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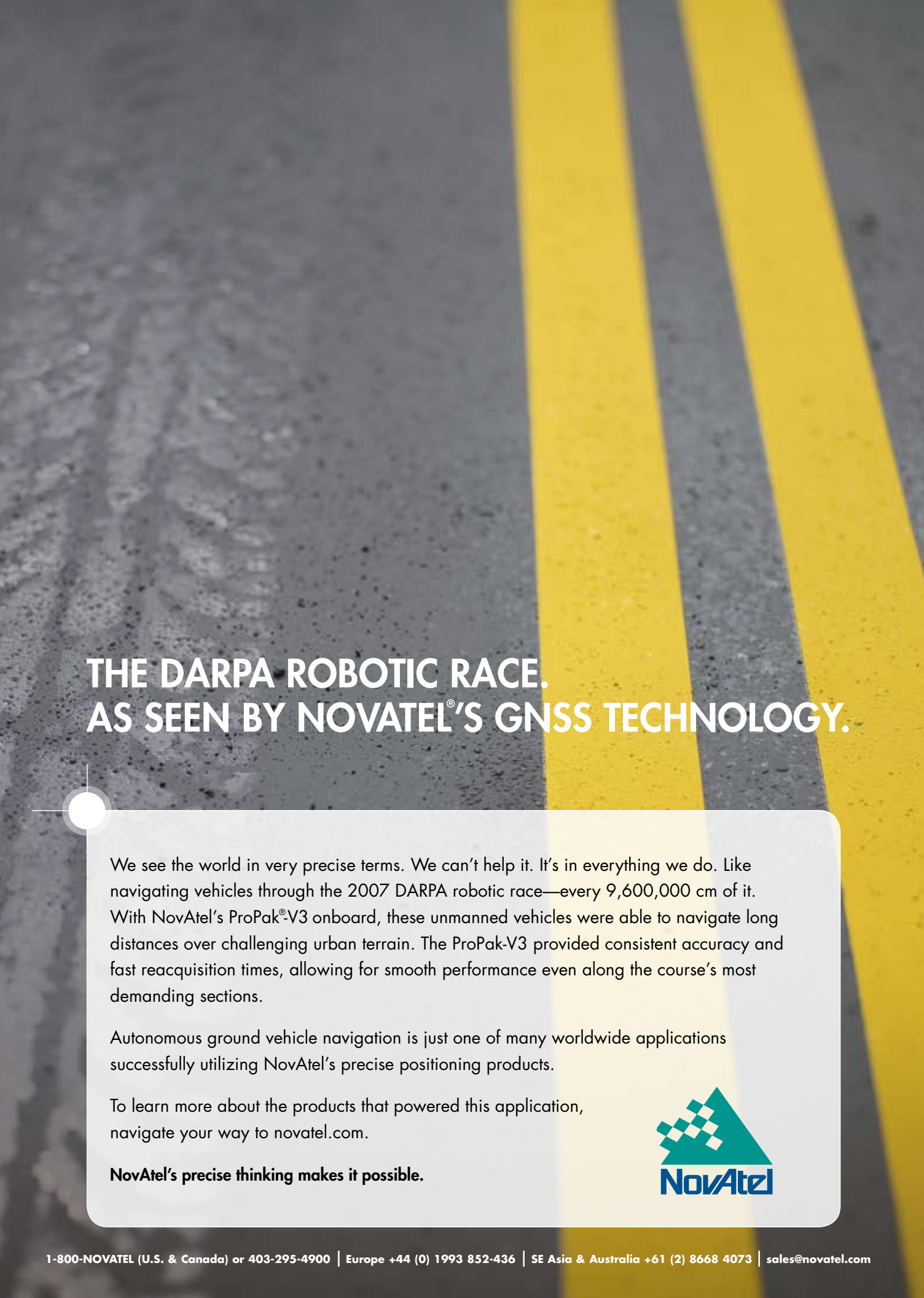

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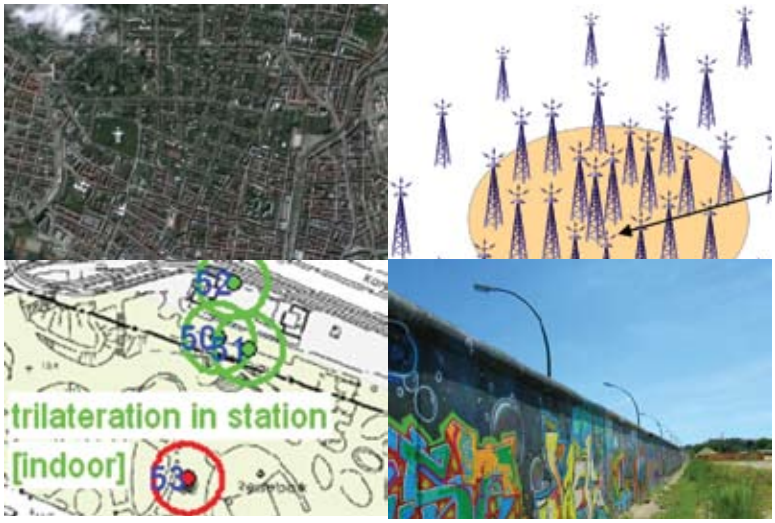

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Ten on ten

It is a demonstration once again.

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ISRO's Polar Satellite Launch Vehicle, PSLV-C9, successfully launched ten satellites together, perhaps the highest payload ever.

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ISRO remains a dominant player in international market for satellite launch.

However, when it comes to remote sensing satellites, it also has to compete with private international players.

The crucial issue then becomes, of accessibility and usability of data vis-à-vis other players.

And when users say, they are happy, ISRO gets 10 on 10.

Bal Krishna, Editor
bal@mycoordinates.org

Cell-based positioning for improving LBS

Cell-based positioning technology can be used to provide valuable knowledge for LBS even in indoor environments

Markus Ray
Human Centered Mobility Technologies, Arsenal research Vienna, Austria
Markus.Ray@arsenal.ac.at

Most of today's Location Based Services (LBS) provide information based solely on a users' location, not taking into account context knowledge about the user's current situation and needs. This often results in low-quality and inappropriate information to the user. Hence, in order to provide user-oriented services, an improvement of the response-quality of information requests is required. Knowledge about the coordinates of places where the user regularly stays in her life combined with semantics about such places can provide valuable knowledge for LBS. Zhou et al. [2] state that "the discovery of a person's meaningful places involves obtaining the physical locations and their labels for a person's places that matter to his daily life and routines". This is in accordance with Hightower et al. [3], who identified two needed steps for finding meaningful places of individual users: (1) finding physical locations of meaningful places and (2) assigning semantic information to those.

Two obvious meaningful places of persons are locations like 'home' or 'work', but the perception of meaningful places might also include places where the user stays once in a while (e.g.: visiting the grandparents all three months). This article outlines a methodology for finding and classifying places where the user regularly stays in her life, in the following denoted as 'prominent places'. A detailed description of this work has been published in [1].

Most of the previous research for finding prominent places has been done based on the Global Positioning System (GPS). GPS is available worldwide and in general provides accurate position measurements. Since GPS is a satellite based technology, an unobstructed view to at least four satellites is required for calculating reliable positions. Hence, within buildings or in narrow streets no or corrupt positioning data is available because of shadowing effects. Most approaches for finding stays of users are based on recurring GPS dropouts like Ashbrook and Starner [4] and Marmasse et al. [5]. To overcome such a heuristic approach, Nurmi and Koolwaaij [6] have presented a GSM cell-transition method supported by GPS for finding meaningful places. In contrast to GPS, cell-based positioning technology is also available within buildings or urban areas and positioning data can be easily obtained by the GSM network using any mobile phone. A cell-based approach for clustering and predicting of mobile phone users' routes based on a cell-transition graph has been presented by Laasonen [7].

Collecting cell-data

In order to draw meaningful conclusions about the motion behavior of individuals, a sufficiently large amount of localization data is required. We have collected 250 000 cell-based position measurements from ten volunteers obtained during half a year of permanent observation using a constant sample rate of five minutes. On average, 25 000 positions have been obtained from each volunteer in cooperation with the biggest Austrian mobile phone provider.

The volunteers agreed in providing their positioning data from July 2006 to December 2006 by signing a special contract regulating privacy issues. The volunteers had full control and transparency about the localization activities via a SMS interface. It

was possible for each volunteer to deactivate, activate and retrieve the status of localization by sending a SMS during the observation period.

Analyzing cell-data

The analysis is split into two steps. First we take the collected cell-data to find places where the volunteers' spend most of her time. The found places are subsequently automatically annotated with semantics by labeling them with e.g. 'home' or 'work' (see also Figure 1)

Finding prominent places

Prominent places are defined as places where the user spends most of her time. In general, such places will be mainly 'home' and 'work' locations. Hence, cells where one volunteer has been located more often than in others (using a constant sample rate) must correspond to her prominent places. Cell-candidates are therefore first identified by filtering out cells exceeding a high dwell time.

In some cases there is a one-to-one relation between a cell candidate and a prominent place. However, it often happens that one prominent place is assigned to multiple cells: Each cell of a mobile phone network covers a defined area with radio signals to provide mobile telecommunication to the end-user. In order to prevent communication lacks due to shadowing effects (e.g. caused by buildings), multiple cells are sometimes used to cover one area, leading to the above phenomenon. If multiple cells are available in one area, the cell with the strongest signal is selected by the mobile phone if acknowledged from the network. Both the mobile phone and the network can initiate a change to another cell at any time to ensure network load balance and communication quality. In our work, center-of-cell-coverage localization was supported by the mobile phone provider: After requesting the current position of one volunteer, the network returns the center coordinates (theoretical center of radio-frequency coverage) of the volunteer's current cell. Hence two cells available at one place can have totally different coordinates for positioning. In urban areas center-of-cell-coverage localization is much more accurate than in rural areas due to higher geographical cell density (See Figure 2). Grouping cell-candidates based on pairwise Euclidian distances would therefore in general not produce meaningful results. We have therefore developed an approach of an individual cell-network graph. Nodes of the cell-network graph represent cells and links represent cell changes.

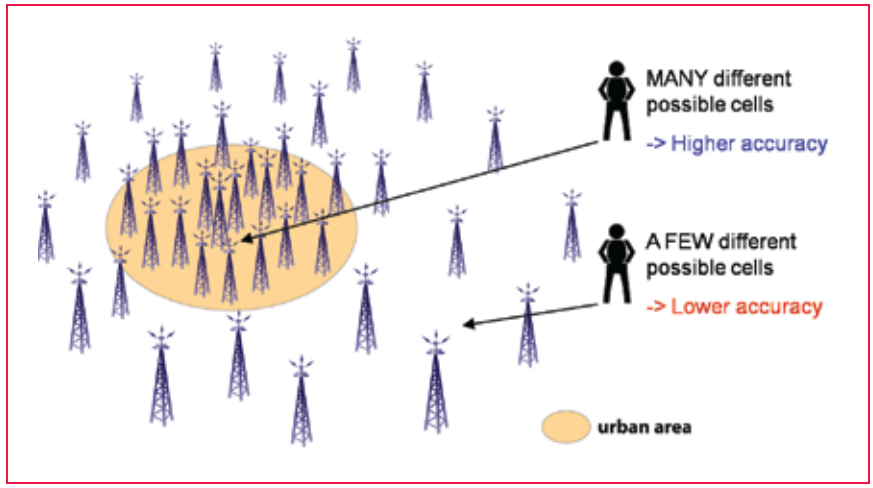

Figure 2: Geographic distribution of cells in urban areas compared to rural areas

The individual cell network graph is used to calculate pairwise topological distances between the potential cell-candidates using the Dijkstra algorithm. Cell-candidates are grouped if the topological distance between them is lower or equal than a predefined number of links. Due to network characteristics, it might happen that not all expected cell-candidates representing one prominent place are linked and therefore correct grouping will fail. To overcome this case, a further approach is used to add missing cells to related prominent places by comparing time series of visiting frequencies.

The assumption that visiting frequencies of cell-candidates – which belong to the same prominent place – should be drawn from a similar underlying continuous distribution allows us to use the Kolmogorov-Smirnov test for grouping missing cell-candidates. If the hypothesis for this test – two samples have the same underlying distribution – is not rejected, then these cell-candidates are grouped. Finally all expected cell-candidates should be successfully grouped.

Classifying prominent places

After grouping is finished we can compute a sequence of prominent places ordered by visits through a work day based on the visiting frequencies. At the same time we can manually define a daily routine for such work days By comparing these two sequences we can label the computed prominent places for finally giving them semantics.

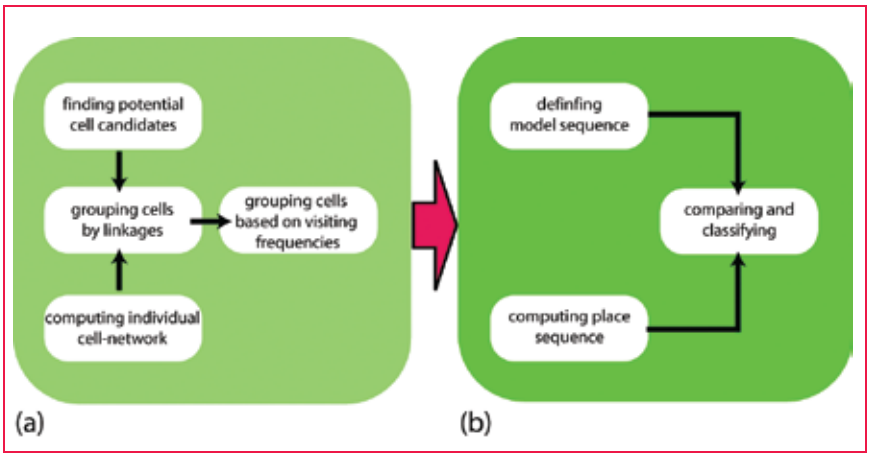

Figure 1: Workflow of analyzing cell-data for finding (a) and classifying (b) prominent places

Figure 3: Example for visualizing prominent places in GoogleEarth. Yellow rectangles indicate the composition of cell-based positions for prominent places.

Step-by-step, for each hour of day, the visiting frequencies of the prominent places are compared and the prominent place with the highest representation is selected for the sequence. In order to avoid toggling in the sequence at transition times of one prominent place to another, smoothed distributions are used for prominent place selections.

A typical daily routine of a work day of an Austrian employee (All volunteers are Austrian) is manually defined as

- being at home (at night/early morning), being at work (in the morning),
- being somewhere else (in the afternoon/evening) and
- being at home (in the evening/night).

From this daily routine three classes of prominent places 'home', 'work' and 'spare time' are derived. Hence, the sequence which is to be compared to the computed sequence is {'home', 'work', 'spare time', 'home'}.

For classification, the first element of the computed sequence is taken and labeled with the first element of the manually defined sequence. By assuming the computed sequence is {'unknown 3', 'unknown 2', 'unknown 1', 'unknown 3'} - 'unknown3' is labeled to 'home'. The same is done with the next element (here 'unknown2' is labeled to 'work'). Finally all other elements of the computed sequence are classified as 'spare time' until the end is reached (Here 'unknown 1' is labeled as 'spare time'). Once-classified prominent places are not re-classified.

Experimental results

The presented methodology has been validated by a 250 000 cell-based positioning data set obtained during a half year of permanent observation. Eleven of twelve home locations (92%) and nine of ten work locations (90%) have been found and correctly classified (Two volunteers moved their home during observation phase). Each volunteer has validated the result based on her provided cell-based positioning data with respect to the correctness of found and classified prominent places. All found prominent places are close to the real location. Geographical accuracy of the found places mainly depends on the cell-network distribution in the surrounding area and cannot be influenced by the used method. Hence, no quantitative validation about the localization quality was performed.

In Figure 3 is an example for visualizing the results in Google Earth. This visualization was used to validate the results together with the volunteers.

The demonstrated grouping and classification results are promising and can be used as basis for improved LBS.

Acknowledgements

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"It is difficult to discern an all-encompassing trend in Asia"

Steve Brazier is the President & CEO of Canalys on trends and challenges in navigation market

Steve Brazier is the President & CEO of Canalys - the fast-growing think-tank that provides research and analysis of trends in global high technology markets. Canalys delivers its highly-valued analysis through continuous services, consulting projects, reports and custom presentations. Steve's work spans the full range of the company's specialisation areas, including mobile devices, PCs, security, networking, servers, storage, fixed and mobile telephony and the digital home. He has led Canalys to make it one of the most respected analyst firms working in the field of technology convergence, by operating across the boundaries that sit between the IT, telecoms and consumer electronics industries.

What are the key market segments you focus on?

Canalys was formed 10 years ago, and we now have a range of services covering various market segments. These include our Mobile services, which comprise Mobile Navigation Analysis and Smart Mobile Device Analysis, which track and study the worldwide markets on a quarterly basis. We have more recently added Business and Consumer Mobility Analysis services. Canalys also has global services focused on the Enterprise market, which look at security, IPTV, unified communications and networking, and on the Consumer market, covering digital entertainment. The name of the company is actually derived from the Latin word for channels, the core focus of our research, so underpinning all of our work is our go-to-market expertise. Additionally, the company has a significant consulting division taking on bespoke projects across all of these areas.

What is your opinion about the trends and challenges in the navigation market?

Navigation has proved to be one of our most exciting areas of research since we started officially tracking the market back in 2004. The sector has been growing aggressively during this period and it has been great to see how this growth has now spread to APAC and the Americas. One of our challenges is tracking all the different types of solutions, be they hardware or software; smart phones, PNDs or PMPs; perpetual or subscription; and ensuring that our definitions and databases will robustly handle them.

How do you see the market potential for satellite navigation in India?

We think there is significant market potential for mobile navigation in India. It is a unique market because smart phones with integrated GPS arrived there before PNDs, a reversal of the situation in Western Europe, the US and China. We believe that there is a burgeoning opportunity for navigation on both smart phones and PNDs, and we will be talking about our forecasts for India at our forthcoming Canalys Navigation Forum event in Bangalore this month. Location-based services are not really established yet in India, but the advent of GPS devices and increasing consumer education around turn-by-turn navigation will change this. Still, there is a lot of work to be done to find revenue-generating business models for location-based services. There are endless decisions to be made about end-user education, pricing, and partnerships between software and hardware vendors and service providers.

Could you highlight key differences in the navigation market in Europe, the US and Asia?

Western Europe already has an established mobile navigation market, which emerged from the trend of bundling PDAs with Bluetooth GPS receivers and software. The market is still growing, and there are even further opportunities to come out of Central and Eastern Europe, the Middle East and Africa, which are all still developing markets. In the US the big impact has come around the Black Friday period, which is the first shopping day after Thanksgiving. In 2006 and 2007 certain vendors really developed deals and special offers that helped swell volumes and educate the market. Hitting certain prices points has really driven the market forward, though pressure on margins is more intense than ever. Asia is such a fragmented market that it is difficult to discern an all-encompassing trend. There are highly developed markets, such as Korea and Japan, which have their own local vendors, and then there is China and India, which have been identified as critical emerging markets. The Oceania countries are also at various stages of development as well.

What is the common thread to the Canalys Navigation Forum 2008, spread across four venues in three continents?

The common thread is about establishing a premier independent meeting place for those involved in the navigation industry in each region. It is about discussing market growth, progression and challenges. We hope to continue to consolidate our position as the industry's leading provider of research, which in turn will contribute to the planning, forecasting and analysis of future opportunities for growth and expansion in mobile navigation.

Active RFID trilateration for indoor positioning

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ALTERNATIVE location methods for absolute positioning in areas where no GNSS position determination is possible due to obstruction of the satellite signals are needed in mobile positioning. Active RFID (Radio Frequency Identification) can be used also for position determination, although the system was not only developed for positioning and tracking but mainly for identification of objects. Using RFID in positioning, different approaches can be distinguished, i.e., cell-based positioning if the RFID tags are installed at active landmarks (i.e., known locations) in the surroundings, trilateration if ranges to the RFID tags are deducted from received signal strength (RSS in RFID terms) values and location fingerprinting where the measured signal power levels are used directly to obtain a position fix. Using Cell of Origin (CoO) the achievable positioning accuracy depends on the size of the cell and is therefore usually several metres up to 10's of metres using long range RFID equipment. Higher positioning accuracies can be obtained using trilateration and fingerprinting. In this paper the use of trilateration is investigated.

Background of active RFID and positioning concepts

Radio Frequency Identification (RFID) is an automatic identification method. A RFID system consists of a tag, a reader and an antenna. The tag is a transponder that can be attached to or incorporated into a product, animal, or person for the purpose of identification using radiowaves. The reader (i.e., a transceiver) is able to read the stored information of the tag in close proximity. RFID tags contain antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver. There are various types of tags; i.e., passive, active and semi-passive tags. Passive RFID tags do not have their own power supply and the read range is less than for active tags, i.e., in the range of about a few mm up to several meters. Active RFID tags, on the other hand, must have a power source, and may have longer ranges and larger memories than passive tags. Many active tags have practical ranges of tens of meters, and a battery life of up to several years. Another advantage of the active tags compared to the passive tags are that they have larger memories and the ability to store additional information (apart from the tags' ID) sent by transceiver. For these reasons, the applications described in this paper make use of active RFID tags with a frequency range of 865.6-867.6 MHz. Further information about the underlying technology can be found in e.g. Finkenzeller (2002).

To employ RFID for positioning and tracking of objects, one strategy is to install RFID readers at certain waypoints (e.g. entrances of buildings, storage rooms, shops, etc.) to detect an object when passing by. For that purpose an RFID tag is attached to or incoporated in the object. This concept is employed for example in theft protection of goods in shops and in warehouse management and logistics. A second approach for using RFID in positioning would be to install RFID tags at known locations (e.g. at active landmarks) especially in areas without GPS visibility (e.g. in tunnels, under bridges, indoor environments, etc.) and have a reader and antenna installed in the mobile device carried by the user. When the user passes by the tag the RFID reader retrieves its ID and other information (e.g. the location).

In the case of cell-based positioning, i.e., Cell of Origin (CoO), the maximum

range of the RFID tag defines a cell of circular shape in which a data exchange between the tag and the reader is possible. Using active RFID tags the positioning accuracy therefore ranges between a few meters up to tens of meters. In our approach the maximum range of the signal can then be set at around 20 m. Higher positioning accuracies can be obtained using trilateration if the ranges to several tags are determined and are used for intersection. For 3-D positioning range measurements to at least three tags are necessary. The ranges from the antenna of the reader to the antenna of the tag is deduced from the conversion of signal power levels into distances.

Signal strength to distance conversion for RFID range deduction in trilateration

To transform the measured signal strength from the RFID tag into a range between the tag and the reader a conversion model has to be employed. This conversion can be performed using a radio wave propagation model. Such a model is an empirical mathematical formulation for the characterization of radio wave propagation as a function of frequency, distance and other conditions. Such models typically predict the path loss along a link or the effective coverage area of a transmitter. For indoor environments one usable model is the ITU (International Telecommunication Union) Indoor Location Model (Wikipedia, 2008) that estimates the path loss inside a room or a closed area inside a building delimited by walls of any form. It assumes a logarithmic relationship between the measured RSSI and the range from the transmitter. Mathematically the ITU-R model (Ranvier, 2004) can be described by

$$s_T = 20 \cdot \log_{10} f_c + 10 \cdot n \cdot \log_{10} d + s_f(n_f) - 28 \qquad (1)$$

where
s_T is the total signal strength in [dBm],
f_c is the carrier frequency in [MHz],
n is the signal strength exponent,
d is the range between the RFID tag and the RFID reader in [m] and
$s_f(n_f)$ is the floor penetration factor of the signal strength which depends on the number of floors between the RFID tag and RFID reader in the building.

In the case of RFID the used parameters might be different to those in equation (1). In order to find out the suitable parameters for a RFID system, a new simplified equation using 3 fixed parameters as given in equation (2) can be employed:

$$s_T = a_0 + a_1 \cdot \log_{10} d \qquad (2)$$

where
a_0 and a_1 are coefficients found during calibration using measurements on a known baseline.

Then the parameter

$a_0 = 20 \cdot \log_{10} f_c + s_f(n_f) - 28$ is an unknown coefficient that includes the fixed carrier frequency and the number of floors in the building $a_1 = 10 \cdot n$ and is the range power loss coefficient. These unknown paramters can be determined using a calibration on a known baseline inside the building. Then the distance d between the RFID tag and the RFID reader can be obtained from equation (3):

$$d = 10^{\frac{s_T - a_0}{a_1}} = 10^{[b_0 + b_1 \cdot s_T]} \qquad (3)$$

with the coefficients
$b_0 = -\frac{a_0}{a_1}$ and $b_1 = \frac{1}{a_1}$.

For further improvement of the accuracy of the logarithmic approximation, the exponent in equation (3) can be extended by a polynomial function of order p as described in the following equation:

$$d = 10^{[b_0 + b_1 \cdot s_T + b_2 \cdot s_T^2 + \ldots + b_p \cdot s_T^p]} \qquad (4)$$

where
p is the order of the polynomial function, b_0, b_1, b_2, …, b_p are the coefficients of the polynomial function determined from a calibration.

Apart from using a logarithmic relationship between the signal strength and the distance also the use of a linear regression was investigated. For that purpose a polynomial function of the order p in the form of

$$d = a_0 + a_1 \cdot s + a_2 \cdot s^2 + \ldots + a_p \cdot s^p \qquad (5)$$

where
d is the distance to the RFID tag in [m],
s is the measured signal strength in [dBm] and a_p are the unknown coefficients of the polynomial function, can be used to describe the relationship between the signal strength and the distance. The unknown coefficients a_p can be computed using a least squares fit if the signal strength s is measured along a baseline at n known regular distances. Then there are n equations with $p + 1$

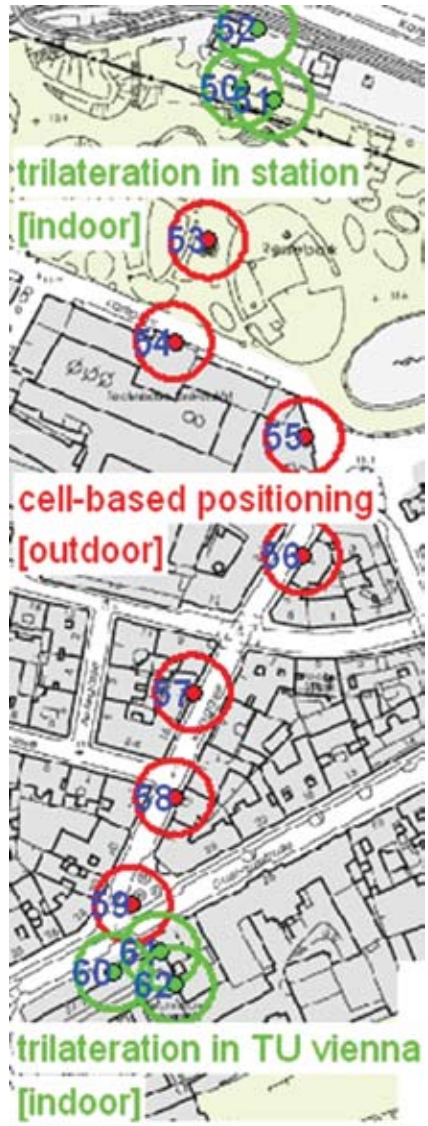

Figure 1. An example of a cell-based positioning concept in outdoor areas of the city of Vienna in conjunction with the trilateration concept for indoor areas

unknowns (where n must be > p + 1). The possible order p of the polynomial function depends on the number of available signal strength observations n and the desired level of approximation.

From previously conducted tests (see Retscher and Fu, 2007a) it could be seen that the mean of the residuals is larger using the logarithmic model than for the simple polynomial fit for the signal strength to distance conversion in trilateration. For this reason, the simple polynomial model provides a more accurate fit to the distance data as the logarithmic model.

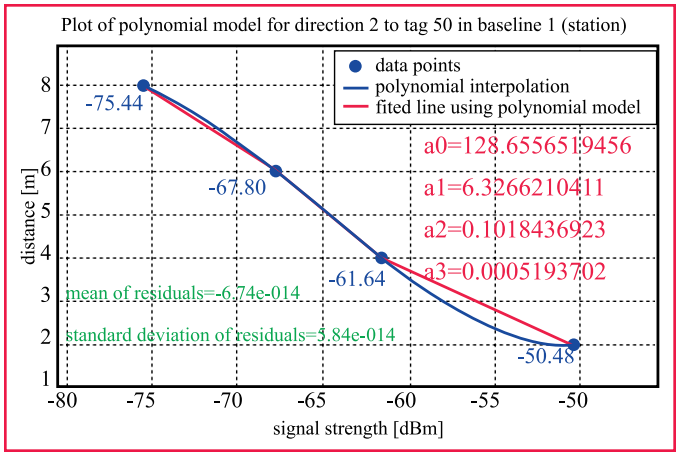

Figure 3. Polynomial model approximation for one baseline in the entrance of the underground station 'Karlsplatz'

If several RFID tags are located in the surrounding environment the current position of the RFID reader can be obtained using trilateration. Then the deduced distances to at least three RFID tags are needed to calculate a 2-D position fix with intersection and an unknown scale factor which takes the difference between the deduced ranges to the RFID tags and the reference point system into account. If more than three distances are available, the position fix can be calculated using a least squares adjustment (see Retscher and Fu, 2008).

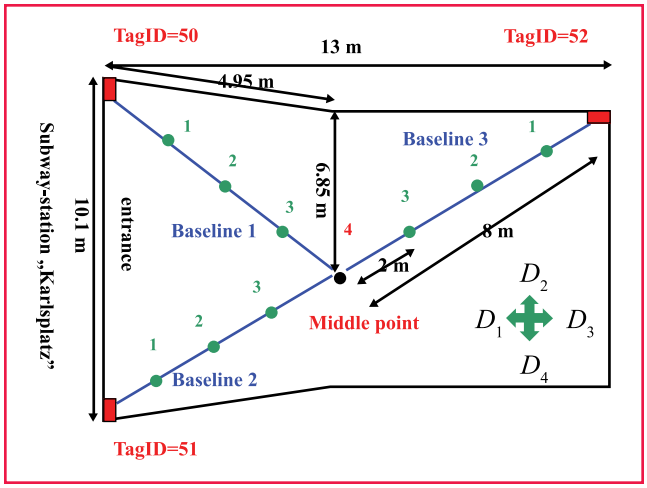

Figure 2. Location of the RFID tags at the entrance of the underground station 'Karlsplatz' used for trilateration

Field test setups and results

For testing our approach the path from a public transport stop (i.e., underground station 'Karlsplatz') to an University building was selected (see Figure 1). Three RFID tags were installed at the entrance of the underground station 'Karlsplatz' (indoor area). Along a road between the underground station and the university building ('TU Vienna' in Figure 1; outdoor area) seven tags were installed on buildings along the way. Additionally, three tags were installed at the building's entrance (indoor area). Each circle indicates a different cell.

In the experiment cell-based positioning has been applied in outdoor areas as an alternative to GPS positioning. As the accuracy of cell-based positioning generally depends on the size of the distinguishable cells, the achievable positioning accuracies might not be sufficient for indoor areas. Ranges from the RFID tags location have been achieved up to around 20 m. In the indoor area mostly higher positioning accuracies are required. Therefore several RFID tags have been installed in the transition zones between outdoor to indoor to be able to locate the user with a higher precision.

For a conversion of the measured signal strength into a range a so called calibration was carried out in the indoor environments in order to get the coefficients of the polynomial model described in equation (5). Figure 2 shows the installation of the tags in the entrance of the underground station 'Karlsplatz' as an example. For the conversion of the signal strength into a range a calibration along three baselines from the RFID tags has been performed to obtain calibration parameters of a characteristic curve for each line.

Figure 3 shows the polynomial model approximation with an order of p = 3 and their resulting coefficients for one of the three baselines in the underground station 'Karlsplatz'. For each baseline

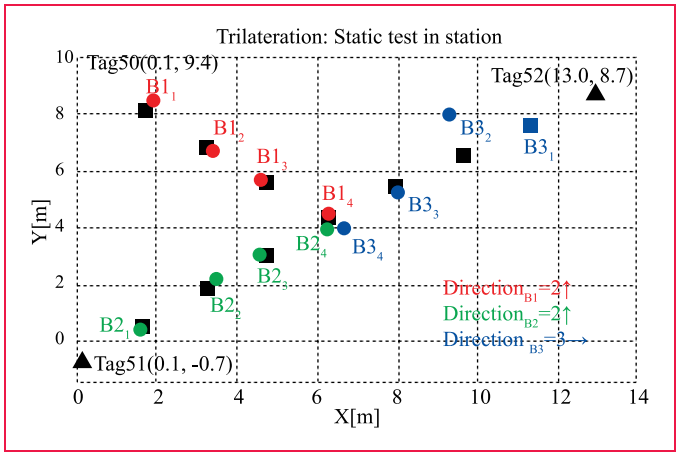

Figure 4. Results of trilateration for the static test points in the entrance of the underground station 'Karlsplatz'

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different coefficients are obtained, because the signal strengths of different tags were influenced differently by the objects in their surroundings. The mean values of the residuals of all the polynomial approximations are nearly zero and their standard deviations are also almost zero. This means that a good approximation with the used polynomial model is achieved. The trend of the polynomial fit is very similar. The measurements have been performed at night with no people walking around.

Two sorts of test were carried out in total. In the first test the signal strength measurements were performed static over a time span of around one minute on the same points used in the calibration, since we know the true location of these points. In the second test the user was walking continuously inside the test area either from the entrance to the center of the test area or vice versa.

The positioning results of the static test for the entrance of the underground station 'Karlsplatz' are shown in Figure 4. Table 1 shows the deviations in the X- and Y-coordinates (dX and dY) from their true location and the radial deviation dr for all test points. In average the radial deviation is only 0.32 m with a standard deviation of ± 0.40 m. The maximum deviation of one point was 0.34 m in the X-coordinates and -1.44 m in the Y-coordinates. This point can be considered as an outlier as the deviations of the other points are much smaller.w

In the second kinematic test the reader was carried from the middle of the entrance of the underground station 'Karlsplatz' to the middle of tag 50 and 51 (from right to left in Figure 2) over a distance of around 14 m. Unlike the measurements in the first test, in this test every point was measured only for a few seconds. Figures 5 shows the positioning results. It can be seen that the trend of the trajectory can be correctly determined. The positioning accuracy was in the range of ± 2 to 3 m.

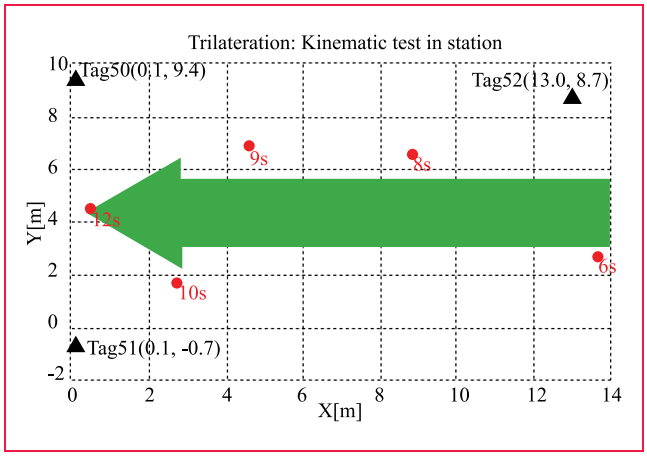

Figure 5. Results of trilateration for the kinematic test in the entrance of the underground station 'Karlsplatz' (the determined location is shown in seconds s from the start of the measurements)

Conclusion and outlook

This paper addresses the investigation of RFID trilateration for indoor positioning. At first some background of RFID was introduced. On this basis it was deduced how the measured signal strength can be converted into a distance. The converted distances could be used for determining the position of the reader by means of trilateration. Finally, the approach was tested in a test environment near the Vienna University of Technology.

For the signal strength to distance conversion a polynomial model was employed. Signal strength measurements were performed on baselines with a point interval of 2 m. The resulting mean value of the residuals in the conversion of the signal strength into a distance is nearly zero (i.e., below ± 2*10-11 m) using a polynomial model with an order of p = 3. These polynomial models were then used for the deduction of ranges to the tags for the location of points in static and kinematic tests. In the static test the test points were located with an accuracy of better than ± 0.35 m in X-direction and ± 1.44 m in Y-direction. In the kinematic tests lower accuracies in the range of ± 2 to 3 m were achieved, but the trend of the moving user was always determined correctly. The achieved positioning accuracies have proven that RFID trilateration can be successfully employed in a small range to the tags.

In the future, we will perform more experiments to improve the polynomial models for signal strength to distance conversion. At the same time the algorithms will be tested in a larger and complicated environment and with more tags.

Table 1. Deviations in the X- and Y-coordinates (dX and dY) from their true location and the radial deviation dr of the static test points in the entrance of the underground station 'Karlsplatz'

Point Nr.	dX [m]	dY [m]	dr [m]
B11	-0.23	-0.31	0.39
B12	-0.15	0.14	0.20
B13	0.11	-0.05	0.12
B14	0.02	-0.12	0.12
B21	0.04	0.05	0.07
B22	-0.19	-0.28	0.34
B23	0.07	-0.05	0.09
B24	0.00	0.24	0.24
B31	-0.01	0.01	0.01
B32	0.35	-1.44	1.48
B33	0.07	0.16	0.17
B34	0.34	0.46	0.57
mean	0.03	-0.10	0.32
std	0.18	0.47	0.40

Acknowledgements

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Galileo update

Second Galileo test satellite launched successfully

Giove-B, the second test satellite for Galileo, was launched aboard a Russian rocket departing from the Baikonur cosmodrome in Kazakhstan. The European Space Agency confirmed that the two solar panels powering the satellite had deployed without incident and were fully. Giove-B will start In-Orbit Validation of the signal configuration and carry out tests of high precision signal ranging. On board the satellite is an extremely accurate atomic clock based on a MASER (microwave amplification by stimulated emission of radiation) and two rubidium atomic clocks.www.heise-online.co.uk

Galileo project finally gets going again

The 27 EU transport ministers unanimously agreed to adopt a basic document defining new rules for the configuration of the Galileo satellite navigation system and the extension of the EGNOS programme. The industrial committee of the European Parliament has accepted this regulation, so it's now up to the MEPs in Strasbourg, after months of quarrelling and blockades, to get the Galileo project moving again.

The orders for the Galileo system will be offered for tender in six major areas. No industrial consortium will be allowed to tender for more than two of these areas, and bidders must furthermore pass on 40 per cent of the total value of the business to small and medium-sized firms that are not members of their consortia.

The project is being subdivided into six main work packages: systems engineering support, completion of the terrestrial mission infrastructure, completion of the terrestrial control infrastructure, satellites, starting equipment, and operation. The deployment phase is being financed by the EU with €3.405 billion – but this takes no account of "unforeseen financial obligations". The income generated by Galileo's commercial service is to go to the European Community. During the operational phase after 2013, the basic document says a decision can be made later on whether public-private partnerships or other ways of placing orders with the private sector will be used for the operation and extension of the system. The income would then be shared out. www.heise-online.co.uk/

Galileo takes shape

Galileo is finally taking shape after representatives of member states and Parliament struck a deal on the project's institutional architecture. This new agreement, if confirmed by ministers, would open the door for quick progress on Galileo. The three institutions namely agreed to retain the Galileo Surveillance Authority (GSA), which Parliament had asked to be dissolved as no private partners are taking part in the project any more. Alongside the GSA, a new institutional structure would be created called Galileo Inter-Institutional Panel (GIP) consisting of three representatives from both Council and the Parliament and one representative from the Commission. The Commission could eventually be represented by the Transport Commissioner. www.euractiv.com/en/transport/

"Navigation on cellphones is the next big wave"

says Vineet Taneja, Head, Go-To-Market, Nokia India

How do you see the prospects of GPS enabled mobile handsets?

Nokia sees that location based experiences, such as mapping and navigation as a fundamental platform in mobile devices going forward. With mobile phones becoming an integral part of their lives, consumers are looking at more and more functionality on a single device, hence the maps and navigation services on a mobile phone have a lot of potential. The main advantage of GPS on mobile device is having mapping, routing and navigation functionality besides the regular handset features like SMS, camera, email etc.

Would you like to indicate some figure to highlight the potential of navigation market in India?

The maps and navigation market has exploded in recent years, especially in developed geographies like the USA, Europe and some parts of Asia Pacific. According to a report by Canalys, 7.4 million mobile navigation devices were shipped globally in 2007 and this number is expected to grow in the years to come.

As per a recent study conducted by us, Navigation has already become one of the top five mobile services globally - others being imaging, music, SMS and gaming.

What is your opinion about PND v/s mobile phone based navigation?

Maps & Navigation on a cell phone are poised to be the next big wave in mobility since a cell phone is always with the consumer and makes their lives simpler. Realising the potential of these services, We have made Maps and navigation a standard feature in all Nokia Nseries multimedia computers and in a wide range of Nokia phones. We have introduced the "Navigator" branded devices, which are truly optimized for Navigation. We will introduce a number of GPS enabled mobile devices in 2008 that will offer an enhanced maps and navigation experience.

Where do you position Nokia vis-à-vis other players in the GPS phones segment?

The industry is converging towards Internet driven experiences and Navigation represents Nokia's vision in combining Internet and mobility on a common platform.

We have taken a lead in this space with bringing out a wide array of devices like the Nokia 6110 Navigator, N95, N95 8GB, N82 and E90 that offer onboard GPS along with high-speed connectivity. All current Nokia S60 and many Series 40 devices also support GPS via a Bluetooth wireless module.

Will LBS become one of fastest growing mobile based Value Added Services market in India?

Yes, the interest is rising in India as the use of location-based services not only benefits the customers but also offers benefits to the industry, including network operators and the marketers / advertisers. A-GPS increases the value of services that operators can offer, while also enabling a much wider range of revenue-generating services. GPS technology helps communicate advertisers' messages to potential customers in more and more creative ways.

What are the challenges that need to be addressed to accelerate the growth of LBS in India?

Location based services is a new concept in India, hence the main challenge is the lack of awareness among users. As a responsible market leader, one of the things we would be focusing on is educating the mobile users on the concept of Navigation and showcasing live demos at various touch points (Shopping malls, Nokia Concept stores, Airports etc)

Secondly, most of the country has not been digitally mapped. Mapping extends only to the main cities and will take some time to get to other locations.

GPS Navigation in India: Interesting times ahead

Amit Prasad
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As per the textbook theory of market maturity in any country, the expected stages are that of market development, rapid growth, saturation or maturity and the decline. Having had the good fortune to predict the evolution of GPS Navigation market in India, here is a retrospective of the various phases, from both the vendor's and consumer perspective.

Firstly, the stage of market development from vendor's perspective was 1999-2003, mostly spent in understanding the technology, identifying various components and selecting the partners who could supply the same. From the consumer's perspective, this phase started much later from 2003-2006 during which initially there was denial that it would ever work in India, then pessimism when it worked but people thought the market would not exist and finally neutrality giving companies the benefit of doubt that 'maybe' it would indeed work someday! The net result was that vendors spent time and money waiting for the market to get ready.

Second phase of rapid market growth, interestingly, has not happened in India even until date. But from a vendor's perspective the year 2007 and 2008 have seen a lot of competitive turbulence, a very small expansion of the market, bundles of contradictory claims from various service providers, which are activities expected during market growth only. From a consumer perspective the same years have already given him better pricing, more choice of product and an opportunity to give user feedback that help improve the product. The net result is that it is a consumer market already, but growth is yet to come!

The third stage of market saturation and maturity from a vendor's perspective is expected to be from 2007-2009, comprising of focus on product differentiators, identification of raw iron components costing as well as efforts to control the technical customer support costs. From a consumer perspective this phase is expected between 2008-2010, consumers will benefit from more choices in the market, excellent customer service and value additions to the product which help in its daily usage. The net result is that both consumers and vendors begin to reap some of the benefits from the market.

The fourth stage of market evolution, decline, is still some distance away from the Indian market. In this phase vendors should expect that the product itself will become invisible, market reach will be critical, all will need to look at new markets within existing segments. From a consumer perspective it will become a commodity product, people with new toy syndrome would change devices periodically and price would be the only factor when taking decisions. The net result would be similar to what the mobile phone market is undergoing and volumes would be huge.

Companies need to watch for the above phases and evolve their business plans such that they emerge as leaders. The challenges are many; the customs duties on import of GPS devices are very high. There is enough market for all players and it is important to encourage competition as an engine of growth.

Overall, I can safely sum up that while the past has been exciting and we have lived in 'interesting times', the future is going to be all the more interesting and exciting than anyone has ever imagined. Several new markets will be created and leaders will be made of existing companies or born out of new ones in this space. Let us look forward to a huge growth in the coming years so that we can sit back and smile when it actually does come our way.

Simulation of Galileo E5 Signal

Fantinato Samuele
Fantinato Samuele: he got a degree in Telecommunications Engineering in July 2007 at University of Padova, Italy, with the top of the marks. He was at ``Department of Information Engineering''. He joined Qascom Srl (an Italian company working in GPS security and authentication), during the thesis period. He is now interested in working in companies researching in navigation and satellite communication systems.
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E5 band (1164 -1215 MHz), composed of E5a and E5b bands, is part of the spectrum allocated by ITU for new Radio Navigation Satellite Services in 2000. E5 signal has the wider bandwidth (51.150 MHz) never used in satellite navigation. Galileo E5 signal is composed by two data components and two pilot components broadcasted together by means of the multiplexing scheme AltBOC(15,10). E5a band will be used for Freely/NAV message (Open Service) and the codes of data and pilot components are uncripted, E5b band will be used for Integrity/NAV message for Safety of Life and Open Service. Integrity of signal is probably the most advanced service introduced by Galileo [1]. One of the main feature of E5 band is that the signal can be received in two ways: the first is to filter and demodulate only one of side bands E5a or E5b (see Fig. 1) the second is to process the overall received signal containing the components of both bands [2],[3]. In this sections is considered the second way because it will be adopted by professional receivers and this will avoid to obtain all the advantages of Galileo signal. E5 is the most promising signal in terms of performance in multipath environment and positioning for critical applications but also the most challenging for a receiver or a simulation. In this paper will be presented the simulation of the transmission and reception of E5 signal. It will be first described the generation of codes, then it will be illustrated Galileo AltBOC(15,10) signal structure and its differences with a conventional AltBOC, it will be shown a way for the generation of that signal and some basic characteristics for the development of a software receiver for E5.

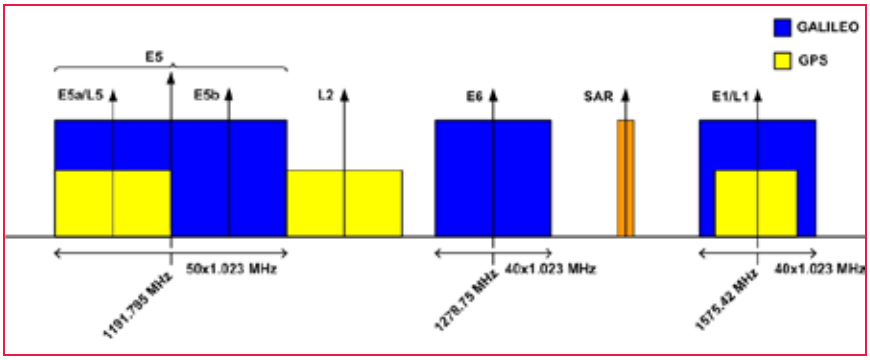

Figure 1 Galileo spectrum allocation

Simulation

The simulation is developed using Matlab. Four satellites are transmitting Galileo AltBOC(15,10) signal in steps of one millisecond.

For each transmitted signal some effects are introduced like doppler shift due to relative motion between satellite and receiver, delay, multipath channel and gaussian noise and then the overall received signal is processed with some algorithms typical of software receivers. All the blocks are simulated at baseband.

Signal Generation

The first step in the simulation is the generation of Galileo E5 codes. In E5 signal there are four components or channels: e_{a-I}, e_{a-Q}, e_{b-I} and e_{b-Q}. Each component has its own code which is the product of the repetition of a primary code of 10230 chips, corresponding to 1 ms of signal, and a secondary code of different length, see Tab. 1. "Galileo Signal In Space Interface Control Document" (SIS ICD) gives the basis for generation of codes: the primary codes are generated by means of two Linear Feedback Shift Registers. For each satellite SIS ICD gives the "start values" and the values of feedback taps as polynomials in octal notation and some instructions to build correctly the LFSR. The secondary codes are only the conversion in binary representation of a hexadecimal number. Through some Matlab functions primary and secondary codes are generated for all satellites involved in simulation. As known in a Matlab simulation is necessary

Table 1 Feature of E5 components

Channel	Type	Chip rate [Mchip/s]	Data rate [symbols/s]	Code Length Primary/ Secondary chips
e_{a-I}	Data	10.23	50	10230/20
e_{a-Q}	Pilot	10.23	--	10230/100
e_{b-I}	Data	10.23	250	10230/4
e_{b-Q}	Pilot	10.23	--	10230/100

to define the reference time domain of each signal. The bits of the codes are then mapped in +1 BPSK values producing the discrete signals $e_{x-y}(nT_c)$ with $T_c \cong$ 97.75ns that is the chip period. e_{a-I} and e_{b-I} are data channels with data rate reported in Tab. 1, and so the ranging codes are multiplied by two different data streams, e_{a-Q} and e_{b-Q} are pilot channels containing only the ranging codes.

In conventional AltBOC the complex signal $e_b(t) = e_{b-I}(t) + je_{b-Q}(t)$ is multiplied by a complex squared subcarrier $e_r(t) = c_r(t) + js_r(t)$ where $c_r(t)$ is the sign of a cosine function and $S_r(t)$ is the sign of a sine function and the complex signal $e_a(t) = e_{a-I}(t) + je_{a-Q}(t)$ is multiplied by the complex conjugate of $e_r(t)$, i.e. $e_r^*(t)$ obtaining the signal:

$$s(t) = \{[e_{a-I}(t) + e_{b-I}(t)]c_r(t) + [e_{a-Q}(t) - e_{b-Q}(t)]s_r(t)\} + j\{[e_{a-Q}(t) + e_{b-Q}(t)]c_r(t) + [e_{b-I}(t) - e_{a-I}(t)]s_r(t)\} \quad \text{Eq.1}$$

In Figure 3 is represented how an AltBOC signal is built and its power spectral density in which one can recognize the two main lobes that represent the bands E5a and E5b.

The Galileo AltBOC(15,10) signal structure is more complex than conventional AltBOC and has expression:

$$s(t) = \boldsymbol{Re}[s(t)] + \boldsymbol{jIm}[s(t)] \quad \text{Eq.2}$$

where:

$$\boldsymbol{Re}[s(t)] = \frac{1}{2\sqrt{2}}(e_{a-I}(t) + e_{b-I}(t))[sc_s(t) + e_{a-Q}(t)e_{b-Q}(t)sc_p(t)] + \frac{1}{2\sqrt{2}}(e_{a-Q}(t) - e_{b-Q}(t))[sc_s(t - T_c/4) - e_{a-I}(t)e_{b-I}(t)sc_p(t - T_c/4)] \quad \text{Eq.3}$$

$$\boldsymbol{Im}[s(t)] = \frac{1}{2\sqrt{2}}(e_{a-Q}(t) + e_{b-Q}(t))[sc_s(t) + e_{a-I}(t)e_{b-I}(t)sc_p(t)] + \frac{1}{2\sqrt{2}}(e_{b-I}(t) - e_{a-I}(t))[sc_s(t - T_c/4) - e_{a-Q}(t)e_{b-Q}(t)sc_p(t - T_c/4)]$$

where $SC_S(t)$ and $SC_p(t)$ are two subcarriers quantized in four values (Fig. 4).

In Galileo AltBOC has been modified introducing two different subcarriers and the products of the components in order to obtain a signal that lies on an 8-PSK constellation (constant envelope) which is very important for satellites high power amplifiers.

In the following lines is reported how, in the simulation, the samples of E5 signal are generated, for more details see [11]. As known in AltBOC(n, m), n represent the chip rate of the signal and m the frequency of the subcarriers. As one can see the subcarrier period is $T_s = (n/m)T_c = (2/3)T_c$. The two subcarriers are defined every Ts/8, so after the multiplexing scheme each chip period is composed of N = 12 slots in which the values of the signal can be different. The components $e_{x-Y}(nT_c)$ are then interpolated with a "hold interpolator" of factor N = 12 and so directly multiplexed according to the expression of Eq. 2. The output signal is defined in $T_{AB} = T_c/12$.

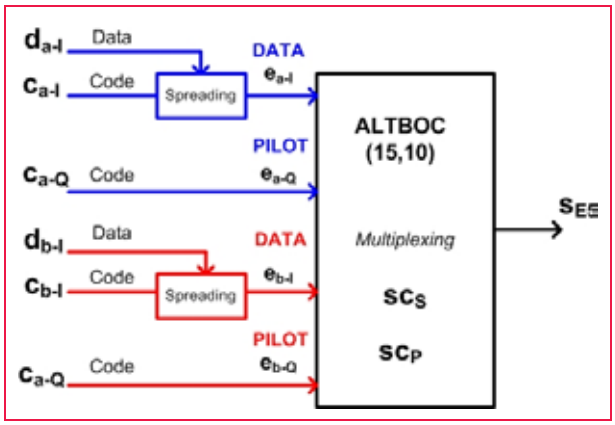

Figure 2 Generation of AltBOC(15,10) signal

Now is shown the relationship between the chip rate $R_c = 1/T_c$ and the bandwidth in which the signal should be transmitted. The one side bandwidth is B = 25.575MHz that $B = 2.5R_c$. Now is necessary to select a correct sampling frequency: $F_{samp} =$ KB with K > 2. So the ratio between the sample time, $T_{samp} = 1/F_{samp}$, and T_{AB} is $T_{samp}/T_{AB} = 24/5K$. For example if K = 4 one have to upsample the signal by a factor 5, filter (In the simulation is introduced a raised root cosine filter with roll-off factor α =0.22) it in order to bandlimiting it, and then sample it with a factor 6 obtaining 10 samples for chip. These equations and values can be important in the development of a software receiver for E5,

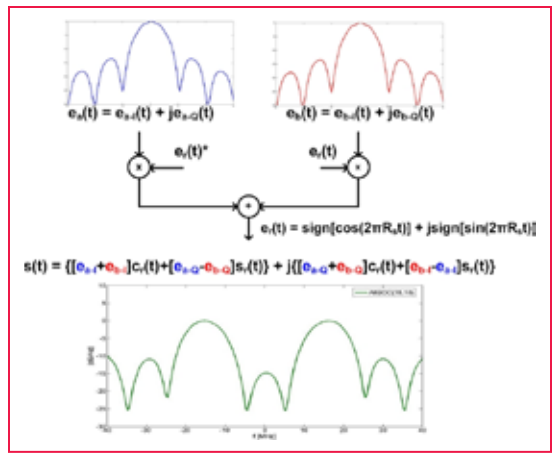

Figure 3 Construction and Power Spectral Density of AltBOC Signal

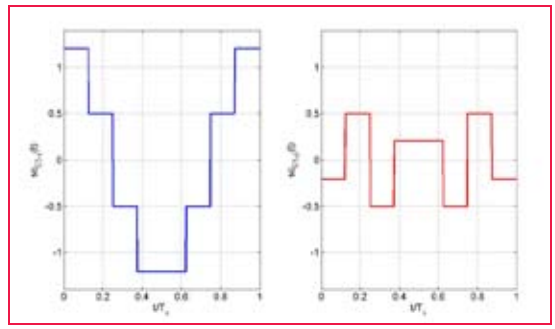

Figure 4 Subcarriers $SC_s(t)$ and $SC_p(t)$

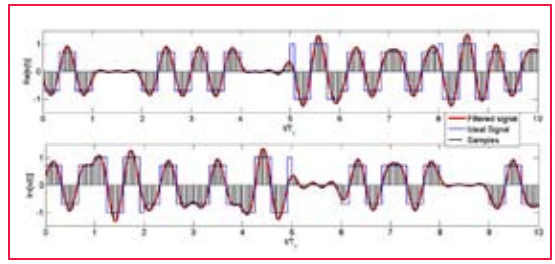

Figure 5 Real and Imaginary part of E5 ideal signal, E5 filtered signal and its samples (K=8)

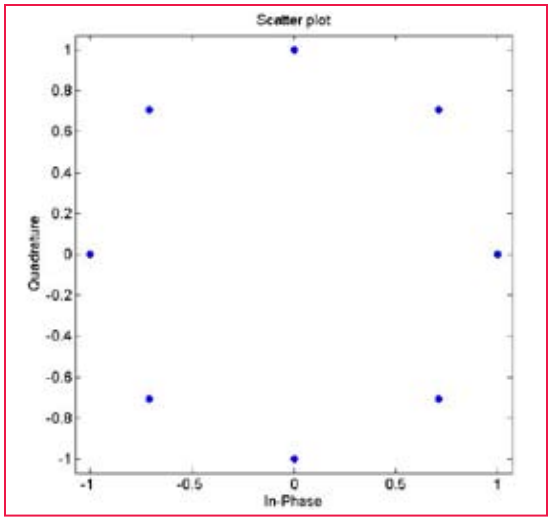

Figure 6 Constellation of E5 signal

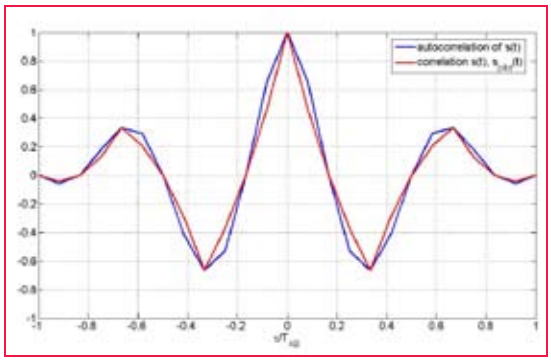

Figure 7 Shapes of autocorrelation of S(t) and correlation between S(t) and $S_{pilot}(t)$

in particular the value of K determine the sampling frequency and so the resolution of the receiver. The procedure illustrated can be useful in a software receiver for the efficient generation of the local signals for the correlations with the input signal.

Real and imaginary part of AltBOC(15,10) signal are in Fig. 5 and its constellation is represented in Fig. 6.

Acquisition, Tracking and Data Recovery

As previously said it has been developed a receiver for the demodulation of the overall E5 signal: the signal in input at the receiver is directly sampled (in a simulation the signal is already sampled) and the complex samples are then processed. In the acquisition and tracking process is performed a correlation between the received sampled signal and the samples of a local AltBOC(15,10) pilot signal defined as:

$$s_{pilot}(t) = 2(\sqrt{2}-1)(e_{a-Q}(t) - e_{b-Q}(t))[sc_s(t-T_s/4)] + j2(\sqrt{2}-1)(e_{a-Q}(t) + e_{b-Q}(t))[sc_s(t)] \quad \text{Eq.4}$$

This signal can been obtained from Eq. 2 setting to zero the data components e_{a-I} and e_{b-I} and the different normalization factor is introduced in order to not reduce the peak of correlation. In figure 7 one can observe that there is no a significant difference between the autocorrelation of S(t) signal and the correlation between S(t) and $S_{pilot}(t)$. The acquisition is performed using FFT based technique [4] and the delay and doppler frequency are estimated with precision depending on the sample time T_{samp} and on the length of correlation. Also for the tracking of the signal the correlation is between the received signal and pilot signal of Eq. 4. For the tracking it is implemented a non-coherent Early minus Late DLL [6].

The data recovery operations use two local sampled signals (Eq. 5 and 6) that are both correlated with the incoming received signal [9]. These signal are obtained setting to zero the pilot components in S(t). This choice is made because using only one signal ($S_{data-I}(t)$) shows a problem when the sign of the two data is opposite: there is a zero in the middle of both real and imaginary part of correlation.

$$s_{data-I}(t) = 2(\sqrt{2}-1)(e_{a-I}(t) + e_{b-I}(t))[sc_s(t)] + j2(\sqrt{2}-1)(e_{b-I}(t) - e_{a-I}(t))[sc_s(t-T_s/4)] \quad \text{Eq.5}$$

$$s_{data-2}(t) = 2(\sqrt{2}-1)(e_{b-I}(t) - e_{a-I}(t))[sc_s(t)] + j2(\sqrt{2}-1)(e_{a-I}(t) + e_{b-I}(t))[sc_s(t-T_s/4)] \quad \text{Eq.6}$$

Making correlation with these two signals for the decision for the transmitted data is necessary to observe only real parts of the two correlations. For example when the data of component $e_{a-I} = -1$ nd the data of component $e_{b-I} = 1$ the shapes of real and imaginary parts of correlations $r_1(t)$ and $r_2(t)$ between the received signal and $S_{data-1}(t)$ and $S_{data-2}(t)$ respectively are in Fig. 8. In the table 2 are summarized all the cases.

Table 2 Table for the decision at receiver

d_{a-I}	$d_{a-I} = -1$	$Re[r_1(t)]$	$Re[r_2(t)]$
1	1	1	0
1	-1	0	-1
-1	1	0	1
-1	-1	-1	0

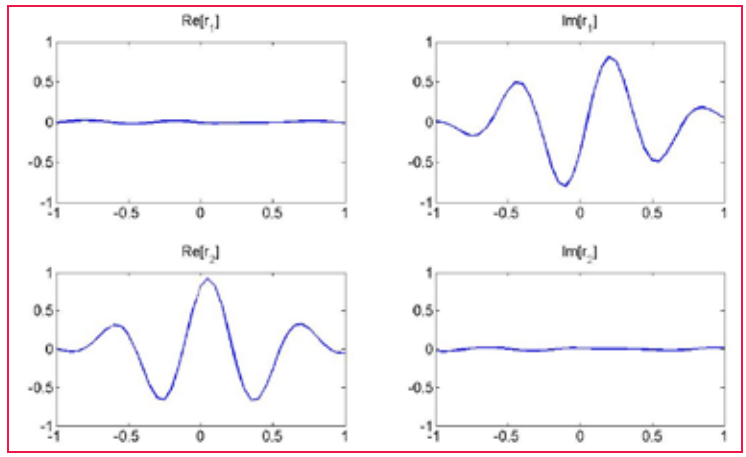

Figure 8 Shapes of correlations $r_1(t)$ and $r_2(t)$

Conclusion

In this paper have been described the main features of Galileo E5 signal and some algorithms for signal generation and software receivers. In particular have been highlighted differences between conventional AltBOC and that used in Galileo: two subcarriers are used and the signal has an 8-PSK constellation. Have been given some useful equations for the implementation of a signal generator or the development of a simulation and have been proposed some techniques for the acquisition, tracking and data recovery of the overall received signal.

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"Improved infrastructure changes people's lives"

Scott Lofgren, global director of Bentley Systems, Inc.'s BE Careers Network, on how Bentley is introducing India's youth to the engineering profession with the Future Cities India 2020 program.

What is the Future Cities India 2020 program?

Future Cities India 2020 was inspired by the U.S.-based National Engineers Week Future City Competition. That program, which is in its 16th year, reaches more than 30,000 students annually. Bentley sponsors the Future City Competition National Finals and also chairs its Leadership Council.

In October 2005, our CEO, Greg Bentley, met with Union Minister for Science and Technology Kapil Sibal to discuss replicating such a program in India. Mr. Sibal was very excited about the possibilities and gave us the vision and support to move forward. As a result, we have been able to complete two successful Future Cities India 2020 competitions.

How relevant is the program for India?

The infrastructure demands on cities in India are staggering, and few world examples exist to show us how to meet them. India's urban population is expected to increase from 25 percent of the country's population today to 40 percent in the next 10 to 15 years. How that increase will affect the infrastructure should be on the minds of everyone in India each and every day – as well as on the minds of people around the globe, given the global nature of today's economies. Morning and afternoon commutes, the water supply, electricity, air quality -- these are all fundamental to quality of life in urban societies and major increases in population will have a significant impact on each of them.

Compounding the challenge of the demand for more and better performing infrastructure is the shortfall in the number of new infrastructure engineers, architects and planners who will be needed to design, build and operate this infrastructure in the future. We believe it is essential to encourage the next generation to get involved and understand the career opportunities that the infrastructure professions present. It is important that high school and college students apply their energy, creativity, and imagination to such a critical area – one that will impact their future and affect their quality of life. Having a forum for students to use their creative energy and solve infrastructure design challenges, we believe, is a good idea and very relevant in the context of India.

What has been your experience with this program in India?

We launched the pilot phase of the program in 2006-07 in Delhi as a design competition for high school students. The infrastructure designs were developed in response to real-world problems and were completed using advanced CAD software donated by Bentley to the academic institutions enrolled in the program. In the first pilot phase, 15 teams from eight high schools competed. Teachers and infrastructure professionals mentored the teams on the project, which called for designing a roadway capable of accommodating

the increased traffic expected during the 2010 Commonwealth Games.

In the 2007-08 edition of the competition, 14 teams out of 10 high schools representing Delhi and the National Capital Region competed. The challenge was to develop conceptual solutions for the redevelopment of the temporary structures in the Commonwealth Games Authority for the International Athletes' "Site Development of Proposed Commonwealth Games Village, Delhi After 2010" plan.

How beneficial is this program to the larger context of infrastructure development?

New and renovated infrastructure is a prime catalyst for economic development, which in turn improves the quality of life and raises the standard of living. Unfortunately, a shortage of engineering professionals in all disciplines makes improving infrastructure more challenging, and this is true not just for India, but globally as well. Given that becoming a productive infrastructure practitioner takes many years of training, there is no quick fix for increasing the number of engineers and architects.

Future Cities India 2020 is the catalyst we can use to inspire young minds to consider the profession. Of course, not all of the participants in our program enter the engineering ranks, but some will, and they will help India and the world will be better prepared to meet the growing demand for new and improved infrastructure.

Another factor is that a large proportion of the engineering work force is approaching retirement, which means we must do something now to fill the ranks. Future Cities India 2020 is only one solution. Bentley is also working with academia to attract young people to infrastructure disciplines.

We have expressed to our young participants that one day they can change the world, increase their earning capacity, and gain tremendous respect as infrastructure professionals. We are working with academic institutions to update their educational curricula with the latest infrastructure engineering technology; and provide them with the tools and training that will give graduates job-ready skills they can immediately put to good use when they are hired.

Bentley is also addressing this shortage by using its BE Careers Network to train young infrastructure engineers. Its mission is to help students graduate with market-ready technology skills.

Can you describe the goal of BE Careers Network and your goal in working with students?

BE Careers Network has a world-wide focus with Bentley personnel promoting a complete program that includes more than 50 software titles, training, competitions, and much more at the high school and university level in over 40 countries. Through our network, we are able to share best practices globally and help students, academic institutions, and the infrastructure professions. For me it is an opportunity to pay back society by helping students develop in the engineering fields that are most in need of new recruits to their disciplines.

GIS for lymphatic filariasis morbidity management and control

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THE disability problem due to Lmphatic Filariasis (LF) disease has been reported in 80 countries Ottesan EA (2000). Globally, the 1.1 billion people are exposed to risk of LF and the estimated LF affected population is 120 million Ottesan EA (2000), Michael E et al. (1996). Our recent estimation showed that there are 21 million diseased individuals in India alone Sabesan S et al. (2000) contributing approximately 40 per cent of global burden. A progressive lymphadema with increasing episodic attack adenolymphngistis (ADL) is the most important cause of physical suffering, permanent disability Pani SP and Lall R (1998) and the economic loss of the affected individuals and the community Ramaiah KD et al. (1998, 1999, 2000). Apart from these LF is also responsible for social problems including sexual disability and discomfort of marital life Dreyer G et al (1997).

The disease "Lymphatic Filariasis" mainly affect the lymphatic system of a man and it manifest itself in the form of lymphangistis, filarial fever, funiculitis, epididymo-orchitis during acute stages and the chronic phase includes elephantiasis, hydrocele and chronic oedema Pani SP and Lall R (1998). Though the mortality due to filariasis is negligible, regular treatment and management of limb swelling from becoming worse is high degree of attention in view of its disability and disease burden during the entire lifetime of the individual and the community Pani SP and Lall R (1998), Ramaiah KD et al. (1998) and Dreyer G et al (1997).

Lymphatic filariasis is recognized as one of the potential eradicable diseases CDC (1993). The Global Alliance for Elimination of Lymphatic Filariasis (GAELF) has recommended that the transmission control and morbidity management are two important pillars in the global elimination strategy for Lymphatic Filariasis (LF) Das PK. and Pani SP (2000). For transmission control, annual single dose mass administration of anti-parasitic drugs Das PK. and Pani SP (2000) is being implemented in several countries including India.

The study aimed to provide aids and guidance or a manual massage to disease-affected community through self-help groups (SHG) for filariasis morbidity management and control by self-help measures Dreyer G et al (2000), which is recognized as need, based current strategy in the Global Elimination of Lymphatic Filariasis Programme.

Materials and Methods

Study Site

The study site, Pondicherry is the capital of Pondicherry Union Territory, which is located in the East coast of South India about 160 Km south of Chennai (formerly Madras), it geographically extends between 11o 53' 45" N and 11o 58' 55" N, 79o 46' 15" E and 79o 50' 50" E. It has the geographical area measured to 48.06 Sq. Km. Monsoon is experienced from October to December in every year. Total urban population is 516,985, (Males 260,482 and Females 256,503) and the total number of households is 101,481 (Census of India 2001).

Study Design

The study was designed for the selection of appropriate service locations for morbidity management for filariasis disease, mainly considering the patients convenience, using GIS decision support tool. It provides to capture the filariasis disease data in electronic mode and attach the same to the digital map of the study area for the spatial analysis on GIS Platform. The study was carried in three stages. In the initial stage, field data was collected through reconnaissance survey, which was conducted in every doorstep in every street of the study site. In the second stage, a geo-database was created and which was linked to the GIS spatial database engine for depicting the attributes on the digital map of the study site for preparation of distribution map and further spatial analysis. Finally, to develop a decision support tool, spatial analysis was carried out for determining the appropriate locations and allocating optimum patients to each self-help morbidity management centre considering distance and other basic facilities (i.e. roads, transports, electricity, water, accommodations, and SHG).

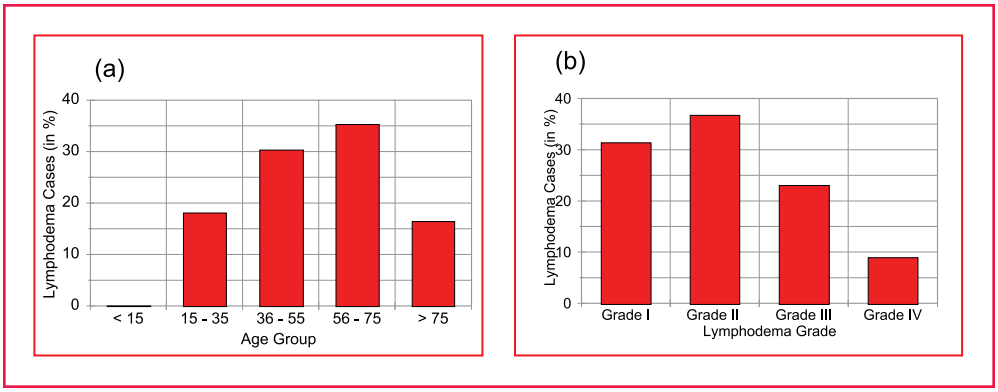

Figure 1. (a) The occurrence of lymphodema cases in different age group, and (b) lymphodema cases with different grade in Pondicherry Urban.

The data is pooled into a single GIS platform to achieve the objectives. Mapping the existing health facilities and identifying the new locations for opening self-help health centres in the center of every disease cluster (community) with minimum distance coverage for local treatment, was consider as main factor for the decision support tool. This was based on the understanding of people's intricacy for traveling long distance i.e. more than half a kilo metre for local treatment and the huge expenditure for periodical traveling for morbidity management are the background key factors of the spatial ring buffering analysis, and thus, the study was framed with a hypothesis that no lymphodema patient would prefer to travel beyond 1 Km distance for seeking treatment.

The self-help Health Service Centres

The self-help groups included voluntary organizations, youth club, NGOs, youth welfare association and community movements. The distance of each distance ring buffer was measured from the center of each disease clusters to the peripherals of each lymphodema case household location. Based on the distance and other basic facilities and in the patient's convenience, the existing PHC, GH in and around the study areas are plotted for optimum allocation of the patients to the existing facilities and identified appropriate new locations for opening Self Help health Centres.

Results and Discussions

Totally, 482 cases (both males and females) were identified and these were recorded properly, using GARMIN GPS 12XL. The preliminary analysis shows that < 15 years we have no record on lymphodema case, working adult age group 15 to 35 years is potentially having problem of 18 per cent, and steadily increased 30.3 per cent in the 35 to 55 years age group (working middle age group), in the later age group of > 55 to 75 years having record of 35.3 per cent (170 cases), and finally, 16.4 per cent (79 cases) were recorded in the age group of < 75 years. It shows that the potential working age group is affected severely. In the over all view, grade II is highest record of 36.7 per cent and followed by grade-I 31.2 per cent, grade III 23.2 percent and grade IV 8.9 per cent are recorded. Disease time duration of having lymphodema problem is assessed by questionnaire method. Based on this questionnaire, 228 (47%) cases were identified with disease for the

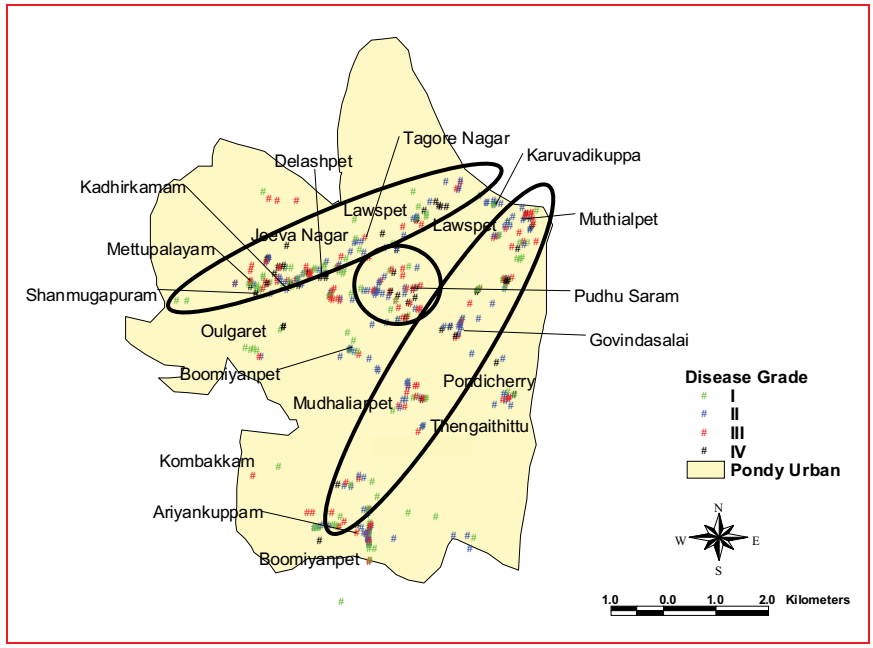

Figure2. Study area of Pondicherry Urban showing the filariasis lymphodema disease with different grades

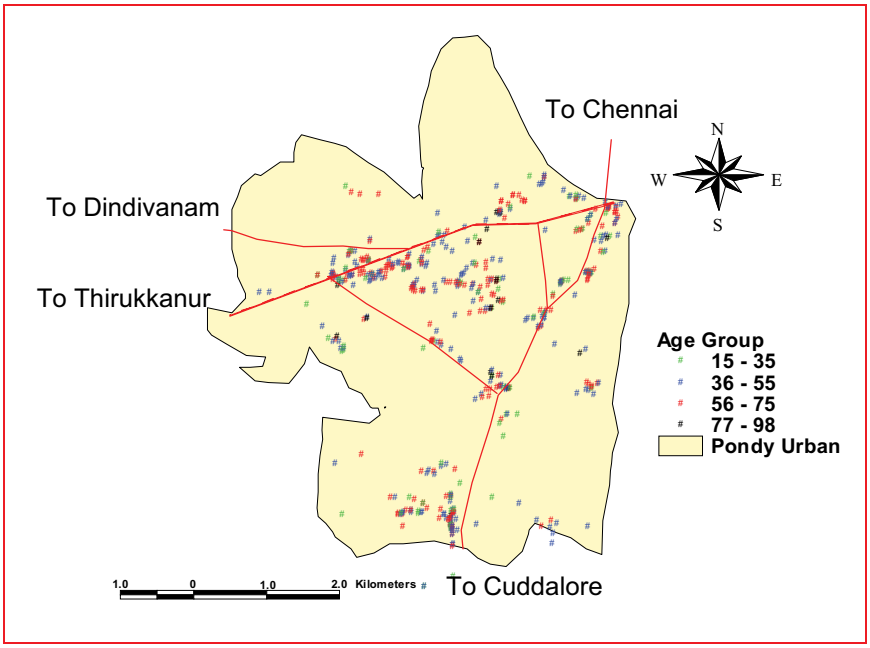

Figure 3. Filariasis lymphodema Cases classified in to different age group (based on spatial cluster analysis), major roads (line showing red colour) are overlaid on the urban map

past 1 year, 108 (22%) cases were assessed having problem of disease for 1-10 years, 73 (15.1%) cases were recorded with disease problem for 10-20 years, 20 (4.1%) cases were having disease problem for the period of 20 to 30 years and finally, the disease cases recorded to 53 (10.9%) with more than 30 years (Fig.1a and 1b).

The Digital map of Pondicherry urban was prepared Map Info 4.5 GIS platform. The digital data was captured in to GIS platform for plotting the locations of the disease cases. These disease cases were further classified with filariasis lymphodema grade wise and age wise distribution (fig2. and fig.3).

The function of spatial analysis shows that the accomplishing the disease density, which gives an average of 1.89 km in all direction. It has the ribbon like spatial pattern of disease distribution mainly due to the major settlements are developed along the both side of roads are fueled to atypical spatial pattern of disease distribution.

Selection of self-help Health Service centres

Spatial ring buffering, spatial clustering, and nearest neighbourhood analysis was performed for easy understanding of spatial pattern and disease clustering. The distributions of the disease cases are found two major linear patterns and one ring cluster (fig.2). Though the lymphodema cases proportionally high in the 56 -75 years of age group and the presents of lymphodema grade II cases is high in percentage it has found in all over the human settlements (fig.3). The list of existing PHC/ GH is depicted on the Pondicherry urban boundary map. The different distance rule of 0.2KM, 0.3KM, 0.4KM 0.5 KM, 0.6, 0.7 KM, 0.8 and 0.9 KM were created over the disease distribution map, using spatial ring buffering technique at GIS platform. The minimum, maximum and the mean distances of each disease cluster are calculated against to each distance rule/ ring buffering. Since, the K-mean patients density 1.89 Km, the spatial ring buffering performance started from 0.2KM, and it is increased by 0.1KM and which is extended up to 1KM.

Number of existing centers and the required centers against each distance rule (0.2KM, 0.3KM, 0.4KM, 0.5KM, 0.6KM, 0.7Km, 0.8KM, 0.9Km & 1.0KM) were calculated and tabulated for the optimum coverage of the patients with in the specified distance coverage. Ring buffering of 0.2KM, 0.3Km and 0.4Km are overlaid on lymphodema distribution map and derived the output of 0.4 Km ring buffer (Fig.4). The results of 0.5Km and 0.6Km ring buffers are giving the same results of 0.4Km distance ring buffer, therefore, next analysis, the distance of 0.7Km, 0.8Km, and 0.9Km ring buffers are overlaid on lymphodema cases and obtained 0.7Km as the output of second analysis (Fig.5).

Required number of SHGC with different distant rule for optimum allocation of patients to each SHGC for filariasis morbidity management:

Sl.No.	Distance (in Km)	Required SHG Centres (Existing*-New)	Total Patients covered / Centre	Mean Distance Travel by Individual	Minimum Distance Travel by Individual	Maximum Distance Travel by Individual
1	0.2	47	9	0.097	0.07	0.25
2	0.3	47	9	0.126	0.07	0.27
3	0.4	16	19	0.189	0.07	0.44
4	0.5	11	30	0.189	0.07	0.54
5	0.6	8	30	0.189	0.07	0.63
6	0.7	5	32	0.250	0.07	0.72
7	0.8	5	32	0.250	0.07	0.72
8	0.9	5	32	0.270	0.07	0.72
*Existing PHC is 10 including 1 GH						

Conclusion

The distributions of the disease cases are found to be linear pattern of spatial distribution associated with major roads system. The lymphodema cases proportionally high in the 56 -75 years of age group and the presents of lymphodema grade II and lymphodema grade III cases are high in percentage. The study gives result that with 0.7 KM ring buffering distance is having optimum service coverage. The present study hypothesis is that the aged patients could travel less than 1KM distance from their residence to the health centres

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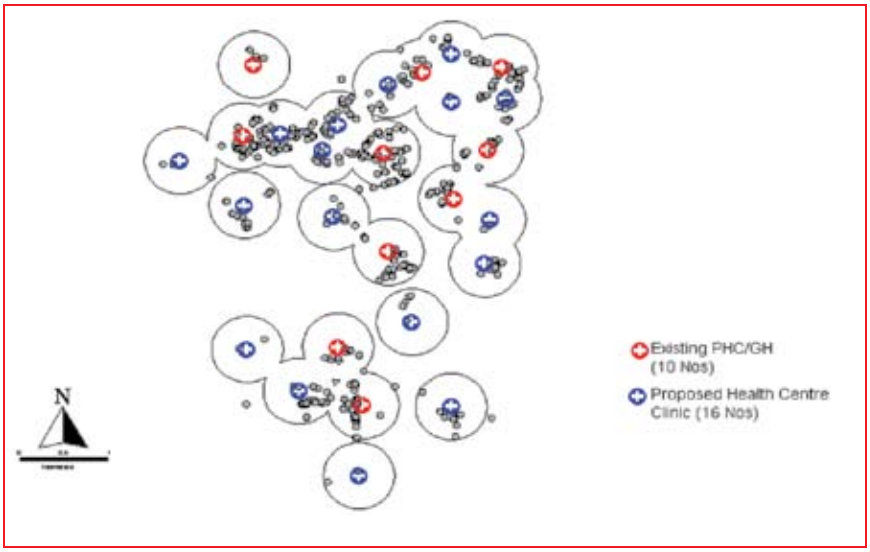

Figure 4. Optimum allocation of patients to the existing health centres and the proposed new location for opening SHG health centres: rule fixed 0.4 Km ring buffer only

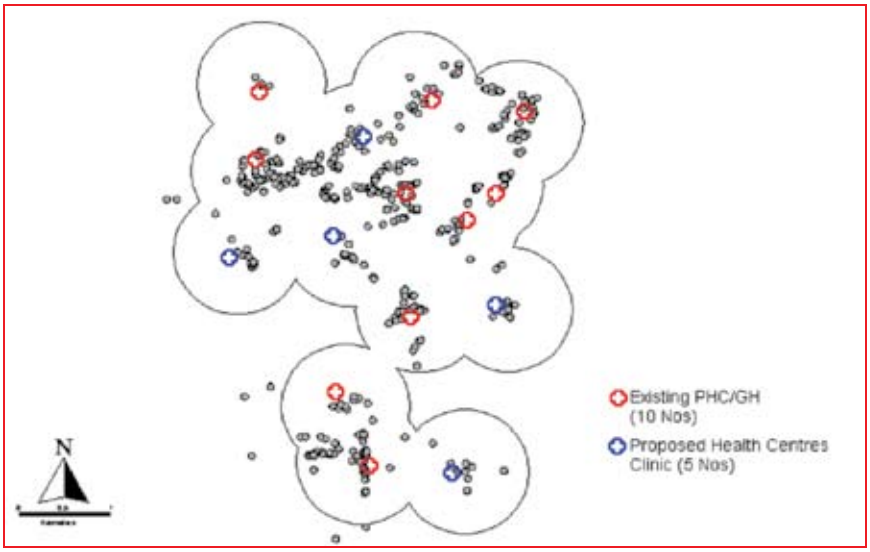

Figure 5 Optimum allocations of patients to the existing health centres and the proposed new location for opening SHG health centres: rule fixed by 0.7Km, ring buffer only

for morbidity management is care fully examined. The study area required 15 centres with 0.7KM distance ring buffer or coverage area, out of 15, 10 centres are already existed, and 5 more new centres only required covering all the patients. We suggest that opening self-help health service centres with coverage of less than 1-kilometer distance in urban like Pondicherry is ideal.

Acknowledgement

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Industrial GNSS market to Hit $240B by 2013

According to ABI Research, industrial applications such as network timing, land surveying, and machine control are quickly gaining momentum. It forecasts that by 2013 GNSS end-user devices and systems will generate yearly revenues of $240 billion. However, innovative workaround solutions based on the post-processing of the GPS signal are being developed, as is the use of assisted-GPS technology to provide location and satellite data to connected devices for faster fixes and better coverage *www.abiresearch.com*

BAE unveils anti-jamming GPS receiver technology

BAE Systems has developed a satellite navigation receiver system that provides uninterrupted GPS signal reception for air, land, and sea platforms and applications. The company developed the system in response to the emerging threat of disruption to operations of GPS navigation systems. *www.baesystems.com*

GPS to guide tourists along the Berlin Wall

The Berlin Senate authorities have now licensed an official GPS-enabled guide – MauerGuide or Wall Guide - as part of their integrated Berlin Wall information campaign. Based on a GPS-enabled PDA from ASUS, the WallGuide takes the users along the traces of the Berlin Wall to the five key locations in the Wall's history at Checkpoint Charlie, Brandenburg Gate, the Eastside Gallery, the Topography of Terror, and the Berlin Wall Memorial in Bernauer Strasse. *www.gpsbusinessnews.com*

Chamundeshwari Electricity Supply selects new grid information System

CESCL in Mysore, India has selected Cascade AS, Norway and their Indian subsidiary Reli-e-Marg's OpenNIS as their new grid information system. It is a Field Management system and a portable GIS package running on a ruggedized tablet PC. It is used to collect geographical information related to electricity distribution assets in the field, take positions of electricity poles, substations and underground cables. OmniSTAR was selected by the company as the supplier of the positioning component of their solution. The OmniSTAR DGPS units will be used to trace the actual path of underground cables.

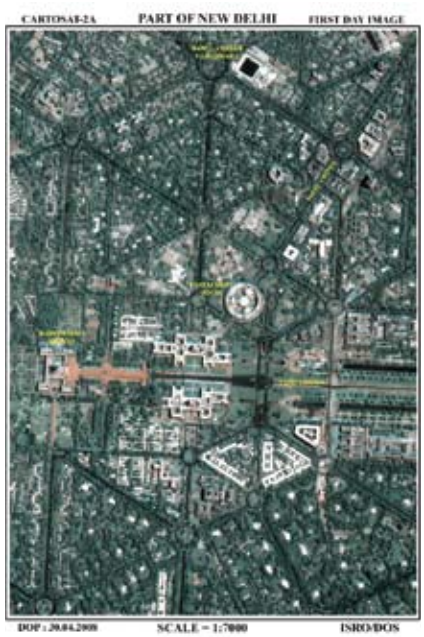
New generation EGNOS RIMS receivers

The European Space Agency has awarded a contract for the development of a 'New Generation' RIMS receiver breadboard to IFEN GmbH. The breadboard development is related to the activities of the definition and development of a Multi-Regional System in the frame of the GNSS Evolution Programme as logical extension of the current regional EGNOS capabilities. *www.ifen.com*

India's leap into space

Another feather in the cap

ON April 28, 2008, ISRO's Polar Satellite Launch Vehicle, PSLV-C9, successfully launched the 690 kg Indian remote sensing satellite CARTOSAT-2A, the 83 kg Indian Mini Satellite (IMS-1) and eight nanosatellites for international customers into a 637 km polar Sun Synchronous Orbit (SSO). PSLV-C9 in its 'core alone' configuration launched ten satellites with a total weight of about 820 kg.



CARTOSAT-2A

CARTOSAT-2A is a state-of-the art remote sensing satellite with a spatial resolution of about one metre and swath of 9.6 km. The satellite carries a panchromatic camera (PAN) capable of taking black-and-white pictures in the visible region of electromagnetic spectrum. The highly agile CARTOSAT-2A is steerable along as well as across the direction of its movement to facilitate imaging of any area more frequently. Soon after separation from PSLV fourth stage, the two solar panels of CARTOSAT-2A were automatically deployed. The satellite's health is continuously monitored from the Spacecraft Control Centre at Bangalore with the help of ISTRAC network of stations at Bangalore, Lucknow, Mauritius, Bearslake in Russia, Biak in Indonesia and Svalbard in Norway. High-resolution data from CARTOSAT-2A will be invaluable in urban and rural development applications calling for large scale mapping.

Indian Mini Satellite (IMS -1)

Indian Mini Satellite is developed by ISRO for remote sensing applications. It incorporates many new technologies and has miniaturised subsystems. It carries two remote sensing payloads - A Multi-spectral camera (Mx Payload) and a Hyper-spectral camera (HySI Payload), operating in the visible and near infrared regions of the electromagnetic spectrum. The spatial resolution of Mx camera is 37 metre with a swath of 151 km while that of HySI is about 506 metre with a swath of about 130 km. The data from this mission will be made available to interested space agencies and student community from developing countries to provide necessary impetus to capacity building in using satellite data. The versatile IMS-1 has been specifically developed to carry different payloads in future without significant changes in it and has a design life time of two years.

Nano Satellites for International Customers

Eight Nanosatellites from abroad are carried as auxiliary payloads besides IMS-1 as well as CARTOSAT-2A. The total weight of these Nanosatellite payloads is about 50 Kg. Six of the eight Nanosatellites are clustered together with the collective name NLS-4. The other two nanosatellites are NLS-5 AND RUBIN-8. NLS-4, developed by University of Toronto, Canada consists of six nano-satellites developed by various universities. Two of them - CUTE 1.7 and SEEDS - are built in Japan, while the other four - CAN-X2, AAUSAT-II, COMPASS-1 and DELPHI-C3 are built in Canada, Denmark, Germany and the Netherlands respectively. The 8 nanosatellite are built to develop nano technologies for use in satellites as well as for the development of technologies for satellite applications.

On April 29, 2008, the Multispectral camera onboard IMS-1 was switched on and high quality imagery covering Allahabad to Rameswaram was obtained.

On April 30, 2008, the Hyper Spectral Imaging (HySI) camera onboard IMS-1 and panchromatic (PAN) camera onboard CARTOSAT-2A were switched on. Imagery from HySI camera covered Uttarakhand to Karnataka passing through Delhi and Bhopal. PAN camera covered strips of land from Saharanpur to Nuh (South of Delhi) and Sangli to Goa Coast. Data was received at National Remote Sensing Agency (NRSA), Shadnagar, Hyderabad. Quality of the imagery received is excellent. *www.isro.gov.in*

Prime Minister congratulates Team ISRO

High quality imageries acquired immediately after the launch of Cartosat-2A and Indian Mini Satellite-1 (IMS-1) were presented to the Prime Minister, Dr. Manmohan Singh at Delhi by Dr. G. Madhavan Nair, Chairman, ISRO along with a team of senior scientis

The Prime Minister was highly appreciative of the success of the PSLV-C9 mission which placed 10 satellites into orbit. He congratulated the entire team for the magnificent performance. The Prime Minister was also briefed about ISRO's missions of the immediate future like Chandrayaan-1 and new initiatives related to the Manned Spaceflight Programme. The Prime Minister wished ISRO team success in all its future endeavours.

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Spirent delivers 3 carrier solution, launches GSS8000

The architecture of Spirent's systems is designed to support coherent simulation of multiple GNSS signals together. The SimGEN for Windows® software enables control and flexibility over multiple satellite constellations as well as interference sources and augmentation systems such as EGNOS and WAAS. It operates in real time to generate simulated RF signals across all GNSS and interference signals. Spirent Communications has also recently launched new Spirent GSS8000 simulation system, a signal generator unit for GPS, Galileo and GLONASS testing. It tests advanced satellite navigation technologies and offers enhanced capability, increased flexibility and improved signal fidelity.This new solution supports processing rates as low as 4 ms with pseudorange accuracy at 1 mm for many scenarios. Its new design allows for a wide variety of configurations from GPS L1 right up to comprehensive multi-RF output and/or multi-constellation test systems. *www.spirent.com*

Blue Marble's support to INSPIRE

Blue Marble Geographics announces new support for the Infrastructure for Spatial Information in Europe (INSPIRE) parameters, including the Ordnance Survey Ireland (OSi) Irish Grid polynomial datum transformation definition. The Irish Grid joins hundreds of unit, ellipsoid, datum transformation, and coordinate system definitions, including many from standard government, corporate, and EPSG/POSC databases, all available in the Geographic Calculator by Blue Marble. *www.bluemarblegeo.com*

Leica Geosystems Geospatial Imaging becomes Erdas

Leica Geosystems Geospatial Imaging has changed its name to Erdas Inc. Erdas will sell a range of software designed to provide an end-to-end solution for extracting maximum value from Earth imagery. The name change does not affect Leica Geosystems, which will continue to sell surveying hardware, total stations, other devices, and the software associated with such devices.

NPR-302 series

Nikon-Trimble Co., Ltd. has introduced the NPR-302 Series of Nikon® Total Stations—high precision, long-range reflectorless mechanical total stations with laser pointers suitable for a variety of surveying applications.

Trimble GCS900 Grade control system, VRS Now™ service

Trimble has introduced its Trimble® GCS900 Grade Control System version 10.8, which provides automatic blade control, configurable earthworks progress monitoring and blade guidance software on the machine. It allows earthworks operators to visualize, construct and balance road surfaces more accurately and faster, in higher gears.

Trimble has also launched Trimble® VRS Now™ Service in Madrid, Spain. It will provide surveyors, civil engineers and geospatial professionals in the area with instant access to real-time kinematic (RTK) GNSS corrections without the need for a base station. *www.trimble.com*.

Eclipse Developer Kit by Hemisphere GPS

Hemisphere GPS has released an OEM development kit for its Eclipse dual-frequency GPS receiver technology. It allow product designers and system integrators to more easily access and test all of the available features on an Eclipse board, simplifying the effort needed to reach a proof of concept and shortening the time required bringing a product to market. *www.insidegnss.com*

EADS Astrium to buy Surrey Satellite Technology

EADS Astrium has agreed to acquire U.K-based University of Surrey spinoff company Surrey Satellite Technology Ltd. (SSTL), maker of Galileo's first satellite, GIOVE-A. The deal provides the financial and industrial resources required for SSTL's expansion and future development. The university will maintain a close tie with SSTL, retaining a small stake in the company as well.

PCI Geomatics announces the release of ProLines

PCI Geomatics has announced the release of ProLines. These highly automated image processing chains are used to correct, mosaic, and enhance imagery, as well as extract elevation data derived from satellite and airborne sensors. ProLines are designed for production environments and can process large amounts of image data in an unassisted fashion. *www.pcigeomatics.com*

GRASS GIS releases version 6.3.0

GRASS 6.3.0 is a "technology preview" release, the first beta on the path to GRASS 6.4-stable, and also marks the start of work on GRASS 7. As such GRASS 6.3.0 is not intended to be a stable release with ongoing support, but after five months of quality-assurance review users can be confident to use this version for their day to day work, indeed due to the open development model many already do.*http://grass.osgeo.org*

DigitalGlobe joins Autodesk to provide world imagery

DigitalGlobe has joined Autodesk's data initiative. Its participation in the initiative will give Autodesk customers access to world imagery solutions. Autodesk's new data initiative portal offers customers access to DigitalGlobe's online library of world imagery directly with AutoCAD Map 3D® software. *http://media.digitalglobe.com/*

Bentley to help sustain bridge infrastructure

Bentley Systems has taken an initiative to deliver Bridge Information Modeling (BrIM) technology for the entire bridge lifecycle. BrIM, will drive the initiative under the leadership of Bentley Senior VP, Gabe Norona. It will provide broad access to newly acquired advanced bridge

products in Bentley's comprehensive software portfolio. It will also integrate these and other related Bentley products to provide an interoperable, data-managed bridge solution for planning, design, engineering, analysis, fabrication, construction, maintenance, and rehabilitation. *www.bentley.com*

Leica IPAS20 – New compact airborne direct georeferencing system

The new Leica IPAS20 modular standalone system delivers direct georeferencing for a wide range of airborne sensors such as imaging, LIDAR, synthetic aperture radar, thermal and multispectral systems. It is equipped with the latest GPS/GLONASS technology and a plug and play IMU interface. Leica Geosystems provides a complete airborne workflow that includes software.

MobileMapper® CX with DigiTerra® Explore by Magellan

DigiTerra Explorer mobile GIS and field mapping software is available pre-installed on an SD card with the Magellan MobileMapper CX handheld GPS/GIS receiver. It promises exceptional productivity at low-cost for field mapping and data collection applications and gaining attention as a fast and easy-to-use GIS application package for visualizing, analyzing, editing and collecting digital topographical and descriptive data in the field.

Carlson Software to Give Users CAD Platform Choice

Carlson Software Inc., recently released Carlson series; Civil 2009, Survey 2009, Hydrology 2009, Mining 2009, Takeoff 2009 and GIS 2009. In addition to this new choice of CAD engines, the 2009 Carlson software line-up features 100s of improvements in functionality. Additional new feature highlights include the ability to view an aerial image draped onto a surface in both the Carlson 3D Viewer and Surface 3D Flyover.

New Managing Director of Vexcel Imaging GmbH

Mr. Alexander Wiechert has taken over as Managing Director of Vexcel Imaging GmbH, Graz, effective. He replaces the Vexcel founder and Vexcel Imaging CEO, Franz Leberl, who recently retired.

ERDAS Announces Sun Solaris Support for Image Web Server 8.5

ERDAS Image Web Server 8.5 shall support the Sun Solaris (x86) operating system. IWS is a high-speed, specialized server application that efficiently distributes large volumes of geospatial image data. Sun Solaris delivers a high level of performance, stability and security. It spans the entire enterprise: the Web tier, the data warehouse and the most demanding technical software applications.

POSPac Air 5.0 now available to all Optech airborne survey clients

Optech Incorporated, shall offer its airborne survey clients the latest developments in inertial navigation solutions. POSPac Air 5.0 by Applanix represents a huge leap in maximizing data collection efficiencies when using Optech's ALTMs and ultimately increases return on investment.

From the desk of Novatel

NovAtel Inc. has released EuroPak-15ab receiver. It tracks the Galileo E1/L1, E5a, and E5b signals from the GIOVE-A and GIOVE-B test satellites. It also tracks GPS and SBAS L1 and L5 signals, and is ideal for monitoring the new L1/L5 wide area system GEO signals.

NovAtel Waypoint Products Group™ has also released Inertial Explorer Version 8.10 software used for GNSS/INS post-processing.

As part of the integration of Antcom products into the NovAtel offering, it is changing the names of our Special-Purpose antennas, and discontinuing our non-RoHS-compliant L1 antennas.

NovAtel Inc. recently launched its GL1DE technology for agricultural applications; it combines L1 code and L1 phase data for consistent positional output. It is designed for agricultural applications in which pass-to-pass repeatability is critical. Users of GL1DE will experience a smooth, consistent position appropriate for both lightbar and autosteer systems; position jumps are virtually eliminated.

ESRI Vietnam Opens

ESRI in association with ESRI Thailand has opened ESRI Viet-nam. The company hopes to expand the education market in the country and plans to increase GIS training through joint initiatives with local schools and universities

Chronos launches portable GPS reradiator solution

Chronos Technology, has launched a portable GPS Reradiator solution for military applications. The L1/L2 GPS Reradiator is designed for rapid deployment in a variety of military environments such as aircraft and helicopters (up to 70,000ft), hangars, bunkers, armoured fighting vehicles, field deployable solutions etc. . www.pr-inside.com

Rockwell Collins delivers 40,000th GPS engine to the US army

Rockwell Collins has delivered 200,000 Defense Advanced Global Positioning System Receivers (DAGR) for use by US and international warfighters, and has reached the 40,000 unit sales milestone for its GPS engine for the US Army's Ground Based GPS Receiver Application Module (GB-GRAM) program. *www.rockwellcollins.com*

Raytheon wins $61 million contract for GPS Receivers

Raytheon Company has won a $61 million U.S. Air Force contract to complete the development and certification of next-generation GPS receivers. *http://money.cnn.com*

HTC launches the P3470 in India

HTC Corporation has launched HTC P3470™ in India. Combining a lightweight design, large screen, navigation wheel, and macro lens, this smartphone is coupled with GPS-based devices and offers the best sat-nav solution for PDA or mobile phone. *http://sifybroadband.techwhack.com*

Altek announces GPS digital camera

Altek, a Taiwan-based digital camera maker, unveiled a digital camera with built-in GPS function. With an 8-megapixel resolution and a 3-inch touch screen, the camera can automatically record the longitude and latitude of where a picture is taken. www.digitimes.com

More than 100 million users of mobile LBS in Europe by 2012

According to Berg Insight, more than 100 million mobile subscribers in Europe will use LBS by 2012. Mapping, navigation and search are believed to become the top applications, followed by social networking and tracking. *johan.fagerberg@berginsight.com*

Mobile LBS revenue to reach $13.3 b worldwide by 2013

After years of hype, mobile LBS are finally gaining traction among wireless subscribers. It is driven on the supply side by WCDMA and GSM handsets incorporating GPS capabilities; and also increasing consumer interest in personal navigation functionality. According to ABI Research, LBS revenue is forecast to reach an annual global total of $13.3 billion by 2013, up from an estimated $515 million during 2007. *www.reuters.com*

PND prices in China dropping

According to Global Sources, 61% of mainland China and Taiwan portable GPS manufacturers expect to reduce export quotes in 2008, due fierce price competition.79 percent, expect to decrease their export quotes by as much as 10 %. Despite the price decrease, 77 %of the manufacturers plan to increase production capacity to capitalize on the growing global demand. *www2.theiet.org*

OnStar ranked top consumer telematics vendor

OnStar has been ranked at the top of the latest Consumer Telematics Vendor Matrix released by ABI Research. BMW and Nissan claimed the second and third spots in this ranking. The Vendor Matrix is an analytical tool developed by ABI Research to provide a clear understanding of vendors' positions in specific markets. *www.gpsbusinessnews.com*

Honda partners with Japanese police for location-based crime info

Honda Motor Co. and Japanese police has launched a new service for its Internavi navigation system that displays vehicle-related statistics for the destination zone of the travel. It shows "information on crimes such as car thefts and break-ins, and flags high-risk areas near the driver's destination, throwing in audio and visual cues. *www.gpsbusinessnews.com*

Sigmatel announces processor solution dedicated to PNDs

SigmaTel, Inc., has released complete processor solution for the portable navigation GPS market, enabling lower system costs for PNDs. It has also integrated analog audio codec and the power management functions. *www.gpsbusinessnews.com*

Navteq offerings for BTC

NAVTEQ is working with the Broadcaster Traffic Consortium, LLC providing real-time traffic and other location-based information for PNDs and automobile in-dash systems via HD Radio technology. The technology allows NAVTEQ and the BTC to deliver high-quality, up-to-the-minute information including traffic flow and points of interest to consumers.

Symbian SQL and new LBS architecture accelerate path to mobile convergence

Symbian Limited, has announced Symbian SQL and an advanced LBS architecture – two new technologies that herald the next generation of mobile computing. It will include advanced desktop and positioning technologies in its portfolio. Both the technologies will help developing handsets that handle very large amounts of data, and which provide users with relevant information based on their current location, in tune with consumer demand. www.allaboutsymbian.com/news

AT&T Launches GPS-Enabled BlackBerry Pearl 8110

AT&T launched the BlackBerry Pearl 8110 with built-in GPS capabilities GPS support allows AT&T Navigator to provide users turn-by-turn voice and on-screen

directions with moving 3D maps. It also alerts users through voice and on-screen prompts to traffic slowdowns and host of other options. www.smartphonetoday.com

Sony Ericsson unveils HSDPA phones

Sony Ericsson released twonew HSDPA phones - the clamshell style Z780 and the bar style G502. The Z780 is a tri-band 3G, UMTS/HSDPA 850/1900/2100 and GSM/GPRS/EDGE 850/900/1800/1900 phone while the G502 is UMTS/HSDPA 2100 and GSM/GPRS/EDGE 900/1800/1900. Both phones come with Google Maps for Mobile. www.unwir3d.com

Real-Time asset location tracking for Boeing , USA

RFID Global Solution, Inc. is currently implementing an RFID-enabled asset tracking system for The Boeing Company at the Kennedy Space Center in Florida. It uses GlobalView ™ real-time location tracking software to monitor the whereabouts of both critical assets and components across pre-defined areas of the space center. www.rfidgs.com

Researchers crack iPhone's Wi-Fi positioning system

Researchers from the ETH Zurich breached the iPhone's/iPod's Wi-Fi positioning system and found that the technology is vulnerable to location spoofing. The lack of a GPS module in the first generation iPhone was a surprise to some, given the fact that the device comes with a fantastic Google Maps integration. Apple was able to almost fix this problem by rolling out support for Skyhook's WiFi Positioning System with a software update, but if you ever had doubts that this alternative positioning system is not as reliable as GPS, your doubts are now confirmed. *www.tgdaily.com*

Garmin® provides navigator for Samsung mobile phones

Now Samsung mobile phones will have Garmin's turn-by-turn, voice-prompted navigation. It is based on Garmin Mobile™ XT navigation software, and are expected to be available in Europe and other parts of the world in several months www8.garmin.com

Nokia unveils new phones

Nokia, has recently unveiled Nokia 6600 Fold, Nokia 6600 Slide and Nokia 3600 Slide – Along with other high end features the 6600 slide is also integrated with Nokia Maps and optional Bluetooth GPS module. http://infotech.indiatimes.com

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Satellite-based information system to bolster maritime security along the India coast

India is setting up a satellite-based information system to identify and track ships, bolstering maritime security along the country's coast and leading to faster search and rescue of distressed vessels. This will bring India in line with latest guidelines of the Safety of Life at Sea (Solas) convention administered by global regulator International Maritime Organization (IMO).

India, a signatory to Solas, expects the tracking system—long-range identification and tracking of ships, or LITS—to be in place by the first week of November. Antrix Corp., the commercial arm of the country's space agency Indian Space Research Organisation, is implementing the system for the directorate general of shipping. LITS would be integrated with future land-based vessel-tracking systems, including that of the Coast Guard and the Navy. The system would come up in Mumbai with a remote data centre for disaster recovery in New Delhi. It would track more than 6,000 ships, including passenger vessels and high-speed craft on international voyages using the mobile network of Inmarsat, the global mobile satellite communications firm.

Geospatial data to go online with Brunei Spatial Data Infrastructure launch

BSDI is the technology, standards, access system and protocols necessary to harmonise all of the Sultanate's geospatial databases and make them available on the internet. It is facilitated by the Ministry of Development and led by the Department of Survey in partnership with the Land and Town and Country Planning. BSDI will publish base layers of geographic data such as elevations, transportation systems and water bodies that provide context and reference information for Brunei Darussalam. www.brunei-online.com

India's first digital environmental atlas

India's first Digital Environmental interactive Atlas is just a click away. It is a compilation of categorised thematic maps on green (forest, biodiversity), blue (water resources) and brown (air pollution) environmental issues and provides flexibility and versatility for users to visualise environment spatial data using simple GIS functionalities. All the maps presented and displayed in the Atlas are in Pressure – State – Impact – Response framework. The Atlas will be a source for accurate, timely and accessible information on the state of environment. pib.nic.in

"Prevention is better than cure" – Predicting dengue hotspots in Malaysia

Malaysian Remote Sensing Agency shall be using remote sensing technology to prepare dengue risk map. "The idea came about when we realised that current approaches are only used to address the issue after it had already happened. So we thought of preventing it before it happened by narrowing down the likely areas to be affected before the dengue outbreak even occur red," said Dr. Darus, Director General of MACRES. The map, which is expected to be ready by the end of the year, would identify dengue "hot-spots" on a monthly basis. www.nst.com.my/

Couple sues Google

A couple from Pennsylvania, US have sued Google, saying pictures of their home on Google's 'Street View' feature violated their privacy, devalued their property and caused them mental suffering. Street View allows users to view highly detailed, panaromic ground-level photos by clicking on a map. Google is facing a court action. According to Google, the website is happy to remove images if property owners 'cite a good reason' and can show ownership of the property depicted. www.asmmag.com/news/858

Pictometry infringement lawsuit settled

Pictometry International Corp., a leading provider of georeferenced aerial image libraries, has settled its lawsuit with Aerial Cartographics of America; Ofek Aerial Photography International; and Greenman-Pedersen Inc., with Ofek admitting patent infringement. www.pictometry.com

Revolutionary CO_2 maps zoom in on greenhouse gas sources

A new, high-resolution, interactive map of U.S. carbon dioxide emissions from fossil fuels has found that the emissions aren't all what it was thought as SE USA is much larger source of emission than NE USA as it was assumed. According to Prof. Gurney of Purdue University, the maps and system, called Vulcan, show CO2 emissions at more than 100 times more detail than was available before. Data on carbon dioxide emissions were reported, in the best cases, monthly at the level of an entire state. The Vulcan model examines CO2 emissions at local levels on an hourly basis. http://www.eas.purdue.edu/carbon/vulcan,www.eurekalert.org

ICIMOD to Develop Interactive Map of Bagmati River

The International Centre for Integrated Mountain Development (ICIMOD) will develop a mapping and information system for the Bagmati Watershed. Under an agreement with the National Trust for Nature Conservation, ICIMOD will acquire data, maps and documents which will contribute to developing a comprehensive plan of action for restoration and management of the river system.

Mumbai's jungles to be monitored

Every inch of the Sanjay Gandhi National Park forests will be watched by distant satellites. Tata Consultancy Services (TCS) will install the GIS-based software surveillance network, GeoVun, in the Borivali forests. TCS, along with Conservation Action Trust (CAT) and WTI Advanced Technology Limited, has signed an MOU with the Government of Maharashtra, India. The system will allow the users to identify best routes for patrolling, perform spatial analysis and produce reports by integrating all maps and tables.

Yahoo India launches maps in local languages

Yahoo! India for the first time has introduced maps in local Indian languages and walking directions available at http://in.maps.yahoo.com/. Besides maps in local language of the place it has a user-friendly display; walking directions from any point in the city; accessible via email etc.

Afghanistan Airborne Survey Completed

Policymakers, potential private investors and the public have received valuable new information to help identify fault-lines and the potential location of undiscovered water, oil and gas, and non-fuel mineral resources in Afghanistan. The data was collected by U.S. Geological Survey scientists who flew over Afghanistan conducting an airborne geophysical and photographic survey of the country. USGS scientists worked with the Naval Research Laboratory, Afghanistan Geological Survey, Afghanistan Head Office for Geodesy and Cartography, personnel from the NRL Scientific Development Squadron ONE (VXS-1), Afghanistan Ministry of Mines and Industry, and the Canadian Forces Mapping and Charting Establishment.

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1 – 6 June, 2008
Department of Geography, University of the Aegean, Mytilene, Lesvos , Greece
http://www.aegean.gr/geography/earthconference2008/ en/main_fr.htm

Navigation and Location Europe 2008
4 - 5 June, Amsterdam, The Netherlands
Osman@telematicsupdate.com
www.telematicsupdate.com/navdev

Global Mapping Forum 2008
5-7 June, Tokyo Japan
sec@iscgm.org
www.gmforum2008.org/

FIG Workshop E-learning
11-13 June 2008
ITC, Enschede, The Netherlands
fig-elearning2008@itc.nl
www.itc.nl/fig_elearning2008

July 2008

International Summer Schoool on GNSS
21 – 31 July
Berchtesgaden, Bavaria, Germany
www.munich-satellite-navigation-summerschool.org

August 2008

ESRI's 28th annual International User Conference
August 4-8, 2008 in San Diego, California
www.esri.com

3rd Indonesian Geo-Information Technology Exhibition
August 6-9, Jakarta Convention center
geospatial-exh.com

14th GIS Conference
August 12-13, Hochiminh City, Vietnam
Phuoc.gis@uit.edu.vn

Septemeber 2008

Institute of Navigation's Satellite Division ION GNSS 2008
September 16-19, 2008
Savannah, Georgia, USA
www.ion.org

The Perspectives, The role of Surveyors in the European Economy and Society
17-19, September
Strasbourg, France
www.geometre-strasbourg2008.eu

CARIS 2008
September 22 - 26, Bath, United Kingdom
www.caris.com/caris2008

INTERGEO
30 Sept- 2 October
Bremen, Germany
www.intergeo.de

November 2008

ACRS 2008
10 - 14 November
Galadari Hotel, Colombo, Sri Lanka
acrs2008@sltnet.lk

International Symposium on GPS/GNSS 2008
11 - 14 November, Tokyo, Japan
gnss@gnss2008.jp
http;//www.gnss2008.jp

December 2008

GEOExpo 2008 China
2 - 4 December 2008,
Shanghai, China
sales@chinageo-expo.com
http://www.ChinaGeo-Expo.com

CANALYS Navigation Forum 2008
13th May, Bangalore , India
15th May, Taipei , Taiwan
8-10, Sep, Budapest , Hungary
14-15 Oct, San Fransico , USA
Gemma_whittaker@canalys.com
http://www.canalysnavigationforum.com/

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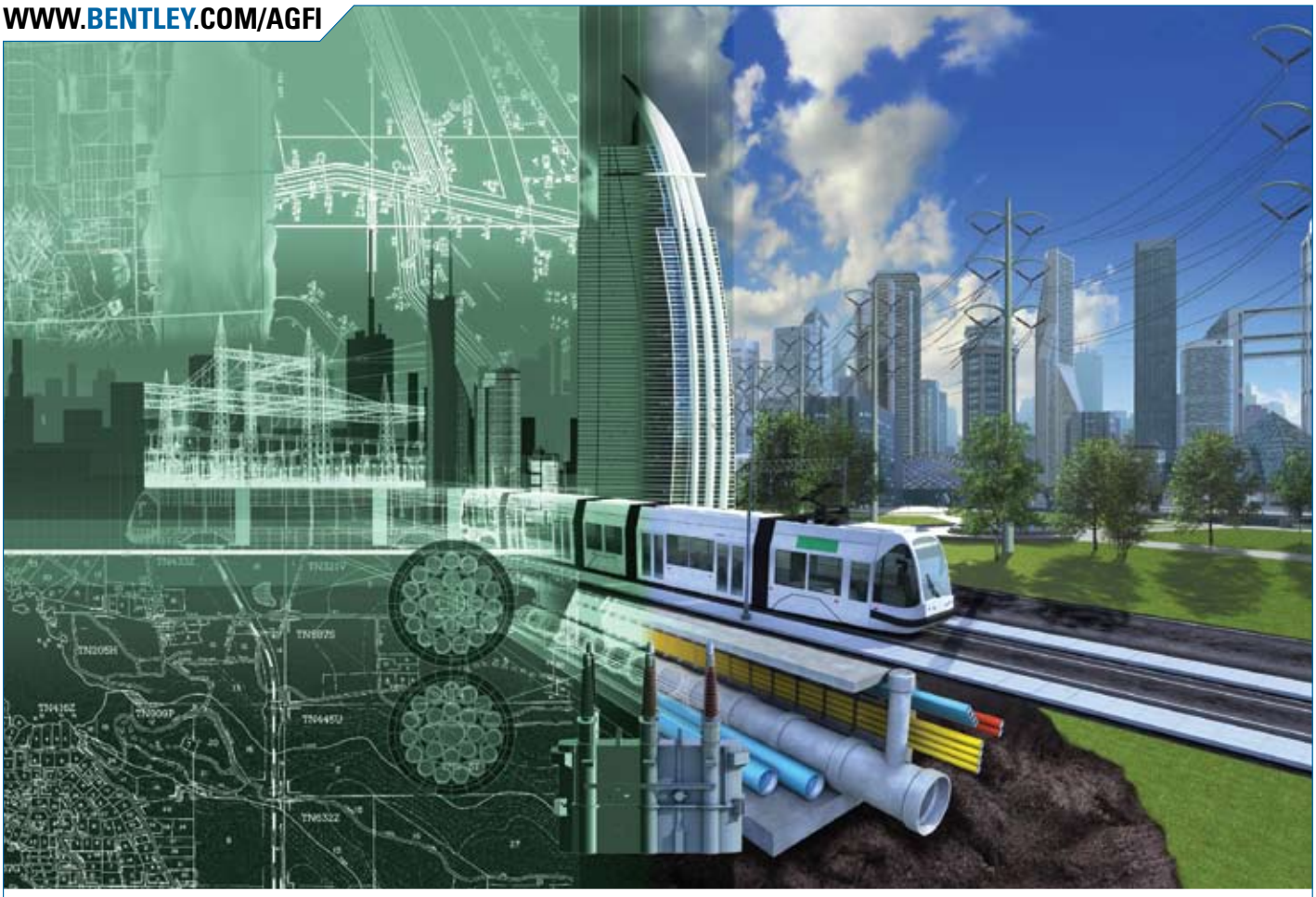

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ProMark 500 encompasses all the RTK features that land surveyors expect for productive and reliable positioning and concentrates the best Magellan technologies for the survey market.

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