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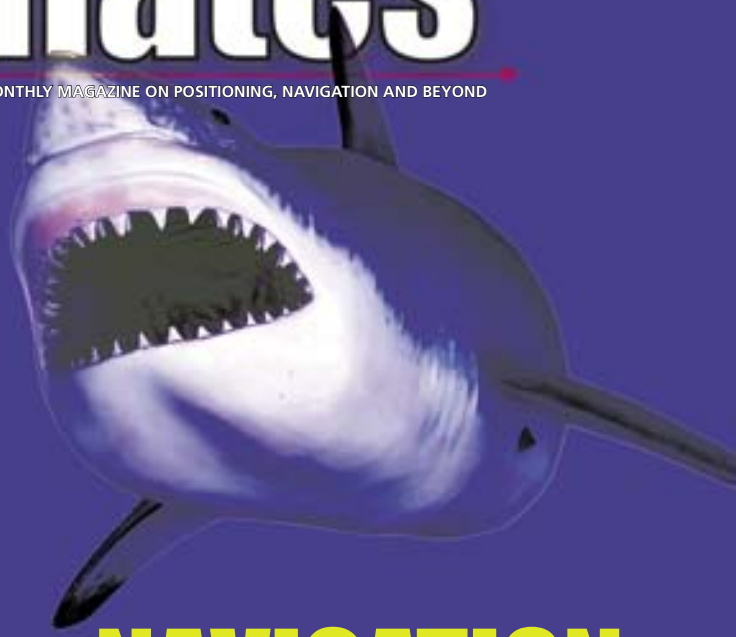
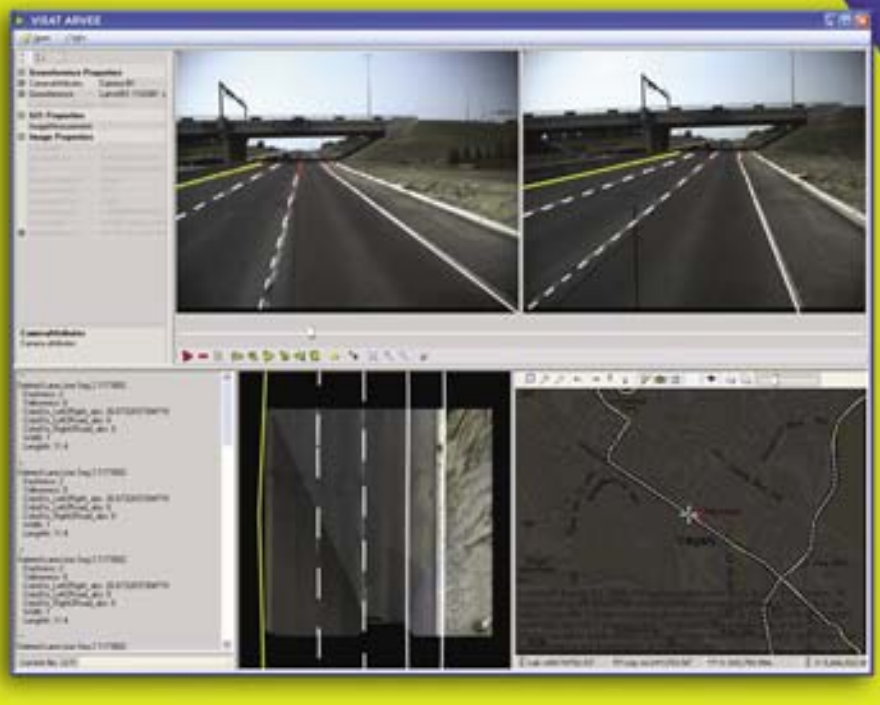


NAVIGATION market

VISAT

Mapping what you see



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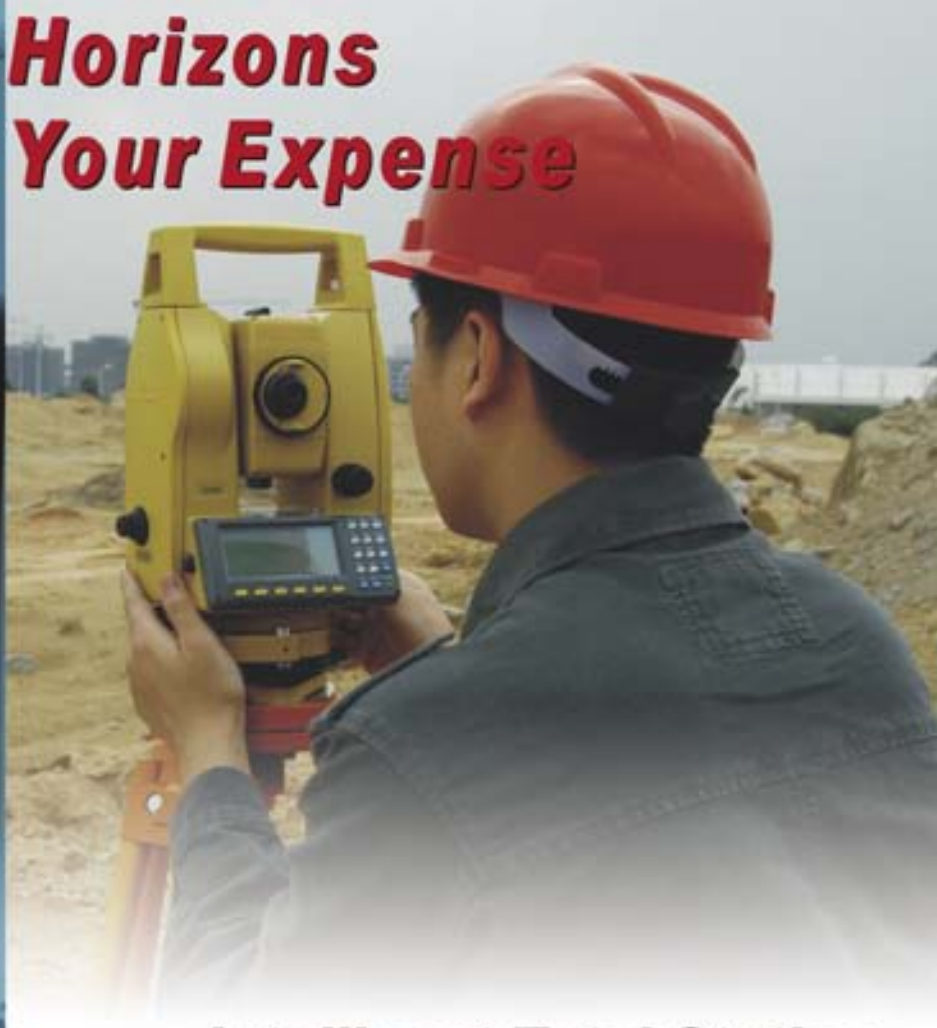

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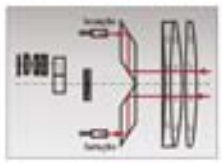

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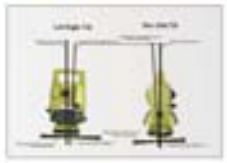

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Articles






Columns

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This issue of Coordinates is of 40 pages, including cover.

Remembering Prof M N Kulkarni

Prof Madhav N Kulakrni.

A member of Coordinates family.

We had been fortunate to have his guidance for last two years.

His sudden demise has left us in shock.

His name itself was synonym of GPS/Geodesy in India.

An irreparable loss to GPS community and science.

We share our heartfelt grief with the bereaved family
and pray for strength to cope with the crisis.

We pay our tribute to him.

We will nourish the dreams he had for geodesy and GPS in India.

"We need Everest 2007". That's what he wrote last in Coordinates in Feb 2007.

We will strive for that.

Bal Krishna, Editor
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VISAT: Mapping what you see

A new generation of the VISAT™ Mobile Mapping System has been developed in cooperation with Absolute Mapping Solution (AMS) which truly delivers a mobile mapping platform that integrates multi-sensors subsystems

Naser El-Sheimy, Taher Hassan and Martin Lavigne

With the continued growth of urban centers all around the world, city planners are required to keep up with up-to-date geographical at a faster rate. This has led to the establishment of spatially-referenced Geographic Information Systems (GIS) for a variety of municipal applications. This information, however, is expensive to obtain by conventional methods. In addition, conventional methods supply only point solutions and are therefore not suited to support the increasingly complex requirements posed by urban centers in a timely fashion. Satellite remote sensing and aerial photogrammetry are two methods which can provide various GIS information at high rates and reasonable cost. However, with the first method, the associated accuracy is not suitable for many applications, and in the second case the near vertical field of view provides only part of the information required.

Furthermore, the type and quality of information required by the user is changing, quite often the user prefers a cartographically less perfect product (e.g. map substitute) that contains the most recent information rather than a product of very high cartographic standard but with outdated information. Also, the demand for user specific maps or data and for non-cartographic products such as reports, images, graphs, and frequently asked questions are steadily increasing. For example; 3D digital maps (with landmarks; road vectors; transportation infrastructure information; etc.) that offer more visual information to make car navigation easier will soon replace the conventional 2D maps. 3D digital maps with enhanced 3D visualization will make maps even more attractive, informative and interesting, supporting a new range of Internet and consumer applications.

With the advances in satellite and inertial georeferencing techniques and the readily available of digital imaging sensors, a considerable portion of GIS information can be acquired from moving vehicles. The advantage of kinematic-mode data collection is that the survey can be performed much faster and therefore more economically, whilst gathering mapped data from a new dimension – in the same plane where the data is seen and needed, or what the human eye sees.

Mobile Mapping – The venue for 3D Mapping

The concept of mobile mapping or mapping from moving vehicles has been around for as long as photogrammetry has been practiced. Early incarnations of Mobile Mapping Systems (MMS) were however, restricted to applications that permitted the determination of the mapped from existing ground control points. Fifteen years ago, advances in satellite and inertial location technologies made it possible to develop mobile mapping system differently. Instead of using ground control as reference for orientating the images, the trajectory and attitude of the imaging platform could now be determined directly. This made mobile mapping to be independent of preset ground control points. Hand in hand with this development was the change from analog to digital imaging– a change that has considerably evolved over the past years (Schwarz and El-Sheimy, 2004). As a result, mobile mapping systems have evolved from a concept of academic interest to a commercially viable industry and are currently at a point where they match classical survey techniques in accuracy but far surpass in economy, speed and efficiency. These systems integrate navigation sensors and imaging sensors to determine the positions of the imaged points.. Although, the idea of mobile mapping is based on a simple concept, the real world implementation brings a lot of challenging problems. These are a product of integrating the concepts of kinematic geodesy, navigation, remote sensing, machine vision, and digital photogrammetry sciences which have been always treated separately. For more details, the reader is advised to read the article by Skaloud (1999) on mobile mapping implementation problems.

The initial trials to build a Mobile mapping system was a van for highway inventory (HI) 1983 by the University of Calgary (Schwarz et. al. 1993), however real implementation of practical systems were developed by the Centre for Mapping at the Ohio State University and the University of Calgary in the mid nineties. The University of Calgary system development objective was

"A mobile mapping system that positions all visible objects of interest for an urban GIS with an RMS accuracy of 0.3 m while moving through a road corridor at a speed of 60 km/h and a maximum distance to the desired objects of 50 m. Data acquisition must be automatic and should contain real-time quality control features. Data processing, except for quality control, will be done in post mission and should have separate modules for georeferencing, image data base management, imaging, and quality assessment." (El-Sheimy, 1996)

The outcome of this project was the

VISAT™ Van. The VISAT™ system – in its initial form – was notable because of the large number of imaging sensors it employed. Where previous land-based MMS were simple stereovision systems employing only two forward facing cameras, VISAT had eight cameras – permitting more flexible data collection and better imaging geometry. A new generation of the VISAT™ Mobile Mapping System has been developed in cooperation with Absolute Mapping Solution (AMS) which truly delivers a mobile mapping platform that integrates multi-sensors subsystems (See Figure 1).

In this article, an overview of the VISAT™ van is given. The sensors on board the VISAT™ are described highlighting their system functionality while providing an overview of the system's operational mapping cycle. System deliverables and accuracy are discussed. Finally, an outlook into the future development of the VISAT™ including hardware, software, and applications is presented.

VISAT™ - System components

Although all mobile mapping vans share the same concept of direct georeferencing, they carry different types and grades of sensors depending on the application, integration scheme, and the required accuracy. For example, vans which are used for highway maintenance are equipped with a single GPS receiver and a single camera to detect the locations of asphalt defects with accuracy of few meters. In general, a mobile mapping van integrates navigation sensors and imaging sensors that can be used to determine the position of imaged points. All the sensors are rigidly mounted together on a platform; the former sensors determine the position and orientation of the platform, and the latter sensors determine the position of points external to the platform. The sensors that are used for the external position determination are predominantly photographic sensors and thus are typically referred to as imaging sensors (El-Sheimy, 1999).

Figure 1: VISAT™ Van Mobile Mapping System

However, additional sensors such as laser rangefinders (Li et al., 1999) or laser scanners are also used in MMS and therefore the more general terms of mapping sensors or relative sensors may also be used when referring to the remote sensors (Ellum and El-Sheimy, 2001). Generally speaking, the final system quality depends on the accuracy of the used sensors and their hardware/software integration schemes.

The core hardware components of the VISAT™ van are a Strap down Inertial Navigation System (SINS), a dual-frequency GPS receiver, and a cluster of digital color cameras. The primary purposes of these components are – the GPS provides the position of the van, the SINS provides the orientation of the van, and the cameras are used for relative positioning from the van. These components, however, also have important secondary functions. For the GPS, these secondary tasks include controlling the long-term error growth of the SINS through the GPS/SINS Kalman filter and providing the precise timing base for all data streams. The secondary tasks of the SINS stem from its ability to be used as a position sensor in addition to an orientation sensor; consequently, these tasks include bridging GPS signal outages, detecting and correcting GPS cycle slips, and precise interpolation between GPS positions. The latter task – interpolation between GPS positions – is possible because the SINS provide data at 200 Hz, while the GPS positions and velocities are only available at 1-2 Hz.

In addition to the GPS, SINS, and cameras, the VISAT system also integrates a Distance Measuring Instrument (DMI). The pick-up from the DMI is used to trigger the acquisition of the images from the cameras at constant distance

Table 1: Primary and Secondary Functions of VISAT Sensors

Sensor	Primary Function	Secondary Function
GPS	Determines the cameras' 3D space position	• Controls the INS error propagation • Provides system synchronization • Gives coordinates in WGS84
INS	Determines the cameras' 3D space orientation	• Bridges GPS outages • Corrects GPS cycle slips • Gives precise interpolation between GPS fixes
Cameras	Two georeferenced cameras provide the position of objects in 3D space	• Provides redundancy, i.e., more than two cameras/images of the same object • Can be used to update navigation data through triangulation procedures
DMI	Triggers the cameras at constant distance intervals	• Updates the INS data if the GPS signal is blocked for periods longer than the INS bridging level required to fix GPS ambiguities (half a cycle)

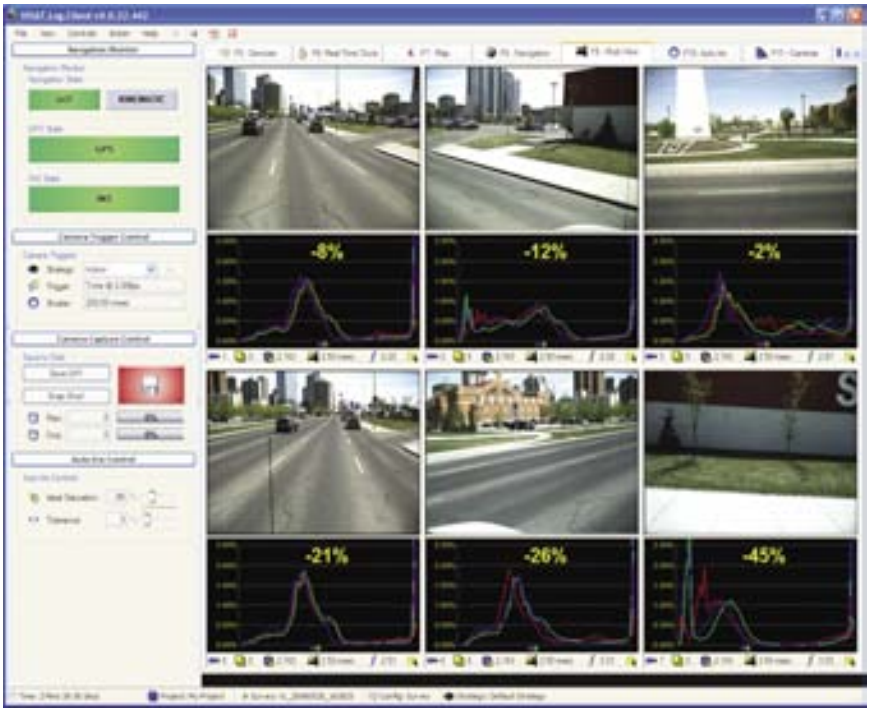


Figure 2: VISAT™ Log Application Running in VISAT Van

intervals defined by the user. Table 1 summarizes the primary and secondary tasks of the sensor in VISAT. Currently, the VISAT™ imaging component consists of 6 to 12 progressive color digital cameras (1600 x 1200 pixels or 2048 x 2048 pixels) which provide a 280 to 360^0 field of view. The images are captured at high sampling rates and can be controlled by either time or traveled distance (usually every 2-7 m).

The images are captured while the van is moving at the highway posted speed (up to 125 km/h). Essentially, all navigation and mapping data streams are synchronized to a common time frame using a high frequency synchronized multi-channel clock. VISAT™ has an efficient and robust data logging module which enables the collection of the data with minimum time delay.

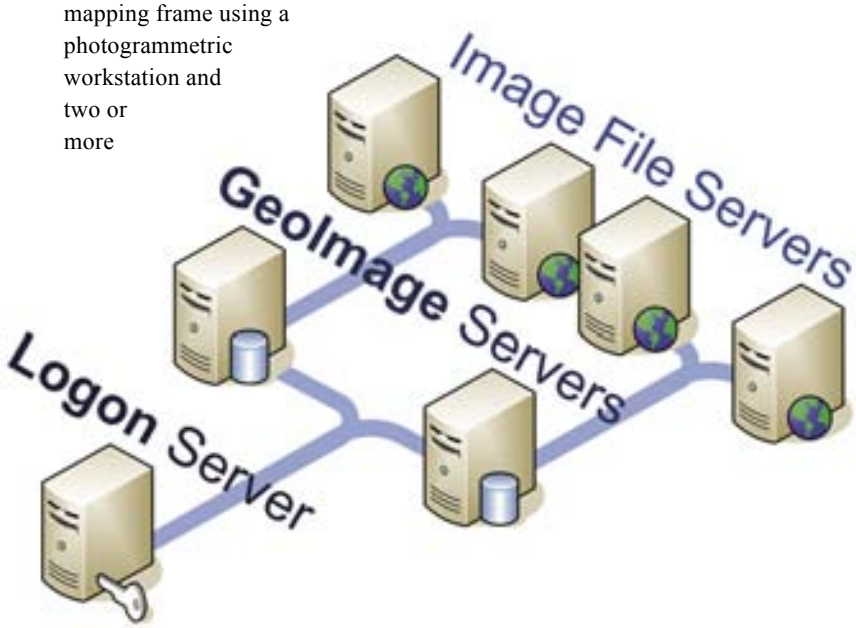
The VISAT™ logging system (see Figure 2) also has an expert module for real-time quality control, which communicates with the system's operator and provides useful information such as length of the survey, distance to master station, directions to specific routes, etc.

VISAT™ - Operational cycle

VISAT™ provide a task-oriented implementation of mapping concepts. Surveying by VISAT™ consists of three steps, which are essentially the same as for any mobile mapping system:

- Data acquisition
- Georeferencing of the images using data from the navigation sensors (GPS and SINS).
- Positioning of objects in a mapping frame using a photogrammetric workstation and two or more georeferenced images.

All data collected by the VISAT van is post-processed. During the post-processing, the digital images acquired from the VISAT van are georeferenced using the position and orientation as determined by the GPS and SINS data. The system position and orientation are interpolated at the instants of image exposures and then combined with the system calibration parameters, as described by lever arm and boresight angles, to relate the images to the real world coordinate system (El-Sheimy, 2005). The georeferenced images are hosted on VISAT™ GeoImage Servers along with the camera calibration that describes the inner orientation of the sensors, and the system calibrations that describe the lever arm and boresight angles. This new generation of servers allows client access via .NET Remoting on TCP, HTTP, or Named Pipe channels for desktop, workgroup, or internet deployment and distribution. VISAT™ GeoImage Servers also act as a Universal Description Discovery and Integration Service (UDDI Web Service). The distributed three layers architecture of the server, Login and Security, GeoImage Metadata, and Image File Server architecture can accommodate for mega size VISAT Image Libraries by using



VISAT™ GeoImage Server Architecture

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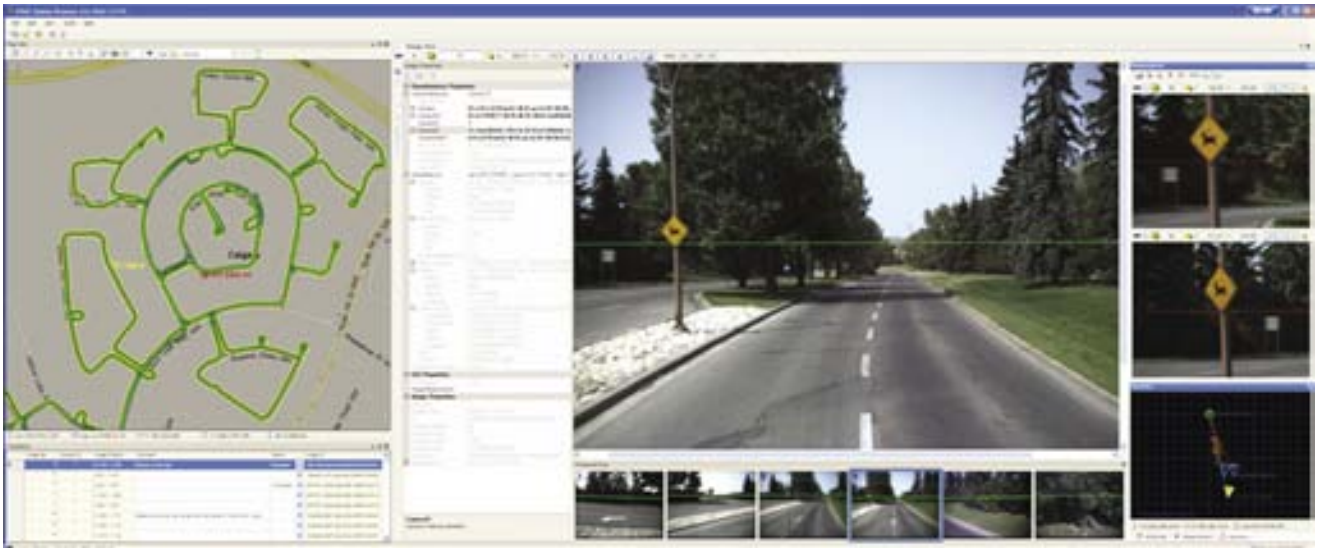
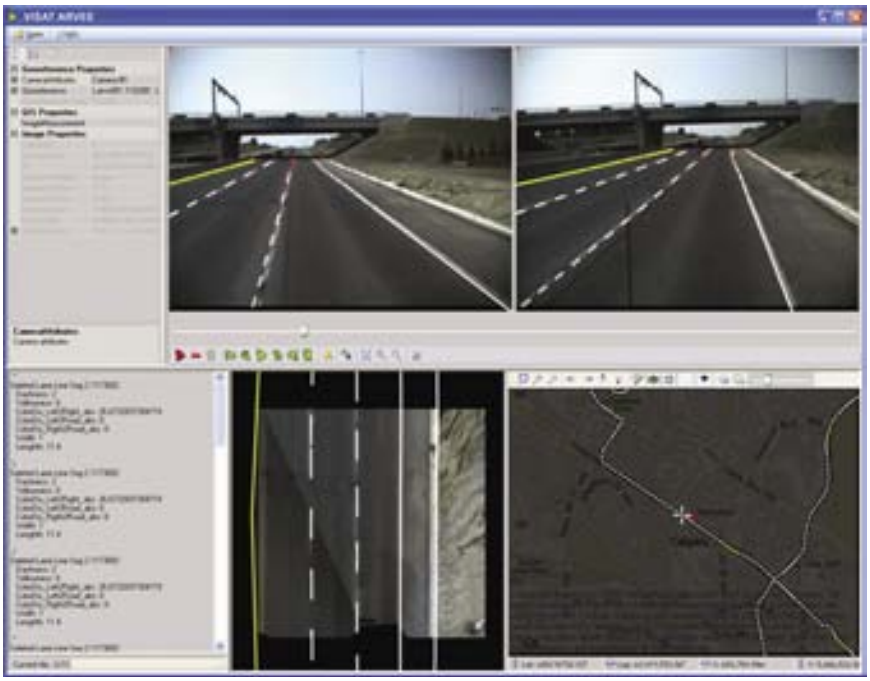


VISAT™ Station Measurement

Network Load Balancing (NLB) and Server Clustering techniques.

The next stage is the extraction of 3-D coordinates from the images. In addition, geometric information and attributes of themed objects such as control points, utility lines, and land parcels may be needed to form GIS elements for themed layers. This task is performed using a photogrammetric workstation called the VISAT Station™ that enables the measurement of objects appearing in the images and the generation of GIS elements. VISAT™ Station is the client application that enables the user to make use of the collected georeferenced images and perform mapping and GIS editing. The georeferenced images are accessed from a local file on the user's desktop or by logging on to one of the VISAT™ GeoImage Servers on the enterprise's Intranet or by subscription to public servers on the Internet. Point features are digitized by measuring the point in at least two images. The 3D point coordinates are obtained using simple photogrammetric intersection. Attribute information can be also collected by assigning the appropriate point symbol for the point feature. VISAT™ data are easily populated into GIS software like ARC-GIS.



VISAT™ - ARVEE Application

Automated Road Vector Extraction Engine (ARVEE) is a VISAT software component, especially designed to automatically detect and extract road lane line markings and road edges. ARVEE is an automated component running as a service on VISAT™ GeoImages Server that automatically process or re-process new or update georeference image files placed on the server. ARVEE derived information contains the 3D lane line vectors, their color and line type attributes. The 3D Road Vectors are also used in the Automated Quality Control Service (AQCS) of the server infrastructure and can easily be integrated into GIS platforms providing a vital method for creating and/or updating an important GIS layer for the next generation of Advanced Car Navigation, Driver Assistance Systems, and Fleet Management Services. (Wang et al., 2007 and El-Sheimy et al., 2007).

Mobile mapping - future outlook

Mobile mapping for land vehicles, the combination of digital imaging and georeferencing, has developed from a topic of academic interest to a commercially viable industry with

several applications. The VISAT technology, presented in this paper as an example of MMS, offers a system which is unique in several aspects:

- it offers a high-accuracy (10 – 30 cm RMSE) georeferenced imagery-based data product
- its georeferenced imagery (6 to 12 progressive color digital cameras of 1600 x 1200 pixels or 2048 x 2048 pixels which provide a 280 to 360^0 field of view) can be used for 3D visualization or mined for GIS applications,
- its images are captured while the van is moving at the highway posted speed (up to 125 km/h) and therefore the cost to acquire the data is significantly lower than other methods
- the level of accuracy and resolution delivered opens the door to a host of applications for which there is a current shortage of data

With the rapid development of high-resolution digital frame cameras and the current development of laser and other sensors, economy and efficiency will continue to improve for MMS. The future of MMS is nothing short of promising and exciting. For example, the next generation of VISAT™, the VISAT™ Van 3D Modeler which is currently under development with a prototype expected in early 2008 will include a terrestrial laser scanner for 3D modeling applications, enabling the user to "view" a photorealistic 3D model of the streets, surrounding buildings, road surface, etc. Future extension of the VISAT™ Van 3D Modeler includes the integration of multi-spectral sensors, infrared, and ground penetrating radar (GPR) with the overall objectives of providing a system capable of producing 3D virtual cities. This is just the beginning – MMS, VISAT included, truly provide a faithful capture of mapping what we see.

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GPS enabled mobiles reclassified

The circular presented here is the reclassification of higher technology featured mobile phones by Central Board of Excise and Customs, Government of India. It is also supplimented by news that appeared recently in Economic times. If GPS as a secondary feature on a mobile phone attracts lower customs duty, could we hope for the same for stand alone GPS receivers? We will try to understand the possibility in the forthcoming issue of Coordinates. Please share your views on this with us at bal@mycoordinates.org

Circular No.17/2007-Cus F. No.528/26/2005-Cus(TU)

Government of India, Ministry of Finance, Department of Revenue, Central Board of Excise & Customs

Sub: Clarification in respect of classification of higher technology featured mobile / cellular handset or telephones – regarding.

Board has received certain representations from the trade and industry regarding classification of higher technology featured mobile / cellular handsets or telephones, which contain GPS features apart from other functions like music, camera, voice recording, e-mail, internet and related editing features. Field formations have also requested to issue a clarification in the matter of classification of a hybrid product containing PDA, mobile phone with camera and GPS, which are being imported presently...

3. The issue was examined in the Board. Telephones for cellular networks or other wireless networks are presently classified under sub-heading 8517 12 of the First Schedule of the Customs Tariff Act, 1975. This Act does not provide specific Chapter Note or Sub heading Note on this product. As per Harmonized Commodity Description and Coding System (HS in short) effective from 1.1.2007, 'telephones for cellular networks or for other wireless networks' are classified under heading 8517. Earlier, prior to HS changes 2007, cellular phones were classified under heading 8525. There is no mention of the mobile phones that also have features of word processing, e-mail, internet, Global Positioning System (GPS) Receiver, Personal Digital Assistant (PDA), Smart phone etc. in the HS Notes. Further, tariff Item 8526 91 90 covers 'other radio navigational aid apparatus', which, inter alia, includes Global Positioning System (GPS), radar apparatus. Similarly, sub-heading 8471 30 covers 'portable digital automatic data processing machines, weighing not more than 10 kg., consisting of at least a central processing unit, a keyboard and a display'. HS explanatory notes to sub-heading 8471 30 state that machines which are equipped with flat screen, capable of operating without an external source of electric power and having an acoustic modem for establishing a link via the switched network are classifiable under sub heading 8471 30. However, there is no exclusion or specific note for classification of mobile/cellular phones with other functions as described above, in the HS Notes. Therefore, field formations were experiencing difficulty in classifying a product having combination of characteristics of a Personal Digital Assistant (PDA) / Personal Computer, GPS receiver, Camera and cellular phone...

5. In terms of the First Schedule to the Customs Tariff, 'telephones for cellular networks or other wireless networks, push-button type or other', would be classifiable under sub-heading 8517 12. Similarly, 'portable automatic data processing machine weighing not more than 10 Kgs., consisting of at least a CPU, a key board and a display' would be classifiable under sub heading 8471 30; and 'radio navigational aid apparatus' would be classifiable under sub heading 8526 91. From the scope of the headings / sub-headings, Board found that all mobile or cellular telephones whether working on the Global System for Mobile Communications (GSM) standard, Code Division Multiple Access (CDMA) cellular systems, Wireless Local Loop (WLL) or any other Mobile technologies, principally used as communication device would get covered under sub-heading 8517 12. These are essentially communication devices working on the basis of towers and base stations arranged into a network of cells, which send and receive radio signals for the cellular / mobile phone for communication. In view of the above, Board clarifies that sub-heading 8517 12 will cover all types of telephones that work on cellular networking technology or other wireless network...

7. Certain cellular/ mobile phones called as 'smart phones' may also have other additional features such as accessing the Internet, sending and receiving E-mails, video recording/ camera, word processing, radio or audio capabilities with color screens, QWERTY keyboard, touch screen. It may also run application software and synchronize with PCs, function as Global Positioning System (GPS) receiver. These devices work on operating systems (software) like Symbian OS, Microsoft Windows Mobile OS, Linux OS, which are similar to the software used in desktop PC / laptop. All these functionalities grouped as PDA or pocket PC or camera or GPS receiver, contained in cellular/ mobile phones, though represent as composite machine, for the purpose of classification, it will be governed by the Customs Tariff Act and the General Rules for Interpretation (GRI) as explained in para 4 above. Accordingly, in terms of Section Note 3 to Section Note XVI when the goods satisfy the following conditions these would be characterized as transmission apparatus in cellular / wireless network rather than as an Automatic Data Processing (ADP) machine or camera or GPS receiver.

(i) use transmission of signals (representing speech, messages, data or pictures) by means of electro-magnetic waves which are transmitted through the ether without any line connection i.e., wireless, in any of the bandwidth allotted to mobile/ cellular networks say 850 MHz to 1900 MHz; and

(ii) consist of transmission and reception hardware such as transceivers, antenna, microphone, speaker, battery, radio-frequency chip, basic band chip, power management chip, Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI) or other unique identity for cellular/mobile phone as well as radio-frequency transmission software such as GSM, General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE) etc.,

Hence, such cellular/ mobile phones remain classified in sub-heading 8517 12, as the principal function of these equipments remain as 'telephony'.

8. It is further explained that cellular / mobile phones can also be employed as data modems to form a wireless access point connecting a personal computer to the Internet. In this use, the mobile phone is providing a gateway between the cellular service provider's data network and PCs. In terms of chapter note 5 D (ii), it is made clear that such mobile phones shall not be classified under heading 8471 when they are presented separately. In other words, only when such phones are presented along with ADP machine or when composite machines consisting of ADP and mobile phones, where ADP is the principal function, these would be classified under heading 8471. Further, it is clarified that GPS receivers having phone function that does not operate through any of the cellular network or mobile technologies for the transmission or reception of signals, but operates exclusively through direct satellite connection or differential GPS (on the longwave radio frequencies between say 285 kHz to 325 kHz) is however classifiable under sub-heading 8526 91 as other radio navigational aid apparatus...

http://www.cbec.gov.in/customs/cs-circulars/cs-circulars07/circ17-2k7-cus.htm

A sigh of relief!

The Central Board of Excise and Customs (CBEC) has gone back on a move to classify GPRS phones as radio navigational apparatus (better known as satellite phones) for tax purposes. This means GPRS-enabled phones will face a 4% Customs duty rather than the 34% applicable on satellite phones.

The move comes as a major relief to mobile phone and PDA manufacturers like Nokia, Samsung, Blackberry, Motorola, PalmOne, O2, i-mate and HP.

In January 2007, a circular from the Office of the Commissioner Customs classified HP's iPAQ 6515 GPRS phone as a GPS receiver, subjecting it to a Customs duty of 34% instead of 4% levied on mobile phones. The circular caused widespread panic in the industry, which feared prices of GPRS phones would go up by 25% if the same principle is applied to other similar models.

The mobile handset market in India is estimated at over Rs.30,000 crore at present, with high-end (GPRS, MP3, camera) phones accounting for nearly 40% of the market.

On April 19, the under-secretary, Customs policy, in CBEC issued a clarification rescinding the January circular. "An apparatus will be classified as a mobile phone rather than an ADP machine or camera or GPS receiver when its principal function is telephony. For transmission of signals, it should use the bandwidth allotted to cellular/mobile networks.

It should comprise a transceiver, antenna, subscriber identity module (SIM), IMEI (International Mobile Equipment Identity) or other unique identity for cellular/mobile phones as well as software such as GSM, GPRS and EDGE etc," the clarification said. Despite the presence of many advanced features, many users of GPRS phones use them mainly for basic functions such as voice calls and text messages.

After the January circular, GPRS-enabled phones with GPS (global positioning system), MP3 and PDA features were being compared with GPS, MP3 players and computers (as they carry higher duty) by tax officials though no formal order had been issued in this regard. There was also confusion among taxmen over classification of PDAs, camera phones and GPS receivers with respect to the duty bracket.

In the HP iPAQ case, the now withdrawn January circular noted that since the equipment had "three principal functions of phone, GPS receiver and PC, it was thus classifiable under CTH (custom tariff heading) 8526 as a GPS receiver (satellite phones)".

GPS receivers having a phone function that doesn't communicate through cellular/ mobile networks but satellite connection or differential GPS (on longwave radio frequencies) are now, following the April clarification, classifiable as radio navigational aid apparatus. HP iPAQ used normal cellular networks.

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Early warning system for Tsunami in the Indian Ocean

The entire national Early Warning System is targeted to be made operational by September 2007

Shailesh Nayak

Tsunami is a series of traveling waves of extremely long wavelength generated primarily by earthquake occurring below and near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunami. Though the return period of tsunami is infrequent, the destruction done by tsunami is widespread, in terms of life and property. The most devastating tsunami occurred in December, 2004 affected the coastal countries of the entire Indian Ocean. It became necessary to set up a system in India to monitor seismic activity and sea level to evaluate potentially tsunamigenic waves and disseminate tsunami alert or warning.

The project on "Establishment of National Early Warning System for Tsunami & Storm Surges in the Indian Ocean" was approved by the Government of India in October 2005 for implementation at a cost of Rs.125 Crores with the Ministry of Earth Sciences as the nodal ministry. The major participants in the Project are institutions under Ministry of Earth Sciences [Indian National Centre for Ocean Information Services (INCOIS), National Institute of Ocean Technology (NIOT), Project Directorate of Integrated Coastal and Marine Area Management (ICMAM), India Meteorology Department (IMD)], Department of Science and Technology [Survey of India (SOI)], Department of Space (Indian Space Research Organisation (ISRO) and National Remote Sensing Agency (NRSA)], and Council of Scientific and Industrial Research [National Institute of Oceanography (NIO) and National Geophysical Research Institute (NGRI)].

The entire national Early Warning System is targeted to be made operational by September 2007 after necessary testing and simulations. This Project has been identified by the Government of India as a thrust area in its basic agenda for 2005.

The system comprises of network of seismic stations, bottom pressure recorders, tidal stations, coastal radars, and automatic weather stations, receiving data from all these sensors in near time, mainly using INSAT satellite and integrating them through decision support system and issue alert or warning as appropriate.

Seismic stations

In the vicinity of India, there are two tsunmaigenic zones, Andaman-Sumatra trench and the Makran coast. It is necessary to monitor seismic activity along these two areas. This has been planned by installing digital seismometers, GPS receivers, and strong motion accelerometers and real time communication links to estimate moment magnitude reliably. This will help to provide first level of advisory within minutes of earthquake occurrence.

The installation and interconnecting 17 broadband seismic stations and for real time communication of data to the Central Receiving Station (CRS) of India Meteorological Department at New Delhi and to the Parallel CRS at INCOIS, Hyderabad is envisaged to be completed by August 2006.

Monitoring Sea Level

The initial tsunami warning or alert is confirmed by monitoring sea level in deep sea as well as on coast. This is being implemented by installing bottom pressure recorders (BPRs) and tide gauges to monitor sea level changes. India is installing such bottom pressure recorders in both the Bay of Bengal (10) and in the Arabian Sea (2) at appropriate locations. Four BPR's have been deployed by NIOT in the Bay of Bengal. Data from one buoy is successfully transmitting data to NIOT that is being received in real-time at INCOIS through VSAT connectivity. ISRO is working on the indigenous development of BPR's.

50 Tide Gauges are planned to be installed as part of this network (36 by Survey of India and 14 by NIOT). Data from Six Tide stations installed by NIOT at Chennai, Kandla, Vizhinjam, Mangalore, Minnie Bay, and Rangath Bay is being received at NIOT and retransmitted to INCOIS through the VSAT. The data from eleven tide gauges is already being received at SOI, Dehradun by VSAT network established by ECIL. INCOIS has initiated actions to receive SOI Tide gauge from Dehradun to INCOIS in real-time through VSAT.

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Enhancement of Ocean observations

Five Coastal Observing Radars and two Current Meter Moorings are planned to be installed. HF Radars have been successfully used to detect and measure the strength of Tsunami Surface signatures. One such radar has been installed near Chennai for experimental purposes.

Upper Ocean and Surface Met-Ocean data from 25 surface drifters (atmospheric pressure, winds, sub-surface temperature, surface velocities), XBT Lines (for collecting Temperature Profiles), Moored Data buoys (Air Pressure, Air Temperature, Humidity, Wind Speed & Direction, SST, SSS), and 25 Automatic Weather Stations (Air Pressure, Air Temperature, Humidity, Wind Speed & Direction, Rainfall) are being acquired. Drifters and XBT are being implemented through NIO. Moored Buoy data is being received from NIOT through VSAT.

Creation of high resolution topography and bathymetry

Coastal topography and bathymetry play very crucial role in running inundation models. A very detailed survey of the Indian coastline has been initiated, wherever such information was lacking.

Bathymetry data base at appropriate resolution and format required for Tsunami and Storm Surge Models has been created using all the existing sources of data as well as by conducting surveys at selected critical coastal locations.

NRSA is responsible for Topographic Mapping of 15, 000 Sq km area (for 7500 line km and 2 km inland from the coastline) with airborne LIDAR & Digital Camera data in conjunction with GPS control survey using photogrammetric techniques.

NRSA has already acquired required airborne data for Machilipatnam – Kochi stretch i.e. for an area of 3,300 sq. km. Of this, processing DEM generation from Nagapattinam to Cuddalore has been completed. The generation of digital topographic maps for the balance 3040 sq km is progressing and this is expected to be completed by April – May 2007. The aerial flying for the remaining 11, 700 sq km, is under progress.

Coastal vulnerability modeling and inundation mapping

The information about magnitude, location, and depth at which an earthquake has occurred has been used to model travel time, inundation, and run-up of tsunami to coastal regions. Since running such models in real time is not advisable, it is necessary to generate scenarios (in thousands) of various possible earthquakes and generate look-up tables for possible travel time. A travel-time atlas has already been generated. The information about sea level can also provided to this model for validating earlier estimates of travel time, inundation levels, and run-up.

The possible risks of coastal inundation due to tsunami and storm surge by using tsunami and storm surge models constructed using numerical equations have been implemented. Inundation Maps of coastal locations have been generated by ICMAM on 1:4000 scale for 5 scenarios of historical Earthquakes and Storm Surges.

Setting up a dedicated early warning centre

An Interim Tsunami Warning Centre, following the Standard Operational Procedure, has already been made operational at INCOIS since July 2005. This centre receives earthquake and tsunami advisories from India Meteorological Department, Japan Meteorological Agency, Pacific Tsunami Warning Centre as well as Tide Gauge Data from SOI, NIOT and other International Stations. This arrangement has worked well during the Tsunami that hit Java on July 17, 2006 wherein it was confirmed within an hour that the Tsunami was not likely to hit the Indian Coastline.

Communication of real-time data from Seismic Stations, Tide Gauges, BPR's to the early warning centre is very critical for generating timely tsunami warnings. An end-to-end communication plan has been worked out in collaboration with the Indian Space Research Organisation that envisages use of INSAT DRT for one way and INSAT MSS for two way communication from Tide Gauges and DART Buoys. The installation of INSAT Satellite Communication facilities at INCOIS will be ready by March 2007. In addition, VSAT network, dedicated broadband internet and INMARSAT reception facilities are also being established.

The Virtual Private Network for Disaster Management Support (VPNDMS) node has been set up at INCOIS that facilitates reliable connectivity to the Ministry of Home Affairs for dissemination of Warnings. In addition, INCOIS is also working on technological options that facilitate dissemination of warnings directly to the public through Mass Media, IMD Cyclone Warning Centers, PFZ Electronic Display Boards, Mobile SMS Messages, Telephones, etc.

Education

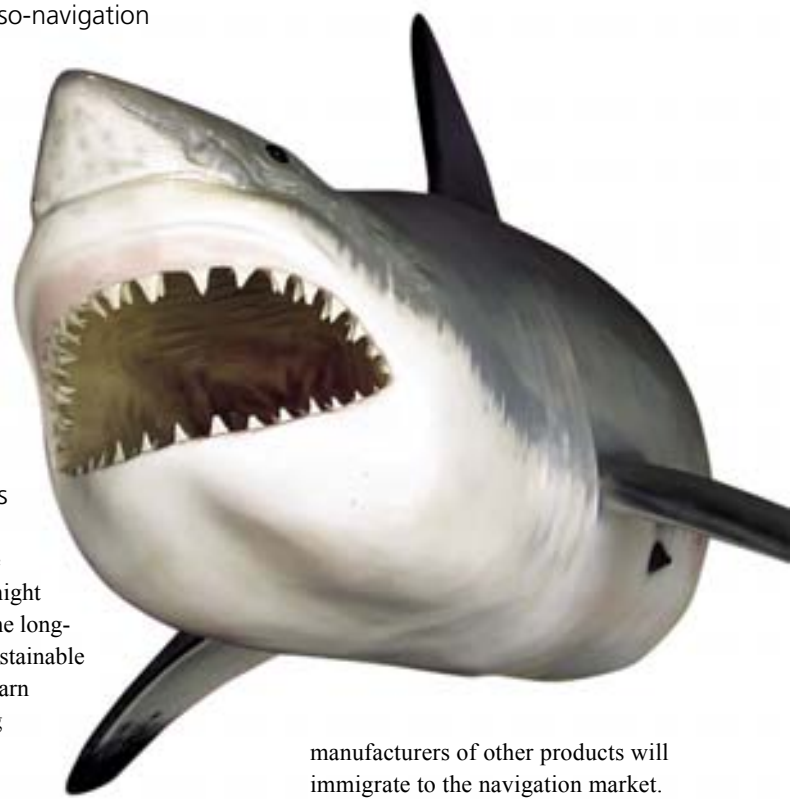
An easily understandable publicity material on earthquake, tsunami, and storm surges in vernacular languages is being created to be distributed to the general public. A dedicated multi-lingual web-site is also being developed to provide information on Tsunamis and Storm Surges.

Shailesh Nayak
Director, Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, India

Navigating the navigation market

The market will move away from pure navigation to also-navigation

Alden Lee



Fifteen years ago people hardly had mobile phones; today it seems awkward if you do not possess one. After this success story the IT sector has its new gadget: Navigation systems. Similar to the mobile phone market it is growing tremendously.

Market structure

There is another similarity between the navigation and mobile phone markets: Both markets are oligopolistic, since the top four companies have together more than 75 % market share.

Numerous other companies are fighting for the remaining 25 %; every year many go bankrupt and every year new companies are entering the market, believing that they are smarter than the others.

Market trends

That fierce competition has served well to bring prices down. So, nowadays most players are sourcing their products from sub-manufacturers in China. However, this means that anybody can enter the market and source easily navigation devices, when the volume commitment is big enough.

In Korea, where almost one-hundred companies are fighting for a market of only 1.5 million navigation devices this year, some companies have found niche markets by providing navigation systems with better or more features: Display size has moved from 3 inches to 7 inches, MP3, MPEG4 and even digital TV was implemented.

In the future we will see implementations of more technologies in order to keep low-price competitors in a distance: WiBro/WiMax so that drivers can stay always connected, voice recognition to avoid pressing buttons while driving, and features for safe driving.

Market winners

For some time this strategy might work, but in the long-run it is not sustainable as we could learn from Samsung Mobile's experience: Samsung mobile phones increased market shares drastically, despite high prices, when clam shell phones with cameras were introduced to the market. Rivals like Nokia and Motorola did not have these features at that time. However, it took them eighteen months to follow and to regain their former market position. Therefore Samsung moved to the next technology: digital TV. This time consumer's were less responsive and Samsung mobile phones could not repeat the former success.

We can conclude that in the long run – besides a few big hardware manufacturers – there will be only room for small manufacturers that produce hardware for niche markets which are too small for big players to consider.

New competitors

The trend to additional features will turn-out to be a threat to incumbent companies: Once navigation is just one of several functions, manufacturers of other products will immigrate to the navigation market. Most notable are manufacturers from the following three areas: 1. Mobile Phone, 2. Notebook, 3. Automotive.

Mobile phone

The combination of navigation with GPRS/CDMA technology is natural, so some navigation companies have started already to implement such modules.

Once these companies have built the market successfully and consumers got used to that feature, the mobile phone manufacturers will easily dominate that market. Due to their patents and high volume production, it will not be possible to beat them on price. They probably will have to pay less than USD 1,- - for the GPS chip. In addition their experience will enable them to design products with better performance.

During the 3GSM World Congress 2007 in Barcelona Nokia has already announced that in the future most mobile phones will have GPS capability. So we

can expect that mobile phones will enter the navigation market even more aggressively.

This trend is supported by mobile network operators, which seek for new opportunities to gain revenues. While fees for phone calls are continuously decreasing, operators are looking for ways to increase the usage of data transfer with applications like exact positioning or downloading of maps.

In Korea the share of mobile navigation has reached already 30 % of the total market for navigation devices. Using the mobile phone for navigation enables the driver to tell an operator where he wants to go so he does not have to press buttons while driving. The only advantage of the normal car navigation system remains the display size.

Notebook manufacturer

Since 2006 Microsoft and Intel are promoting ultra-mobile PCs (UMPCs) under the name of Origami. The UMPCs are Windows-based touch pads that weigh below 1 kg and have up to 7 inch displays. So far these devices were not successful in the market, maybe because the ordinary consumer cannot see an advantage to normal notebooks. However, major companies continue their investments to create a new market for that kind of computers.

Navigation is one important feature to distinguish the usage of UMPCs from normal notebooks. While currently only a few devices have an embedded GPS receiver, we will soon see more of such products. These devices will set the limits for high-end navigation systems offering already features like HSDPA, WLAN, WiMax and 900 MHz CPUs.

Automotive

From 2009 eCall will be compulsory for new cars in the European Union. This means that every new car has to have a GPS receiver and a GSM module in order to transfer the location in case of an accident.

Once there is a GSM module in the car and since more and more car break-downs are due to the car's electronic system, automotive suppliers are planning remote diagnostic solutions: Accessing the car computer, reading the trouble codes, and sending the data to designated repair shops for remote inspection. Via a display in the car the driver could be warned if the car is not functioning correctly.

When there is a built-in GPS receiver, GSM module, and display in the car, it is only the map software missing to have a full-functional navigation system. Because no extra hardware cost is involved, such a solution could easily become standard in cars. In Japan most navigation devices are already built-in systems.

Due to the remote diagnostic capability the navigation devices would even offer a feature which companies from the IT industry cannot provide, securing companies like Delphi, Visteon, Bosch, and SiemensVDO with a comfortable market entry barrier.

Because there will be still demand for mobile devices, car manufacturers will provide an interface in the dashboard where drivers can plug-in mobile devices. Through this interface the navigation system can be connected to the car system, if the software is compatible. Due to the software compliance car manufacturers will be able to control companies that provide these devices.

Market change

Market entries from other areas will significantly change the navigation market: The low-end market will be taken over by mobile phones, the high-end market will be taken over by UMPCs while sooner or later the automotive industry will control the market.

Software

While new market entrants will threat current hardware manufacturers, they will boost the business of navigation software companies. Companies that provide map data and point of interests (POIs) as well as companies that provide the maps and user interfaces will see a growing number of potential customers with huge volume.

Nevertheless, also the software companies have to adjust to new challenges: 1. the map data will have to contain more attributes, 2. new applications have to be embedded, 3. navigation systems will become interactive.

Map data

NavNGo has shown how to challenge the duopoly of Navteq and Tele Atlas: Although NavNGo is mainly a map software provider, it has a strong point in providing detailed geographic information for Eastern Europe. Especially in emerging markets new companies will challenge the current duopoly.

But also in developed countries like Korea opportunities can be found: The medium-sized company Thinkware has built the best data and map software for that country and consequently holds 50 % of the local map software market. No competitor can offer the magnitude of information as Thinkware. It takes 4GB to store Thinkware's map of South Korea, a country which has only 1 % of the size of the US or China.

The big race for map data for India and China has just started and it is not clear yet which companies will emerge as market leaders.

New applications

Despite adding more attributes to maps, companies will need to add more software applications in order to differentiate from competitors.

Maps for example will be linked to Google Earth and/or to real pictures of the streets and the views around.

Since all data for one country would be too huge, the data had to be downloaded selectively, offering good business models for mobile operators.

Especially when driving, I am entering continuously areas I am not familiar with. Local based services (LBS) can help with information in these areas. While companies in most countries are still struggling with profitable business models, companies in Korea have discovered successful ways and are preparing to go overseas. Again a trend which is heavily supported by mobile phone operators.

Interactive

As we see the World Wide Web developing to Web 2.0, there will be Navigation 2.0. Devices will become interactive: When driving I want to choose restaurants for taking a rest which have received good marks from other travellers. After relaxing and eating there, I want to give my own rating. I might even travel alone but do not want to eat alone. Eventually mobile communities will emerge.

More choices

Incumbent navigation software companies will not have to fight as much as the hardware companies to protect their business. The major fight will be about new geographic markets and new market segments won by new applications. It is still an open race and not decided yet which companies will provide successful solutions.

Niche markets

While there are certain trends in the main stream navigation market, there are always new applications and requirements arising which offer business opportunities. Recently we have seen three new areas: 1. Enhanced View, 2. Insurance, and 3. Traffic Authorities

Enhanced view

Combined with other devices, some drivers like to use navigation systems for more safety in the car, especially when trailers are used. One or more cameras can be connected to the display, enhancing the driver's field of view and eliminating any blind angle.

Insurance

The faster you drive the more accidents happen. Therefore some insurance companies like Axa in Ireland and Unipol in Italy have started to give discounts to clients who do not drive over speed. Control is secured by a device with GPS and the capability of transferring data.

Traffic authorities

Last year the UAE has signed a $125 million contract with IBM to provide a traffic monitoring and speed-enforcing system in which a GPS-enabled device would be installed in cars to provide a voice warning if the driver exceeds the local speed limit. If the voice warning is ignored, the system would use a GPRS link to beam the car's speed, identity and location to the police so that a ticket could be issued. Probably there will be some more countries who would like to control their citizens. In the USA there is already a law which requires that every phone call shall be able to be localized, while the European eCall initiative has the same idea.

More safety

What has started with telling me where I am and in which direction I should go, has become an instrument for more safety. I might enjoy an enhanced view, while I might be against automatized ticket issueing for over-speeding; nevertheless, both applications follow the same trend. In the future we will see more safety applications in combination with navigation systems.

Conclusion

Besides a few big players medium-sized hardware companies will only survive in niche markets. In a first wave mobile phone companies will control the low-end market, while notebook companies will control the high-end market. In a second wave automotive companies will gain more and more market share.

Current software companies may retain their current business but there is enough room in the market for new software companies that can offer detailed map attributes and/or attractive new applications.

The market will move away from pure navigation to also-navigation, offering life-style features like restaurant recommendations and safety features like cameras or eCall.

Big companies will only survive when they stay price competitive, while small and medium-sized companies can only survive when they anticipate market trends on time and are amongst the first to supply new demand.

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Understanding Galileo

Galileo will make civil users of satellite navigation in Europe and all over the world independent of the American GPS

Hendrik Thielemann

Exact determination of position, at any time, from any location, secure and precise navigation, efficient route planning – in the future it will all be summed up in one word: Galileo. This new European navigation system with 30 satellites will be ready for use in the beginning of the next decade. A first test satellite has been launched into its orbit in 2005. Another one will follow by the end of this year. Galileo will make civil users of satellite navigation in Europe and all over the world independent of the American Global Positioning System (GPS). Even more, especially in connection with civilian use, Galileo will outperform GPS and thereby open the gate for new applications and markets for satellite supported navigation. Especially in the combination with navigation, mobile telecommunication and information services, there is an immense utilisation and market potential.

Artist's impression of four European navigation satellites in Orbit. (Copyright: EADS Astrium)

The Galileo

Galileo is the first joint project of the European Union and the European Space Agency ESA. The global satellite navigation system is to be realised in a public private partnership. The European Union and a private concession company will share the costs for the development and setup of the navigation system.

The Galileo constellation consists of 30 satellites, which circle the Earth at a height of just under 24,000 kilometres. Three of them serve as active reserve satellites. The user device determines its position on the globe by calculating the distance to at least three of the Galileo satellites. The more precise this distance measurement, the more precisely can the position of the user be determined. The distance is determined with the aid of a highly precise time signal. The satellites emit these time signals and the user device measures the time that elapses until the signal is received.

Services

Galileo will provide a total of five services:

- The Open Service (OS) is intended for mass use, like automobile navigation systems. The OS signals can be received free of charge by anyone who has a suitable user device. In future, the open signals of the European Galileo-System and the US-American GPS will be interoperable. Users will thus benefit from better signal availability and higher accuracy of their position determination.
- The Safety-of-Life Service (SoL) is intended above all for safety critical transport applications, for instance for guiding air or rail traffic. The certified SoL service can only be used with special certified user devices. The Galileo operator will guarantee the continuous availability and high precision of the SoL signals. This guarantee is a unique selling point for the European Galileo-System. Due to missing guarantees, GPS is not a suitable navigation system for safety critical applications such as controlling airport approaches and distances between trains; the Galileo Safety-of-Life Service will serve these purposes.
- The Commercial Service (CS) is intended for users who require higher precision than that provided by the Open Service.
- Galileo will transmit a special signal for the Public Regulated Service (PRS), a service for applications relating to sovereign tasks. This coded signal will be characterized by a high resistance to jamming and it will only be possible to receive

it using special terminal units. Whether, and to what extent, this signal will be used by the military has not yet been determined and is subject to political decision. However, opinions on this are currently divided. Whilst France, for example, has shown great interest in using the PRS for military purposes, the response from Germany has been rather more reserved on this issue.

- The Search and Rescue Service (SAR) is a European contribution to a world-wide search and rescue system.

The setup plans

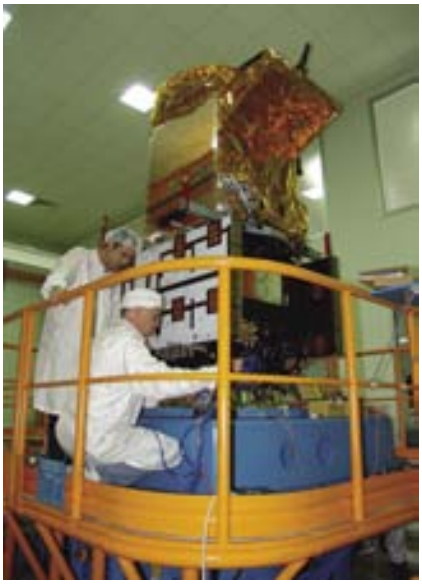
The setup of the European satellite navigation system will be done in two phases: the In-Orbit-Validation-Phase (IOV), which is scheduled to last until 2009 and the Full-Operational-Capability-Phase (FOC) which will follow.

The In-Orbit-Validation phase (IOV) comprises the development, construction and launch of two test satellites and the first four operational navigation satellites. In addition, a part of the ground infrastructure will already have been set up during this phase. The first test satellite, Giove A, has been launched in December 2005 and is successfully transmitting signals. The second test satellite, Giove B, is set for launch by the end of 2007. Afterwards, the first four operational satellites will be launched and this partial system will be tested extensively under real-life conditions.

The IOV-Phase is funded 100 per cent publicly. During this first phase, the European Space Agency (ESA) is in charge of the system procurement. In January 2006, ESA has signed the special purpose company European Satellite Navigation Industries (ESNI) as main contractor for the IOV-Phase. ESNI is a joint venture which is owned by the major European players in space industry. EADS Astrium is the largest shareholder. Astrium GmbH in Germany and Astrium Ltd in Britain each hold 19 percent of the shares. Other shareholders are Finmeccanica (Italy, 19 percent), Alcatel (France, 19 percent), Galileo Sistemas y Servicios (Spain, 12 percent) and Thales (France, 12 percent). When the planned merger between Alcatel and Thales is finalized, the new company will hold 31 Percent of the shares.

The stakeholders

As the largest shareholder of Galileo Industries, EADS Astrium will play an important role in the construction of the European Satellite navigation system. In the framework of the industry consortium EADS Astrium is to assume system responsibility for the so-called space segment of Galileo as well as the ground control segment. In addition, EADS Astrium is also involved in the so-called Ground



Giove B, the second test satellite for the European Navigation System Galileo, during tests in Rome, Italy. The Satellite is set for launch by the end of 2007. (Copyright: EADS Astrium)

Mission Segment, which includes the necessary ground infrastructure for the processing and quality of the Galileo navigation signals and services.

The hub of the activities associated with the space segment is in Ottobrunn near Munich, Germany. Not only is the system responsibility for development and construction of the Galileo satellites housed there, important components are also to be manufactured in Ottobrunn, such as the entire energy supply and position control of the satellites.

Following their involvement in the earlier Phase activities, EADS Astrium in Portsmouth, UK are well placed to support the future phases of the project, in particular, the Ground Control Segment and Payload development. Technical input to Ground Control will draw on the companies' expertise in Telemetry Tracking & Command (TT&C) and Key Management Facilities, whilst the Payload team can draw on significant previous experience developing L-band hardware and navigation payloads for mobile payloads such as Inmarsat 3 and 4, in conjunction with a pan-European team developing Galileo payload hardware, under parallel ESA programmes. EADS Astrium in France and in Spain are also participating in the prestigious Galileo programme.

Astrium's business division, Space Transportation, will build the engines for the satellites and is the industrial system leader for the European launch rocket Ariane 5 that can bring the satellites into the orbit. Another subsidiary of EADS Astrium, the Spanish CASA in the framework of the Galileo Sistemas y Servicios plays an important role in the construction of the ground infrastructure for Galileo.

The second phase of the Galileo setup, called Full-Operational-Capability-Phase (FOC) comprises the construction and launch of another 26 navigation satellites and the remaining ground infrastructure. This part of the navigation system will be procured by a privately owned company - the so called concessionaire. The concession company will not only be in charge of procurement, it will also organize the private part of the funding within the PPP-Framework and finally operate the European Satellite Navigation System for a contractual period of 20 years. The concessionaire will earn its revenues from commercially marketing the Galileo signals and the services derived from these.

To become the concessionaire, another dedicated pan-european industry consortium will be founded. The eight shareholders of the concessionaire will be EADS Astrium, Alcatel, Finmeccanica, Aena, Hispasat, Inmarsat, Thales and TeleOp. The Headquarters of the Galileo Concessionaire will be located in Toulouse, France. The Operations Company will be located in London, United Kingdom. The two Control Centres (Constellation and Mission) as well as the two Performance Evaluation Centres supporting the concessionaire headquarters will be located in Germany and Italy. Spain will host facilities that include redundancy for the Control Centres and those related to Galileo safety critical applications. The concession contract is currently negotiated between the European Union's Galileo Supervisory Authority (GSA) and the eight shareholders of the future concessionaire.

Hendrik Thielemann
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Remembering Prof Madhav N Kulkarni

In sudden and untimely demise of young Prof. Madhav Kulkarni, India has lost the best and boldest geodesists. Proud of the glorious past, he wanted that independent SOI should achieve GREAT of its own. For his reverence to Everest, he was trying to achieve the new 21st century Indian Geodetic System as "Everest 2007". Since meeting him first time during the 1992 GPS satellite symposium in Columbus, Ohio, I always admired his determination to "accomplish" for India. To pay REAL homage to Madhav, let us realize the Everest Geodetic System 2007 and start DSMs and OSMs with 21st century format, which would lead India to be the BEST in the world.

— Muneendra Kumar, Ph.D.

This is to convey our deep condolences on the sudden demise of Prof Madhav Kulkarni. We have indeed lost an excellent academician and a very good friend. He was a man of great insight and personality, and his death is a great loss for IIT and the entire GPS community.

— Trimble Navigation India Pvt. Ltd. and their Distribution Partners

Dr Madhav N Kulkarni was Professor of Geodesy & Remote Sensing at IIT Bombay. He joined faculty of the Geodesy & Remote Sensing Division of Civil Engineering Department, Indian Institute of Technology (IIT), Bombay, in June 1999, after taking voluntary retirement from Army Engineers, as Lt Co. An Alumnus of IIT Kharagpur,

Dr Kulkarni served in Survey of India, a Department under DST, for 20 years, on deputation from Army. He carried out and supervised extensive Geodetic survey operations from the Himalayas to Kanyakumari, for diverse applications. He did his Masters and PhD in Space Geodesy at The Ohio State University, USA, in a NASA-funded project, on a study leave, and received two international awards. His areas of specialization include Space Geodesy, Satellite-based Surveying & Mapping techniques, Earthquake Studies using Geodetic Techniques, and Global Positioning System (GPS).

Dr. Kulkarni was also an Adjunct Professor at the Indian Institute of Geomagnetism, Mumbai, and member of several National committees, including the National GPS Expert Group. He has over 50 technical publications to his credit. Prof. Kulkarni was also an advisor for Coordinates since its inception.

Prof Kulkarini's views on Indian Geodetic Datum was published in Feb 07 issue of Coordinates. (http://www.mycoordinates.org/thedatumdebate-feb2007-1.php)

Integrated response system for disaster mitigation management

A framework for an online nodal agency for automated processing of all the data

Squadron Leader Mudit Mathur and Wing Commander YD Andurkar

In recent past , humanity has suffered an increasing number of natural disasters affecting more than 2.5billion people, killing 478,100 and causing economic losses of about US$690bn (UNEP/ GRID-Arendal, 2005). Some of the distinctive instances are: December 2004 Indian Ocean earthquake and its concomitant tsunamis, The US eastern coast and Central America, hurricanes Katrina, Rita, Mitch, Stan and Wilma in September-October 2005, Pakistani earthquake of 2005, and now the current avian influenza in Asia and Europe. Natural and man-made tragedies, such as earthquakes, floods, nuclear catastrophes, pose an ever-present challenge to emergency services. Victims and societies at large have responded differently in each case. Some were heroic, some responsible but many panicked and responded irrationally. This aggravated the already bad situation. All of them could have responded more effectively if they were better informed and aright managed.

It is clear that despite excellent efforts by many groups, the wealth of data residing with various organizations is not often effectively utilized in disaster management. Disaster management is not a linear process that can be documented easily in a flow chart with a readily apparent beginning and absolute end. Rather, it is a cyclical process of approximation, response and re-calibration that involves many different doers whose roles in relation to one another, are likely to dynamically change based on circumstances and the stage in the process. The one constant evident in the process is the chaos and entropy that drives the system of rules.

The existing technology can provide disaster managers the important products that could save lives, reduce damage to property, mitigate overall damage, conserve resources and ameliorate human suffering. The current situation has many defects and has eclectic method for disaster management. To develop effective architectures and technologies that meet the needs of the disaster management there must be a precise understanding of the disaster management lifecycle. All the Communities must be synergized to define the disaster management system. They must necessary be associated with the cycle of data ontogenesis, dissemination, analysis and review. There should be an accurate understanding of the dynamics between these ingredients and the "interfaces" that this kinetics imply. Only with such an understanding, can we effectively pattern the process and derive technology solutions that map well into the business model of disaster management.

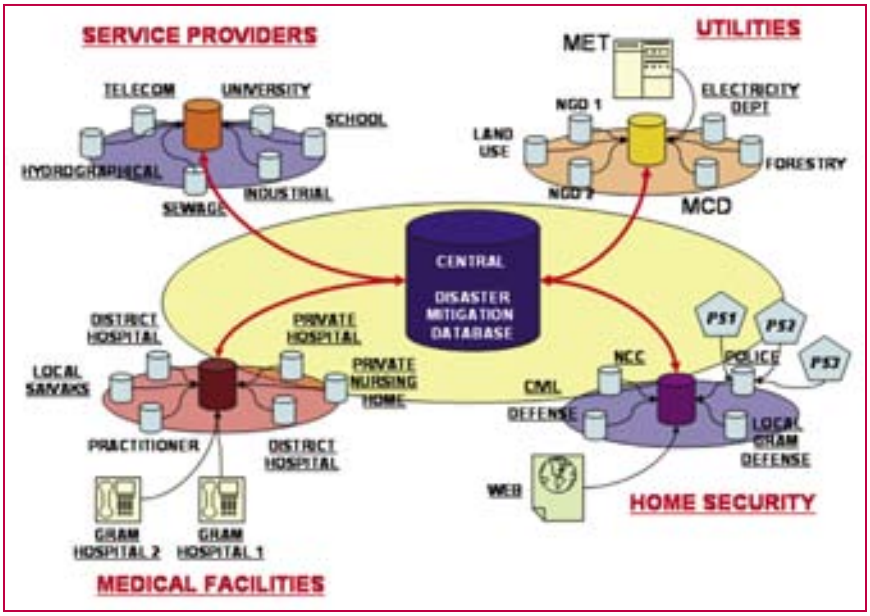
The profile of a pre-disaster situation can be built in terms of four distinct groups; namely the hazardous entities, the victims, the intermediaries whose presence or absence can aggravate/ mitigate the impact of the disaster, agencies holding potentially useful information in disaster management. The paper discusses the construction such a profile by quantification of the disaster potential of the hazardous entities and the impact of the intermediaries. Enormous amount of information for such a vulnerability evaluation and disaster management is available disparate Governmental and public agencies. The paper proposes a framework for an online nodal agency for automated processing of all the data to build up such profiles. This can help in evolution of comprehensive disaster mitigation and management plans.

The paper briefly discusses how such a system would have responded in situations such as Bhopal gas disaster

Knowledge discovery for mitigation

Data integration

The information required for disaster mitigation comes from the variety of databases and resources used by divergent bureaux. A large amount of information in the public domain about the accessibility by rail, road, and air can be augmented, updated using remote sensing technologies. The information about the land usage pattern, water supply, power supply, sewage disposal, fire services, and availability of health services is available with local administration. The telecommunication companies control the vast networks that can be used as the channels of information to reach the individuals, families and population masses in the disaster area. The power supply companies, the water supply companies, the hospitals and the public health departments, banks and insurance companies, the police and other security agencies have vital information which can be used for the disaster mitigation. Normally, all these databases are independently designed, maintained and used by these agencies. In order to cope up with the disaster in fast and highly coordinated manner, information sharing among these agencies is vital. Police, fire departments,

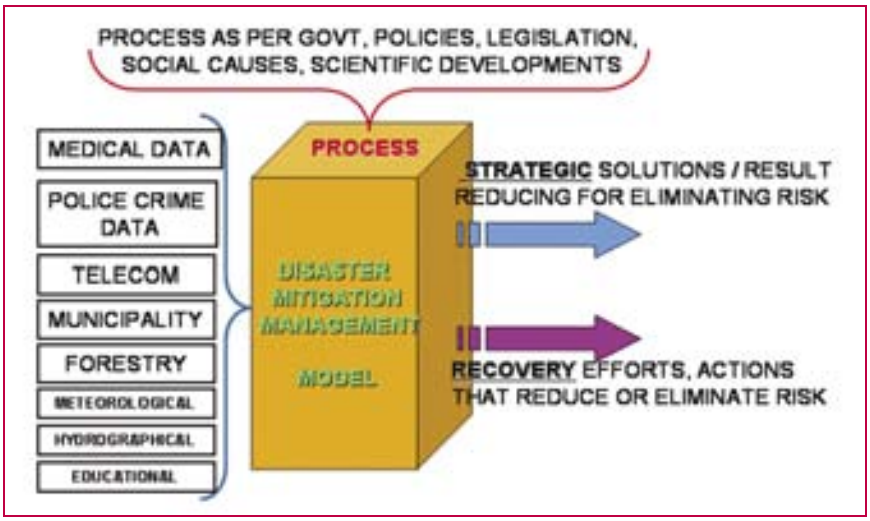


public health, civil defense, and other organizations not only have to perform efficiently individually, but also in a unified manner.

Apart from the factual information from different agencies the disaster mitigation system must obtain the information on regulatory / standardization parameter from the appropriate authorities. The databases need to be talking in a real-time manner on a common platform. The data integration will require a certain level of standardization and compulsory data sharing. This requires a national level effort in the form of law enactment and clear regulations guiding everyone. Such a disaster mitigation authority may have a centralized or distributed architecture to handle the local disasters and the regional or national disasters.

Hazard evaluation

To develop effective architectures and technologies that meet the needs of the disaster management there must be a precise understanding of the disaster management lifecycle. All the communities in disaster mitigation must be associated with the data cycle of genesis, dissemination, analysis and review. There should be an accurate understanding of the dynamics between these ingredients and the "interfaces" that this kinetics imply. Only with such an understanding, can we effectively pattern the process and derive technology solutions that map well into the business model of disaster management.



The vulnerability analysis

The first step in any disaster mitigation management effort would be vulnerability analysis of the area and the population. Broadly speaking, the vulnerability of a system, population or individual to a threat, relates to its capacity to be harmed by that threat. Vulnerability varies widely across peoples, sectors, and regions. The occurrence of extreme events, their emplacement with the environmental declensions is usually a local or regional phenomenon, while the expected outcomes are global ones. Continuous scientific discussions exist about general concepts of vulnerability and the development of indicators, which are suitable for the different scales and conditions.

The methodological challenge is to develop a reporting framework that can include qualitative, quantitative appraisal of vulnerability. Such an appraisal must be context-specific and linked to data on adaptive capacity. Ideally, vulnerability assessments should be continuously up-dated. Although assessments are often carried out at a particular scale, there are significant cross-scale interactions, due to the interconnectedness of economic, social, and environmental systems.

Catastrophic value of hazard (CVH)

CVH is an index of the net damage that a hazardous entity can inflict on its surroundings. The CVH analysis is based on extensive cross-referencing and data authentication using data drawn from variety of resources. The CVH indicators should be used to evaluate adaptive strategies and measures for monitoring development processes. The CVH analysis applications borrow the necessary information from the databases. Two approaches in CVH assessments can be: Risk-based and Exposure based.

Point catastrophic failure (PCF) value

There is a long chain of intermediaries between the hazardous entity and the potential victims. The presence or

the absence of these intermediaries can aggravate or mitigate the damage caused by the hazardous entity on the surroundings. The hazard can be compared to the fountainhead with a specific CVH while the intermediaries may increase or decrease the severity of the damage depending on their PCF value.

The methodology to evaluate the threat posed to the population, environment and various natural by the man-made hazards in tem of CVH and PCF values can be devised by, appropriate expert agencies. Different available methodologies / pattern must be compared, evaluated and updated on continuous basis. The disaster mitigation mechanism must use the factual data, regulatory / policy framework and the damage assessment methods (provided by experts). to generate the CVH, PCF and vulnerability values these values can be utilized on a real time basis.

The CVH and PFC values can not only identify the current threat levels but also generate recommended set of actions. Insertion of any new hazard, intermediary, deviation from the standards, and change in the standards or the assessment methods will automatically lead to the reappraisal of the status. Hence the system functions like the conscious system capable of responding to the ever-changing surroundings.

The system may run own housekeeping programs which continuously cross check the inputs provided by the different agencies and bring out the inconsistencies. Common determinations can be, that it is unyielding to assess CVH as an integral part of the causal chain of risk and to appreciate that changing vulnerability (conscious & awareness) is an effective strategy for risk management. Vulnerability analysis, along with conscious & awareness particularly those aimed at advancing sustainability can be identified by the following elements:

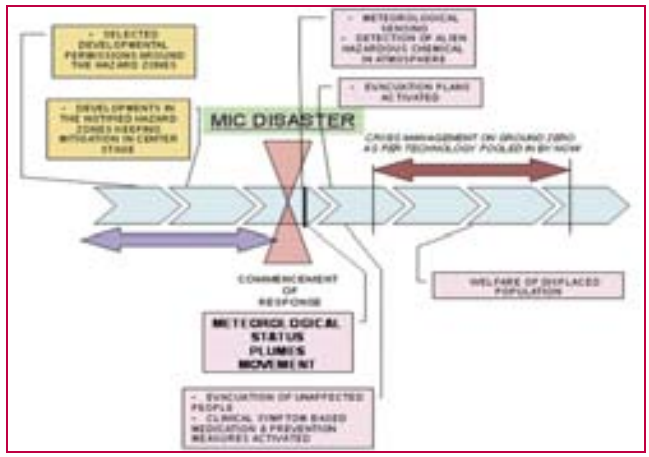
- Multiple interacting perturbations and stressors/stresses and the sequencing of them;
- Exposure beyond the presence of a perturbation and stressor/ stress, including the Manner in which the coupled system experiences hazards;
- Sensitivity of the coupled system to the exposure;
- The system's capacities to cope or respond (resilience), including the consequences and attendant risks of slow (or poor) recovery;
- The system's restructuring after the responses taken (i.e., adjustments or adaptations);
- Nested scales and scalar dynamics of hazards, coupled systems, and their responses.

Case study: bhopal gas tragedy

Description

The incident occurred at approximately 0030 on Monday 3rd December 1984 in the suburbs of Bhopal, India. It is one of the worst industrial air pollution disasters in the world, affecting nearly 200,000 people. The source of the incident was a large pesticide factory owned by Union Carbide. One of the intermediates of the pesticide production was methyl isocyanate (MIC). The poisonous methyl isocyanate (MIC) gas leaked out from one of the tanks in the Union Carbide factory. On the day of the incident there was an increase in temperature in one of the tanks to 38 C which brought MIC close to the boiling point. The increased pressure exceeded the design value of the tank causing it to rupture a relief valve. Approximately 40/41 tones of MIC vapors escaped through a 33m high atmospheric vent-line. The sodium hydroxide scrubber designed to neutralize MIC was not in operation at that time. When it was eventually switched on the scrubber was unable to cope with the volume of MIC released. The release continued for about 90 minutes into the cool, dry stable atmosphere of Bhopal. The cloud of gas that formed over the factory slowly drifted towards the city in the darkness of the night. Some residents from the affected area realized that something was wrong and tried to escape; but many of them never had a chance and simply perished. The gravity of inadequate direction was that the workers at Bhopal train station were found dead approximately two hours after the release. Five days after the incident the toll was more than 2500. Within a month of the incident toll more than 3500 precious life perished. Some of the striking irregularities observed were.

- During the initial 48 hours following incident no measurements of atmospheric MIC were taken.
- Sampling team had little idea of what they were looking for in terms of chemicals.
- Patients though were provided with symptomatic treatment but hospitals could not cope up further as toll climbed.
- There was little toxicologically understanding of MIC.
- Lack of emergency management systems within the factory.
- No specific hazard contingency plan for emergency services,
- No detailed meteorological plot of the movement of plume.



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Integrated mitigation response (IMR)

If a hypothetical mitigation system as described above was in place at Bhopal before the disaster, it could have generated advisories, cautions and start warnings on following matters in terms of CVH and PCF values.

- Storage of hazardous chemicals (High CVH) dangerously close to populated areas (High Vulnerability).
- Nonexistence of adequate storage safety equipment, to cater for public safety. (High PCF)
- Procedural periodic checks by a central agency observer for third party checks (High PCF).
- A complete lack of knowledge on toxicological implications of chemical. (Moderate PCF)
- Road evacuation plans to be put in place at all times. (High PCF)
- Absence of mechanism to detect toxic chemicals in the atmosphere and track spread. By ensuring multi point wind movement tracking system. (Very High PCF)
- List of all the locals and their phone details linked at all times, so as to provide them with advisory from area affected central system. (Moderate PCF)

It is quite likely that these cautions would have been ignored before the disaster. But they would have definitely help in more effective post disaster management / response in the following areas.

- Identification / prioritization of the population requiring emergency evacuation.
- Identification of transport, accommodation, public health, communication resources at disposal.
- Coordinated and effective response for the immigration of people from the disaster area. Identification of the appropriate clinical procedures for treatment of the victims.
- Emergency treatment of the victims.

Conclusion

Presently much of the effort to compile the data, carry out vulnerability, CVH, PCF value analysis looks like proverbial carving of the mountain in search of a rat. The truth is out there for anyone cares to see. There is a shortage of electricity, water supply is inadequate, malnourishment is common, crimes rampant, there is no approach road for the village, a fire tender can never hope to make its way through the maze of by lanes and yet the people are going about their life. The system must deal with the situation as is and not as it ought to be.

The normal life with all its well-known problems is irreversibly damaged by the disaster. It creates waves like a stone thrown in the pond. The integrated disaster mitigation apparatus can generate more comprehensive as well as prioritized set of 'things to be done' in pre-disaster as well as post-disaster phases as against any manual system. The disaster mitigation machinery functions like war waging machine only with an opposite aim.

Disaster mitigation management require a very coordinated and a rapid response. Today the technology offers us an unprecedented chance to rise to the occasion in a well thought out and transparent manner. Investment in this vital area will definitely save the societies and nations from a lot of death and destruction

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Squadron Leader Mudit Mathur is a commissioned officer in Indian Air Force. He has undergone advanced training in the field of aerospace remote sensing and its applications from National Remote Sensing Agency (NRSA), Vikram Sarabhai Space Center (VSSC) & Ecole Militare (Paris)
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Consumer demand for GPS increasing: CEA report

According to a research report by the Consumer Electronics Association (CEA), GPS - Exploring Ownership and Interest revealed an 80 percent owner satisfaction rate, which was strongly influenced by the ease of use and display quality of the devices, which are used primarily for navigation assistance in a vehicle. While GPS ownership is still relatively small at 18 percent of online consumers, the research demonstrates shipment revenues nearly tripling between 2005 and 2006. Nearly 24% of online consumers are planning to purchase a GPS device within the next year, spending an average of $410 resulting in sales reaching $4.1 billion in 2007. The study shows that 33 percent of future GPS buyers are interested in owning a cell phone with a GPS. Rest of the other uses are hiking 18%, walking16%, boating 14% biking 7%, running 6% and flying 4% *www.webwire.com*

Navigation to become a focus of China's car GPS market

CCID Consulting, the first Chinese consulting firm listed in Hong Kong, forecasts that "navigation" will become a trend in China's car GPS market. In 2006, China's automotive electronics market grew upto RMB 86.76 billion, up 39% over 2005. In 2006, automotive electronics products were upgraded, in particularly chassis control systems. New car electronic products such as GPS and TPMS also gathered pace in their penetration. In 2006, 815,000 sets of GPS were sold in China, generating sales revenues of RMB 4.19 billion. Compared with 2005, sales volume and sales revenues grew 50.8% and 107.3%, respectively. Starting from 2007, China's car GPS market will enter a brand new period of growth. Japanese car-makers will continue to lead the pre-installed market, with all high-end Japanese cars and some new car models to be installed with pre-installed navigation GPS. *www.sys-con.com*

Taiwan to take up 50% global market share for GPS

GPS manufactured by Taiwanese companies are on course to take up 50% of the global market share, according to an analyst at the Institute for Information Industry. *http://english.rti.org.tw*

Fierce competition may send GPS chip prices down 10-20%

Competition in the GPS chip supply chain may send prices down by 10-20% in the 2007. SiRF has come under price pressure after TomTom and Garmin were said to have adopted GPS solutions from Global Locate and MediaTek respectively. Further pressure has also come from improving relationships between Mitac International (the parent company of Mio Technology that markets Mio-branded PNDs) and GPS chip supplier Centrality, the sources said. *www.digitimes.com*

China launches Compass navigation satellite

China has launched "Compass" navigational system, which is expected to provide services to customers all over China and neighboring countries by 2008. The satellite system is mainly designed for the country's economic development, providing navigation and positioning services in transportation, meteorology, petroleum prospecting, forest fire monitoring, disaster forecast, telecommunications and public security, among others. *http://news.xinhuanet.com*

Russia to expand Glonass satellite group by year end

Russia will increase the number of satellites in Glonass to 18 by the end of 2007, according to the head of Russia's Federal Space Agency (Roskosmos). A total of 9.88 billion rubles ($379.7 million) has been appropriated for Glonass from the federal budget in 2007, and 4.72 billion ($181.4 million) in 2006. A full orbital group of 24 satellites will be ready for global coverage by the end of 2009, but even with 18 satellites in orbit it will be able to start providing services for military and civilian users, covering Russian territory. *www.gpsdaily.com*

New device extends battery life up to 90 days in GPS units

Tracking The World, USA, recently released a hibernating battery case for use in compact GPS units that significantly conserves battery power by using motion detection extending battery life up to 90 days. *www.prlog.org*

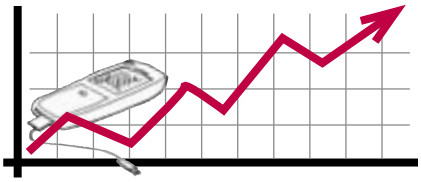
Researchers find GPS is impacted by solar radio burst

According to researchers at Cornell University, solar radio bursts can have a serious impact on the GPS and other communication technologies using radio waves. The findings were announced in Washington, D.C., at the first Space Weather Enterprise Forum. *www.prnewswire.com*

GPS Photo Mapping, Google Earth to deliver exploration reports

Waystar Inc. of Edmonton scouts exploration locations and provides reports with access routes and stream crossings to be used by the heavy seismic survey vehicles and crews to reach the exploration areas. These routes and crossings must be mapped in advance with their locations pinpointed in official exploration applications to the Alberta government.While scouting it takes photographs of every stream crossing with a GPS-equipped digital camera and downloading the photos to a laptop computer with GPS-Photo Link software, which automatically correlates each photo with the GPS-location where it was taken. It has a built-in function to export the photos to Google Earth. *www.geospatialexperts.com*

Mobile industry set to boom with GPS technology



As per the RNCOS report, "Globally, the GPS market is expected to exceed US$ 30 Billion by 2008. The two segments under this technology namely people tracking & handset market will have maximum growth rate, about 9%." Mobile industry is set to boom in 2007 with mobile giants, application developers, and OS managers planning to introduce various large-scale rollouts of GPS technology. Most phone manufacturers will introduce devices enabled for navigating with a GPS like Nokia has plans to introduce a personal mapping program that'll let users to send messages to each other and also have instructions on how to congregate, delivered to the handset. www.rncos.com

SiRF GPS powers Intel ultra mobile solutions

SiRFstarIII(TM) architecture will provide the GPS-based location awareness for products based on the new Intel Ultra Mobile Platform 2007. It will provide GPS functionality for Intel Ultra Mobile PC (UMPC) and Mobile Internet Device (MID) platforms, which will enable manufacturers to create compelling new location-based applications. *www.sirf.com*

MTC-Vodafone Bahrain offers interactive mobile LBS

MTC-Vodafone (Bahrain) has upgraded its intelligent location-finding facilities. Customers can receive driving directions via SMS and MMS using M-Guide, a Directory Service on a specially-designed menu on each customer's phone. The upgraded LBS service results from an agreement with GEOMATEC enabling access to frequent road information updates. *www.mtc-vodafone.com*

VZ Navigator provides LBS in Spanish

Verizon Wireless customers can now add VZ Navigator in Spanish to their Get It Now enabled phones to get maps and audible turn-by-turn directions to over 14 million points of interest. Verizon *www.verizonwireless.com*

Vodafone GPS BlackBerry ready in may

Vodafone has announced GPS-enabled Blackberry 8800 that will be mapping out the country for Australian road warriors. The smartphone has built-in GPS and manages to pack in the usual BlackBerry email functionality plus multimedia features on top of the mapping and variety of location based applications and services. *www.mobilised.com.au*

eSpatial's LBS application deployed by the US DoD

The Military homefront now offers mobile capability enabling anyone with supported mobile devices to use the mobile version of the website (http://militaryinstallations.dod.mil/mobile/). The application assists the military community to locate, learn about, and travel to a variety of Programs and Services located on over 250 military installations worldwide. *www.espatial.com*

Patent awarded to TCS for wireless applications

TeleCommunication Systems, Inc. (TCS), USA has been awarded patent number 7,200,380 for "Wireless Telecommunications LBS Scheme Selection." Given a request by an application to locate a mobile device within a certified level of accuracy for a given time period, the patent proposes a way to select the location scheme that will achieve the best result. The location scheme may be an A-GPS location fix, a network-based location fix or the last known cached fix, depending upon the accuracy required and the time sensitivity of the application. *www1.telecomsys.com*

Nissan developing GPS-based ITS

Nissan's ITS will employ the next 3G cellular communications system where the GPS function is used as the basis to provide location information of the cellular phone. In this system, location data transmitted from the pedestrian's cellular phone and vehicle is fed to the ITS to allow the system to determine the corresponding positions between the pedestrian and the vehicle. This system will help to reduce road accidents particularly in a blind-spot situation. *www.technologynewsdaily.com*

Putting a GPS Chip Inside a SIM Card

BlueSky Positioning has developed patent-pending technology and processes to embed Assisted Global Positioning System (A-GPS) capability in the SIM card. The SIM uses an assistance data server in the mobile network to reduce the location identification time and increase accuracy within buildings and densely populated areas. This would enable network operators to launch location based services without either relying on network intensive cell-positioning, or requiring customers to upgrade to a GPS capable handset.

Wayfinder Location Software to be Preinstalled on Nokia N95 Phones

mobilkom austria has agreed to start pre-loading software from Wayfinder into the Nokia N95 phone with built-in GPS when sold by the operator. The latest software comes equipped with 3D maps, Power Search and a night mode.

Nextel deploys GPS services

Nextel México has launched GPS value added services. The iFollow and iLocator services allow the company's push-to-talk (PTT) subscribers to use the GPS services through an integrated GPS chipset available for most of its handsets. It uses a platform provided by location services company Openwave.

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Mobile:+91-9818797768
TEL: +91 11 64563666 FAX:+91 11 25464245
ONLINE MSN:kolidaindia@hotmail.com

www.kolidainstrument.com

NovAtel Inc launches new OEMV products

NovAtel has launched its new OEMV-1G and FlexPak(TM)-V1G products with GPS+GLONASS positioning solutions. Also, full GPS+GLONASS AdVance RTK (Real Time Kinematic) positioning capabilities are available on all existing OEMV-2 and OEMV-3 products via its 3.2 firmware release. *www.novatel.com.*

Crescent VS100 Series GPS Compass

Hemisphere GPS has introduced the new Crescent VS100 and VS110. Based on Crescent Technology, it presents an affordable and robust heading and positioning solution for machine control and marine navigation applications including dredging and hydrographic surveying. VS100 Series is a low cost GPS Compass and delivers the performance necessary to replace traditional gyrocompasses *www.hemispheregps.com*

Trimble launches GPS content layer for Google Earth

Trimble has launched the first multimedia layer of GPS-based adventure details for Google Earth. It has interactive information from the Outdoors catalog of GPS-on-cellular applications, also premium content from contributors to backpacker, Bicycling and Mountain Bike magazines. Users can access a wide variety of multimedia data on fitness and outdoor adventures, like routes, points of interest, pictures, A/V etc. *www.trimble.com*

Raytheon gets $32.5M Excalibur contract

The US Army awarded a USD 32.5 million contract to a unit of Raytheon Co. for a system that uses satellites to guide precision artillery. The Missile Systems will perform work on the Excalibur, a GPS artillery system. Work will be performed in various US locations through June 31, 2009. *www.businessweek.com*

Fugro acquires EarthData, USA

Fugro has signed an agreement to acquire 100% of EarthData group, USA. EarthData provides airborne mapping, remote sensing and geographic information services. It provides international data acquisition services and has a data processing center in China. EarthData/Horizons has a fleet of 12 aircraft and a variety of sensors which include state-of-the-art digital cameras, laser mapping systems and airborne radar mapping technology - GeoSAR. *www.fugro.com*

Core Production Database Version 2.5 Now Available

CARIS has released Core Production Database (CPD) version 2.5. Using Oracle data processing, CPD is a seamless, geospatial database that enables stakeholders to consolidate their data into a single source. *www.caris.com*.

Blue Marble joins ESRI Business Partner Program

Blue Marble Geographics announced joining ESRI as Business Partner Program. BMG will develop applications to enhance and expand the geodetic conversion tools of ArcGIS and other ESRI products and resell ArcWeb Services. It will also provide geodetic consulting and training services for ESRI users *www.bluemarblegeo.com.*

NAVTEQ taps Autodesk to collaborate on online venture

NAVTEQ has announced Autodesk, Inc. to bring an additional array of tools and technical support to the developer community through its Network for Developers site. It aims to help accelerate the successful creation of superior location-based content for wireless and internet channels. *www.navteq.com*

Magellan launches Maestro 3000 series

Magellan announced the worldwide introduction of the Maestro 3100 and Maestro 3140 portable vehicle navigation devices. It has a 3.5 inch QVGA display and a sleek design. It guides drivers with turn-by-turn voice and visual prompts. *www.magellangps.com*

TomTom launches TomTom ONE XL

TomTom has launched ONE XL range. The 4.3 inch screen guarantees drivers a clear view of the screen. It has also launched RIDER, which is a navigation solution designed for bikers by bikers. *www.tomtom.com*

Leica FCMS Flight & Sensor Control Management System

Airborne mission planning and survey flights are the first steps in powering geospatial imaging. Leica FPES is a powerful office tool for flight planning and evaluation. Leica FCMS performs all tasks, such as flight guidance, sensor release and sensor monitoring, on a single interface. *www.leica-geosystems.com*

LG LN700 navigation system

LG is offering LN700, a travel solution for car users who don't already have built-in GPS navigation system. It is fist-sized and can be installed in

ISRO releases Cartosat 2 images

Perth Airport, Australia as seen by CARTOSAT - 2 (www.isro.gov.in)

any vehicle easily as it comes with mounting equipment.*www.itp.net*

u-blox selects Spirent for GNSS development equipment

Spirent Communications would supply GSS6100 single channel production test systems to u-blox that will be used in RF development and production testing. It will also be used by field application engineers to enhance customer support. *www.u-blox.com*

u-blox announces LEA-4R dead reckoning GPS module

u-blox AG has announced the LEA-4R GPS module with built-in dead reckoning technology that will ensure 100% road coverage. It shall provide an accurate position in any environment where there are obstructed GPS signals. *www.u-blox.com*.

TruePosition to provide E-911 phase II location solution

TruePosition, Inc., USA shall provide its wireless location system to Plateau Wireless. It will enables wireless carrier to satisfy the Phase II requirements of the Federal Communication Commission's Enhanced-911 mandate. *www.trueposition.com*

New GNSS Receiver Option for Applanix POS AV

Applanix has introduced a new GNSS receiver option for its airborne vehicle, POS AV supporting GPS and GLONASS signals. Raw data can now be logged from the receiver along with IMU data for GNSS-Aided Inertial post processing through the POSPac V4.4 software. *www.applanix.com*

PCI Geomatics supports University of Regina project

PCI Geomatics announced its support for the Canada Foundation for Innovation (CFI) which funds research infrastructure helping Canadian universities and colleges carry out technology development. It has provided assistance to the University of Regina recently. *www.pcigeomatics.com*

BAE systems to continue high-tech mapping for pennsylvania

BAE Systems shall be carrying out next phase of digital mapping of the Commonwealth of Pennsylvania, USA. A $2.7 million contract, it will continue the development of base map data supporting the statewide geographic information architecture called the Pennsylvania Map (PAMAP). *www.baesystems.com*

Switzerland upgrades its nationwide positioning network

Trimble has announced supply of 31 NetR5 GNSS reference stations and Zephyr Geodetic 2 antennas to Switzerlands Federal Office for Topography (swisstopo) to upgrade its nationwide positioning network. The infrastructure will support signals from GPS and GLONASS. *www.trimble.com*

Bentley BE Excellence Award to AAMHatch

The BE Excellence Award was presented to AAMHatch Director, Peter Blake, in Los Angeles on 1 May 2007. The project that achieved this global recognition was the True Orthophoto of Melbourne City. "We are excited to have won this award as it highlights our technical leadership in 3D Mapping. This project also recently won an Asia Pacific Spatial Excellence Award," said Mr Nicholls, General Manager of AAMHatch.*www.aamhatch.com.au*

New version of FleetOutlook fleet management application

Wireless Matrix Corporation, USA announced the release of latest version of FleetOutlook. It is hosted by Wireless Matrix and delivered as "software as a service". It combines vehicle communications, GPS location and mapping capability, and vehicle monitoring and reporting *www.wirelessmatrixcorp.com*

GPS mapping Free on your mobile

MGMaps combines Google Maps, Yahoo Maps, Windows Live Local and Ask. com maps to generate more relevant results for free. Independent developer, Cristian Streng released its latest update fixing various bugs and introducing the support for GPS tracking. It works using a phone's built-in or additional GPS receiver (connected via Bluetooth) by downloading satellite images to the handset via 3G, charged at standard data-packet download rate. *www.tech.co.uk*

Lockheed Martin completes GPS III system design review

Lockheed Martin has completed on-schedule a system design review of the U.S. Air Force's next generation GPS Space Segment program - GPS Block III. *www.lockheedmartin.com*

PSLV successfully launches Italian satellite

ISRO's Polar Satellite Launch Vehicle, PSLV-C8, successfully launched the 352 kg Italian astronomical satellite, AGILE, into a 550 km circular orbit. In this mission, PSLV was flown, for the first time, without the six strap-on motors of the first stage An Advanced Avionics Module (AAM), weighing 185 kg, to test advanced launch vehicle avionics systems like mission computers, navigation and telemetry systems, was also flown. The propellant in the fourth stage had been reduced by about 400 kg compared to the previous PSLV flight. Since its first successful launch in 1994, PSLV has launched eight Indian remote sensing satellites, an amateur radio satellite, HAMSAT, a recoverable space capsule, SRE-1, and six small satellites for foreign customers into 550-800 km high polar Sun Synchronous Orbits (SSO). It will also be used to launch India's first spacecraft mission to moon, Chandrayaan-1, during 2008. In its standard configuration, the 44 m tall PSLV has a lift-off mass of 295 tonne and a diameter of 3.2 metre. The vehicle has S-band telemetry and C-band transponder systems for monitoring its health and flight status respectively. *www.isro.gov.in*

DigitalGlobe imagery powers Marine Cartography

DigitalGlobe shall provide high-resolution imagery for Garmin's BlueChart g2, which is a new line of highly detailed cartography. It will provide the electronic charting devices to give boaters access to high resolution commercial imaging system.

Egyptsat-1 placed into orbit

Egyptian satellite, Egyptsat-1, was successfully launched from the Baikonur cosmodrome in Kazakhstan on April 17. It is Egypt's first Earth Observation Satellite which is aimed to support development in the fields of construction, cultivation and fighting desertification. It has been jointly built by Egypt's National Authority for Remote Sensing and Space Sciences together with the Yuzhnoye Design Bureau in Ukraine

Vietnam establishes space technology institute

Vietnam's Space Technology Institute, involved in developing satellite technologies, equipment, remote sensing technology and application, and space dynamics, was inaugurated last month. Under a national strategy on research and application of space technology until 2020, Vietnam will master technologies and techniques regarding production of small satellites, launching equipment, and earth stations in the 2011-2020 period.

It will intensify application of space technology in four main spheres, namely communications, hydrometeorology, natural resource and environment, and satellite-based positioning upto 2011. The government shall launch the medium-sized satellite coded Vinasat in 2008. *www.spacemart.com*

NRCan offers digital topographic data for free

As of April 1, 2007, Natural Resources Canada (NRCan) began offering its electronic topographic mapping data for free over the Internet. It is now permitting people to freely redistribute this data, helping to ensure that users receive accurate and consistent information. It will make its data collections available through GeoGratis (geogratis.gc.ca), which is a portal, provided by the Earth Sciences Sector of NRCan.

New Zealand Geospatial Strategy approved

The New Zealand Geospatial Strategy has been approved by Cabinet which is designed to improve knowledge of and access to the geospatial assets owned, maintained or used by government.

The strategy sets out to co-ordinate and direct the way geospatial resources are developed and managed, and aims to ensure compatibility when data is collected by different agencies and reduce duplication and fragmentation of effort. *www.linz.govt.nz/home/news/items/20070302-geospatial-strategy/index.htm*

GOSIC is now fully operational at NCDC

Global Observing Systems Information Center (GOSIC) is now fully operational at the National Climatic Data Center (NCDC) and can be accessed on-line at http://gosic.org.

It provides unique tools for searching and accessing data such as matrices and portals that allows users to search for specific data such as data located at NCDC, as well as at other global data centers.

Australian telecom gets mapping capability

Telco Industry researcher, Market Clarity has released a new edition of its Australian Telecommunications

infrastructure catalogue. It identifies the location of Australia's current telecommunications infrastructure in a database that tracks information on the infrastructure holdings deployed and in service from 118 different infrastructure owners.

Market Clarity has developed and expanded its telecom GIS database by enabling the production of detailed telecoms infrastructure maps.

Live search maps service for cities in UK

Microsoft has extended the 3D capabilities of its Live Search Maps service to the UK. Buildings in cities like Plymouth, Cardiff, Bristol, Gloucester and Wolverhampton.

GIS mapping centre in Nagaland, India goes hi-tech

Nagaland GIS mapping centre has launched its website under the State's Planning department and was linked to the state's official website, www.nagaland.nic.in. it provides information on the state, including roads, railways, airports, towns, major rivers, industries, polling stations and villages and their jurisdictions with break up of population, hospitals, tourist spots, business centres, power stations, schools, panchayat halls and areas where the famous Naga Raja Mircha is grown.

Tele Atlas plans to map out Asia

Tele Atlas NV has announced that its orange mobile mapping vans will be hitting the streets of Asia this year to collect data. It plans to target Singapore, Kuala Lumpur, Malaysia and Taipei, Taiwan this year.

The vehicles are equipped with six high-resolution cameras, GPS, receivers, laser scanners and onboard computers. They collect road and lane information, images of street signs, store fronts and building heights. *www.newsvine.com/_news*

Galileo update

Galileo – the European Programme for Global Navigation Services for civil purposes is an initiative led by European Union. We provide regular updates to our readers on the Galileo programme.

No more delays to GALILEO, say MEPs

In a resolution on GALILEO, European Parliament expresses deep concern about the slowing down of negotiations for the franchise contract feared the increasing overall costs. "GALILEO should be fully operational by 2011. Parliament is "deeply concerned by the fact that the concession negotiations have been at a standstill for several months". MEPs "overwhelmingly" support the clear mandate given to Jacques Barrot, Vice-President of the European Commission responsible for the Galileo Programme, to submit to the June Council: a credible roadmap for coming to contractual conclusions as soon as possible, possible solutions for securing the long-term financial obligations, a scenario for the earliest possible provision of EGNOS satellite navigation services, and alternative scenarios for the realisation of the programme, especially for costs, risk and affordability. *www.europarl.europa.eu*

Septentrio granted license to sell Galileo Receivers

Septentrio has been granted a license by the European Space Agency (ESA) to supply Galileo receivers to customers world-wide. These multi-frequency receivers include GeNeRx, that was the first model ever to receive Galileo signals from space. It is the core receiver used in ESA's network of 13 Galileo Experimental Sensor Stations (GESS), deployed world wide, that is used to perform in-orbit validation of GIOVE-A, Europe's first navigation satellite, and to secure the Galileo frequencies.

LynuxWorks to provide safety-critical platform for Galileo

LynuxWorks, Inc., USA has been selected to provide the real-time operating system (RTOS) for the European Space Agency's Galileo project. This validates its unique approach to safety-critical systems and builds on the company's two decades of innovation and leadership in embedded and real-time technologies. As part of the core element of the Galileo system, LynxOS-178, RTOS to receive Reusable Software Component (RSC) acceptance for reusability from the FAA for DO-178B certification, will provide enhanced capabilities for communications across various devices and operating systems both on the ground and in space. *www.lynuxworks.com*

Galileo Masters 2007

This year's Galileo Masters competition opens on 1 May and will remain open for submissions until 31 July 2007.

The Application Center Ltd. Oberpfaffenhofen, together with the Munich International Trade Fair and its business-to-business trade fair SYSTEMS, are searching for the Galileo Masters 2007. This European satellite navigation competition, which began in 2004, is run under the patronage of the Bavarian Ministry for Economics, Transport, and Technology and supported by the German Aerospace Center (DLR) and ESA through its Technology Transfer Programme (TTP). Its aim is to encourage small enterprises in participating European regions to come up with new ideas for satellite navigation applications. *www.esa.int*

$9.5m e-Map project in Brunei

A B$9.5 million project for the delivery of the country's national Spatial Data Infrastructure (NSDI) was officially contracted during a signing ceremony between the Ministry of Development and Selective Powertech Consulting, held at the Ministry. The project team include, CARIS (Canada); Maicons Technology Sdn Bhd (Malaysia); and Dalpus Technologies (Brunei Darussalam).

Targeted to be completed over a 12-month period, the main components of e-Map are Framework Data (vector, raster and grid), Products, Metadata, NSDI Catalogue, Data Warehouse and Online Business Applications. The primary proponents of the project are the Ministry of Development Departments of Survey, Land and

Exchanging documents (left to right): Acting Deputy Surveyor General, Surveyor General, Permanent Secretary (Technical and Professional) at the Ministry of Development, Awang Mohd Taib @ Abdul Aziz bin Dato Hj Mohd Din and Lai Hock Nam of Selective Powertech Consulting.

Town & Country Planning. The common point of access for all e-Map online applications is a Portal through which applications will be delivered for online mapping, e-PPT land subdivision and consolidation, e-Planning for Town and Country Planning for land development, and e-Land land administration and taxation.

"E-Map is a system which will disseminate information related to geographic, survey, land, development, town planning and other information over the Internet. It comprises a group of sub-systems, all of which will access a common set of databases," explains Haji Mohammed Jamil bin Haji Mohammed Ali, Surveyor General of the Survey Department, Ministry of Development.

MARK YOUR CALENDAR

May 2007

International Conference on Integrated Navigation System
28-30 May, Saint Petersburg, Russia
elprib-onti@telros.net

Geoinformation for Disaster Management (Gi4DM2007)
23-25 May, Toronto, Canada
junli@ryerson.ca

5th International Symposium on Mobile Mapping Technology
28-31 May, Padova, Italy
naser@geomatics.ucalgary.ca

June 2007

Navigation Europe 2007
6-7 June 2007 in Amsterdam.
www.telematicsupdate.com/naveurope2007/

21st Pacific Science Congress
12-16 June, Okinawa, Japan
psc21@to.jim.u-ryukyu.ac.jp.

Spatial Data Quality 2007 5th International Symposium
13-15 June, ITC, Enschede, The Netherlands
issdq2007@itc.nl

27th ESRI International User Conference
18-22 June San Diego, California USA
www.esri.com

TRANS-NAV 2007
20 - 22 June, Gdynia, Poland
weintrit@am.gdynia.pl

Geoinformation Forum Japan
20-22 June, Pacifico Yokohama, Japan
geoforum@jsurvey.jp

July 2007

Cambridge Conference 2007
15-20 July Cambridge, UK
www.ordnancesurvey.co.uk/

Asia Oceania Geosciences Society, 4th Annual Meeting
30 July – 3 August, Bangkok, Thailand

August 2007

7th International Workshop of Geographical Information System
1-3 August Beijing, China
iwgis@lreis.ac.cn

XXIII ICA International Cartographic Conference
4-10 August, Moscow, Russia
info@icc2007.com.

GIS 14 Conference
14-15 August 2007
Vietnam

ISPRS Workshop on Updating Geo-spatial Databases with Imagery
28-29 August, Urumchi, Xinjiang, China
jjie@nsdi.gov.cn, jiangjie_263@263.net.

2nd Indonesian Geospatial Technology Exhibition
29 August - 1 September
Bakosurtanal; Jakarta
http://www.geospatial-exh.com/

September 2007

ION GNSS 2007
September 25-28, 2007, Ft. Worth, TX
www.ion.org

October 2007

36th Annual ILA Convention and TEchnical Symposium!
October 14-17, at the Embassy Suites Orlando International Drive Orlando,Florida, USA

9th South-East Asian Survey Congress
28 October - 2 November
Christchurch, New Zealand
http:/www.surveyors.org.nz/user/

Nav 07 - The Navigation Conference and Exhibition
30 Oct 2007 -01 Nov 2007
www.rin.org.uk
conference@rin.org.uk

November 2007

International Symposium on GPS/GNSS
05 - 07 Nov 2007, Johar Bahru, Malaysia

ISG/GNSS 2007
6-8 November, Kuala Lumpur, Malaysia
md.nor@fksg.utm.my

ACRS2007
November 12-16, 2007, Kuala Lumpur, Malaysia
http://www.macres.gov.my/acrs2007

WG I/6 Workshop on Remote Sensing Applications
13-16 November, Kuala Lumpur, Malaysia
mazlan@fksg.utm.my

Institution of Surveyors, India announces:

Training Course on Modern Trend in Land Management
6-10 March, New Delhi
15-19 May, Andaman & Nicobar Islands
10-14 July, Shillong
21-25 August, Jammu
colbhat@yahoo.com

Spatial Data for Effective Land Management
10-12 October, Mumbai, India
colbhat@yahoo.com

ION GNSS 2007

September 25–28, 2007 ★ Fort Worth, Texas ★ Tutorials: Sept. 24–25

Co-sponsored FOUO Sessions by JSDE and AFRL: Sept. 25

★ Early Registration & Advance Hotel Reservation Deadline: Sept. 3

★ Exhibit Space Going Fast!

Session Topics

- ★ Multipath
- ★ GNSS-INS
- ★ Algorithms for Multi-sensor Fusion
- ★ Military Aviation Systems
- ★ Galileo System Design & Services
- ★ Multi-Sensor Navigation, Guidance & Control Systems
- ★ Remote Sensing With GPS & Integrated Sensors
- ★ Military Applications
- ★ GNSS Civil Interference & Spectrum Aspects
- ★ Surveying & Geodesy
- ★ Network-Based RTK
- ★ Modeling & Simulation
- ★ Alternatives & Backups to GNSS
- ★ Novel Applications
- ★ Galileo Integrity, Multi-constellation RAIM
- ★ Galileo & GPS/Galileo Reference & User Receivers
- ★ GNSS Ground-Based Augmentation Systems
- ★ Indoor Positioning
- ★ GLONASS Modernization, QZSS, & Other GNSS
- ★ GNSS Receiver Algorithms
- ★ GNSS Antenna & Radio Technology
- ★ Atmospheric Effects on GNSS
- ★ Software Receivers
- ★ Land Applications
- ★ Marine Applications
- ★ Aviation Applications
- ★ GNSS Space-Based Augmentation Systems
- ★ Space & Satellite Applications
- ★ Galileo Signal Structure, GPS/Galileo Interoperability
- ★ Modeling & Simulation
- ★ Timing & Scientific Applications
- ★ GPS Modernization/GPS III
- ★ New Product Announcements
- ★ Algorithms & Methods

WWW.ION.ORG

THE 20TH INTERNATIONAL TECHNICAL MEETING OF THE INSTITUTE OF NAVIGATION SATELLITE DIVISION

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