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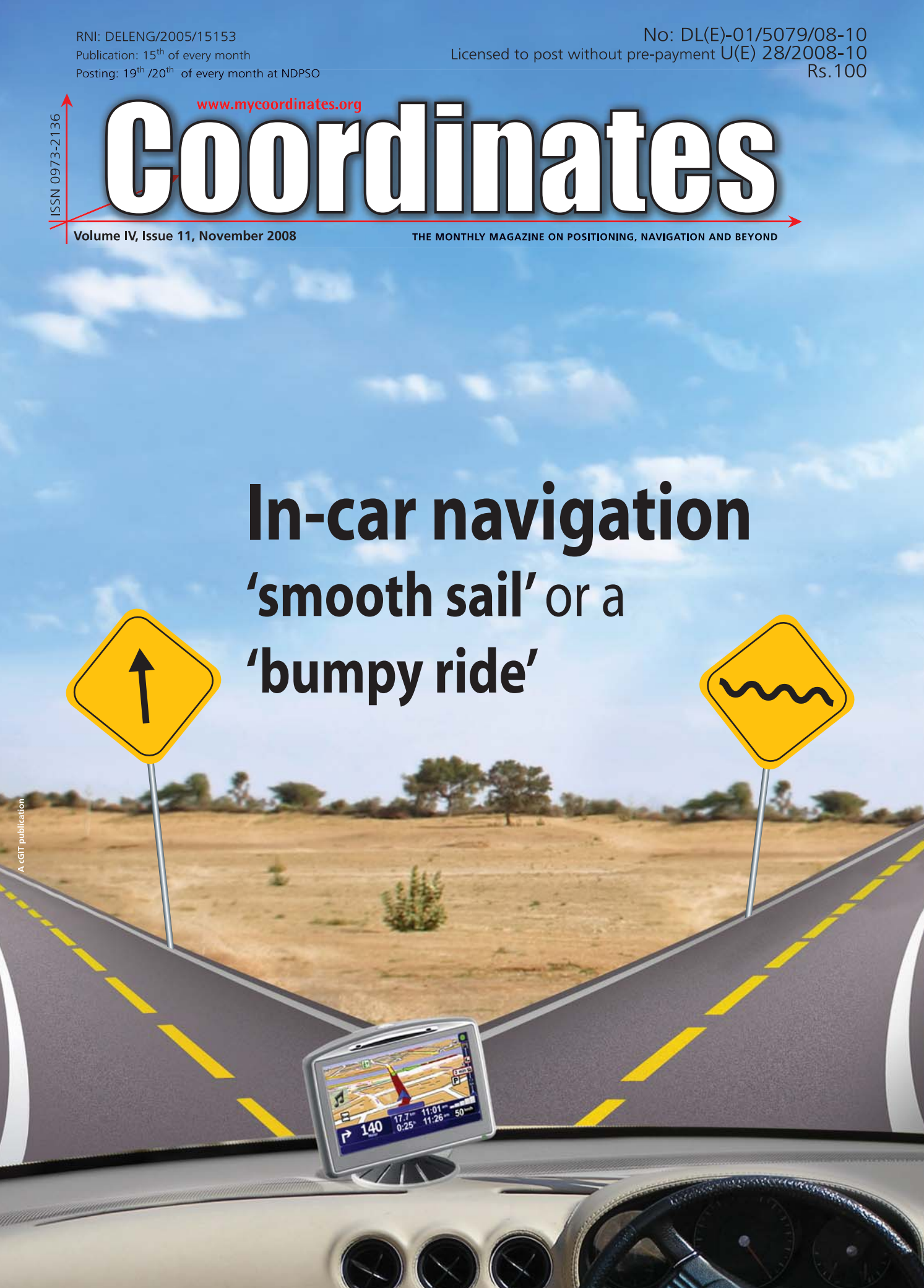

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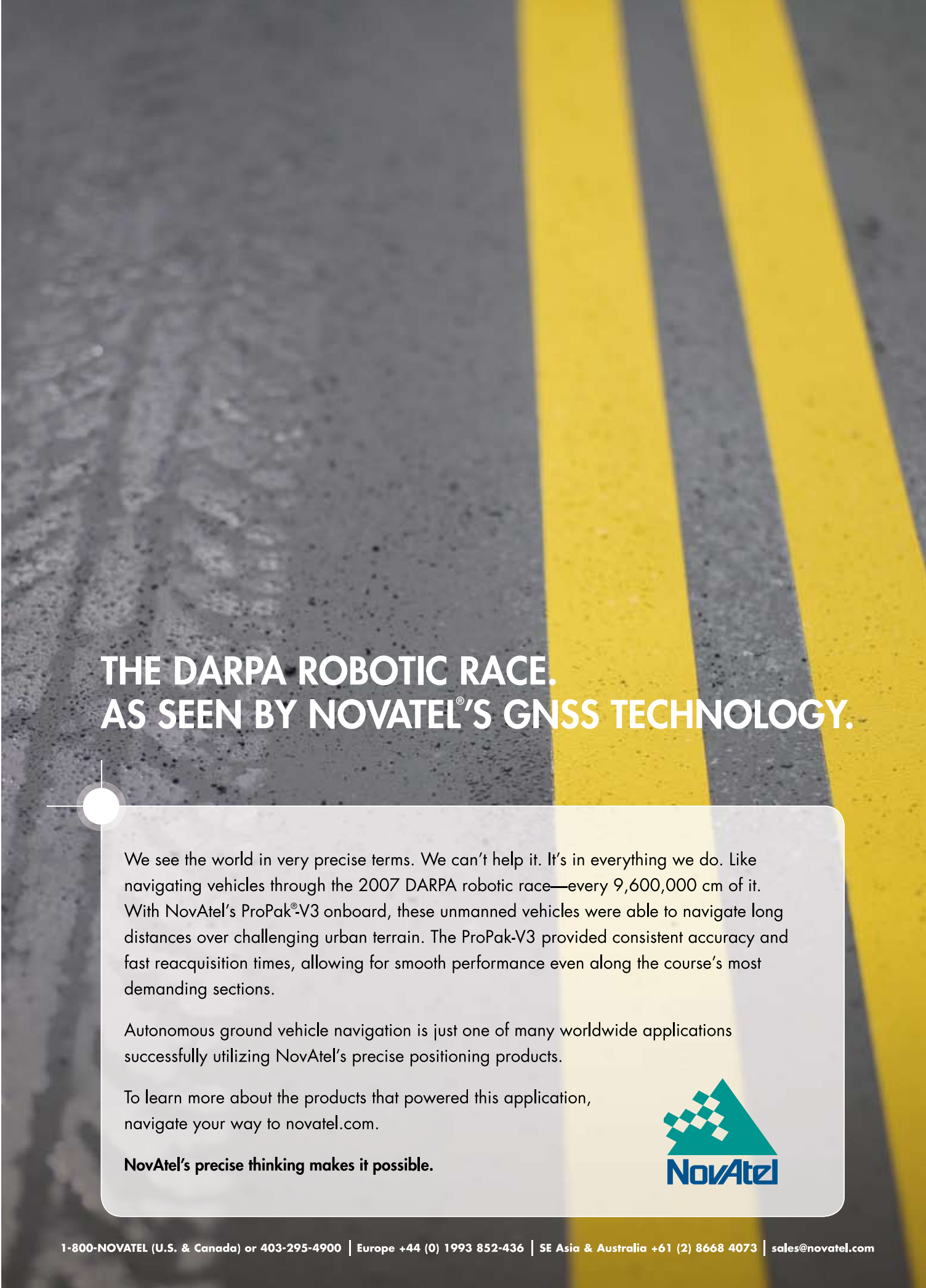

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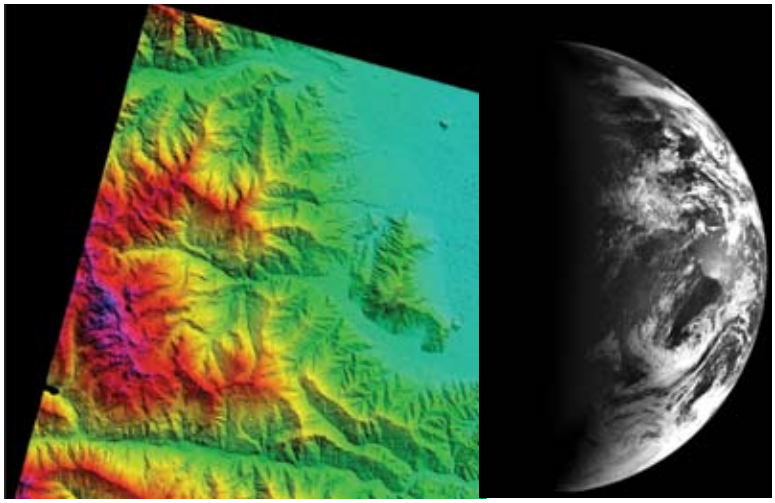

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This issue of Coordinates is of 44 pages, including cover

Yes, we can!

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And work harder for future.

Bal Krishna, Editor
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Accurate geo-referencing and DSM generation with HRSI

Satellite images are an interesting source for 3D mapping. However, they still do have a number of substantial disadvantages when compared to aerial images

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Earth-observation techniques attract currently a substantial amount of interest and open fresh research and business opportunities for the geospatial community. They offer nowadays a broad spectrum of diverse platforms, sensors and products. UAV systems are paving their way into novel applications. The development of large format digital aerial camera systems has triggered a renewed interest in aerial photogrammetry. This is all in line with a general trend of turning the attention "back-to-earth" in science and development.

With the advent of very high-resolution satellite imagers (VHRSI) this development is strongly supported and enforced. We are witnessing presently worldwide many activities in space, fueled by environmental, resource management, security and also military concerns. Many countries are getting involved, setting up their own earth-observation programs, others are strengthening their existing ones. With WorldView-1 and GeoEye-1 we have reached the 50 cm footprint level and the development will not stop here.

VHRSI sensors differ from each other. They are characterized by a number of geometric, radiometric, spectral and operational specifications. This raises questions concerning the appropriate use of those devices. 3D mapping is a hot topic under discussion. But whatever application may be envisioned, at the beginning of every value-adding procedure stands the problem of geo-referencing and (in many cases) DTM generation.

Processing of VHRSI with SAT-PP

All high-resolution satellite sensors acquire panchromatic and/or multispectral images in pushbroom mode for photogrammetric and remote sensing applications. They use Linear Array CCD technology for image sensing and are equipped with high quality orbital position and attitude determination devices like GPS, IMU systems and/or star-trackers.

For the full exploitation of the potential of the Linear Array CCD sensors' data, the "classical" satellite image analysis methods must be extended in order to describe the imaging geometry correctly, which is characterized by nearly parallel projection in along-track direction and perspective projection in cross-track direction.

We have developed a full suite of new algorithms and the related software package SAT-PP (Satellite Image Precision Processing) for the accurate processing

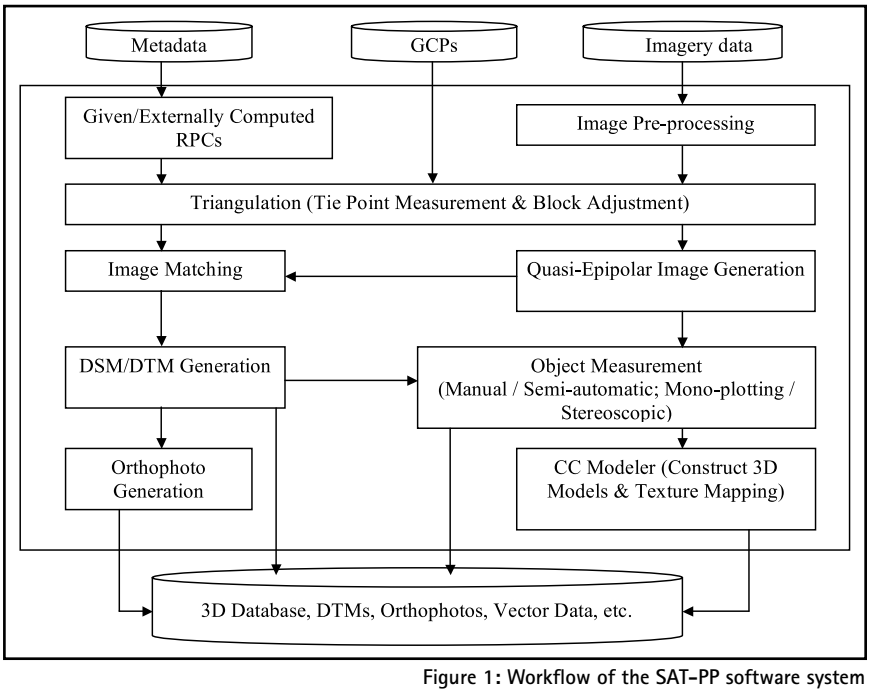

Figure 1: Workflow of the SAT-PP software system

of high-resolution satellite image data. The software can accommodate images from IKONOS, QuickBird, SPOT5 HRG/HRS, Cartosat-1, ALOS/PRISM, WorldView-1 and sensors of similar type to be expected in the future.

The software package SAT-PP consists of the following components (Figure 1):

(a) User interface for project and data management, image format conversion and pre-processing (with an edge-preserving smoothing filter) and image display / roaming in mono and stereo modes

(b) Sensor and trajectory models (rigorous and generic ones such as the rational polynomial function model – RPF), designed for the high-resolution Linear Array sensor geometry

(c) Orientation of single stereo models and triangulation of larger units. On-line quality control and error analysis via interaction with graphics elements. Ground control point (GCP) and tie point measurement in manual and semi-automated modes

(d) Derivation of quasi-epipolar images for stereo mapping and feature collection

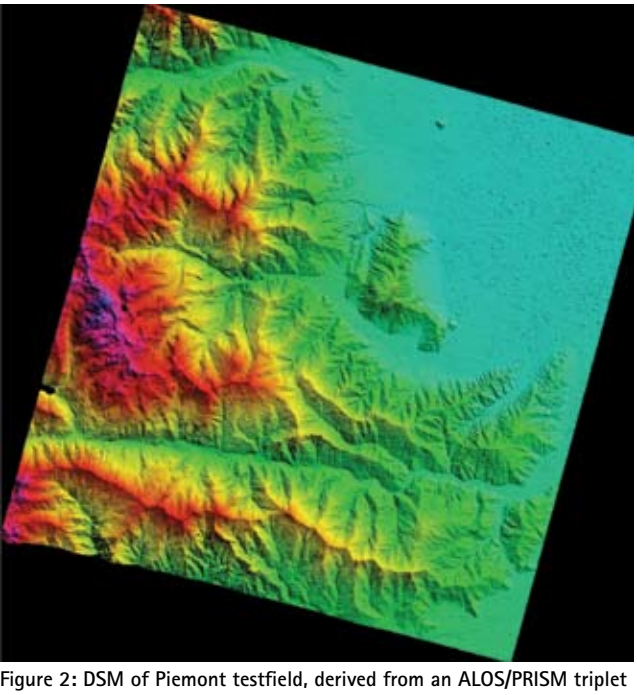

Figure 2: DSM of Piemont testfield, derived from an ALOS/PRISM triplet with SAT-PP

(e) Automated generation of Digital Surface Models (DSMs) by using a precise and robust image matching approach, combining area-based, feature-based and relational matching techniques. Stereoscopic checking of the automatically matched features

(f) Generation of orthorectified images

(g) Mono-plotting functions with existing or automatically derived DTMs. Stereoscopic measurement and collection of objects with particular emphasis on 3D city modeling by using the semi-automatic 3D modeling software CyberCity ModelerTM

(h) Pan-sharpened image generation to enhance the visual information of multispectral imagery by fusing it with the detailed spatial information of panchromatic imagery. Fully automated sub-pixel image registration between multispectral and panchromatic imagery

Geo-referencing

The increased spatial resolution of the HRSI and the stereo capabilities demand accurate methods for geo-referencing. The methods used for geo-referencing can be categorized in two main groups: rigorous ("physical") and generic models (also called "parameterized" and "non-parameterized" models, respectively). These approaches have several advantages and disadvantages against each other. In order to make full use of the sensors' geometrical potential in terms of geolocation accuracy, a rigorous modeling of the sensor and trajectory geometry is to be favoured. Physical sensor models require precise knowledge of interior and exterior orientation parameters. The information may be acquired through laboratory calibration and/or on-the-job self-calibration/orientation. On the contrary, the generic models, such as the Rational Polynomial Function (RPF) Model, Direct Linear Transform, 2D/3D affine transformation, etc. do not require a-priori knowledge of the sensor location, altitude, and interior geometry for the user. They basically provide an approximate solution and the model parameters do not correspond fully to the physical state of the sensor. However, these models are easier to implement, generic for various sensors, easy to transfer from one software package to another, and more suitable for inexperienced users. However, depending on the procedures used for the generation of RPF-parameters there is usually the need to post-correct the orientation with some GCPs and low-order polynomials. This technique may also be interpreted as self-calibration (of RPF models).

The image processing level, which is often denoted in product levels (1A, 1B, etc.), should be considered when choosing a particular geo-referencing technique. For example, the rigorous models should be applied to geometrically raw data. A number of pre-processing methods are always applied in order to correct the radiometric and geometric systematic errors, at least partially. The raw (original from the acquisition) satellite images are usually processed internally and not provided to the users. A high processing level increases the data costs inevitably. The user needs depend on the required geometric accuracy and intended applications. Advanced users can handle raw data for sophisticated analysis, while end-users and non-photogrammetrists prefer the high-level processed and already geo-referenced images.

Recently, as Member of the Calibration/ Validation Team of JAXA's ALOS/ PRISM mission we have validated our geo-referencing and DSM generation approaches using ALOS/PRISM images over several testfields (Saitama, Okazaki, Sakurajima, all Japan; Piemont, Italy; Haiphong, Vietnam; Bern/Thun and Zurich/Winterthur, both Switzerland;, Wellington, South Africa; Adana, Turkey). The results are very consistent over all testfields. We achieve from checkpoint analyses 0.5-0.8 pixel planimetric

accuracy and 0.3-0.8 pixel in height. This corresponds quite well with earlier results which we have obtained with SPOT-5, IKONOS and Quickbird images (0.3 pixel in planimetry and 0.5 pixel in height). The ALOS/PRISM results are a bit inferior, especially in planimetry, because PRISM images are suffering under low image quality.

All results are based on a sufficiently high developed sensor model and just a few (1-5) ground control points (the required number depends on the used sensor model and the number and type of self-calibration parameters).

DSM/DTM generation

This is a key issue in many applications. If produced in manual mode this does not constitute a problem, it only needs time – a lot of time. Therefore automated DSM generation by image matching becomes a relevant topic. Image matching - in its essence - is still an unsolved problem. With our software SAT-PP, which includes an advanced matching module, we obtain height accuracies between 1 and 5 pixels from high-resolution satellite images, depending on the type of terrain, land cover, image texture and image quality. In the worst cases – very steep terrain with strong tree coverage and shadows in the valleys - we may have to expect an accuracy of only 5 pixels. Validating the performance of image matchers with VHRSI data requires very high accuracy DSM reference data (ideally it should be accurate to at least 1/3 of a pixel). We obtain this from laserscans and aerial images.

While the RMS errors in such tests show usually quite good results we must note that in all these cases substantial blunders (10 times the RMSE and more) still exist in the data. This is not acceptable to the cartographer. This can only be solved by substantial and time-consuming post-editing of the DSM. Therefore, the avoidance and/or detection of blunders in the automatically generated DSM is a critical point for future research and development.

The next problem we are faced with is the reduction of the DSM, produced by the image matcher, to the DTM, as represented in the landscape model. Although there are some attempts available to automatically perform the reduction, the results are not convincing, because these algorithms are purely based on geometrical considerations. What is needed however is an image or point cloud interpretation approach which lets us understand what kind of objects we are dealing with in the particular areas of images or point clouds.

3D mapping

3D mapping entails much more than just geo-referencing and DSM generation. Since it is generally assumed that high-resolution satellite images with stereo capabilities provide for an interesting data source for topographic mapping we are currently doing a sequence of tests in order to find out to what extent sensors like IKONOS, WorldView-, etc. are suited for topographic mapping.

Our test with manual measurements of IKONOS stereo images for 1:25,000 topo-mapping in Switzerland revealed many problems. Small terrain features did get lost in contours and many buildings could not be interpreted and mapped appropriately. Also, the classification of roads turned out to be difficult in many cases.

Modern technologies allow for the new concept of 3D mapping, shifting the concept of map generation as the primary product to the generation of 3D digital landscape models. However, many issues of truly 3D modeling are not yet well understood.

However, one often occurring question can be answered already now: Fully automated processing techniques are far away from delivering reliable results.

Outlook

High Resolution Satellite Images (HRSI) are used in a wide range of applications and by users from different disciplines. With the increasing spatial resolutions, the HRSI can meet requirements of many new applications where accurate geographical information is necessary. The temporal resolutions of the sensors are improved with extended viewing and tilting capabilities. The average revisit times of the satellites are also increasing, making them applicable even for many disaster management and process monitoring applications. Thus the HRSI provide efficient data sources for mapping, GIS database updating, change detection, and environmental monitoring applications.

3D mapping is becoming a buzzword in the geospatial community. However, in an earlier contribution in this Magazine we have pointed out that neither the goals nor the procedures of 3D mapping are clearly defined yet. The available new technologies require a totally fresh approach to mapping.

For efficient utilization of this kind of images, accurate geometric processing is needed. Our software package SAT-PP is a powerful and flexible tool for accurate and automatic 3D processing of high-resolution satellite images. It has already been tested in many projects using the imagery of different high-resolution

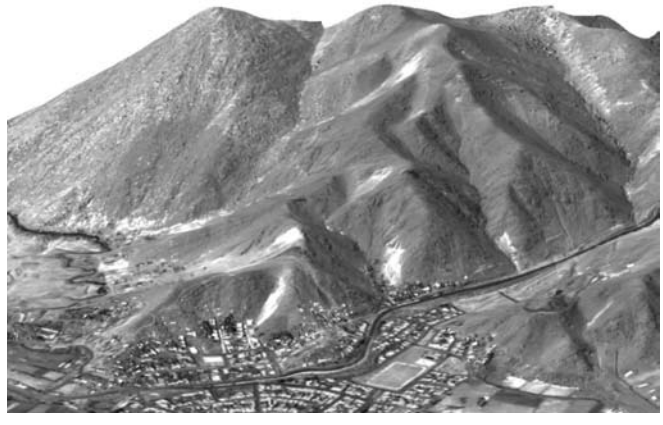

Figure 3: View on the DSM of Arequipa, Peru, derived from a Worldview-1 stereo with SAT-PP

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sensors. The specially designed matching component for the imagery of the Linear Array CCD sensors is especially powerful for producing high-quality DSMs, in terms of accuracy and completeness. Functions like ortho-image generation, monoplotting and feature extraction are also available. When used together with the CyberCity ModelerTM, 3D city models can be produced efficiently from the images of very high resolution satellite sensors, such as IKONOS, Quickbird, WorldView-1 and others to be expected in the future.

Satellite images are an interesting source for 3D mapping. However, they still do have a number of substantial disadvantages when compared to aerial images. In our tests with manual mapping from IKONOS stereo images we found that IKONOS images were not sufficient for the production of 1:25,000 map data. But even if we consider that satellite images are already now available at the same spatial resolution as aerial images (WorldView-1 with 0.5 m GSD) we still have to take into account the lower radiometric quality of satellite data. When compared to aerial images the ground Sampling Distance (GSD) should not be taken as the only parameter. Especially digital aerial images provide us with a hitherto unsurpassed image quality, which is very crucial when it comes to the interpretation of map features.

However, these statements refer to the map specifications of Switzerland. In other countries these specifications may not be as stringent.

3D mapping is becoming a buzzword in the geospatial community. However, neither the goals nor the procedures of 3D mapping are clearly defined yet

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Navigation in India: smooth sail or a bumpy ride

Perspectives on key factors aiding and affecting in-car navigation in India.

Indian customers want cheap and best

Amit Prasad
Founder & MD, SatNav Technologies
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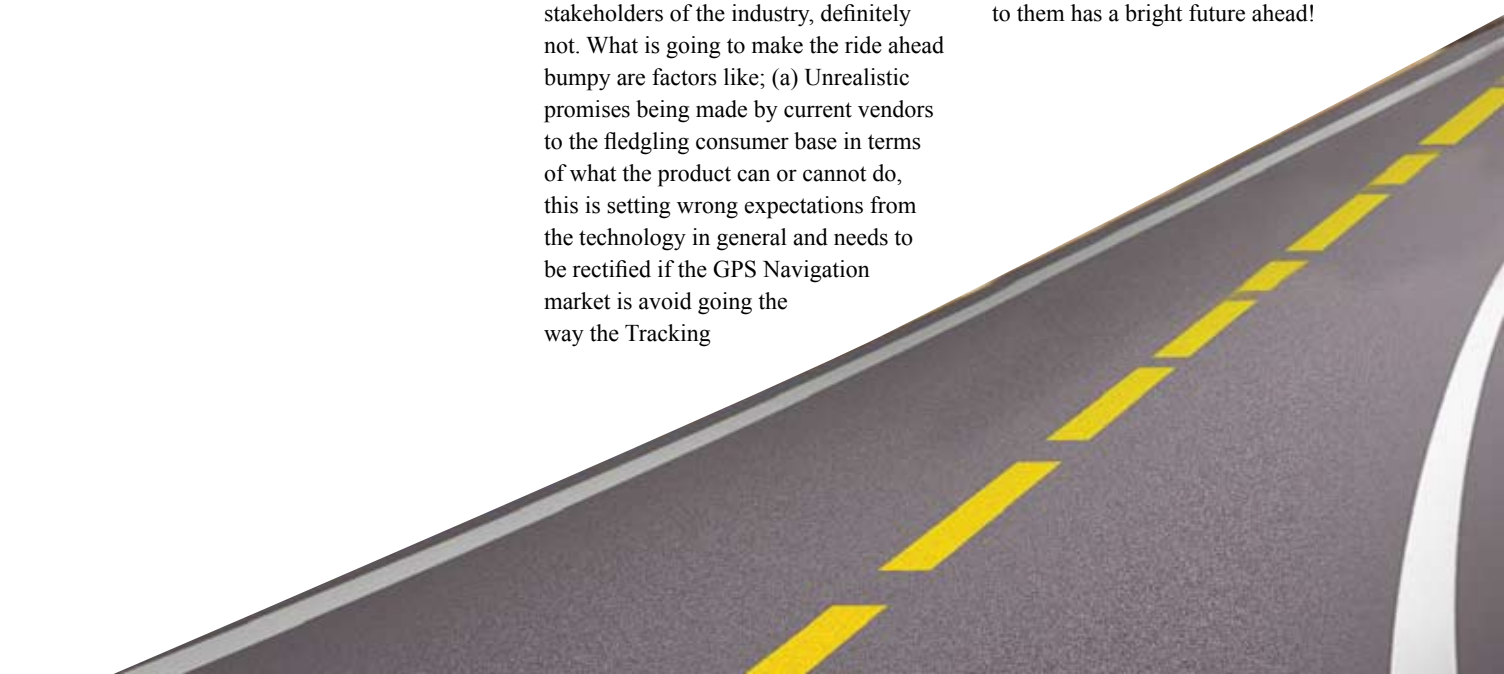
At SatNav, we have had the privilege of seeing the Indian GPS Navigation Industry from the year 2002, the time we launched our first voice based system, when comments like 'who needs it?', 'my driver knows all the places', 'I prefer asking a panwallah to such devices' were the norm. Today the world has changed where the comments are, 'why doesn't it tell me the right way to my home?' and 'it's a useful product', 'we appreciate you for bringing this technology to our country', in the year 2008. So we no longer have the challenge of going into OEMs and other organisations to convince them of the need to have an In-Car Navigation, the consumer has spoken loud and clear, and he definitely wants GPS in India too. With our direct to consumer online strategy in 2007, we have ensured that the same has happened. True, not in the numbers that are prevalent in the developed economies but surely there is a demand curve that is getting defined.

Does this mean there will be a smooth sailing from this point on? In our opinion, based on extensive interaction with various stakeholders of the industry, definitely not. What is going to make the ride ahead bumpy are factors like; (a) Unrealistic promises being made by current vendors to the fledgling consumer base in terms of what the product can or cannot do, this is setting wrong expectations from the technology in general and needs to be rectified if the GPS Navigation market is avoid going the way the Tracking services market did over the last few years. (b) Another problem is that while the consumer is very clearly appreciative of what he/she is getting, the decision makers in the channels which can actually bring the product into the market are still very pessimistic about what they see.

We need to quickly convert those non-believers and and tell them that GPS is here to stay, whether you like it or not.

And the more time you lose the more your competition is gaining in the process. So all players need to be realistic in what they commit, don't say things just to make a short term sale, focus on educating the market and entrench yourself for the long haul. The company which does this best, will have a smooth sail while others are headed for the bumpy road!

The market is still growing by leaps and bounds there, these are not likely to affect consumer demand as long as the vendors offer value to customers I always say, Indian customers want cheap and best, whoever can give it to them has a bright future ahead!



We may see a repeat of the Telecom story in the navigation space

Shivalik Prasad,
Vice President,
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shivalik@mapmyindia.com

Growth - India is going through rapid urbanization and the connectivity across cities is rapidly expanding with lots of new highways being built. More and more people are buying automobiles and traveling to near by hill stations, resorts, outlying townships etc. One can see a lot of movement of people across the county.

As movement increases it is our belief that navigation products will become an integral part of the lifestyle of the people at large for the reasons such as convenience, safety, security and comfort. Indian navigation industry is here to stay and grow. MapmyIndia believes as more and more players enter the Indian navigation marketplace, the overall market will expand and one should not be surprised if we see a repeat of the Telecom story in the navigation space.

Impediments - Navigation is given fact in the western world and also in countries like Japan, Korea. The biggest issue facing navigation today in India is lack of awareness. We believe since the large telecom operators and handset OEM are entering this space, the issue of awareness about navigation and GPS related products will soon be history and with the advent of 3G networks, navigation will be part of the mainstream solution on all sorts of mobility devices. Since India does not have legacy navigation products, the products will be based on the latest and greatest technology at prices that will be much more reduced than what they were for example in Germany 10 years ago.

The user in India is still new to navigation, slowly but surely we are seeing that the user is using map tools be it via the internet, or PND or mobile phones. In the last one year there has been a definite increased consumption of navigation products in India. The user wants the product to be highly local (my landmarks, my school, restaurants serving my favorite cuisines etc) such that the experience is much more enhanced.

Navigation is here to stay be it on dedicated devices or connected mobility devices as long as it serves a purpose from safety, security and convenience point of view. Navigable map data is the heart and soul of all navigation solutions and MapmyIndia is proud to provide to the Indian consumers what we believe is the best available map data in India. As we speak many new point of interest (landmarks) are being added which is a hybrid combination of user content which is validated by field surveys.

The last mile is still a challenge

Ashutosh Pande
MD Indian Operations,
Sirf Technologies
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Bhai-sahab – a familiar salutation as one tries to find his or her way around towns in India. Can an In-car navigator replace this living breathing direction finder?

As one observes the entry of in car navigation systems into the Indian market one has to look at the next best alternative and try to differentiate their product offering against that alternative. In India this alternative is the proverbial 'Bhai Sahab' – the last mile navigator. Some will even hitch a ride with you to your destination and you don't have to worry about leaving the charger at home! The last mile is still a challenge – I can navigate myself to Nainital from Delhi – having to still stop at a few places to get onto the right road segment. However, once in Nainital, how do I get to House # 4 in Joy Villa or to 15 Vernon Cottage Annex? Alas, I do have to resort to the neighborhood 'Bhai Sahab' for directions. This will change over time as content is created. With widespread infrastructure projects coming in Tier 1 and Tier 2 cities, navigable roads in India are changing weekly if not daily. How does a Portable Navigations Device (PND) navigate one through this mess? Isn't a navigation system designed to accord this convenience to its owner?

Kudos to the pioneers like SatNav and MapmyIndia for introducing Indians to PNDs and in-car navigation. Techno-enthusiasts have gobbled up these products and early adopters are experimenting with them. But is India ready for these products? I have to say that PNDs in India will have a bumpy ride. India is not ready for PNDs. The chasm between early adopters and mass adoption is huge – PNDs as single function device will have to compete with MP3 players and In-car video players. In India, when it comes to choices 'Bollywood' wins over others and in portable music and video players will win over PNDs.

Not all is doom and gloom and efforts to date are not lost. New classes of PNDs, with media playing capability, are being launched. These devices can play music, video, pictures as well as offer navigation capability. Navigation is a 'secondary' function as opposed to a 'primary' function. The channel for sales of these devices is also different. These devices, if positioned properly, have the potential to catch tailwind and ride smoothly blaring 'Suhana safar aau yeh mausam hasin, hamen dar hai ham kno na jayen kahin' while the navigator stops one from getting lost on country roads.

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Those who survive the initial bumpy ride would be there to reap the benefits later

Raghavendra Krishnamurthy
Group Manager, Bosch
Raghavendra.R@in.bosch.com

Indian consumers have always been very open in adapting to affordable new technology products. Be it Walkman in 80's, Radio Pagers in 90's or Cell Phone in this decade - the gadgets have always adorned the life style like never before. The latter half of this decade saw the prices of products like Blue tooth, Mobile Camera, GPRS, Wireless etc plummeting and eventually they reaching the commodity status.

With improved lifestyles in India, automotive market has witnessed a big boom in the recent years. The recent trend has been that of incorporating cutting edge technologies in the areas of Safety (ABS, ESP, Airbags etc), Engine Management (Common Rail, Hybrid, Exhaust etc) and Multimedia (Audio, Video, Bluetooth) in the cars. Increased convergence with Consumer Electronics and corresponding decrease in the prices has resulted in car multimedia devices forcing their way into entry- & mid-car segments. Entry of Navigation systems is one such recent development in India.

From the outset, being one of the fastest growing automotive markets in the world, the market opportunities appear very attractive for Navigation systems in India. Also, relatively few players in this space offer unparallel advantages to the early entrants. However, vendors may not find it very easy to sustain the opportunities.

This is primarily due to the combination of infrastructure & technological reasons. Essential requirements, for a Navigation unit to calculate route properly, such as comprehensive road network data, reliable street information (one ways, parking areas, speed limits, signals etc), structured address format, rule-compliant traffic behavior etc, are not default parameters in India. This poses a huge challenge to the technical community and calls for creating innovative solutions.

From an entrepreneurial angle, ironically, these very challenges and unique business opportunities in the areas of LBS (Location Based Services), Remote Assistance, Telematics, Toll Collection etc, offer enough reasons to conduct business in India.

Finally, adopting out-of-the box business models to keep the volumes high and at the same time cost of ownership to the customer low would be another critical success factor. For example, cost/mode of the map updates will be one of those decisive factors. Other factors such as Licensing & Government Policies, Forums & Bodies influencing the policies, would also play a significant role in determining the journey next.

In summary, Indian context offers enough challenges early-on. Those who survive the initial bumpy ride would be there to reap the benefits later, for it is hard to ignore India!

It is even more interesting that Blaupunkt, the Inventor of Car Navigation has entered the market at this stage in India. It gives me a feeling that we can expect very interesting developments for the Indian consumer in the near future.

Providing accurate and useful maps for Indian roads and cities is a formidable challenge

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With unveiling of the revolutionary Tata "Nano" small car having a huge market potential, India has captured attention of all major automotive technology vendors. The satellite based land-vehicle navigation is one such technology. The improving roadways infrastructure, rapidly increasing number of mobile phone users and review of regulatory policies on use of Digital Maps are some of the factors which have resulted into introduction of several "Navigation and Route Guidance" solutions for passenger cars in the Indian market. Major players have entered in the Indian market with products based on both dedicated Personal Navigation Devices and mobile handsets with built-in GPS.

In order to enable a smooth ride for the customer when using the navigation technology, various stakeholders like navigation device vendors, vehicle manufacturers, service providers and government regulatory agencies will have to work together for the common goal of satisfaction and safety of the customer From customer's perspective, although availability of international grade systems is a desirable situation, it is necessary to scrutinize the utility of various features provided and the cost of ownership of a car navigation system. In addition to accurate and reliable route guidance system , the customer will expect features like traffic and weather information, voice based navigation in Indian languages, localized travel related information, hands-free voice communication, seamless integration with devices like i-pod and so on. The device vendors will have to meet these

"The whole industry has been overly optimistic"

Magnus Nilsson
Chief Executive Officer,
Wayfinder

How crucial is India for Wayfinder?

India is a very promising market. Our services are all based around the mobile phone as the delivery vehicle so to speak. India is not very big today from a revenue point of view, but we believe that in the next two years it is going to become very important.

You have your present tie up with MapmyIndia, Nokia and Airtel in India. Please comment.

With MapmyIndia we have a mutually exclusive agreement on the server based navigation site. With the others it is more a matter of gaining trust and confidence with one another and working out a relationship. With Airtel, we now hope to expand beyond the Blackberry devices, to really push forward and to have much more integrated offerings together with them. On the device side, Nokia has their own solution, so the focus with them is in areas in which they do not have their own solutions.

What kind of solutions are you providing to map data providers in India?

We produce applications built around our server as well as our client technology and then we make an agreement with MapmyIndia, which utilizes their navigable maps for delivering those services. So they are supplying maps to us and we then sell applications to the end user. This is the way we work with Tele Atlas and Navteq as well.

Could you please highlight one of Wayfinders killer application?

Right now it is within navigation - Wayfinder Navigator. That is the most important from a revenue standpoint. From a user perspective, Wayfinder Earth is actually bigger – in that it is a free product you can download, test and use for looking at maps – it is more an educational type of product I would say. But we are growing volumes for Wayfinder Active and other products as well, so we plan to have a host of location applications utilizing our location aware server to produce compelling user experiences utilizing location as the common denominator.

How do you see China vis-à-vis Inida?

China will come. It has some difficulties in terms of how the government is working – they encrypt their map data, so it requires a different approach to the market where you need to encrypt all the material.

If you look at the GPS and the map you might see a different place then where you actually are which makes it a bit tricky. Other than that China is a very interesting market, but we have found it less cumbersome in the initial stages to start the service in India. It is not only to do with the need of the market because that is equally big in China, but more the regulatory issues that make it more difficult to enter China. And not the least the language!

What about the market potential?

We have always been, I personally feel, overly optimistic, the whole industry has been overly optimistic. You might have heard that our company was founded in 1989 based on a notion that every single phone will have GPS in 1995. But what I see now is that we do not need to guess anymore; every series phone S60 coming out from Nokia for example has a GPS. Because you know the official market share, and how many phones they are going to come out with, you can sit down and count how much it might mean. Regarding Nokia, it might be about 35 to 45 million phones and then the question is about the rest of the industry.

We believe it might be about 75 million – somewhere between 50-100 million I think is a fair guess for the mobile market in 2008. And most of that is going to happen in the second half of the year.

expectations at an affordable cost and also maintain high quality performance required for automotive applications.

The vehicle manufacturers will have to design vehicle infotainment architectures which can host personal navigation devices, mobile phones or dedicated black boxes. The vehicle system will open a communication channel with the navigation device to share its information on vehicle parameters and its hardware like visual displays. The integration process should also cater to safety considerations like driver distraction and protection from injury in event of crash.

The role of mobile telephone network providers and location based service providers will be important to offer value added services mentioned above. The government regulatory agencies can act as catalyst in standardizing and establishing Emergency Help system as a basic feature of any navigation system. Providing accurate and useful maps for Indian roads and cities is a formidable challenge due to different addressing systems followed and the on-going construction of new roads and buildings. The map provider can ensure the accuracy of maps by taking help from government agencies and meet requirements for reliable navigation.

PND in India definitely holds a lot of potential, but it will not be "bed of roses"

Alok Shankar
Managing Director,
Brightpoint
India

It is still too early to say about the in-car navigation's success in India, as the navigation segment is in its infancy stage here. Globally, the PND (Personal Navigation Device) is a promising product category with market penetration of only about 6%, thus offering a big opportunity for all the players in the supply chain of this industry. Western Europe and North America currently stand at 15% and 4% respectively.

With the rapid growth of the GPS market in countries like China and India, majority of the navigation devices are anticipated to be shipped in the Asia-Pacific region by 2012. Lack of high quality map data and regional variances in navigating set some obstacles for navigation market's growth in Asia. As an example, in some countries people are accustomed to navigate by landmarks rather than the street names, which might not even exist.

In India, people are still unaware of GPS, but the navigation industry is expected to grow as new improved maps and navigation products are being launched in major cities. Though the satellite navigation industry has high barriers of entry; the enormous market opportunity is attracting a slew of players. Few leading players who are early to market with the best quality maps, large geographic coverage, user-friendly UI and a good after-sales support, are to dominate the market.

Brightpoint India is also looking at this opportunity. Having the vision 'to be the market leader in the distribution of navigation devices', Brightpoint has developed great relationships with leaders like Garmin in the PND space. In India, a lot has to be done to educate the market about the benefits of navigation. Consumers ask – "why should I buy this navigation device?" PND devices are still rather expensive for an average Indian consumer, and people are confused about the cost of navigation. PND can help finding a way to a destination and to reduce the travel time, but directions can also be sought by asking any passerby. So, what will be the influencing factor for a consumer to make the purchase decision?

To create that "value for money" proposition, synergies have to be met. Indian government has to reduce import & local taxes and navigation companies have to promote the benefits such as safety for women travelers, route planning, effective time utilization etc. Furthermore, Value Added Services such as live traffic updates and on-line hotel bookings can increase the attention for PND devices. Today Nokia is creating the navigation category in mobile phones, and it could well be so that Indian consumers will opt to skip the PNDs and go with the improved navigation experience offered by mobiles.

Worldwide statistics from 2007 show that PNDs dominated the GPS device market with more than 90% market share. So, PND in India definitely holds a lot of potential, but it certainly will not be a "bed of roses".

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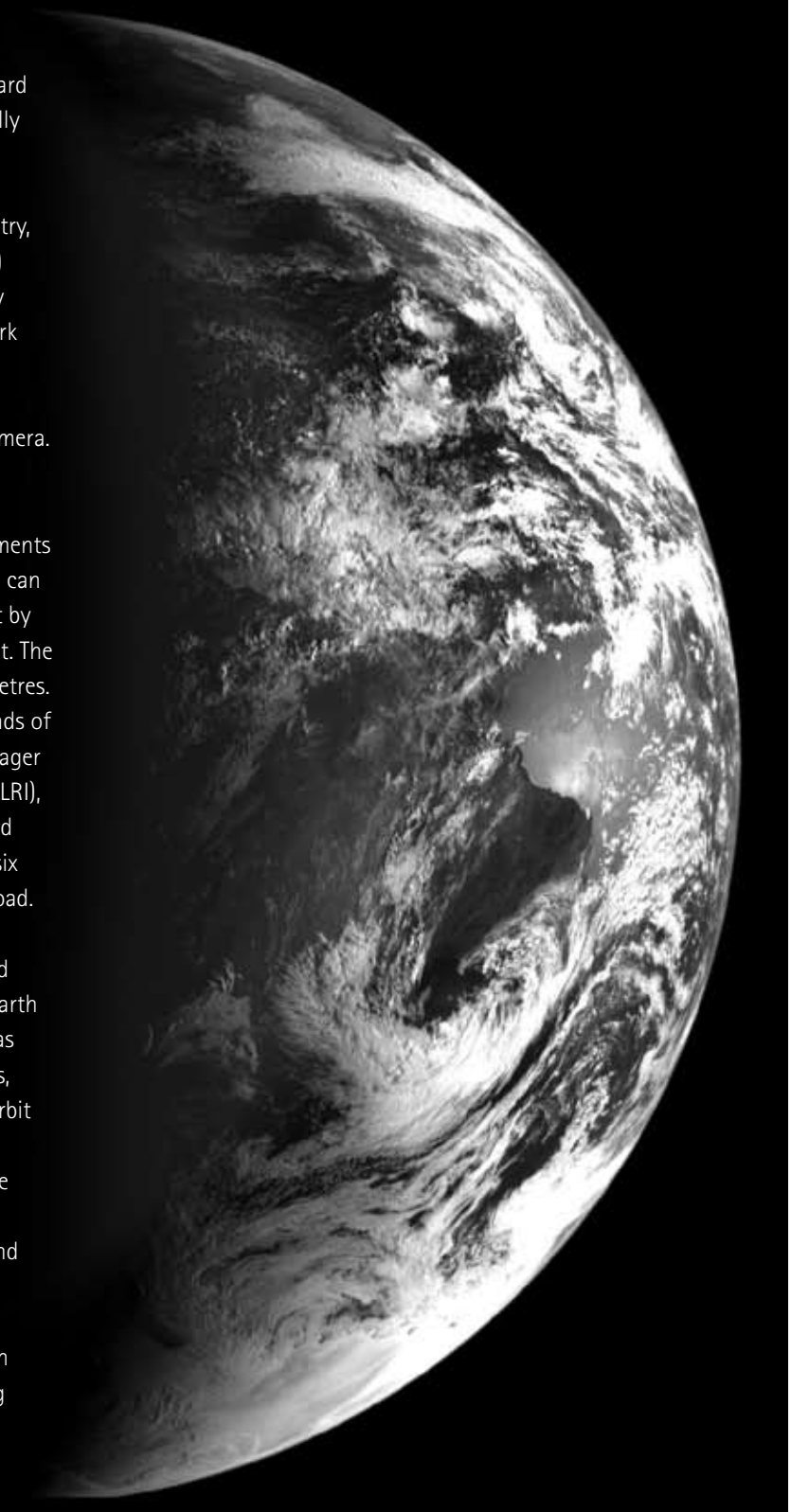

The Terrain Mapping camera (TMC) on board Chandrayaan-1 spacecraft was successfully operated on October 29, 2008 through a series of commands issued from the Spacecraft Control Centre of ISRO Telemetry, Tracking and Command Network (ISTRAC) at Bangalore. Analysis of the first imagery received by the Indian Deep Space Network (IDSN) at Byalalu and later processed by Indian Space Science Data Centre (ISSDC) confirms excellent performance of the camera. The image taken from a height of 70,000 km shows Australia's Southern Coast.

TMC is one of the eleven scientific instruments (payloads) of Chandrayaan-1. The camera can take black and white pictures of an object by recording the visible light reflected from it. The instrument has a resolution of about 5 metres. Besides TMC, the other four Indian payloads of Chandrayaan-1 are the Hyper spectral Imager (HySI), Lunar Laser Ranging Instrument (LLRI), High Energy X-ray Spectrometer (HEX) and the Moon Impact Probe (MIP). The other six payloads of Chandrayaan-1 are from abroad.

It may be recalled that the 1380 kg Chandrayaan-1 was successfully launched into an initial elliptical orbit around the Earth by PSLV-C11 on October 22, 2008. This was followed by four orbit raising manoeuvres, which together raised Chandrayaan-1's orbit to a much higher altitude. The spacecraft is now circling the Earth in an orbit whose apogee (farthest point to Earth) lies at 267,000 km (Two lakh sixty seven thousand km) and perigee (nearest point to Earth) at 465 km. In this orbit, Chandrayaan-1 takes about six days to go round the Earth once. The spacecraft performance is being continuously monitored and is normal.

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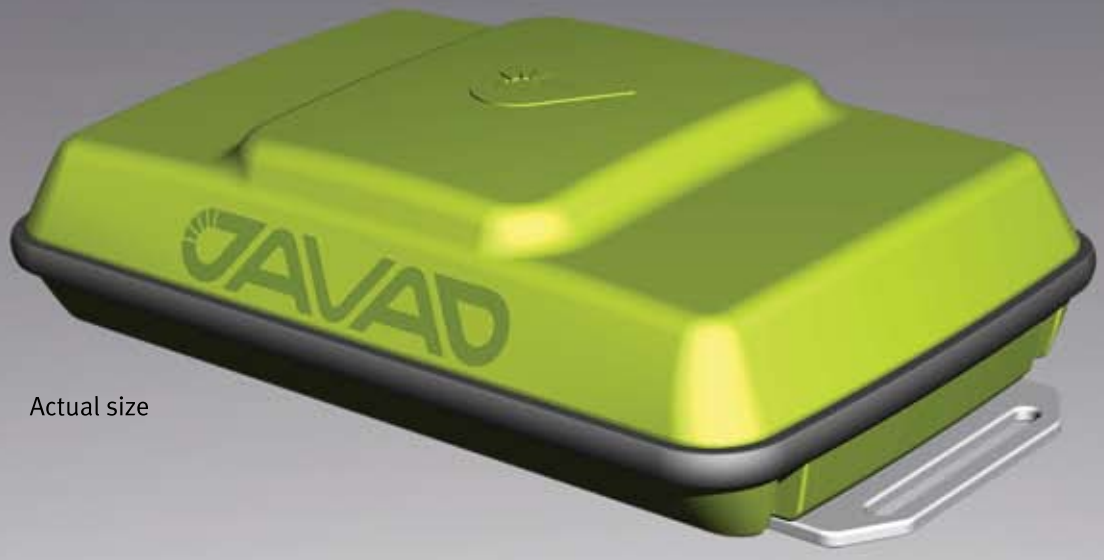

Actual size

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Standard Configuration

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- GPS L1
- Galileo E1
- GLONASS L1
- 100 Hz update rate
- RAIM
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- Internal GSM Module
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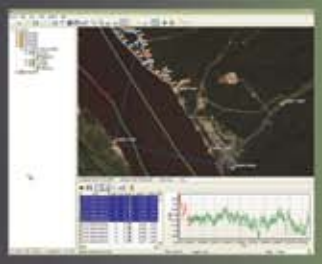

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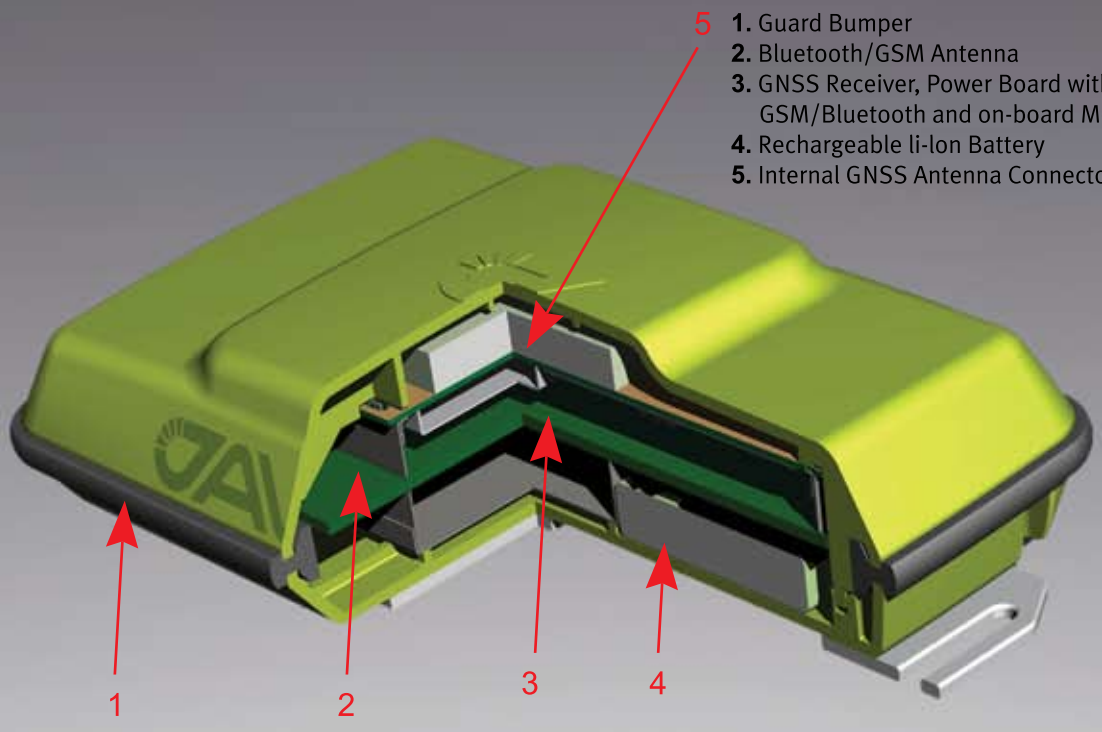

Tracking Specification

Tracking Channels
GPS L1/Galileo E1/GLONASS L1

Signals Tracked
L1 C/A, Code & Carrier

Power Specification

Battery
Internal Li-Ion battery (3.7 V, 1.05 Ah) with internal charger

Operating time	Standby mode
	Call mode
Input Voltage	+4.5 to +6.5 volts

GNSS Antenna Specifications

GNSS Antenna	Internal
Antenna Type	Microstrip (Zero Centered)
Ground Plane	Antenna on a flat ground plane

Radio Specifications

GSM/GPRS Module
Internal GSM/GPRS quad-band module, GPRS Class 10

GSM/GPRS Antenna Internal

I/O

Communication Port
Bluetooth V2.0+EDR Class 2 supporting SPP Slave and Master Profiles

External Power port	1 port
GSM Status Indicator	One LED

Performance Specifications

Static, Fast Static Accuracy
Horizontal: 0.3 cm + 0.5 ppm * base_line_length
Vertical: 0.5 cm + 0.5 ppm * base_line_length

Kinematic Accuracy
Horizontal: 1 cm +1 ppm * base_line_length
Vertical: 1.5 cm +1.5 ppm * base_line_length

RTK(OTF) Accuracy
Horizontal: 1 cm +1 ppm * base_line_length
Vertical: 1.5 cm + 1.5 ppm * base_line_length

DGPS Accuracy	< 0.25 m Post Processing, < 0.5 m Real Time
Cold Start	<65 seconds
Warm Start	<5 seconds
Reacquisition	<1 second

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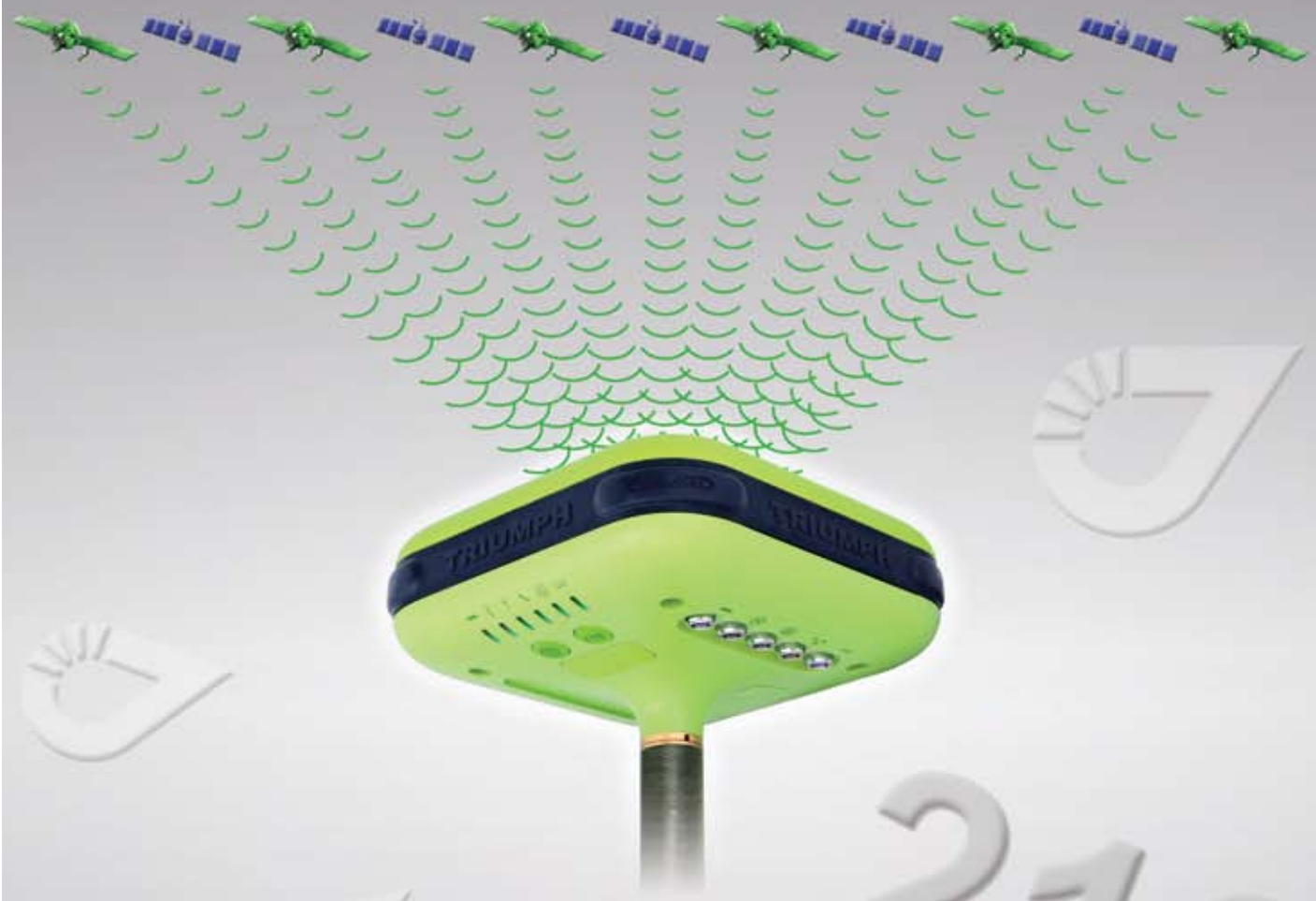

216

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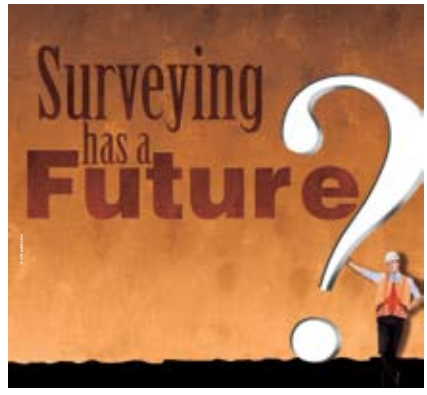
Is surveying a dying profession?

Surveyors need to adopt the new technologies and to expand their operations beyond traditional activities

Dr Francis W Derby
Professor of Surveying Engineering and Geographic Information Systems at Penn State University
fwd3@psu.edu



The future of the surveying profession is an issue that has been lingering for many years. Recently, the concern has been growing wider and louder among surveyors. Some surveyors contend that the surveying profession, in its current form, is heading towards extinction. Their reasons include a gradual decline in the number of qualified and licensed professionals, impact of emerging technologies, sophisticated and more capable equipment, and a decline in the number of new graduates into the profession. Others have even considered it a less rewarding profession. But are these reasons valid and if so, is there a solution to the problem? To address these questions, one needs to look at current challenges to the profession as well as the possible impact of any factors that could adversely impact the future of the profession.

To begin, let us look at the public perception of the surveyor. It is clear that compared with architects, engineers, computer scientists and other professionals, surveyors have a low social status, at least in the US, despite the fact that the starting salaries are comparable among all the categories. Also, among those people who are employed by the government, the surveyor's salary increases at a faster pace than some members of the same categories. One would expect that salaries alone should encourage people to choose careers in surveying. Unfortunately, in the US, the average person does not see surveying as a profession. Most people in the US

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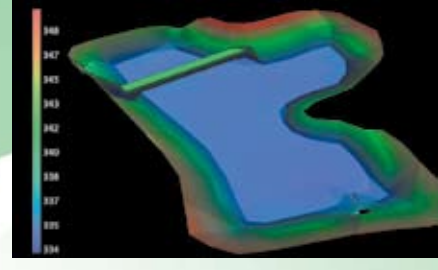

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erroneously think of surveying in terms of boundary or construction activities, which makes surveying a trade rather than a profession. This misconception makes it is difficult to encourage high school students to pursue careers in surveying. This public perception of the surveyor is different in places like Canada or Europe where surveying is viewed as a profession.

In the US today, the average age of a surveyor is over 55 years. This means that within the next fifteen years many surveyors are going to retire. With declining numbers of students graduating from surveying programs, there is a strong possibility that the current shortage of surveying professionals is going to worsen.

Often cited, but least convincing, is the emergence of enabling technologies and associated equipment such as Global Positioning Systems (GPS), Robotic Total Stations, Geographic Information Systems (GIS), powerful computers and database management systems. An argument has been made that application of GPS technology in the construction industry is impacting the extent to which surveyors are needed on construction projects. In a similar manner, it is the belief that upon the maturation of parcel-based GIS technology, when banks and mortgage institutions no longer need a surveyed plan of the land to ascertain its extent ownership, and value, boundary surveying will also be curtailed. However, the notion that these new technologies are catalysts to the demise to the surveying profession is completely false. It is important to know that job losses will only come to those who fail to adapt to these new technologies. This requires continuous education and training of current professionals and adaptation of existing curricula in surveying institutions.

Every new technology requires some additional training. For example, whereas application of GPS technology in surveying requires some knowledge least squares solution principles, the surveyor who provides data for GIS analyses needs to understand GIS principles and the importance of metadata. The same goes for digital photogrammetry, remote sensing and other technologies. Surveying institutions that offer associate degrees have difficulty introducing these important topics into their curriculum. Furthermore, the requirements for professional licensure in the US place emphasis on boundary surveying, to the detriment of other areas. Most importantly, the requirements for licensure discourage students from pursuing advanced degrees in surveying. This is causing low enrollments in graduate education programs in surveying, lack of faculty with advanced degrees in surveying, and therefore, lack of research in surveying.

Although the decline in enrollments into surveying programs is causing some institutions to reconsider the cost benefits for offering surveying education, the prognosis is not all gloom and doom. The new technologies are bringing exciting opportunities for the surveyor to expend beyond the traditional surveying activities. Surveyors need to adopt the new technologies and to expand their operations beyond traditional activities. Students of today are technology oriented and therefore more excited by the emerging technologies in surveying.

The downward trend in enrollments will change if high school students are informed about the emerging opportunities in surveying beyond boundary surveying.

The surveying profession is not a dying profession

Surveying was there when Egyptians were building pyramids

A W Mir
Chief Executive
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Surveying which has been even called the foundation of civil engineering profession has been into existence far longer than some of the high tech and highly paid glamorous professions of recent times. Surveying was practiced when Egyptians were building Pyramids.

Demand for surveyors has been increasing with the advancement of technology and invention of new instruments. When photogrammetry became the prime tool of map making and the use of Plane Table diminished, many said that the need for surveyors will decrease and their number will diminish. But the facts are the opposite. The new technology and electronic instruments have indeed increased the efficiency and rate of output of surveyors but it has not reduced their number. The technical schools and universities are producing more surveyors and survey engineers now than they did ever before, yet there are global shortage surveyors. The demand for information about our mother earth and what is on it or immediately below it ever more. It is surveying profession which is providing such information.

GIS and related other information systems, are very powerful tools for planners and decision makers, are the products of surveying profession. The surveying profession is not a dying profession. Instead, it is an evolving profession.

Understanding land administration systems

This paper introduces basic land administration theory and highlights four key concepts that are fundamental to understanding modern land administration systems. Readers may recall the first part of the paper in October issue of Coordinates. Here is the concluding part that focuses on the changing role of ownership and the role of land markets.

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The rapid growth of restrictions on land in modern societies is paralleled by a change in the nature of land ownership. Nations are building genuine partnerships between communities and land owners, so that environmental and business controls are more mutual endeavors. Rather than approach controls as restrictions, the nature of ownership is redesigned to define opportunities of owners within a framework of responsible land uses for delivery of environmental and other gains. This stewardship concept is familiar to many Europeans long used to the historical, social and environmental importance of land. For these Europeans, the social responsibilities of land owners have a much longer heritage, with the exemplar provision in the German Constitution insisting on the land owner's social role. The nature of land use in The Netherlands, given much of the land mass is below sea level, presupposes high levels of community cooperation, and integrates land ownership responsibilities into the broader common good. The long history of rural villages in Denmark and public support for the Danes who live in rural areas also encourages collaboration.

The Australian mining industry provides typical examples of collaborative engagement of local people, aboriginal owners and the broader public. The Australian National Water Initiative and the National Land and Water Resources Audit reinforce the realisation that activities of one land owner affect others. The development of market based instruments (MBI), such as EcoTenders and BushTenders, is an Australian attempt to build environmental consequences into land management. Australia's initiatives in "unbundling" land to create separate, tradable commodities, including water titles, are now established and are built into existing land administration systems as far as possible. As yet a comprehensive analysis of the impact of unbundling land interests on

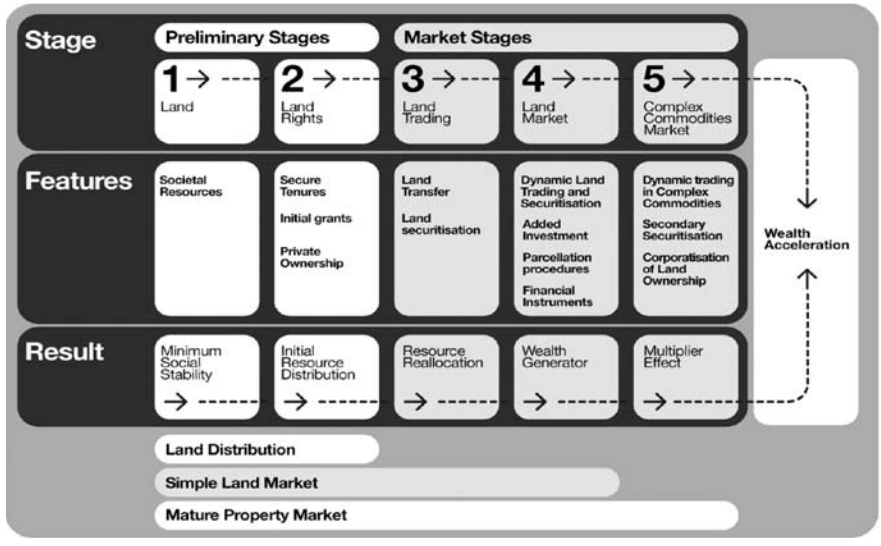

Figure 4: Evolution of Land Markets (Wallace and Williamson, 2006)

property theory and comprehensive land management is not available.

Whatever the mechanism, modern land ownership has taken on social and environmental consequences, at odds with the idea of an absolute property owner. Australia and European approaches to land management are inherently different. While Europe is generally approaching land management as a comprehensive and holistic challenge requiring strong government information and administration systems, Australia is creating layers of separate commodities out of land and adapting existing LAS as much as possible to accommodate this trading without a national approach. In these varying national contexts, the one commonality, the need for land information to drive land management in support of sustainable development, will remain the universal land administration driver of the future.

The land market of 1940 is unrecognisable in today's modern market (Figure 4). Modern land markets evolved from systems for simple land trading to trading complex commodities. New trading opportunities and new products were, and continue to be, invented. The controls and restrictions over land became multi-purpose with an increasing focus on achieving sustainable development objectives.

As with simple commodities such as land parcels, all commodities require quantification and precise definition (de Soto, 2000). While LAS have not yet incorporated the administration of complex commodities to a significant degree, these modern complex land markets offer many opportunities for LAS administrators and associated professionals, if they are prepared to think laterally and capitalise on their traditional measurement, legal, technical and land management skills

This complexity is compounded by the "unbundling of rights in land" (ie water, biota etc) thereby adding to the range of complex commodities available for trading. For example, the replication of land related systems in resource and water contexts is demanding new flexibilities in our approaches to land administration. These emerging demands will stimulate different approaches to using cadastral information.

Our understanding of the evolution of land markets is limited, but it must be developed if LAS administrators are going to maximise the potential of trading in complex commodities by developing appropriate land administration systems. Figure 4 shows the various stages in the evolution of land markets from simple land trading to markets in complex commodities. The growth of a complex commodities market showing examples of complex commodities is presented diagrammatically in Figure 5.

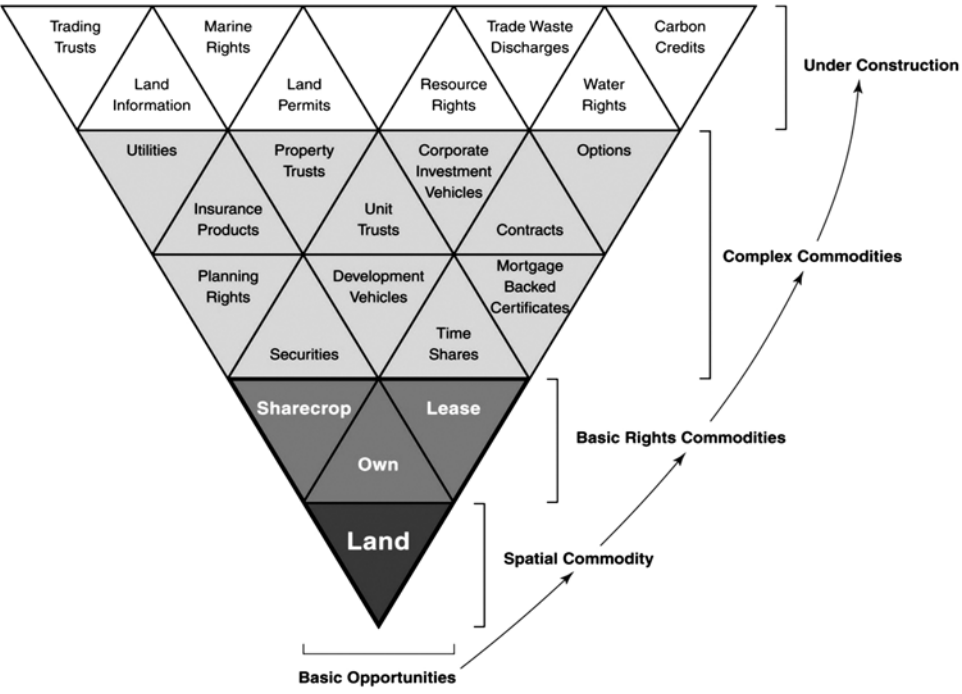

Figure 5 Complex commodities market (Wallace and Williamson, 2006).

A land management vision

Developed countries use LAS to support their land markets and accelerate wealth creation by systematically converting land into an open-ended range of commodities, as described above. Internationally, market advancement will remain the driver for LAS change. But it should not be. Sustainable development is more urgent – economic wealth is only one part of the game. Unless countries adopt the land management paradigm informed LAS, they cannot mange their future effectively. Our argument is that planned responses to land and resources will help manage the social, economic and environmental consequences of human behaviour. Only then will nations be able to deal with the water, salinity, global warming and cooling, and land and resource access issues facing the globe.

Thus this theory of land administration assumes that resources applied to building a cadastre can pervasively improve an entire LAS, and eventually public and private administration in general, while simultaneously improving land based services to government, business and the public. Whether the question is how to set up a LAS, or how to adapt an existing system, designers need to take into account the dynamism in land, people's attitudes, institutions, technologies used, and its potential. A capacity to predict aspects of the future is helpful for managing this dynamism.

Figure 6: A land management vision that incorporates a spatially enabled land administration system and builds on the land management paradigm. This vision presents another major challenge for LAS designers - that is, for a jurisdiction to understand and accept the vision and the operation and interaction of the key components

being the cadastre, the SDI, the spatially enabled LAS. Sustainable development objectives will then be easier to achieve and evaluate. Adaptability and usability of modern spatial systems will encourage more information to be collected and made available. For governments, improved information chains will assist development and implementation of a suitable land policy framework. The services available to private and public sectors, and to community organizations, should commensurably improve. Ideally these processes are interactive: modern information and communication technology, the engagement of users in design of suitable services, and the adaptability of new applications should increase and mutually influence each other.

The spectacular growth in spatial technologies is the basis for predicting a future for land administration in which spatially enabled governments have much more useful information on which to base their decisions about sustainable development. This future land management vision is offered to challenge those engaged in land administration and related activities, and to provide a clear direction for excellence in LAS.

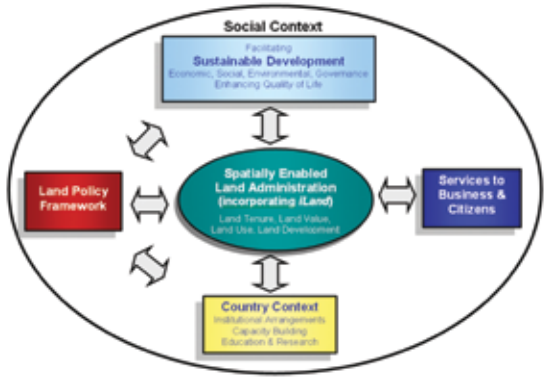

Figure 6: A land management vision

Good governance and land administration

Lastly, good governance is at the heart of good land administration. Governance is the process of governing. Land administration is therefore essentially about good governance. The UNECE land administration principles (2005) are built on the assumption that "sustainable development is dependent on the State having overall responsibility for managing information about the ownership, value and use of land". The land management paradigm extends this connection by demanding an even wider approach to governance in land administration, in which the government builds infrastructures for management of land in addition to management of information. Thus the paradigm builds governance directly into land administration. Governance refers to the manner in which power is exercised by governments in managing a country's social, economic, and spatial recourses. It simply means: the process of decision-making and the process by which decisions are implemented. This indicates that government is just one of the actors in governance. The concept of governance includes formal as well as informal actors involved in decision-making and implementation of decisions made, and the formal and informal

structures that have been set in place to arrive at and implement the decision.

These general considerations link land administration with governance so that land governance is seen as essential to successful nationhood and civic capacity. In its study on Good Governance in Land Tenure and Administration, FAO remarks:

"The message to land administrators is that they cannot pursue technical excellence in isolation. Their skills and techniques should serve the interests of society as a whole... Land administrators act as guardians of the rights to land and the people who hold those rights. In doing so, they act to stabilize public order and provide the preconditions of a thriving economy." (FAO, 2007).

The major international agencies demonstrate that successful land administration requires accountable government. Sustainable systems require the institutions that interact with the citizens who are its intended beneficiaries do so in ways that build their confidence, particularly by negating disputes and managing points of tension relating to land ownership, use and availability.

The major engagement should involve policy formation and implementation to ensure that the system reflects the cognitive capacity of the beneficiaries and their beliefs about land. A national capacity to create laws through legislation and subordinate legislation is also necessary for sustainable LAS. For nations on the development track, rule by law, rather than rule by elites or ad hoc responses to circumstances, is essential. These conditions apply even if the nation's administration horizon includes land held in social tenures that rely on informal systems of land management.

For successful governance, institutions need to be stable, transparent and free of corruption. Weak governance in land administration leads to massive over-regulation, production of conflicting and gap-ridden bodies of laws, standards and documents, but with little cohesion and mutual reinforcement of legal and economic norms. Sadly, LAS more often exhibit corruption in collection of fees; multiple rent seeking and unnecessary processes; delivery of multiple and ineffective titles to parcels; arbitrary allocation of land and negligible capacity for planning or controlling building quality. Repeated problems in developing countries include legitimation of mass land theft; failure to police uncontrolled evictions; inability to manage interaction between competing tenure holders especially between land owners and users and resource takers; and inability to manage state assets. Weak governance will never be able to manage the transition of the world's populations from rural areas to urban slums. Simply good governance is central to delivery of appropriate, effective and efficient land administration in both developing and developed countries.

Conclusion

This paper argues that it is difficult if not impossible to design, build and manage land administration systems that will support sustainable development unless a there is a good understanding of the underlying theories and concepts, particularly as applied to an integrated land administration framework. The paper discusses the basic ingredients of the framework being the land management paradigm, land administration processes, the use of the tool box approach and the role of land administration in delivering sustainable development.

The key concepts that are explored in more detail to improve understanding include the land management paradigm, the role of the cadastre in land administration, the changing nature of ownership and the role of land markets, and the need for and components of a land management vision. The paper concludes by emphasizing the need for good governance as an over-arching principle otherwise all the other components will not be achievable.

Acknowledgement

This paper draws on the collective experience and research of the authors over many years and particularly in recent years as they have worked together on a new book to be titled "Land administration and sustainable development" to be published by ESRI Press in the USA in 2009. The article also draws on the research of colleagues and graduate students in the Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne. This paper has been presented at the International Seminar on Land Administration Trends and Issues in Asia and The Pacific Region, 19-20 August 2008, Kuala Lumpur, Malaysia as part of the 14th meeting of the UN sponsored Permanent Committee on GIS infrastructure for Asia and the Pacific (PCGIAP).

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Motorola launches GPS-based touchscreen phone

Motorola has launched its touchscreen GPS-enabled phone offering navigation maps and landmarks of 30 cities in India. *http://economictimes.indiatimes.com*

Google Earth for iPhone

Google Earth is now available for Apple's iPhone mobile handsets and iPod touch mobile entertainment centre. The application is available in 18 languages and in 22 countries.

deCarta to launch LBS API for the iPhone

LBS platform supplier deCarta has launched an application programming interface (API) for deCarta Mobile that supports rapid development of location-aware applications for the Apple iPhone. deCarta previously announced support for J2ME compatible phones.

Garmin launches car and boat navigation device

Garmin has released a PND, the GPSMAP 600 series that combine in-car and marine navigation on a 5.2 inches touch screen in a rugged casing. The GPSMAP 640 will be available in the US and 620 for the rest of the world.

Mio PND gets into Skoda cars

Mio has partnered with Skoda to make available a Mio PND as a navigation option to Skoda Fabia, Fabia Combi and Roomster. The device will be similar to these of the Mio Moov range.

GPS banned but Apple plans to sell.

Apple plans to sell its iPhone handset in Egypt, in defiance on a ban on the sale or use of GPS devices by the Egyptian government. Meanwhile, rival phone maker Nokia shall refrain from selling its GPS equipped handsets there. The laws have been sponsored by the Egyptian military on security grounds preventing the use of any device with GPS. Existing online maps by the likes of Google, Nokia or TeleAtlas are either non-existent or of very poor quality due to the problems of accurate data. It is impossible to use them to develop in-car mapping systems for instance.

SatNav Tech to distribute Destinator for Symbian

Intrinsyc and SatNav Technologies have entered into a new agreement under which, SatNav will distribute the re-launched Destinator for Symbian software to be used on various models of Symbian smartphones sold in India. It includes the SatNav ONE-India map that covers all major cities of India. *www.gpsbusinessnews.com*

MapmyIndia releases iNav application and car navigation devices

MapmyIndia has released iNav, a GPS-based application for mobile phones. It transmits user's exact location to the ones concerned and vice versa any time of the day or night, eliminating the need of worried calls to know whereabouts of the near and dear ones.

BPCL in India launches vehicle tracking system

Bharat Petroleum Corporation Ltd has launched a GPS based vehicle tracking system for its 5,200 tanker trucks fleet. It will help the company track the trucks for better logistic efficiency. It will also prevent pilferage and fuel adulteration. bharatpetroleum.com

SatNav Technologies adds 1 million points of interest

SatNav Technologies has enhanced its maps by adding 1 million Points of Interest (POIs), with important ones also having specs like addresses and contact numbers in them for 12 important categories of POIs across 8 major cities in India. This is the first time any company has built content at this magnitude which will provide a huge value add to the end customers. *www.satnavtechnologies.com*

Qualcomm Technology Enables Mobile Phone Based on the Android Platform

Qualcomm chipset will enable the first Android-powered mobile phone-the T-Mobile G1, manufactured by HTC. By integrating its chipset hardware and software capabilities with Android, it has played an integral role in bringing the first Android handset to market. *www.qualcomm.com*

NAVTEQ announces Industry Strategy for Map-Enhanced ADAS

NAVTEQ has developed a new Map and Positioning Engine (MPE) strategy. Making Advanced Driver Assistance Systems (ADAS) available to all vehicles without an installed navigation system or navigable map. Behind this strategy is NAVTEQ's new MPE reference solution, which accelerates the development of ADAS applications embedded directly in a vehicle's electronic control unit, often referred to as the Controller Area Network (CAN) bus, or electronic sensor. *www.navteq.com*

Orange to provide road traffic data based on GSM signal

Wireless operator Orange has recently unveiled a platform to generate road traffic data based on signal events in its wireless network. This platform is able to transform its GSM signal data into real time average speed on any road segment. The same kind of technology is used by TomTom for its HD traffic service in cooperation with Vodafone's European affiliates, Airsage with Sprint in the US and IntelliOne with Rogers Wireless in Canada. However, this is the first time an operator is developing this technology by itself.

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Galileo update

EU not boldly funding space ambitions

The European Union wants to become a major player in space projects, EU ministers agreed, amid concerns that member states and industry are unwilling to provide the astronomical costs involved. They agreed on "the need to develop instruments and financial schemes for European space policy," announced French Research Minister Valerie Pecresse, whose country holds the EU's rotating presidency. However a statement issued after the ministerial meeting gave no details on the funding needs or means, highlighting the problem. www.spacedaily.com

Radiation shut down EU test satellite for two weeks

A second test satellite for Galileo closed itself down for more than two weeks last month because of space radiation, concurring sources said. The Giove-B satellite, launched in April, stopped operating from September 9 to 24, said Franco Bonacina, spokesman at the Paris-based European Space Agency (ESA), which is overseeing the Galileo project.

Joint statement on GPS and Galileo Cooperation

Representatives of the Government of the US, the European Community (EC) and its Member States met in their first plenary session to review and discuss matters of mutual importance regarding cooperation in the use of global navigation satellite systems. During the meeting, representatives of the Parties reviewed the ongoing work of the U.S.-EC working groups on GPS and Galileo technical and trade issues and discussed various issues related to the emergence of global and regional satellite navigation systems in addition to GPS and Galileo.

The U.S. intends to continue to operate GPS and to provide the Standard Positioning Service for peaceful civil, commercial and scientific use on a continuous, worldwide basis, free of direct user fees. The European Community has launched the procurement of the Galileo system and revised the governance of the European global navigation satellite systems (Galileo and European Geostationary Navigation Overlay Service (EGNOS)) which will provide services including open, safety-of-life, commercial, and public regulated services. The Parties believe that compatibility and civil interoperability not only between GPS and Galileo, but also with other global navigation satellite systems, will promote global economic growth and strengthen transatlantic cooperation. *www.state.gov.*

100% FDI in GPS units soon in India

The Government of India is all set to allow 100% foreign direct investment in global positioning system (GPS)-enabled devices. At present, there is 100% FDI in products under telecom equipment category. A notification would soon be issued about bringing GPS-enabled systems under the list of FDI-approved telecom equipment. Of late, the demand for GPS-based security systems has gathered steam following recent bomb blasts in various Indian cities.

The GPS is a space-based radio navigation system that provides reliable positioning, navigation and timing services to civilian users on a continuous worldwide basis. The technology is applied in the areas of roads and highways, space, aviation, rail, agriculture and public security. GPS tags which are installed at various locations help track real time movements.

According to sources, there was confusion among the policy makers over FDI in manufacture of GPS-enabled systems, even though there is 100% FDI in manufacture of telecom equipment in India. "Once approved, GPS would become part of telecom equipment in list of FDI-approved manufacturing activities," a source said.

The issue of FDI in GPS systems came up recently in a series of meetings held by the foreign investment promotion board (FIPB). Of late, many Indian companies have evinced interest to manufacture GPS devices in joint venture with foreign counterparts. *http://economictimes.indiatimes.com*

Russia ready to help Cuba develop its own space center

Russia shall assist Cuba to develop its own space center, announced the head of the Russian Space Agency Roscosmos, Anatoly Perminov recently. He is part of the Russian emissaries who are led by the deputy prime minister, Igor Sechin, on the tour he is making Moscow by different Latin American countries. "During the negotiations with our Cuban colleagues, we have analyzed the fulfillment of agreements reached about two months

ago. They are preparing agreements on cooperation in the use of space for civilian purposes, on the space navigation system GLONASS and navigational aids on the territory of Cuba, "said Prminov. http://cast-in-gold.blogspot.com/2008/10/russia-ready-to-help-cuba-develop-its.html

Three Glonass satellites launched

Three Glonass satellites were launched into orbit on 25 September from the Baikonur Cosmodrome in Khazakstan. The satellites are part of a constellation currently designed to operate with 16 satellites. However, only 13 are currently operating at capacity. The system, which is used for both civilian and military purposes, had 9.9 billion rubles allocated to it by the Russian government last year, according to a report in RIA Novoski.

GPS transponders to assist fishermen in distress at sea in Ahmedabad, India

To assist the fishermen in distress when at sea, the Indian Coast Guard along with the Space Application Centre of the Indian Space Research Organisation (ISRO), Ahmedabad and VXL Technologies Ltd, Faridabad, have jointly developed a low-cost GPS based alert system.

It transmits the boat's co-ordinates to the Coast Guard Maritime Rescue Co-ordination Centre (MRCC) in Mumbai. The distress alerts sent out by the boats will be picked up by the INSAT 3A satellite which will relay the same to the reception centre at the MRCC. www.indianexpress.com

Forestland mapping in Gujarat using GPS

Forestland mapping under Scheduled Tribes and other Forest Dwellers (Recognition of Forest Right) Act, 2006 will no more be a long-drawn paper work in Gujarat. The Gujarat Tribal Development Department shall soon begin a pilot project to survey forestland claimed by forest dwellers and tribals using GPS. *www.indianexpress.com*

'Bhuvan'– India's answer to Google Earth

Indian Space Research Organisation (ISRO) will soon launch 'Bhuvan', which will provide online maps based on GIS in line of Google Earth, ISRO chairman, G Madhavan Nair said recently. It is equivalent to the Google Earth, but is going to be much more precise .It will provide the latest information on our natural resources. We are going to provide very accurate maps of the region with the latest picture. The service likely to commence in the coming six months, will be available to the people in appropriate manner. This will provide valuable and updated information to the people. The software and infrastructure necessary for the service is being established. Though most of the information will be online, but precision data will be given to selected users only," Nair said. *www.thehindu.com*

Thailand launches Theos

Thailand has successfully launched Theos (Thai Earth Observation System) on 1 October 2008. It was successfully placed into a transfer orbit by a Russian-Ukranian Dnepr rocket launched from an undeground silo at the Yasny space base in southern Russia.The 750 kg Theos satellite was designed and manufactured by French company EADS Astrium.

China launches two EO satellites

China launched two environmental monitoring satellites recently. These were launched on a single Long March 2C rocket from the Taiyuan Satellite Launch Centre in Shanxi Province. They would enhance the country's capacity to forecast natural disasters.

China's satellite application industry to be worth 300 billion yuan

With the development of the Compass Navigation Satellite System, the total output of China's satellite application industry will be 300 billion yuan by 2015, demonstrating the massive potential of the market, according to Cao Chong, the director of Compass Civil Application Market and Industrialization Expert Commission, at the recent 2008 China (Hefei) Forum on Compass Navigation Technology and Industrial Development. *http://english.people.com.cn*

India's plans in satellite manufacturing

With the successful launch of the Chandrayan 1, with payloads from different countries aboard, India has now the capability of commercially launching satellites from different countries, opening a new source of income for the country in the international space market. ISRO has already formed a special team for this purpose and will launch two such small indigenously manufactured satellites in 2009 and 2010, along with overseas payloads. *www.techtree.com*

NGA purchases offerings from DigitalGlobe

National Geospatial-Intelligence Agency has purchased the entire CitySphere 2.0 product, the recently launched, enhanced version of DigitalGlobe's extensive library of on-demand digital satellite and aerial imagery of the most populated global cities. *www.digitalglobe.com*

GeoEye signs contract with Telespazio

On October 15, GeoEye, Inc signed a multi-year agreement with Rome-based Telespazio S.p.A. appointing Telespazio as GeoEye's new Commercial Regional Affiliate for the region of Europe and North Africa. *www.geoeye.com*

"World Premiere" of a RapidEye Satellite Image

The first public release of a RapidEye image is being unveiled on the company's website. This demonstration image highlights the capabilities of RapidEye imagery in many market segments. *www.rapideye.de*

Kathmandu goes digital with online city-guide

Savant Associates has unveiled mapmandu.com, the first online city-guide of Kathmandu. It uses an interactive mapping engine to facilitate localized search of destinations in Kathmandu on a digitalized map. It provides the users with up-to-date online information and other extensive services on various aspects of city life in Kathmandu. *www.nepalnews.com*

Indonesia and China implement carbon accounting system

Indonesia and China may soon implement a new carbon accounting system to help fight global warming. Developed in Australia, the National Carbon Accounting System has been designed to provide a 'balance sheet' that indicates the level of atmospheric pollution caused by land management activities such as forestry, land clearing and farming. Among the range of methods used in such calculations is analysis of maps of the landscape obtained from satellite imagery and remote sensing. www.asmmag.com

Web Enabled Ground Water Information System in India

Central Ground Water Board is developing a "Web Enabled Ground Water Information System (GWIS)" in view of the data dissemination. It is an internet based GIS system which will provide a platform for accessing the ground water related data/maps/information policy planning and management. GWIS will comprise the spatial data base infrastructure and a well established communication system connected through Internet/Intranet alongwith security measures. The data from GWIS will be disseminated as per the Map Restriction Policy of the Government of India. *http://pib.nic.in*

Orissa launches geo-spatial data system for disaster management

Frequently hit by natural calamities like flood, cyclone and heatwaves, Orissa government has launched a pilot project on mobile-based technology for generation of geo-spatial data system as part of it's preparedness to meet the challenges. The system designed by ISRO, is a combination of a medium resolution camera, a GPS, a palmtop computer and a mobile phone set. The pilot project was launched in Puri district for the first time in the country for creating a data base of relief shelters, hospitals and supply godowns. *http://economictimes.indiatimes.com*

Dubai Municipality to introduce New Interactive E-Map

Dubai Municipality's GIS department has unveiled a new interactive e-map. According to Mohammed Abdullah Al Zaffine, director of the department, the new service titled "Takamul" is an electronic service that offers an interactive, comprehensive and high quality map consisting of geographic features and attributes for the Emirate of Dubai. *www.middleeastevents.com*

A new land policy document in China

The Communist Party of China has issued a new land policy document recently allowing farmers to lease their contracted farmland. It also allows them to transfer their land-use right to boost the scale of operation for farm production or to provide funds so they can start new businesses.

Efficient, information-centered production environment for the aviation industry by ESRI

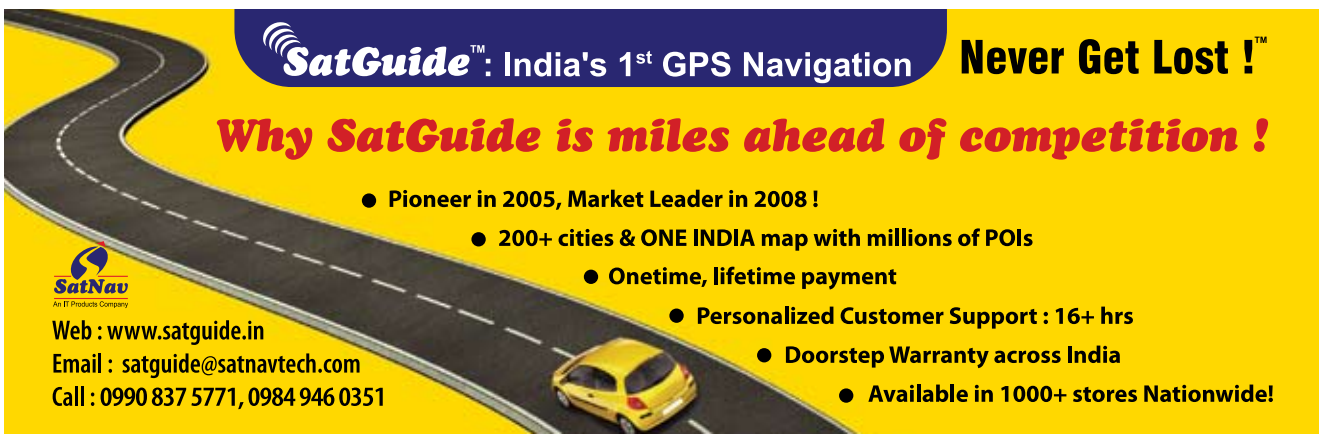
The air navigation and aviation industry will have an easier way to create and manage centralized spatial data, increase their efficiency, and rely on an end-to-end workflow management with the release of Production Line Tool Set for ESRI's ArcGIS 9.3—Aeronautical Solution. The software continues to be the foundation of an Aeronautical Information Management system, using the geographic approach.

ERDAS Releases Map2PDF

ERDAS Inc has released Map2PDF for IMAGINE, a new product combining TerraGo Technologies' Map2PDF with the power of ERDAS IMAGINE®, the industry's leading and most complete collection of software tools designed to manipulate, process and understand imagery and vector data.

CARIS Bathymetric Data Management System for Geoscience Australia

Geoscience Australia in Canberra has selected CARIS Bathy DataBASE software for management of large bathymetric data sets, interoperability and distribution. Geoscience Australia is Australia's national agency for geoscience knowledge and geospatial information.



FOIF

OTS6800 series

Reflectorless Total Station

- Reflectorless measuring up to 200m
- Memory: SD card, 1GB(Max:4GB)
- Built-out Temperature and Pressure Sensors
- Data I/O: RS-232C & USB port
- Absolute Encoder
- Alphanumeric Keyboard & Large LCD
- Software Upgrading Via RS-232C

SGS828

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MAGELLAN®
PROFESSIONAL

Real-Time Data Server software

Magellan is also introducing new PC software called Real-Time Data Server (RTDS) that allows GPRS communication between one base and several rovers. The base could be a fixed base (with a direct/local connection to the RTDS) or a mobile base (connected to RTDS through GPRS)

ProMark™ 500

Magellan has released a firmware for ProMark 500 GNSS survey receiver. It includes backward compatibility with the support of Ashtech RTK data correction format, the ability to use the GSM data mode to receive RTK corrections from a GSM-equipped base, and the possibility to use an external CDMA or other type of cell phone to connect to real-time correction sources.

MobileMapper 6

Magellan has also introduced a post-processing option and new feature to its low cost handheld GIS/GPS receiver – MobileMapper 6. It offers the professional features associated with more costly high-end GIS/GPS units, yet it is price-competitive with consumer-grade GPS.

New OEM board, the MB 500

Magellan has launched a new OEM board, the MB 500. It brings to the embedded GNSS board market a unique blend of technologies that increases RTK reliability and assures inter-compatibility with other brands of GNSS receivers. *www.pro.magellangps.com.*

Hemisphere GPS distribution in India

Hemisphere GPS has appointed ASB Systems Pvt. Ltd., of Mumbai their Distributor and Service Centre for the Indian market. ASB are also tasked with growing this network with emphasis on the "Land Based" sector. Hemisphere GPS now have products tailored for all applications ranging from the Marine and Hydrography market to the Survey, GIS, Engineering and Precision RTK markets. It also has many differential GPS offerings. *www.hemispheregps.com*

Spirent® communications and SGS Wireless partnership

Spirent Communications and SGS Wireless have signed an agreement to provide validation and testing services on the Spirent UMTS Location Test System (ULTS) at the SGS Wireless laboratory in Cambridge, UK. SGS will provide Spirent with validation services to ensure that the Spirent ULTS stays at the cutting edge of Assisted-GPS testing capability. SGS will also use the ULTS to provide A-GPS testing services to the cellular handset industry. *www.spirent.com/go/ults*

Leica GeoMoS Web

With the new launched Leica GeoMoS Web, Leica Geosystems now for the first time presents a web based service for visualization and analysis of monitoring. Each authorized user, including customers and partners, can access the monitoring project anywhere and anytime – just using a web browser, pocket pc or mobile phone. *www.leica-geosystems.com*

Spectra Precision introduces New Office Software Suite

Spectra Precision has released Spectra Precision® Survey Office 2.0, software suite. With new total station, digital level as well as coding and description support, the new version is ideal for processing and analyzing GPS and terrestrial survey data recorded in the field and exporting it to a CAD or GIS design package.

Leica FlexLine Total Stations

Leica Geosystems has developed Leica FlexLine total statios. For the first time, hardware and software options can be simply selected so that the FlexLine Total Station exactly meets the individual requirements. It simply enables selection of one of the pre-configured products – or even compose his own Total Station! Adding specific hardware and software options to a base model makes it the perfect companion for day to day use. *www.leica-geosystems.com*

DIMAC Systems introduces DiMAC ULTRALiGHT

DIMAC Systems has recently unveiled the DiMAC ULTRALiGHT, the smallest of the renowned DiMAC™ (Digital Modular Aerial Camera) product family. It consists of just a single Camera Module that captures a footprint of 7,200 pixels across by 5,400 pixels along the flight line. *www.dimacsystems.com*

AAMHatch wins Spatial Excellence Award

At the recent 4th Annual Victorian Spatial Excellence Awards in Australia, AAMHatch stole the show winning two awards: "Victorian Government Award for Spatial Excellence" and best project for "Land Titling and Development". *www.aamhatch.com.au*

Sokkia Topcon debuts 28-Channel GPS/GLONASS Receiver

Japan's Sokkia Topcon has rolled out its GSR1700 CSX L1 GNSS receiver, which incorporates L1 GPS and GLONASS tracking capabilities and features centimeter-level accuracy. The 28-channel L1 GSR1700 CSX receiver eliminates observation range and line-of-sight limitations by tracking both GPS and GLONASS. It also features Bluetooth for connecting multiple peripherals, voice notification in 10 languages, and single-button operation.

Florida joins Bentley's Enterprise License Subscription Program

Florida Department of Transportation (FDOT) has joined Bentley's Enterprise License Subscription program for a 3 year term. FDOT shall be granted access to a comprehensive portfolio of civil engineering, architectural, construction, operations, and geospatial software for a single annual fee. *www.bentley.com*.

East View cartographic launches its own brand of datasets

East View Cartographic has introduced a brand new series of digital geospatial datasets, organized under the product lines of EVCmap and EVCdem. It range from VMAP1-compliant datasets to raster mosaics to digital elevation models, and are only available through East View Cartographic and its distributors. *www.cartographic.com.*

Chronos Technology wins Ordnance Survey contract

Chronos Technology has been awarded a contract to install and commission GNSS receivers and antennae at Continuously Operating Reference Stations (CORS) throughout Great Britain for Ordnance Survey. *www.chronos.co.uk*

Use of satellite navigation for emergency management by GMV

HARMLESS project by GMV is an international FP6 project co-funded by the European Commission and the participating firms and organizations. Its main aim is to study and promote the use of the Galileo and EGNOS satellite navigation systems in emergency management, humanitarian aid and law enforcement support. GMV coordinated the whole consortium, made up by 11 companies of the aerospace sector, technology experts and user communities of countries as UK, France, Italy, the Netherlands and Spain. The project analyzes current applications and future needs with a global vision, analyzing the technical, operational, financial, regulatory and legal aspects and also the economic and social benefits of the new systems.

Solutions for Survey, Engineering and Spatial Imaging Applications by Trimble

Trimble S8 Total Station Models and 4D control software

Trimble S8 Total Station models and Trimble 4D control software create a powerful solution for real-time monitoring of permanent structures such as dams, short-term construction activities and side slopes in mines. It provides surveyors with capabilities to pursue new business opportunities in both real-time monitoring and tunneling applications.

Business Center 2.0

Trimble Business Center is a Quality Assurance tool for GNSS data providing a powerful resource for all of a surveyor's Integrated Surveying projects. Version 2.0 can verify and integrate GNSS and optical data into single file as well as output data to a range of applications such as GIS, photogrammetry and CAD.

Scalable Solutions for Spatial Imaging: New Trimble VX Model

VX Spatial Station is an advanced positioning system that combines optical, 3D scanning and video capabilities to measure objects in 3D and to produce 2D and 3D data sets for spatial imaging projects.

France's Aerial Survey Company acquires Intergraph DMC

Aéro Photo Europe Investigation has acquired a complete Intergraph® Z I Imaging Digital Mapping Camera airborne and ground processing system. It is the first DMC system to be used in France. *www.intergraph.com*.

Fastrax Collaborates with MediaTek for New High Quality GPS Receivers,

Fastrax Ltd.has introduced the new Fastrax UP500 module based on an ultra sensitive GPS chipset by MediaTek Inc., The cooperation is aimed at developing high quality GPS receivers that are specifically targeted for cost effective end-device manufacturing.

u-blox releases revolutionary 1.8 Volt GPS module series

u-blox has released two new low voltage GPS modules NEO5D and NEO5G. They are the world's first modules to operate at 1.8 Volt, which reduces power by 40% or more compared to its predecessors. *www.u-blox.com.*

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sales@chinageo-expo.com
http://www.ChinaGeo-Expo.com

January 2009

ESRI Asia Pacific User Conference
20–21 January 2009
Singapore City, Singapore
http://www.esri.com/events/apuc/index.html

Intergeo East
27-29 January 2009
Istanbul, Turkey
www.intergeo-east.com

February 2009

Trimble Dimension 2009
23-25, February 2009
The Mirage, Las Vegas, USA
http://www.trimbleevents.com/dimensions09

March 2009

Munich Satellite Navigation SummitConference
March 3-5, 2009
Munich, Germany
www.munich-satellite-navigation-summit.org

GEOFORM+'2009
10-13 March
Moscow, Russia
nmr@mvk.ru
www.geoexpo.ru

April 2009

GEO Siberia 2009
21-23 April
Novosibirsk, Russian
nenash@sibfair.ru
www.geosiberia.sibfair.ru

May 2009

International Conference on Integrated Navigation Systems
25-27 May
Saint Petersburg, Russia
www.elektropribor.spb.ru

BE Conference 2009
11-14 May
Charlotte, NC, USA
www.bentley.com

June 2009

GSDI 11 World Conference
15-19 June 2009
Rotterdam, The Netherlands
http://gsdi.org/gsdi11/

TRANS-NAV 2009
8th International Navigational Symposium
June 17-19, 2009, Gdynia, Poland
http://transnav.am.gdynia.pl

August 2009

SEASC 2009,
4-7 August 2009
Bali, Indonesia
www.bakosurtanal.go.id/seasc2009/04/

September 2009

ISDE 2009
9-12 September 2009
Beijing, China
www.digitalearth-isde.org

INTERGEO 2009
22-24 September 2009
Karlsruhe, Germany
www.intergeo.de

ION GNSS 2009
22-25 September
Savannah, Georgia
www.ion.org

mycoordinates.org
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The new generation of Total Stations:
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Based on latest high-end technology and Leica quality, the FlexLine family of Total Stations provide you with complete flexibility and performance. For the first time, hardware and software options can be simply selected so that the FlexLine Total Station exactly meets your requirements.

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Features and Benefits

- Complete flexibility in selecting features
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With a FlexLine Total Station you can be sure of complete flexibility for Today and Tomorrow.

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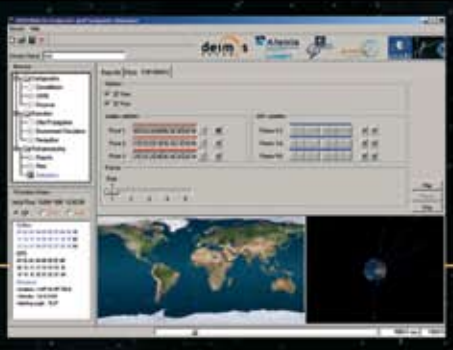
Leica Geosystems

GRANADA

Galileo Receiver ANalysis And Design Application

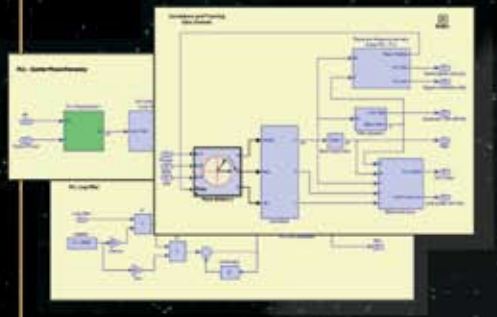
The Reference Galileo Simulation Toolkit

for GNSS Receiver Research and Development



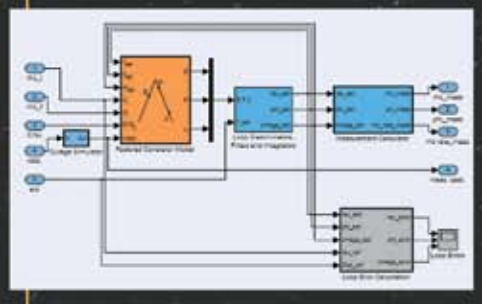
ENVIRONMENT AND NAVIGATION SIMULATOR

- Multisystem navigation analysis (Galileo/GPS)
- Graphical user interface for constellation, environment and receiver configuration
- Raw data and range errors generation



BIT-TRUE GNSS RECEIVER SIMULATOR

- Open MATLAB/Simulink environment for educational, R&D, and testing
- IF sample based signal generation and processing
- Fully configurable receiver architecture
- Up-to-date GPS/Galileo signals including MBOC



FACTORED CORRELATOR MODEL

- MATLAB / Simulink blockset for multichannel receiver simulation
- Intermediate tool for acquisition, tracking and raw data generation
- Swift, flexible and realistic solution based on analytical model of correlators

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