survey (NGS)
- Scripps Coordinate Update Tool (SCOUT) operated by Scripps Orbit and Permanent Array Center (SOPAC)
- Australian Online GPS Processing Service (AUSPOS) operated by National Mapping Division of GeoScience Australia
- AutoGipsy operated by NASA JPL (Jet Propulsion Laboratory)
- CSRS-Precise Point Positioning (CSRS-PPP) operated by Canada Geodetic Survey Division of Natural Resource Canada (NRCan).

Internet-based GPS processing services use different software. For instance SCOUT uses GAMIT software; AUTO-GIPSY uses GIPSY software; OPUS uses PAGES software; CRCS-PPP uses NRCan-PPP software; and AUSPOS usesMicroCosm software. Although the mentioned software have similar mathematical principles, they can differentiate in high modeling and data quality control algorithms (Tsakiri, 2008). The necessities in order to benefit from these services are the same; internet access and an e-mail address. The widely used on-line processing services are summarized below. More detailed information is given in Subası (2011).

Feature / Service	Association	Software	Limitations	Supported Data Type	Receiving Method	Fixed Stations
OPUS	American National Geodetic Survey	PAGES	min. 2 Hours max. 10 MB	*.Z Hatanaka Zip gzip, pkzip	www	Nearest 3 CORS/IGS
AUSPOS	Geoscience Australia	Micro Cosm	min. 1 Hour max. 24 Hours	*.Z Hatanaka Zip gzip, pkzip	www, ftp	Nearest 3 IGS
SCOUT	The Scripps Orbit and Permanent Array Center	GAMIT	min. 1 Hour max. 10mb	*.Z Hatanaka gzip, pkzip	ftp	Nearest 3 IGS

Table 1: Main features of the OPUS, AUSPOS and SCOUT processing services

Online positioning user service (OPUS)

Online Positioning User Service(OPUS) is a service that was set up by American National Ocean and Atmosphere Association (NOAA). In this system, the coordinates are determined from 3 CORS stations for the USA and from 3 IGS stations for the rest of the country. The coordinates are calculated by PAGES software is used improved by NOAA (URL 1). The services web site is http://www.ngs.noaa.gov/OPUS.

After uploading the GPS data collected in the field, type and height of the antenna were also introduced to the system with the help of the easy-usable interface. In addition, the CORS stations and geoid model which will be used in process can also be selected. OPUS calculates the coordinates by taking the results from three independent base vectors. After entering all the necessary information, process starts and results are sent to the e-mail address. For a single station, the process lasts approximately 15-20 minutes. The result message sent via mail includes user name, the studied file's name, used software's version, type and height of the used antenna, calculated survey epoch coordinates, used reference stations' names and coordinates. The OPUS system can process the survey files at most 10 Megabyte size and produced by at least 2 hours with dual frequency receivers. The result files sent to the user after the processing consist of survey epoch coordinates, UTM coordinates, type and height of the antenna, starting and ending times of the survey, ambiguity solution rate and so on (Figure 1).

Australian online GPS processing service (AUSPOS)

It is an online GPS data processing service prepared by Geoscience Australia Association. In this system, the coordinates are determined with the help of the 3 nearest IGS station. In the processing stage, IGS precise orbit information, earth rotation parameters and speed vectors of IGS stations are taken into count. For these evaluation, a GPS survey software is used named MicroCosm. Users can be reached to the AUSPOS processing service via http://www.ga.gov.au/bin/gps.pl web address (Figure 2).

Through the service's interface screen, users start the survey process by entering their e-mail addresses, type and height of antenna. Users can install the data both via interface and a ftp server. RINEX files can be installed in the zipped Hatanaka, *.zip or *.gzip format. In AUSPOS system 7 survey file can be processed at the same time. A survey file of a single day can be processed in approximately 15 minutes and the results are sent via e-mail (Subasi, 2011; URL 2).

In addition to the lots of standard information in the result files, there is also a map showing the location of the stations on the world map, mean-square error values and used troposphere model (Figure 3).

	Position (m)			Height (m)		
	Max	Min	Average	Max	Min	Average
24 hour	0,014	0,003	0,012	-0,038	-0,022	-0,028
12 hour	0,018	0,003	0,012	-0,037	-0,018	-0,028
4 hour	0,070	0,010	0,016	-0,070	0,020	-0,030
2 hour	0,098	0,003	0,024	-0,114	-0,011	-0,032
1 hour	-	-	-	-	-	-

Table 2: Differences between PPP-derived and Known Coordinates for OPUS service

	Position (m)			Height (m)		
	Max	Min	Max	Min	Max	Min
24 hour	0,007	0,001	0,004	-0,027	-0,005	-0,021
12 hour	0,017	0,001	0,006	-0,034	-0,009	-0,021
4 hour	0,130	0,003	0,014	-0,122	0,005	-0,020
2 hour	0,0215	0,005	0,029	-0,178	-0,001	-0,011
1 hour	0,151	0,007	0,050	-0,178	0,003	0,016

Table 3: Differences between PPP-derived and Known Coordinates for AUSPOS service

	Position (m)			Height (m)		
	Max	Min	Max	Min	Max	Min
24 hour	0,009	0,001	0,004	-0,026	-0,08	-0,015
12 hour	0,012	0,001	0,004	-0,042	-0,003	-0,02
4 hour	0,029	0,006	0,006	-0,106	0,004	-0,025
2 hour	0,0117	0,002	0,011	-0,106	-0,002	-0,018
1 hour	0,12	0,002	0,020	-0,106	0,008	0,007

Table 4: Differences between PPP-derived and Known Coordinates for SOPAC service

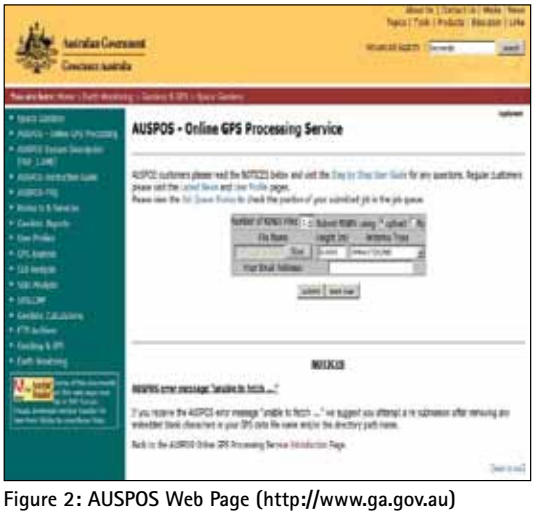

Figure 2: AUSPOS Web Page (http://www.ga.gov.au)

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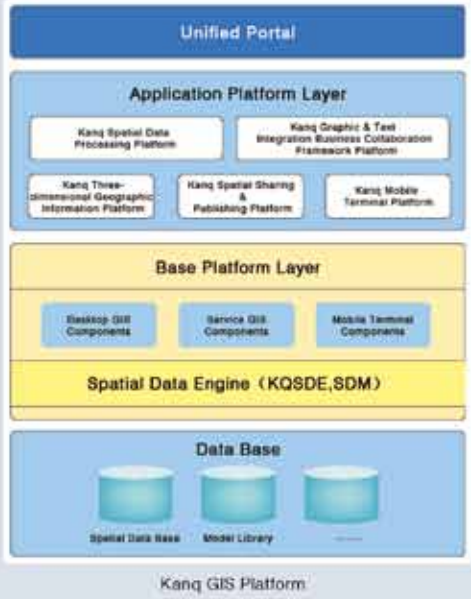

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set up by California University. It broadcasts under the SOPAC (Scripps Orbit and Permanent Array Center) Association. The service page can be accessed from http://sopac.ucsd.edu/cgi-bin/SCOUT.cgi address (Figure 4).

The GPS data files are uploaded in two stages. In the first stage, e-mail and survey files' ftp address to which the results are sent, are entered by using the interface screen (in SCOUT service data can only be sent via ftp). In this stage, it is possible to choose IGS stations that will be use as a reference station. The processing of the data is started after entering antenna type and height. The baselines is calculated from nearest 3 IGS stations and the coordinates are calculated by making a network adjustment. The data entered to the system should be at least 1 hour with a 30 seconds interval. The survey files can be in Hatanaka format or any other zipped formats. However, data in *.zip format is not supported. The SCOUT service uses GAMIT software (URL 3).

In the result file sent after the processing, coordinate information (survey epoch and ITRF 2005) and names of the used reference stations are sent in text file to the users.

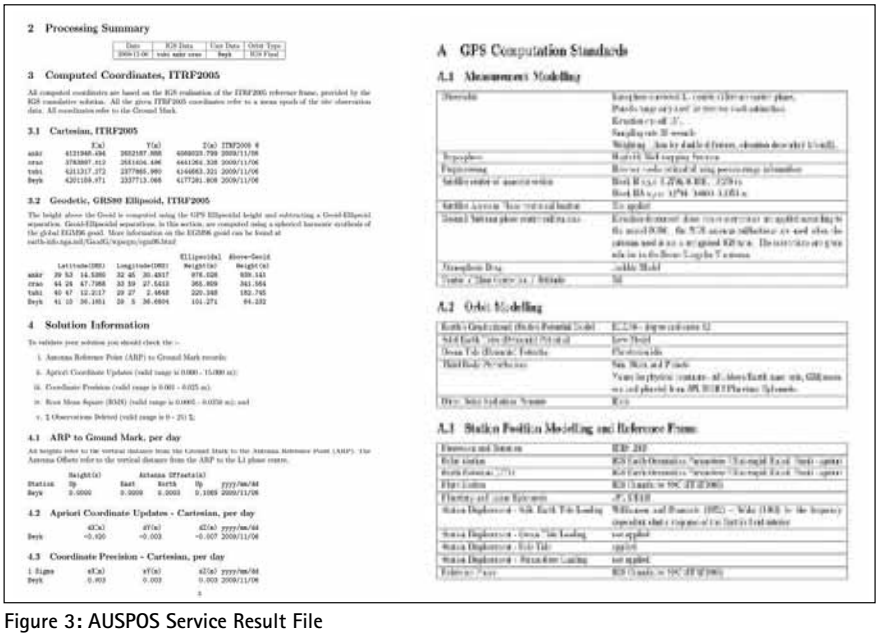

Figure 3: AUSPOS Service Result File

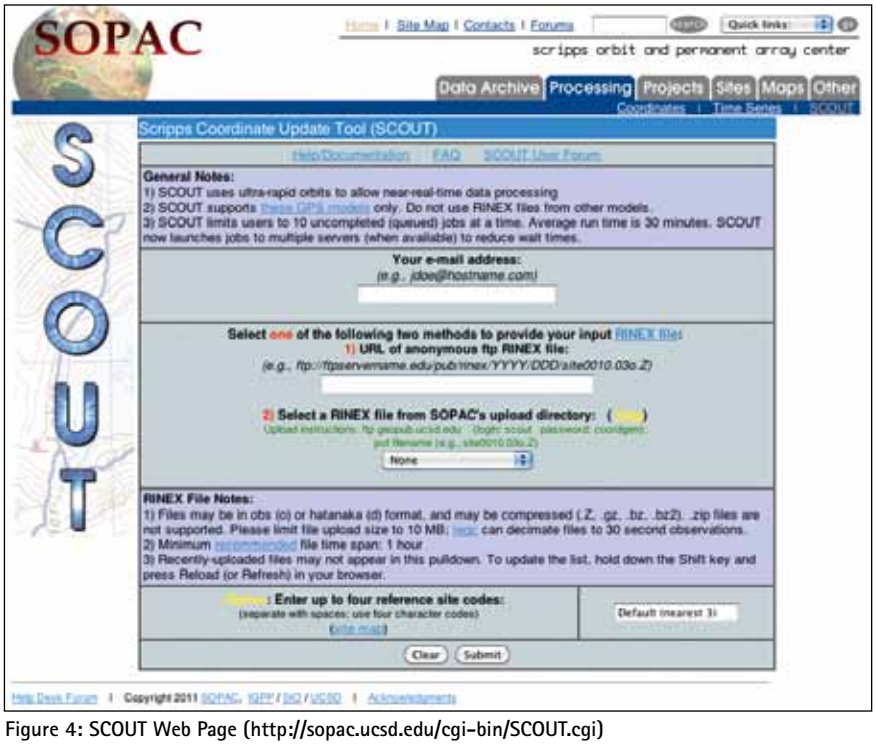

Figure 4: SCOUT Web Page (http://sopac.ucsd.edu/cgi-bin/SCOUT.cgi)

Canadian Spatial Reference System-Precise Point Positioning (CSRS-PPP)

Canadian Spatial Reference System-Precise Point Positioning (CSRS-PPP) is an internet based GPS survey service supplied by NRCAN (Natural Resources Canada). A single point positioning is determined by using Precise Point Positioning technique with precise orbit and clock information (Sanlioglu and Inal, 2005). The single or dual frequency GPS data can be processed in static or kinematic mode with this service.

CSRS-PPP services internet page can be accessed by http://webapp.csrs.nrcan.gc.ca/field/Scripts/CSRS_PPP_main_e.pl address.

The main features of the OPUS, AUSPOS and SCOUT services are given in Table 1.

In this study, six continuously operating GPS stations, operated by ISKI-UKBS, are selected in order to analyse the performance of the on-line processing service (Figure 5).

A GPS surveying campaign was conducted in 2008 and the coordinates were calculated by using BERNESE software very precisely. The details of the study are given in Kahveci et al. (2009). The 6 points have 24 hours GPS sessions on May 16th 2009 and November 6th 2009 are chosen. 24 hour data files were divided into 1 hour, 2 hour, 4 hour, 12 hour sub-sessions.

All these data sets were processed with OPUS, AUSPOS and SCOUT services. Delivered coordinates from these services are compared with known coordinates. Differences in position and ellipsoidal height components are shown in Table 2, 3 and 4 for the OPUS, AUSPOS and SOPAC, respectively.

When analyzing the results in Table 2, 3 and 4, it can be seen that results are obtained between 1 cm and 22 cm accuracy level in position from all

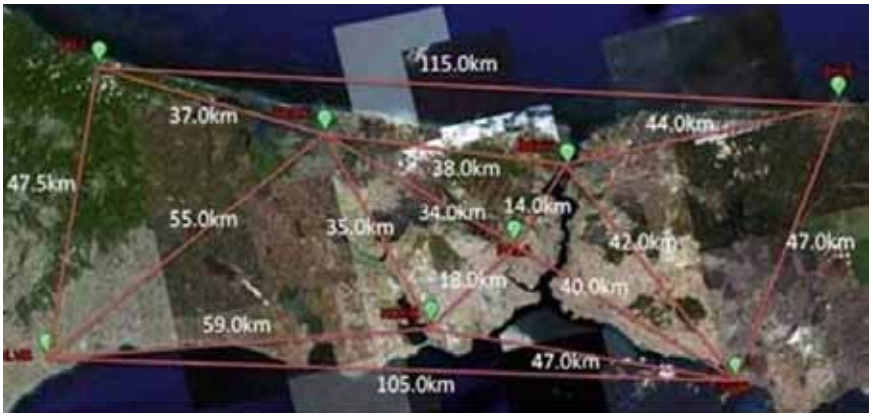

Figure 5: ISKI-UKBS Network

services. In height as expected, results are obtained with the less accuracy. To get sub-decimeter accuracy at least 2 hour data acquisition time needed. The results show that, the SCOUT service among the others provides the best accuracy.

Results

In this study, the accuracy performance of internet-based online GPS processing service is analyzed. The results show that, coordinates are estimated between 1 cm and 22 cm accuracy level in position from all services. To get sub-decimeter accuracy at least 2 hour data span is required. The results show that these services can be used for surveying applications with a cost-effective manner and very easily without knowledge of any GPS processing software.

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URL 1, OPUS website, http://www.ngs.noaa.gov/OPUS, 01 March 2011.

URL 2, AUSPOS website, http://www.ga.gov.au/bin/gps.pl, 01 March 2011.

URL 3, SCOUT website, http://sopac.ucsd.edu/cgi-bin/SCOUT.cgi, 01 March 2011.

National GIS
Shaping India

The Planning Commission and Ministry of Earth Sciences, Government of India conducted a workshop on National GIS on September 14, 2011 in New Delhi to discuss the National GIS vision document version 2 with all concerned involved and to formalize a national-level endorsement. We present here some of the issues highlighted by Dr K Kasturirangan, Member (Science), Planning Commission made on the occasion

Government recognizes that GIS is an important tool for meeting the key issues that Planning Commission is addressing of good governance – planning scientifically, implementing and monitoring the plans effectively and also assessing the benefits outreach in the most effective and equitable manner. In this, the key elements of good governance touch upon many aspects of natural resources, as well as processes relating to economic, social and political governance. The information system required to undertake these critical nation-building and decision-making activities is going to be enormously complex and highly demanding – we need to start revitalizing and positioning such information systems. GIS will be one critical component of such an information system.

India has made tremendous progress in GIS – in fact, India started using GIS way back in mid 1980s and since then, a large number of projects and programmes have been implemented. Over the years, notable strides were taken by several ministries and agencies such as Department of Space, Department of Science and Technology, National Informatics Centre, Survey of India, Geological Survey of India, Forest Survey of India, Ministry of Urban Development, Ministry of Power and even many state government agencies in this regard. Even looking from global perspectives, our programmes like NRIS, NRDMS, NNRMS, NSDI, NUIS, had many unique and visionary underpinnings. However, from a national perspective we had not utilized the fullest potentials of GIS technology yet. The potentials of a myriad applications which are enabled by the GIS due to rapid advances in related technological domains, have to be innovatively and cost effectively applied in support of our inclusive growth agenda.

Let us turn towards the GIS eco-system today in the country. There is tremendous focus for growth in the country, both in terms of achieving it rapidly and sustainably. Here sustainability concept integrates inclusive growth objective also. Achievement of these goals crucially depends upon quality of decision making at all levels. GIS has been playing ever expanding role globally in supporting decision making process. Hence, when it comes to GIS our focus of GIS must be on Decision Support Systems application and our emphasis must be on improving quality of decision making. GIS can be a major differentiator at all levels of governance and nation-building – be it in government, in enterprises or by citizens. In fact, as it relates to such GIS impact, the Planning Commission is interested to address all the hierarchical levels – national, regional and state level and then going down to district and Panchayats level and also covering all government, enterprise and citizen needs.

We should remember that GIS is not just about images and maps, but also of a whole host of spatial data representation of geo-tagged tabular attributes - all of which comprises the GIS-content. So to say, we produce best images, best topographic maps, best forest maps etc is just half the solution – unless these are all usable at the end of a user or decision-maker, the second half is not bridged. Structurally, the government is organized in sectors – thus data collection and mapping is sectoral – but what GIS can do is enrichment of information by cutting across these "sectoral systems" into an integrated data system. Governance demands that these sectoral spatial datasets are combined and new paradigm of information regime created bringing to fore new geographical relationships that enables visualizing spatial patterns in data, hither-to unavailable, and bringing new developmental perspectives right down to grass-roots level and also allowing for making better and qualified decisions. With the potential to construct and visualise maps, analyze information vis-à-vis its spatial attributes, create interactive queries and use results for easy decision-making, geospatial technologies are fast becoming the strongest DSS toolset of decision makers, government, industry and citizens.

Next comes another issue of the user. The user, be it from government, enterprise or a citizen, today faces a major "deterrent" in using GIS. India today lacks GIS-Ready data which is most current and which a user can easily access and use (though pockets of data maybe with some agency here and there) – in spite of the finest of data collection and surveying that is done for topographic map, forest maps, census data or even image data etc. Thus, either the user has to struggle to put tremendous efforts in making these maps/ images to GIS-Ready for his usage or somebody should give this to him ready. So, many a time, even if a user wants to use GIS for his decision-making he may be discouraged by the tremendous technological "bind" he has to get into – and thus he may not use the GIS. Second, if the user has to embed GIS DSS in his work-process, then he needs to be assured of constantly updated data - this GIS-Ready datasets must also be constantly and regularly updated and maintained so that currency of data is most recent for the governance process.

New sets of GIS data that technology today provides and that can be generated – say, maps on 1:10k scale or larger; re-surveyed land ownership data; terrain data on 3D; underground assets data in cities; crowd sourced data and so on are also extremely useful for a user – but these are yet to be available easily to him. We want this major 3-fold gap be removed for the user. The user must not be bothered and worried for GIS-Ready data and must be assured that GIS-Ready data that is needed would be available to him. This is a key paradigm that we want to bring in the eco-system.

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So, I come to the key issue that was then taken up after Hon'ble Prime Minister asked Planning Commission to look into the way beyond GIS. What can we do about these 3 important issues – first, how can we ensure that our decision/governance system is supported by a comprehensive, easy-to-use GIS Decision Support System – whatever the decision-maker wants must be supported by GIS; second, how can any user be rid of the "hassles" of GIS data organization that he now faces – ensuring that GIS-Ready data is readily available; third, how can we have an institutional system in the country that is responsible for GIS and is accountable to meet the GIS needs of the country.

Today, we have come far in addressing these issues and we shall see actionable answers to these. This Workshop will discuss the Vision of National GIS and set forth a series of directions and actions that the country can initiate and in a time-bound manner, bridging all the gaps that exist today and make GIS a part and parcel of our total national system. It is against this backdrop that the Planning Commission has initiated this major step...

Mr Sam Pitroda, Adviser to Prime Minister on Public Information, Infrastructure & Innovations, Goverment of India while addressing the workshop, appreciated the vision and concept of the National GIS and expressed support to the programme. He mentioned that India is at the cusp of another technological and development curve and in its drive for inclusive growth, social equity & development a major requirement would be to re-engineer many systems and processes. He mentioned that Information will be the 4th pillar of democracy and GIS will be that important element of the 4th pillar – helping in the concept of unified information infrastructures and bring one important level of unification and collaboration amongst many stake-holders. The Public Information Infrastructure (PII) had been envisaged to provide broad-band connectivity and a host of e-services to every citizen – be in urban or rural areas. He mentioned that PII aimed to be enabling repositories of citizen needs, geographical and physical characters of our country and programmes of government. He mentioned major technological thrust being taken up – first, the laying of a fibre-network for connecting 250k panchayats; establishment of the National Knowledge Network (NKN) and now the National GIS.

Mr Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, Goverment of India in his inaugural address, mentioned that in the 12th Plan, focus is on social and physical infrastructure with key areas being agriculture; manufacturing; infrastructure, rural connectivity, health and education services and addressing special challenges for vulnerable/ deprived areas. He stressed that the need and demand is for good governance – essentially for effective implementation of development and also in context of better functioning of government and private sector in the economy. He emphasized that GIS is an important technology area which can form the basis of a DSS. He highlighted that a national-level GIS that can serve multiple needs – government, enterprises and citizens and mentioned that National GIS must power more open government and, thereby, leverage economic and social development and reaching the gains of development to the most needy and at the right place. He noted that GIS must also aim to bring accountability and responsibility of public activities where decision-making can be centered around GIS – thus factoring location and time-domain map information. Noting that National GIS will be one capability that can support the nation, he highlighted how spatial planning and determining options and alternatives for planning will become important.

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TR-G3

16 each of GPS L1, Galileo E1,
GLONASS L1

TR-G3T

16 each of GPS L1/L2/L2C/L5,
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Two sets of 14 each of GPS L1,
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Duo-G2D is similar to Duo-G2 but it tracks dual frequency GPS. It can calculate orientations faster.

TRE-G3T

16 each of GPS L1/L2/L2C/L5,
Galileo E1/E5A, GLONASS L1/L2

TRE-G3T-AJ

Has the anti jamming capability

The anti-jamming capabilities of TRE-G3T-AJ basically eliminates the interferences (typical of harmonics of TV and radio stations, etc) which fall within any GNSS signal

Quattro-G3D

One set of 14 each of GPS L1/L2,
Galileo E1, GLONASS L1/L2; and
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Galileo E1

Quattro-G3D is a 100x120 mm Euro-card board that accepts inputs from up to four antennas.

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- Charger
- GSM
- Bluetooth

for: TR-G3, TR-G2T, TR-G3T

Front panel connectors:

Power Input + serial port A + USB + Antenna

Back panel connectors:

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

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

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

DELTA

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

Front panel connectors:

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

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

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

Back panel connectors:

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

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

SIGMA

- Internal battery
- Charger
- Modem
- GSM
- Bluetooth

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

Front panel connectors:

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

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

Back panel connectors:

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

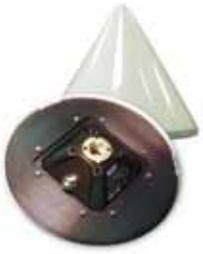
Example: GSM Antenna + SIM door + 1-PPS A + 1-PPS B + Event A + Modem Antenna

Antennas

GrAnt-G3T/G3

GrAnt-G3T
is a versatile high performance antenna with GPS L1/L2/L5; Glonass L1/L2; Galileo L1/E5

GrAnt-G3
Have similar case as GrAnt-G3T.
With GPS L1; Glonass L1; Galileo E1



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140x140x62 mm,
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- Communication is provided via RS422 or CAN interface via M12 8 pin connector

AirAnt

AirAnt is designed to be mounted on aircrafts and applications where low profile and aerodynamic shape are desired. GPS L1/L2/L5; Glonass L1/L2; Galileo L1/E5

120x74x44.5 mm,
0.32 kg

- Overload protection
- Improved rejection out-of-band signal rejection

TriAnt

TriAnt is small, thin, and rugged high performance GNSS antenna. It is ideal for applications like navigation and surround antennas of TRIUMPH-4X. With GPS L1/L2/L5; Glonass L1/L2; Galileo L1/E5

128x128x55 mm,
0.47 kg

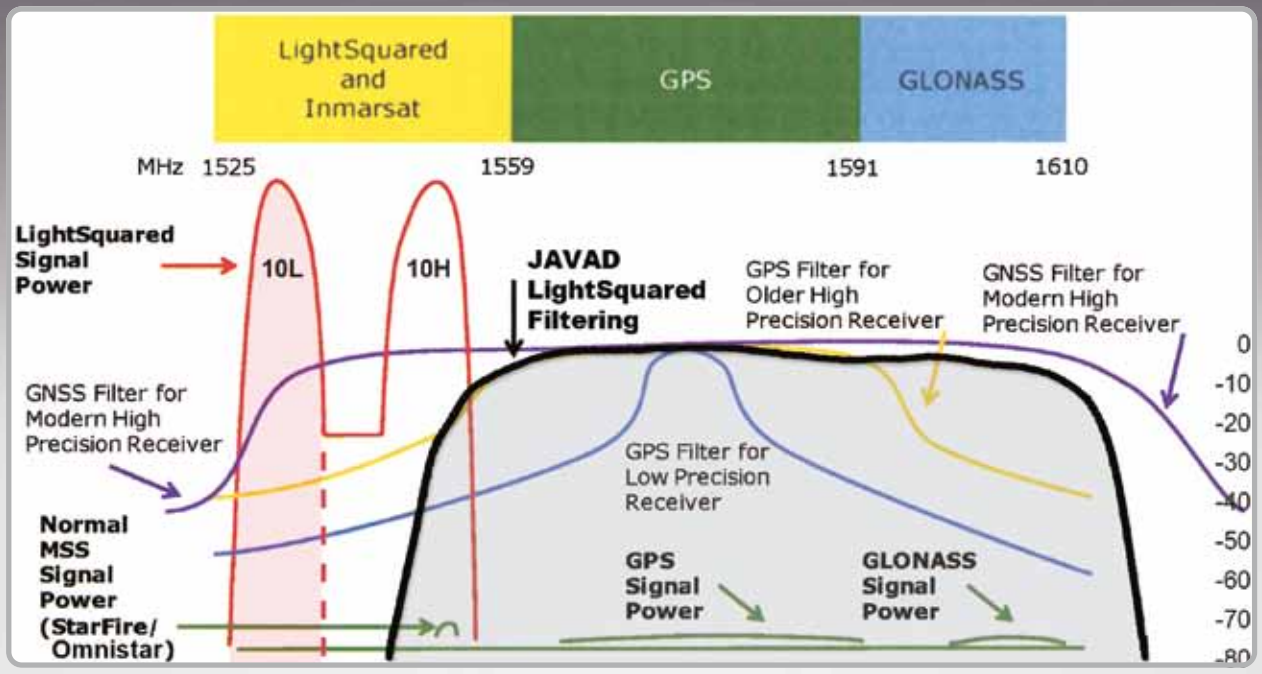
- 2 different mounting options:
  female thread 1”-14
  3 holes M5 ϕ50

RingAnt-G3T

is our GrAnt antenna mounted on our own choke ring ground plate. With GPS L1/L2/L5; Glonass L1/L2; Galileo L1/E5

RingAnt-DM

traditional choke ring with Galileo option and Dorne-Margolin element.
With GPS L1/L2/L5; Glonass L1/L2; Galileo L1/E5/E6



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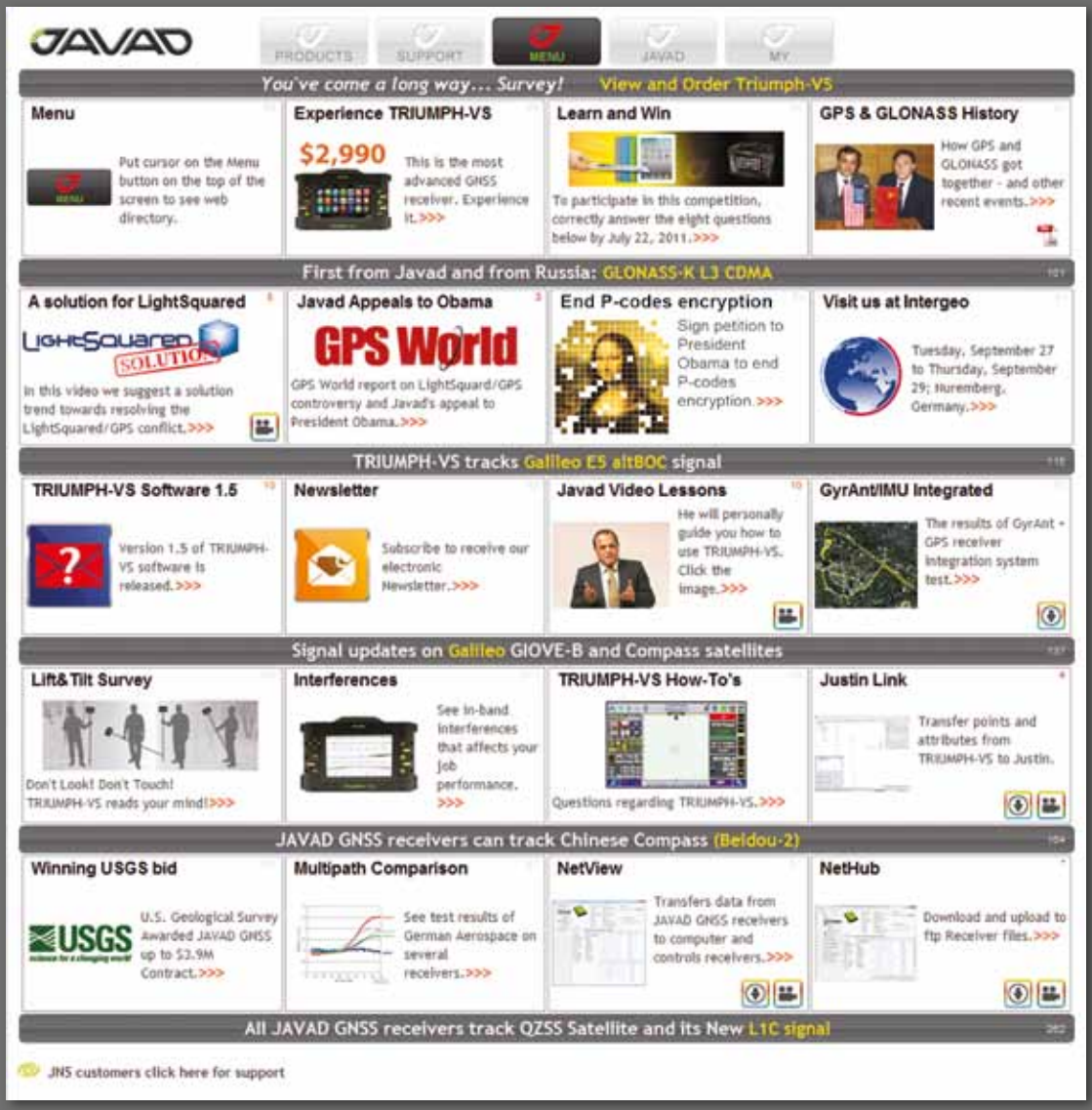

Innovation in archaeological documentation methods

The available technologies and methodologies for digital recording of archaeological sites and objects are really promising

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Archaeology reflects the amazing diversity of human life across the globe (Neto, 2000). Archaeological investigations are considered as a principal source of knowledge of prehistoric, ancient, and extinct cultures. In order to reconstruct history, archaeologists rely on all the unearthed evidence, such as man-made objects, which can be as small as tools and ornaments or as large as architectural residues (Xia, 2006). Thus, it is important to explore archaeological contrivance and record them in a systematic way.

The notion of archaeological heritage includes structures, constructions, buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water (Tantillo, 2007). Nevertheless, archaeology contrivance such as cultural heritage sites and artefacts are facing enormous threat and danger, such as air pollution, acid rain, flood and earthquake. Correspondingly, people nowadays are focusing on rapid development of a new and magnificent building yet neglecting about the existence of the most valuable inheritance left by the people from antiquity. Consequently, all of the above matter had caused constant destruction of cultural heritage sites and artefacts which may not be found by archaeologists. Thus, it is a vital for archaeologist to rapidly record all of the contrivance and finally create a user – friendly presentations of the recorded heritage sites and artefacts.

In doing archaeological recording, archaeologists need to go to the field to carry out excavations on prehistoric and historic sites. They dig up cultural as well as biological remains from the soil left by people in the past (Xia, 2006). The process of excavation is carried out under a systematic circumstance whereby the heritage site is divided into grids and archaeologist will record the findings in each grid by sketching, drawing, capturing

Archaeological Research Scale	Object of Interest	Available Geomatic Approaches	Geometric Resolution	Level of Detail
Regional scale	Landscape Topography Sites	Middle and high-resolution satellite imagery. Small scale aerial images. RADAR and LiDAR. GPS.	↓	↓
Local scale	Sites Architectures Excavation Layers	Large scale aerial images. RADAR and LiDAR. ToF range sensors. Terrestrial images. GPS.		
Objects scale	Excavated artefacts Museum objects	Terrestrial images. Triangulation based sensors. GPS.		

Table 1: Scale of archaeological site and the suitable Geomatic tool to be implemented (Lambers and Remondino, 2007)

images and taking notes. When delineating site boundaries during investigations phase, shovel probes/tests should be excavated in a grid oriented along cardinal directions at < 20 meter intervals on sites less than 50 meters across, and at < 30 meter intervals for sites more than 50 meters across (Oregon Archaeology Guidelines, 2007).

All the findings must undergo several processes before they can be published to the public. The conventional process comprises of measuring its relevance to other features on the site, identifying its geographical stratification, taking it to the lab for clean-up, cataloguing it, repairing it if necessary, drawing and photographing it, and describing it in words. Hence, conventional method of recording and documenting archaeology contrivance seems to be impractical due to time consuming, ineffective presentation and need a lot of manpower. A better system which can record, visualize 3D model and systematically manage the contrivances data is indeed an obligation. The available technologies and methodologies for digital recording of archaeological sites and objects are really promising and the whole heritage community is trying to adapt these approaches for fastest, detailed and easy 3 dimensional (3D) documentations (Campana and Remondino, 2009).

In archaeological research it is essential to apply Geomatic techniques to represent correctly all peculiarities of the investigated objects (Campana et al., 2009). Remondino and El Hakim (2006) stated that the most common techniques used for 3D documentation, reconstruction and interpretation process are image-based and range - based data which can be acquired using photogrammetry and laser scanning approaches. The need of combining multiple techniques, like terrestrial laser scanning, photogrammetry and digital surveying comes from the complexity of some structures and by the lack of a single technique capable of giving satisfactory results in all measuring conditions (Gonzo et al., 2007).

The role of geomatic in archaeology data collection

Conventional method for archaeology data collection

Currently, archaeology undergoes a rapid evolution due to the enthusiasm of archaeologist, researches and students to explore all the possible places which believed as an inheritance from antiquity. Thousands of heritage sites were found and millions of artefacts, bones, grave and facades were discovered. All of the contrivances are the factor that can declare the heritage site as a preservation region and protected by the law. In addition, the place will be visited by many people whether for studying purposes, researching or even for a holiday. As a consequence, the contrivances are exposed to a threat either from human exploration or natural disaster.

The awareness of those threats has prompted archaeologist to record and document the contrivances via conventional way. In the conventional archaeological documentation method, archaeologists collect the data by using tools like optical survey instruments, measuring tapes, film cameras, pen, pencils, string, levels, hammers, trowels and ladders (Patel, 2009). Figure 1a shows the tools used by archaeologist in collecting data. In addition, to sketch the plan (Figure 1b) is really a time consuming process.

Figure 1: (a) Conventional tools used in collecting and recording archaeology contrivances (Patel, 2009). (b) Field drawing and notes made by archaeologist (Patel, 2009)

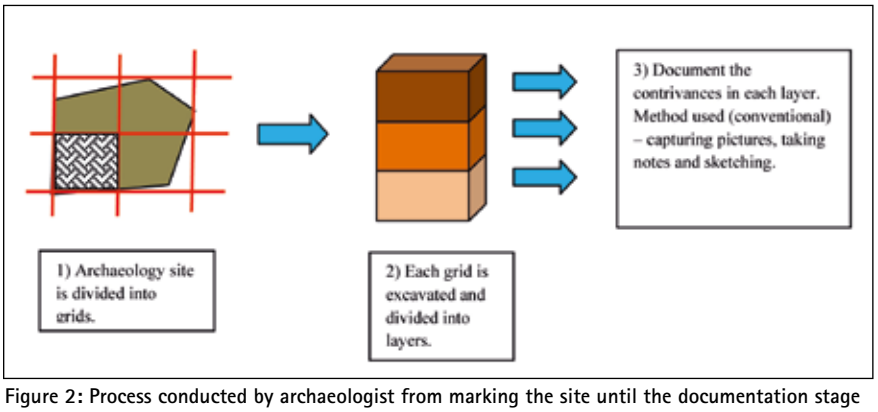

Figure 2: Process conducted by archaeologist from marking the site until the documentation stage

The definitions of an archaeological item and physical space were taken from the Centre for Intercultural Documentation (CIDOC) standard (Grabczewski et al., 2001). Most of the entities are familiar to a field archaeologist. A project may have many sites and each site must have a grid defined over its surface – like lines on graph paper. Each grid creates many squares or sectors comprising several points. Figure 2 illustrates the procedures used by archaeologist in the data collection and the procedure of documentation.

The quality of conventional recording very often depends on the qualification, interest or condition of the documenting archaeologist. There is no precise scale used during the drawing process and thus measurement cannot be directly conducted thorough the picture. As for that, again Geomatic plays the role in documenting the information systematically and in more practical way.

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Application of geomatic in archaeology data collection

In archaeology the systematic and well-judged use of Geomatic techniques for documentation and digital conservation purposes is relatively a recent innovation, not yet applied on a regular basis for a variety of reasons; the perceived 'high cost' of 3D, the difficulties in achieving good 3D models, the difficulty of integrating 3D worlds with other 2D data and traditional documentations and the perception that 3D is only an additional 'aesthetic' factor (Campana et al., 2008). Nonetheless, as time goes by, various methods and algorithms were developed in order to overcome the limitation mentioned above.

Fundamentally, Geomatic methods are developed mainly for collecting topography attribute and use it for mapping purposes. However, the capability of the methods has been experimented in various fields such as craniofacial, town planning, industrial and so forth. The results are excellent. Archaeology is another discipline which seems to be a successful collaboration with Geomatic field especially in term of data collection, visualization and database development. Remote sensing, aerial photogrammetry, close-range photogrammetry and airborne laser scanning are example for Geomatic methods used currently in mapping archaeology sites and recording the contrivances.

Among the Geomatic methods mentioned before, laser scanning technology is becoming increasingly popular recently as the scanning devices become more reliable, cheaper, faster and more portable (Fang et al., 2009). Into the bargain, laser scanning is capable of acquiring 3D data of the scan object and thus enables the production of precise 3D model. According to Yildiz et al. (2009), a 3D scanner is a device that analyzes object to collect data on its shape and possibly its appearance. Besides that, the acquired data can be used to construct digital 3D models which can be applied in various applications such as industrial design, orthotics, reverse engineering, quality control and documentation of cultural artefacts.

As time goes by, laser scanning technology has been upgraded its performance in order to fulfil the needs of the market such as highly detailed 3D model and precise model that can be used for measurement purpose. As a result, laser scanning technology is divided into three major categories which are long range scanning, medium range scanning and close-range scanning. Examples for long range scanning is the airborne Light Detection and Ranging (LiDAR), while for medium range scanning is terrestrial laser scanning. By taking into consideration about the size of the objects, the distance between object and scanner, the surface of the object and the accuracy requirement, a suitable type of range scanner is chosen. Lambers and Remondino (2007) stated that there are three scales of archaeological research where Geomatic techniques and methodologies can be applied. Table 1 shows the detail on the scale of archaeological site and the suitable Geomatic tool to be implemented.

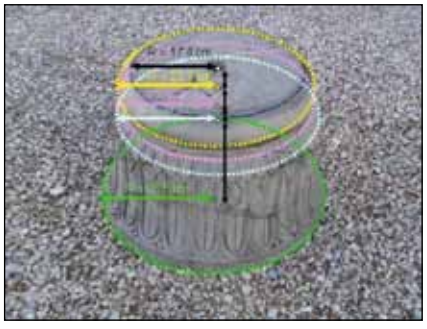

Figure 3: A precisely pedestal model acquired using Photogrammetry method (Miri and Varshosaz, 2005)

Based on a research made by Moser et al. (2009), with a range from 2 to 200 meters the terrestrial Trimble Laser Scanner GX is qualified for the three dimensional documentation of the excavations. Furthermore, the research showed that at an average range of 5 meters from the scanner to the object, the accuracy is approximately ±3 millimetres. Instead of using medium range scanning, the research also used a close-range scanning intentionally for scanning the artefacts. As for accurate texturing purpose, additional images were captured using Nikon D200-10 megapixels.

Close-range photogrammetry or laser scan recording, as proposed for the spatial data capturing process, differ from traditional methods, less complex recording and visualization techniques in that they provide metrically accurate data (Figure 3), (Miri and Varshosaz, 2005). Supported by Simon et al. (2009) in a research regarding the use of close-range 3D laser scanning in the development of virtual museum, close range laser scanning technology provides a variety of exceedingly

Figure 4: The apse of a church in Byzantine Gemiler Island, Turkey (Kadobayashi et al., 2004)

Figuee 5: Batu Pahat shrine

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Instead of recording the contrivance, there was a research conducted with the aim of reconstructing the artefacts found during the excavation process. Close-range laser scanning was again used to scan the artefacts. This is due to the need for high level of detail and accuracy was one of the main criteria in the choice of the technology use, along with a limited amount of time to survey the archaeological artefact (Pires et al., 2006). All the pieces found during excavation were glued together and finally yield a shape like a pot but certain parts were not completed.

Several researches have proved that the use of photogrammetry and laser scanning for archaeology data collection is a practical method compare to the previous method

Geomatic approach in archaeology is not just focusing on modelling the artefacts but it also plays an important role in modelling the heritage site and monument found. There is no single method that is applicable to record every subject of cultural heritage and hence there is a strong demand for a hybrid method that exploits several technologies, (Kadobayashi et al., 2004). The advantage of using laser scanning is that it can produce a very dense 3D point cloud data which is a crucial requirement for creating high-resolution geometric models (Figure 4b). Unfortunately, the colour information is sometimes lower than required. On the other hand, digital photogrammetry can produce high-resolution texture if the original images have sufficient pixels (Figure 4a). Thus, the integration of these two technologies is indeed a key to create high quality 3D recordings and presentations.

Case study

Study Area: Lembah Bujang, Kedah, Malaysia

Malaysia is a country which has interesting and historical places that are well known throughout the world. In addition, several places such as the historic city centre of Melaka and Georgetown, Penang have been declared as UNESCO World Heritage Sites. Despite from the places that have been added into the list of UNESCO World Heritage Sites, a place located at the north of Malaysia stored plenty of impressive historical complexes which can elicit the wonderment feeling. The place is known as Lembah Bujang in Kedah. For the time being, it may not be as outstanding as the wonders of the world but it has its own attraction.

Lembah Bujang is the site of Kedah's ancient civilization, developed from the 4th to the 14th century AD which is during that period it is known as Katahanagara and ruled by Hindu-Buddhist kingdom (Norafida et al., 2003). Since the area is concentrated around Sungai Muda, it played an important role for economic importance and visited by all traders around the world such as from India and China. As a proof, there is Buddhist inscriptions discovered in Lembah Bujang. Until 2008, a local newspaper, News Straits Time stated that more than 80 heritage sites were found and the effort to find more ancient contrivance is still going on.

Lembah Bujang is also claimed to be one of the earliest civilization in South East Asia. To date, lots of shrines are found

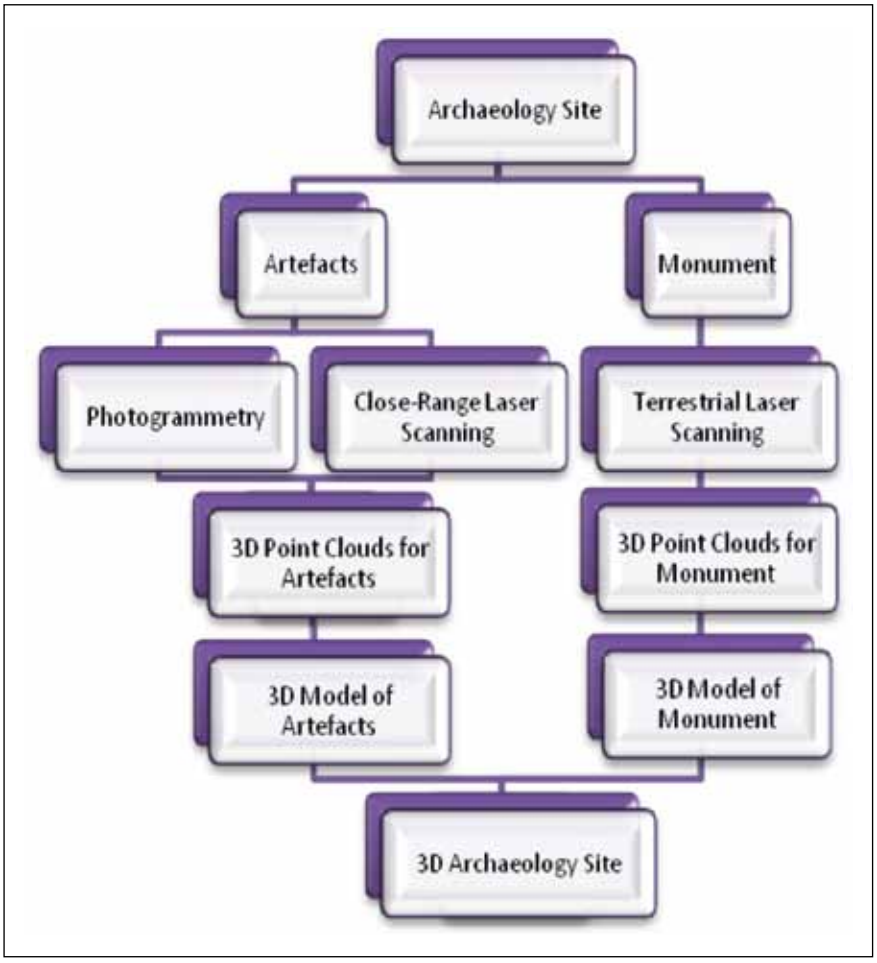

Figure 6: Proposed method to be used for collecting archaeology data

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in Lembah Bujang but none of them are digitally documented and promoted in the web via 3D technology in order to attract people around the world to visit them.

Although technology is vastly spread, Malaysian is still using conventional way to document the historical contrivances such as by capturing images and taking notes. It is such a waste to let all the contrivances damage and what are left are just the images. As for this research, the study area considers only one site out of more than 80 sites that have been found. The biggest shrine found in Lembah Bujang which is Batu Pahat shrine (Figure 5) is chosen to be digitally documented using the state-of-the-art of Geomatic approach.

Proposed methodology

In this study, the proposed technique to be applied is to use laser scanning technology together with photogrammetry approach. Figure 6 indicates the proposed methodology to be used in conducting this research. Basically, in archaeology site, there are two important things to be documented which artefacts are found during the excavation process and the monument. Specifically, for recording artefacts, there are two Geomatic methods used; photogrammetry and close-range laser scanning. In order to yield a quality 3D model of artefact, both methods need to be used because laser scanning will not give the best output once it scanned a black shiny surface. Hence, photogrammetry is used to overcome the problem yet improve the colour information of the artefact. For the purpose of recording monument, terrestrial laser scanning will be used as the size of the monument is quite big.

Archaeological contrivances are the proof to the world civilization and it should be shared with other people efficiently. The artefacts and monument will be presented in a 3D environment with the intention of increasing people's interest. Finally, a digital 3D archaeology site can be shared in a digital manner or web-based due to overcome geographical constraint and to show that technologies and ancient thing can be combined and yield a tremendous contribution to the world.

Conclusion

Recent decades of archaeological research, conventional method was used to manually record and document all the contrivances. Prompt by the highly demand for faster and precise documentation of archaeological finds, archaeologist started to shift from using pencils and paper to digital 3D model and digital database for the heritage sites. Several researches have proved that the used of photogrammetry and laser scanning for archaeology data collection is a practical method compare to the previous method. Instead of giving 3D model as final output, it allows archaeologist to integrate the model with its spatial and attribute data in a system called archaeology database system. However, there are numerous of laser scanning systems, digital camera and database software. User need to know the size of the site, the cost for the project and accuracy required in order to ensure that the technique and method chosen are suitable. In addition, user needs to consider appropriate use of image-processing algorithms or integrating methodologies, to create realistic 3D models with good geometric details.

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Space Wing installs large software sustainment release

The 50th Space Wing's 2nd Space Operations Squadron installed a major software release containing 104 fixes to the GPS Ground Segment. This is the largest sustainment release to the GPS ground segment since transitioning to the Architecture Evolution Plan system in 2007. Since 2007, the GPS Directorate has been concentrating on delivering new capability software to the ground segment for the IIF satellite, increasing navigation signal strength and anti-spoof capability.

Dr Gary McGraw wins Kepler award

The Institute of Navigation's (ION) Satellite Division awarded Dr. Gary McGraw its Johannes Kepler Award September 23, 2011 at the ION GNSS Conference (Portland, Oregon) for his contributions to GPS in the areas of high accuracy, high integrity and highly survivable precision guidance and control of aircraft. He has made significant contributions to the field of satellite navigation and has become a central figure in a number of navigation technology development efforts.

Dr Shivaramaiah wins Parkinson award

The Institute of Navigation's (ION) Satellite Division awarded Dr. Nagaraj Channarayapatna Shivaramaiah of The University of New South Wales (UNSW), Australia its Bradford W. Parkinson Award September 23, 2011 at the ION GNSS Conference (Portland, Oregon). Dr. Shivaramaiah was recognized for graduate student excellence in Global Navigation Satellite Systems in his thesis Enhanced Receiver Techniques for Galileo E5AltBOC Signal.

In his thesis Nagaraj introduced a number of algorithms specific to E5, the most sophisticated GNSS signal, including a patented multipath technique. He is now responsible for developing a space-capable multi-GNSS (L1/E1/L5/E5) version of UNSW's Namuru receiver.

NOAA's VDatum a Vital GIS Tool for Safe Navigational Products

NOAA's just-completed first edition of Vertical Datum Transformation tool - VDatum that will allow users to combine and transform geospatial data from different sources onto a single vertical reference surface, removing the largest obstacle GIS users face when creating products that enable safe navigation and serve other vital purposes for coastal communities.

It allows users to produce a set of consistent geospatial data over coastal and interior areas of the contiguous U.S., removing the differences between the vertical reference systems of land- and water-based data. *http://vdatum.noaa.gov*

OlivePad 2 to feature GLONASS

OlivePad2 scheduled to be launched this september according to the news source, will feature GLONASS signal receiving capability in additiont to GPS signals. It will feature a more powerful processor from Qualcomm, along with Android 2.3 operating system. *www.themobileindian.com*

Proton-M launched after string of failures

A Proton-M rocket carrying a military satellite was successfully launched from Kazakhstan's Baikonur Cosmodrome. It was the first launch of the Proton-M — Russia's main rocket for carrying satellites — since Aug. 18, when a malfunction in the rocket's booster stage sent a $265 million communications satellite into the wrong orbit. *www.themoscowtimes.com*

JAVAD LightSquared partnership

"LightSquared not only can coexist with GPS, it complements it." Says Dr. Javad of of JAVAD GNSS on the occasion of JAVAD GNSS partnering with broadband company LightSquared.

LightSquared's proposal to build a broadband network has come under fire from users of high-precision GNSS over possible interference issues. JAVAD GNSS is promoting its latest receiver, the TRIUMPH-LS (LightSquared). "TRIUMPH-LS can benefit from LightSquared communication channels for receiving RTK corrections," Dr. Javad said. "LightSquared communication channels are much faster and less expensive than conventional channels for RTK correction transmissions."

LightSquared issued a press release stating the partnership will "develop a system that will eliminate related interference issues for high-precision GPS devices." LightSquared said the system can be adapted to work with high-precision GPS devices including those already in the agriculture, surveying, construction and defense industries.

Javad GNSS has completed the design, made prototypes, and tested those prototypes, LightSquared said. Preproduction units will be released for public tests in October, followed by mass production. High-precision receivers for positioning applications are expected to go to market by November 2011 and precision timing devices by March 2012. *www.javad.com*

Petri Rebuts LightSquared Ad

In a letter to the chairman and CEO of LightSquared, House Aviation Subcommittee Chairman Tom Petri (R-WI) sought to set the record straight following the company's ad in the Wall Street Journal the day before.

In his letter, Petri objected to LightSquared's ad which placed the blame for the controversy on the manufacturers of GPS equipment. Petri responded: "This ignores the fact that GPS was located on this part of the spectrum long before LightSquared devised its plan to employ a terrestrial network within the Satellite band of radio spectrum. In fact, your spectrum was purchased at bargain prices because it was not intended for terrestrial operations."

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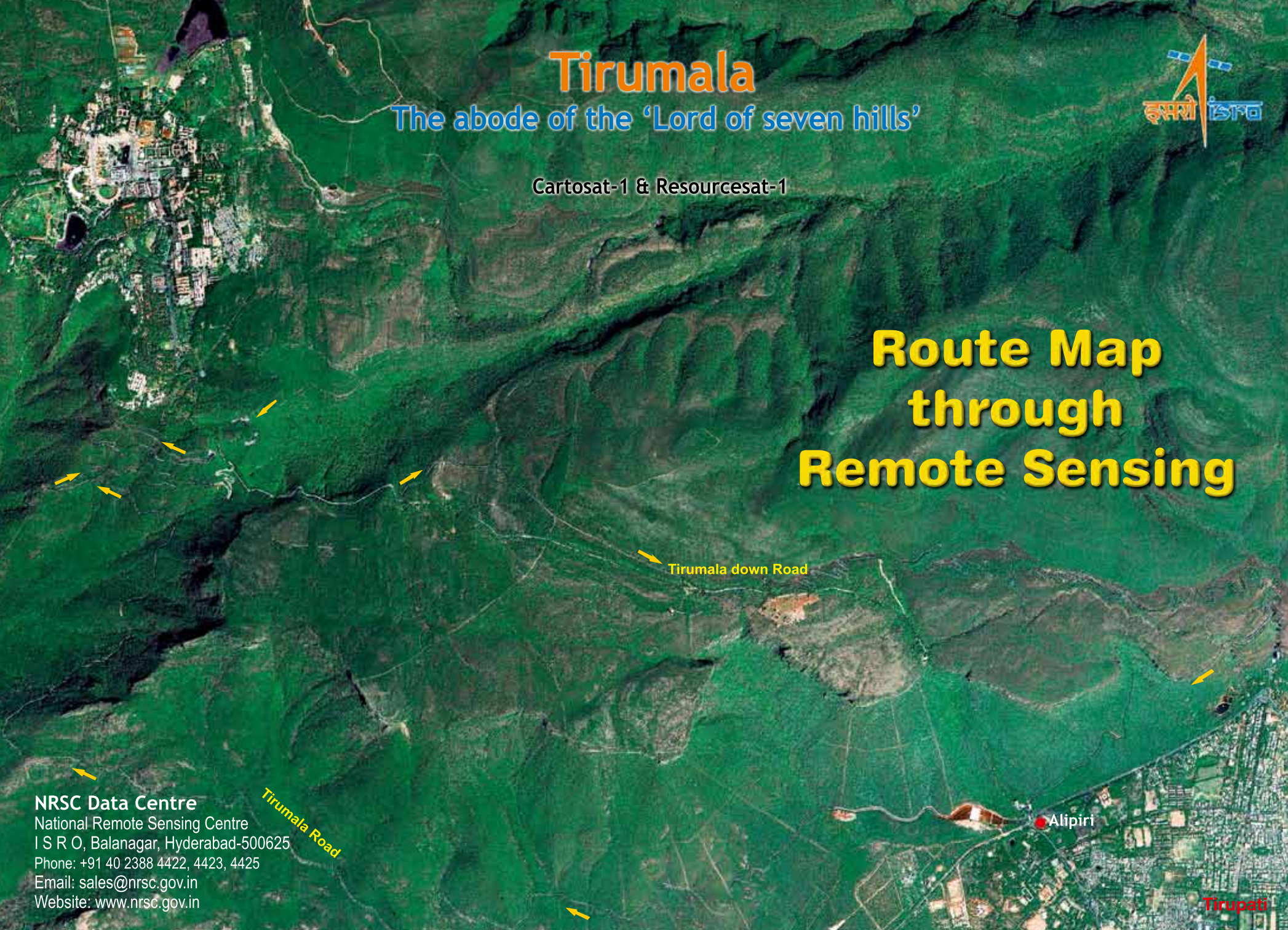

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Indonesia develops NSDI using cloud

Indonesia's National Coordinating Agency for Survey and Mapping, BAKOSURTANAL, is developing its National Spatial Data Infrastructure (NSDI) using cloud computing technology. This initiative aims to provide accurate and reliable geospatial information to government agencies and the general public. *www.futuregov.in*

Abu Dhabi carries out GIS-based census

The Statistics Centre Abu Dhabi (SCAD) is all set to carry out the national census in the emirate for 2011. The project shall be using state-of-the-art devices for the collection of spatial data, aided with GIS maps, enabling the communication of directions to field staff in a timely manner, before the end of the field work.*www.zawya.com*

Bhutan embraces GIS in healthcare

Orange Business Services, an enterprise communications arm of France Telecom, entered into a partnership with the Royal Government of Bhutan and Regal Information Technology to deliver real-time healthcare services to the people of Bhutan. Citizens can easily avail this service by dialling the toll free number 112. The company also added epidemic surveillance and reporting and an integrated disease management system as part of the services. *www.expresshealthcare.in*

India's digitisation of land records

The National Council of Land Reforms in India, headed by the Prime Minister is considering infusing the recommendations of a committee on state agrarian relations set up by the Rural Development Ministry in 2009. The recommendations include an impact study of computerisation of records, setting a timeframe of two years for survey operations in states and reviewing the cost of the programme. The first meeting of Council is scheduled in October 2011. The meeting aims to identify ways to speed up digitisation process of land records across the country.Though some states have invested in land records through their own resources and public-private partnerships, the progress has been slow and uneven. *http://articles.economictimes.indiatimes.com*

Bentley invests in TEEC

Bentley Systems has inaugurated a strategic relationship with The Engineering Essentials Company (TEEC) by investing in a minority equity position and by placing a Bentley representative on its board. Based in Philadelphia, Pa., TEEC is developing software to help AEC (architectural, engineering, and construction) organizations intelligently manage their engineering specifications and related codes and standards. *www.bentley.com*

Qatar's Moazanah project

Ashghal, Qatar's public works authority has teamed up with Rolta to successfully implement a new, geocentric system for capital project request management. Known as Moazanah, the project was envisioned by Ashghal's Engineering Business Services Department. Rolta OnPoint™, the spatial engine at the heart of Rolta Geospatial Fusion™, is the cornerstone of Moazanah. *www.rolta.com/*

ESRI Special Achievement Awards

Registrar General of India received a Special Achievement in GIS (SAG) Award for its vision, leadership, and innovative use of ESRI's GIS technology.

Madhya Pradesh State Centre received a Special Achievement in GIS (SAG) Award for its innovative use of ESRI's GIS technology.

These awards were conferred during the 2011 ESRI International User Conference in San Diego, California.

Bulletproof vest has GPS, sends alert

The S-911 Vest from Laipac Technology is chest armor with brains. It has sprouted a GPS system. It's designed for military, police, law enforcement agencies etc. It is the invisible eye for the Commander during tactical missions. It provides automatic GPS tracking with accurate position, time, date, speed & heading. *www.laipac.com*

Audi A6 to have Google Earth based navigation in 2012

Audi is the first company worldwide to incorporate Google Earth into its MMI Navigation system, which combines 3-D terrain models with aerial views and a detailed street network to calculate routes seamlessly. *MarketWatch*

Garmin: aera 796 & 795 touchscreen aviation navigators with 3D vision

Garmin has launched aera 796 and aera 795, a new series of PND's. The aera 796 incorporates the popular features of the GPSMAP® 696, while aera 796 takes the pilot one step closer to a paperless cockpit with a digital document viewer, scratch pad etc. *http://garmin.blogs.com/*

MicroNav: Miniature INS with GPS

Goodrich Corporation is set to launch its tiny MicroNav®, an inertial navigation system supports precise, low cost guidance for a range of applications such as smaller rockets and missiles or aircraft standby instruments. The total volume of the device is just over 2 cubic inches (340 cu mm), with a weight of 2.8 ounces (79 grams). *www.goodrich.com*

Hertz to procure data from TomTom

TomTom has partnered with Global car rental provider Hertz, to offer vehicle rental customers across Europe the latest edition of the Hertz NeverLost® satnav system, which is based on the TomTom Via 120 EU with its unique dynamic routing. *http://corporate.tomtom.com*

Navteq launches 3D visuals for navigation in India

NAVTEQ, has announced the availability of new visual content for its NAVTEQ® map for India. It includes Motorway Junction Objects, Sign-as-Real and 3D Landmarks, for the top eight cities in India. *http://press.navteq.com*

e-challan for traffic violation in Delhi

Traffic cops in Delhi, India, as a pilot project will be using a pocketbook-sized mini computers attached with a camera and a printer. The camera will be able to take pictures of the defaulters for documentary evidence. The e-Challan system will also be GPS-enabled, where the position of the prosecuting official will also be available; along with a credit card swipe and driver's licence swipe facility, making issuing and paying of challan easier. *http://timesofindia.indiatimes.com/articleshow/9842572.cms*

Nuance gives voice to Waze App for iPhone and Android

Nuance Communications has announced that the Waze social mapping and navigation apps for iPhone and Android are powered by Nuance's text-to-speech to provide turn-by-turn directions and traffic alerts. *www.nuance.com*

High Precision GNSS Market Set to Increase Almost 100% by 2016

Following a difficult 2009, the precision GNSS market is moving into a new period of sustained growth, resulting in a near doubling of shipments and revenues by 2016. Markets such as agriculture, construction, aviation, GIS mapping and military are all forecast to grow strongly. The market is also expanding rapidly into new regions. China was regarded as the second largest market for GNSS receivers in 2010, a market that essentially didn't exist 10 years ago. *www.u-blox.com*

Galileo update

SciSys wins satellite project contract

SciSys, the specialist supplier of bespoke software systems, IT based solutions and support services, has been awarded a contract to support the Full Operational Capability (FOC) Phase of Europe's Galileo System.

This was achieved after successful completion of the European Union (EU) competitive dialogue process and final negotiations with Astrium UK as the prime contractor for the Galileo Ground Control Segment. The SciSys baseline contract is worth around €2m and will run until the end of 2013, with an optional maintenance extension into 2014. *www.stockmarketwire.com/*

EP backs Commission on more secure Galileo services

The European Parliament approved the Commission's proposal on the Public Regulated Service (PRS) access rules for Galileo, Europe's global navigation satellite system. This special service will protect the functioning of management of critical transport and emergency services, police work and border control, as well as of peace missions via its highly robust encrypted signals. These enhanced signals protect the services against threats, such as "spoofing" that can distort signals guiding a car or a ship, and provide inaccurate positioning to e.g. a police car or an ambulance. PRS are valuable in crisis situations where it is essential that emergency and security services continue to function. *http://ec.europa.eu*

Thales Alenia Space ships first two Galileo satellites to launch site

Thales Alenia Space has shipped the first two flight model of a Galileo navigation satellite to Europe's launch base in French Guiana. There they will undergo a final test campaign prior to a launch by Arianespace. Liftoff, on a Soyuz vehicle, is scheduled on October 20 with both satellites.

The satellite rolled out, together with the first one shipped last week, is part of a batch of four designed and built by Astrium Satellites, the industrial prime contractor of the space segment, under contract by the European Space Agency (ESA) for the In-Orbit Validation (IOV) phase.

IOV will demonstrate the capabilities of the Galileo system prior to the deployment of the full constellation which is planned to reach 30 satellites in its final configuration. In addition to providing key equipments for the navigation payload and platform, Thales Alenia Space is in charge of the assembly, integration and test (AIT) phase of the four satellites. The second pair of IOV satellites will be launched by 2012. *www.defpro.com/news/*

Riegl VZ-400 to be used for South African road project

MHP Geomatics has purchased a high speed laser scanner to capture highly accurate 3D measurements as part of a multi-million Rand upgrade project for the South African National Roads Agency. The Riegl VZ-400 supplied by 3D Laser Mapping will be used. *www.3dlasermapping.com*

Mayrise Maps out UK street lighting improvements

Street lighting software from Mayrise Systems is being used to map and manage 130,000 street lights in the UK following the award of two new Private Finance Initiative (PFI) concessions. The MAYRISE street lighting management system will be integrated with remote monitoring technology to allow automatic dimming of street lights and signs and improved asset management. *www. mayrise.co.uk*

Maptek I-Site Studio 3.5

Maptek has released version 3.5 of its laser scan modelling software I-Site Studio. The release coincides with the launch of a dedicated geotechnical module, guaranteed to have site geologists keen to try it out for mapping and analysis. The new module has more extensive tools for users to easily monitor changes in surfaces such as walls, batters and faces. *www.maptek.com*

S320 GNSS survey solution and A31 Precision GPS Beacon Antenna

Hemisphere GPS has announced the new S320™ GNSS survey receiver, XF1 data collector and survey software. S320 combines the advanced GNSS receiver performance of Hemisphere GPS' Eclipse™ II technology, precise geodetic antenna, wireless communication and batteries all in a portable, rugged unit with matching data collector. Designed to be compatible with a variety of existing surveying equipment, S320 is the ideal multi-GNSS positioning system for applications in GIS, construction, mapping, land and marine surveying.

Designed for use with Hemisphere GPS' popular Crescent® and Crescent Vector™ L1 receivers, A31 provides improved 300 KHz Beacon and L-Band (OmniSTAR®) reception and excellent GPS L1 multi-path mitigation with superior noise rejection. *www.hemispheregps.com.*

Harbor city of ancient Rome gets GNSS Coordinate System

The ancient harbor of Ostia, a major Roman archeological site, has been chosen by the Superintendent of the Archeological Heritage of Rome to receive a complete verification of all its former control points and a new GNSS-based coordinate system. The update, which began this past March has been using the Ashtech® ProMark™ 500 GNSS receiver. *www.ashtech.com.*

U.S. Army increases geospatial-intelligence for warfighters with SOCET GXP

The U.S. Army signed a multi-year agreement to add more than 500 new licenses of BAE Systems', SOCET GXP®. As the Army consolidates legacy hardware and software systems into the Distributed Common Ground System – Army (DCGS-A) enterprise, imagery and geospatial analysis tools must meet wide-ranging technical requirements to provide relevant and timely geospatial intelligence to the warfighter.

Microsoft UltraCam Customers win in UltraCam Image contest

The Microsoft UltraCam business unit announced winners of its recently staged image contest. The competition invited UltraCam customers to submit their most impressive aerial photos, captured with any model of UltraCam, to be considered for judging, with the end goal of recognizing and publicizing the 12 best from among the submissions. These images are now featured on the new Multimedia page of the UltraCam website

Leica News

Spider Software Suite v4.1

Leica Geosystems has announced the new version 4.1 of its Leica Spider software suite including Leica GNSS Spider, Leica SpiderWeb and Leica SpiderQC. The software introduces full GPS and GLONASS satellite correction signals support.

GNSS Reference Network for Kosovo with Leica technology

Leica Geosystems and the Kosovo Cadastral Agency signed a contract for the supply and installation of eight reference stations for the establishment of a Continuous Operating Reference Network in Kosovo (KOPOS) after Leica Geosystems AG won the International Competitive Bidding (ICB) procedure financed by the World Bank. *www.leica-geosystems.com*

Leica SmartWorx Viva v4.0

Leica SmartWorx Viva 4.0 onboard software is packed with exciting new features to make data collection and stakeout even simpler and even more productive.

Leica Viva GS25

The Leica Viva GS25 is the ultimate high-end GNSS Surveying Receiver and further expands Leica Geosystems' GNSS surveying portfolio of its successful Leica Viva family.

Leica xRTK and SmartRTK

Leica xRTK is a new RTK solution that provides maximum availability even in the most difficult conditions. Leica SmartRTK delivers reliable, consistent results in all RTK Networks and single base-line modes.

www.leica-geosystems.com

NovAtel GPStation-6 GNSS

NovAtel GPStation-6 GNSS Ionospheric Scintillation and TEC Monitor (GIS) receiver is integral to ionospheric monitoring and space weather applications. The receiver integrates NovAtel's OEM628 measurement engine with a low phase-noise oven-controlled crystal oscillator (OCXO). It provides signal tracking, ionospheric scintillation, and TEC measurements for all current and upcoming GPS, GLONASS, Galileo and Compass satellite signals

Carlson Survey 2012

Carlson Survey 2012 gives users increased 3D visualization, extensive new 3D coding in its industry-renowned Field-to-Finish, and the ability to produce customized, more professional reports among its many additional improvements. It provides support in its 2012 release for AutoCAD 2012 and comes with IntelliCAD 7.1 built-in. *www.carlsonsw.com*

Hexagon Locata partnership

Hexagon has partnered with Locata Corporation Pty Ltd to integrate the Locata positioning technology with Hexagon's positioning receivers. This collaboration will leverage each company's expertise to create the world's first combined GPS-Locata positioning receiver. *www.hexagon.com.*

Spectra ProMark 800 GNSS receiver

The new Spectra Precision® ProMark™ 800 receiver, using advanced Z-BLADE multi-constellation GNSS processing technology, tracks a wide range of available satellite signals including GPS, GLONASS and Galileo as well as WAAS, EGNOS and MSAS satellite-based augmentation systems. This universal GNSS receiver can be operated as a base, rover or network rover for RTK or Static field applications. *www.spectraprecision.com*

Trimble News

Trimble Field Inspector version 2.1

Trimble Field Inspector version 2.1 is compatible with a variety of Trimble handheld computers and is designed for automating utility infrastructure and smart grid asset maintenance and inspection.

Trident Analyst Software

Trimble® Trident Analyst 4.7 software is designed to effectively manage and interpret high-resolution digital images and large point clouds, and automatically extract features from Trimble's MX Mobile Mapping and Survey systems. These capabilities allow land mobile data to be transformed into geospatial intelligence.

eCognition 8.7 Software by Trimble

eCognition 8.7is a new version of advanced software suite designed to extract information from a range of geospatial data including images, point clouds and GIS vectors. *www.trimble.com*

Yandex buys 10 mn sq.km of images

Yandex, a Russian search engine, purchased high resolution images of 10 million sq.km of the Earth territory from ScanEx. The resolution shall be 0.8m per pixel. *www.scanex.ru*

Imagery reveals growing concentration camps in N. Korea

The North Korean government may deny their existence, but photos taken from space have revealed in unprecedented detail the concentration camps that are used imprison more than 200,000 citizens. Previously there have been blurred images taken by satellite but new detailed pictures from South Korea's Unification Ministry allow a closer look at the sites - and also prove they have grown. *www.dailymail.co.uk*

NASA Aquarius mapping sea salinity

NASA released its first global map of the salinity of the Earth's seas produced by its Aquarius satellite. Aquarius launched earlier this year and became operational on Aug. 25. The satellite is studying the surface salinity of seas to provide a global view of salinity to improve scientists' understanding of key climatic processes. The satellite's instruments have produced a map in color revealing a tapestry of global salinity patterns. *http://gantdaily.com*

PSLV-C18 launched weather satellite

PSLV-C18, the Indian rocket carrying the Indo-French tropical weather satellite Megha-Tropiques and three other smaller satellites was launched. Polar Satellite Launch Vehicle - C18 (PSLV-C18) -- blasted off from Sriharikota spaceport, around 80km from Chennai. It is lugging a 1,000-kg Megha Tropiques and three smaller satellites together weighing 42.6 kg. The three nano satellites that will be ferried by the PSLV are the 10.9-kg SRMSAT built by the students of SRM University near Chennai, the three-kg remote sensing satellite Jugnu from the Indian Institute of Technology-Kanpur and the 28.7-kg VesselSat from Luxembourg to locate ships on high seas.

MARK YOUR CALENDAR

November 2011

The 3rd Asia Oceania Regional Workshop on GNSS
1 - 2 November
Jeju Island, Korea
www.multignss.asia/workshop.html

IMTA Global Conference & Trade Show
10-11 November
Bangkok, Thailand
www.imtamaps.org

Regional Geographic Conference – UGI 2011
14-18 November
Santiago, Chile
www.ugi2011.cl

Esri Asia Pacific User Conference
15 - 16 November, 2011
Seoul, Korea
www.esri.com/events/asia-pacific/index.html

US India Aviation Summit
16 – 18 November 2011
New Delhi, India
www.bciu.org

spatial@Gov – Positioning Australia
15 – 17 November
Canberra, Australia
www.cebit.com.au/spatial

International Symposium on GPS & GNSS
15-17 November
Sydney, Australia
www.ignss.org

Surveying & Spatial Sciences Conference 2011
21 – 25 November
Wellington, New Zealand
www.sssc2011.com

ENC 2011
29 November-1 December
London, UK
www.enc2011.org

ELMF 2011
29 – 30 November
Salzburg, Austria
www.lidarmap.org/ELMF/

December 2011

12th ESRI User Conference 2011
7 – 8 December 2011
Noida, India
www.esriindia.com

GNSS Signals 2011
8 - 9 December
Toulouse , France
http://www.cborg.info

United Nations International Meeting on GNSS
12 - 16 December 2011
Vienna, Austria

January 2012

International LiDAR Mapping Forum
23 – 25 January
Denver, CO, USA
www.lidarmap.org

March 2012

RIEGL LiDAR 2012 International Airborne and Mobile User Conference
28 Feb – 1 March
Orlando, USA
www.riegl.com

Munich Satellite Navigation Summit 2012
13 – 15 March
Munich, Germany
www.munich-satellite-navigation-summit.org

ASPRS Annual Conference
19 – 23 March 2012
Sacramento, California, USA
www.asprs.org

April 2012

ENS 2012
23 – 25 April
Gdansk, Poland
www.enc2012.org

May 2012

FIG Working Week 2012
6-10 May
Rome, Italy
www.fig.net

Global Geospatial Joint Conference 2012
14 - 17 May 2012
Québec City, Canada
www.gsdi.org/gsdiconf/gsdi13

MundoGEO#Connect 2012
29 – 31 May
São Paulo, Brazil
http://mundogeoconnect.com/2012/en/

The 3rd China Satellite Navigation Conference
May 2012
Guangzhou, China
www.beidou.org

June 2012

Hexagon 2012
4 - 7 June
Las Vegas, USA

August 2012

The XXII Congress of the ISPRS
25 August - 1 September 2012
Melbourne, Australia
www.isprs.org

Geotrax

Dual Frequency GNSS Solution

Dual Frequency GPS receiver
Static and PPK function (Stop & Go)
GPRS Modem Built inside (Network RTK available)
Radio RTK (Upgradable)

All included
3 days free trial
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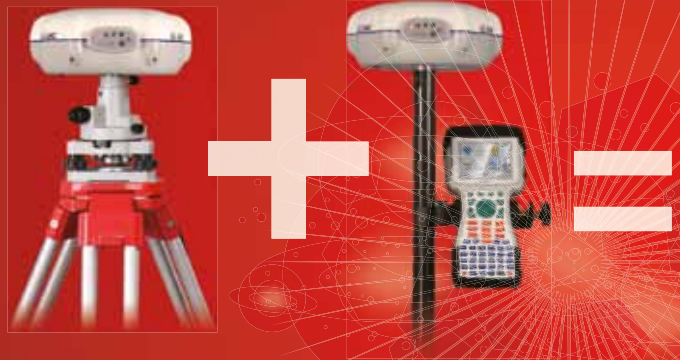
24/7 customer support
Free training



1 Rover Receiver
1 Base Receiver
1 Rugged PDA
1 Set PPK Software

Rs 725000 (*)

GNSS characteristic

24 channels :
- GPS : 12x L1, 12x L2

Advanced multipath mitigation

Optimized tracking for low elevation satellite

Performance specifications

Real Time Kinematics (RTK)
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- Vertical: 20mm+1ppm RMS
- Initialization time: 30s
- Initialization reliability: typical >99.9%

Post Processing Static and Fast Static
- Horizontal: 5mm+1ppm RMS
- Vertical: 10mm+2ppm RMS

Post Processing Kinematic (PPK)
- Horizontal: 10mm+1ppm RMS
- Vertical: 20mm+1ppm RMS

(*) Introductory offer. Stock permitted offer valid until October 31st, 2011 – Promotion available to Indian registered company only. Specifications and prices subject to change without notice. Price does not include local tax, VAT, freight charges …

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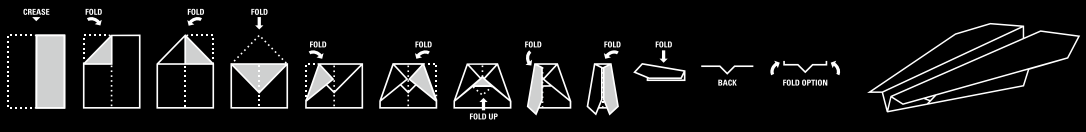

Integrate success into your NovAtel

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