

### > Location-based entertainment

By integrating GPS the gaming world is set to enter unprecedented dimensions that blur the line between the real and virtual.

page 2



### > From mercator to digitalisation

Today, map data are the fuel for location-enabled applications. NAVTEQ gives an insight into how map building has evolved from an ancient craft.

page 3



### > Indoor navigation

GNSS are traditionally suitable for outdoor use. To provide reliable, accurate navigation within buildings, such systems must be combined with external complements.

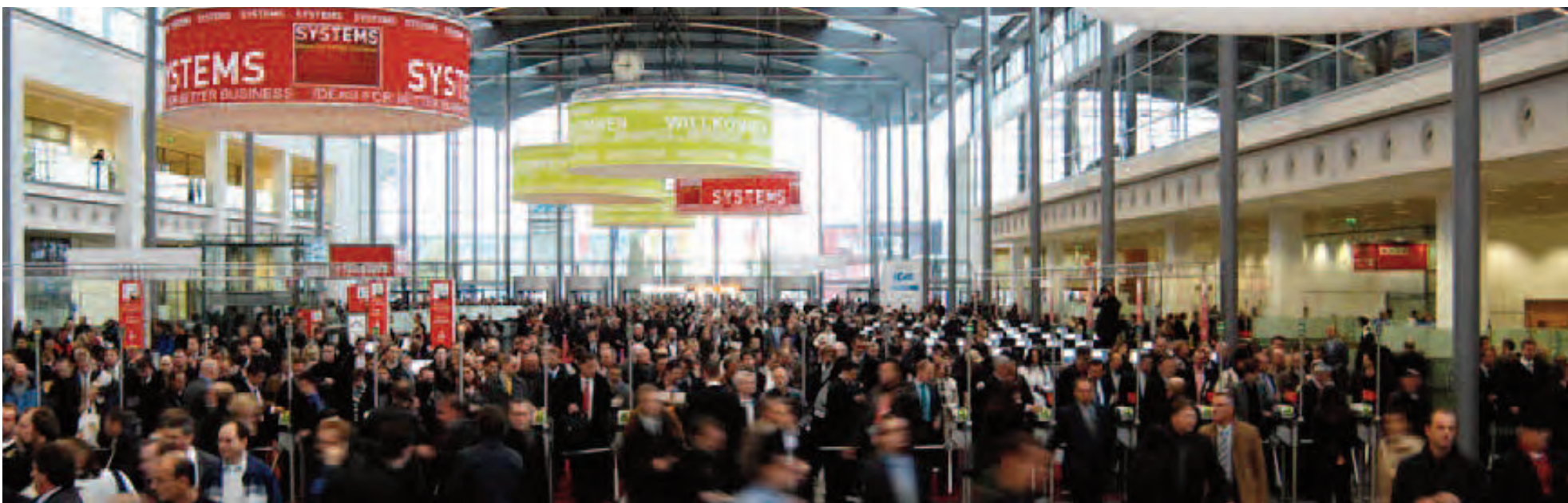
page 4



### > Web-services in the car

By integrating the vehicle into the driver's interactive mobile world a new form of mobility emerges – with the car just being another device.

page 6



© Alex Schelbert

## Navigation World – the name says it all

For the first time, Anwendungszentrum GmbH Oberpfaffenhofen is organising an exclusive conference forum on the topic of navigation with the support of the Bavarian State Ministry of Economic Affairs, Infrastructure, Transport, and Technology. Tailored specifically to the needs of small and mid-size companies, the forum will be held as part of the ICT trade show SYSTEMS. In the Navigation World area of Hall B1, major industry fixtures will discuss the hot topics of indoor navigation, EGNOS, GPS gaming, digital maps and LBS, mobile navigation, and automotive solutions on October 21<sup>st</sup>–22<sup>nd</sup> in Munich, Germany. A two-hour session will be devoted to each of these focus areas, including five technical presentations and a sub-

*Which positioning and localisation technologies make seamless navigation possible indoors? What application potential does EGNOS offer as Europe's augmentation system for GPS? What new dimensions will the gaming world enter thanks to the positioning and precise time signals provided by satellite navigation? What added value does location-based information offer? What opportunities are presented by the rapid rise of GPS-enabled mobile devices, and what improvement and cost-saving potential lies in the automotive sector beyond traditional navigation?*

sequent podium discussion. In this special edition of ESNC news, we'd like to give you a small taste of what awaits you within each of the six aforementioned subjects.

On page two, we introduce you to two concepts that use the exact positioning and precise time signals of satellite navigation to blur the line between virtual and reality in the world of gaming, followed by an

aviation-based example of the advantages and potential of the European Geostationary Navigation Overlay Service (EGNOS).

Page three is all about mobility, with "location-awareness" the operative term for the rapid rise in the use of GPS in mobile devices.

Increasing along with mobility and the demand for location-based

information is the need for technologies that facilitate localisation in enclosed spaces. Technology perspectives and application scenarios in the field of indoor navigation are among the topics of focus on pages four and five.

Meanwhile, page six is devoted to the integration of the vehicle into the driver's mobile, interactive world – Web services in the car!

Also included is an overview of the entire conference agenda.

The Navigation World Conference Forum represents a dedicated continuation of the special focus SYSTEMS has given to the topic of navigation since 2004. For the fifth time, Europe's leading satellite-navigation network will be meeting from October 21<sup>st</sup>–24<sup>th</sup> in Munich. The Navigation World area, directly adjacent to the Conference Forum, promises to be the ideal B2B meeting point for decision-makers in IT, telecommunications, GIS, and satellite navigation. As a "trade show within a trade show", Navigation World seeks to offer software solution providers, integrators, device and component manufacturers, and service providers an ideal area-specific platform for presenting their products and expertise.

The winners of the fifth European Satellite Navigation Competition will also be in attendance to introduce their innovative applications and ideas.

We look forward to seeing you in the Navigation World at Navigation World Conference Area at SYSTEMS 2008!

Klaus Dittrich,  
Managing Director  
Messe München GmbH

Thorsten Rudolph,  
Managing Director  
Anwendungszentrum GmbH  
Oberpfaffenhofen



## NAVIGATION WORLD AREA + CONFERENCE at SYSTEMS 2008

October 21<sup>st</sup> - 24<sup>th</sup> 2008  
Hall B1 / New Munich Trade Fair Center



**NEW:** Conference Stage  
with high-ranking presentations and discussions

→ Exhibition  
→ Conference  
→ Networking

www.navworld24.com

Partner: BITKOM

Organisers: ANWENDUNGSZENTRUM  
Oberpfaffenhofen





## GPS GAMING// Being playful in the development of a creative industrial culture



Dr. Wen-jean Hsueh, general director of ITRI's Creativity Lab will chair the Navigation World session on October 21<sup>st</sup>, 1 pm – 3 pm.

The Creativity Lab of the Industrial Technology Research Institute (ITRI) is the first in Taiwan to base itself on abundant technological resources while cultivating insights into the needs of people and societies to identify critical issues that can be attacked by technologies. It is also the first to link technologies to lifestyle, bringing perspectives from humanity and science together to seek solutions that improve lives. The lab facilitates, generates, evaluates, and demonstrates novel concepts, with collaborations from technical labs towards realization, all through intensive interactions with the industry and cross-disciplinary collaborations. In the process of carrying out its mission, the Creativity Lab strives to influence Taiwanese industry to transform from the mindset of "Made in Taiwan" to "Created in Taiwan."

In line with that strategy ITRI announced a special topic prize on GPS gaming for this year's European Satellite Navigation Competition. The challenge was to find a way to HAVE FUN with a satellite which is precise in timing and positioning and to link people in different positions of the real world with players in a virtual world.

The winner of the special prize will present his awarded idea at the Navigation World Conference Forum.

## Location-based gaming

*Integrated GPS receiver are an important unique selling proposition for mobile phones in comparison with other entertainment devices like the PC or gaming consoles and are the basis for the new genre of location-based games.*



GPS gaming – a new promising market for developers

Based on the fact that there were around 100 million GPS phones in the worldwide markets in 2007, there is a massive growth expected up to 440 million sold devices up to the year 2011 (Source: isupply). The mobile gaming market in general is expected to grow up to 3.1 billion in 2011 (PWC, Media and Entertainment Outlook 2007). Because "location" is one major aspect that makes mobile gaming unique it is to expect that a substantial part of this revenue will come from location-based games.

The German company Orbster started a location-based gaming platform called "GPS Mission" in May 2008. "GPS Mission" is a location-based game played outside on GPS-enabled mobile phones and

PDA's (Nokia, Windows Mobile, iPhone and Android in development). The main aspect of "GPS Mission" is its user-generated content approach. And because creating location-based games has never before been so easy "GPS Mission" is mainly based on user generated content.

A mission can be a scavenger hunt, a playful guide through a town or a story in the real world in which you are the main actor, depending on what its designer created.

After only 4 months and still in its beta phase "GPS Mission" is already played worldwide and players have created missions in 41 countries.

[www.orbster.com](http://www.orbster.com)

## iOpener technology successfully tested in Zolder 24 hours race

*The iOpener technology which allows the mapping of real-world sports competitions to an artificial world, has currently been fully tested during an official 24-hours car race.*

The test was a great success and members of the iOpener team and some guests were actually able to game from behind a PC in real-time against the drivers of the Moritz Racing team driving on the Belgian Zolder circuit. The stress test was made possible through cooperation with the Zolder Circuit, and Moritz Racing

Team. 'You can indeed call this a stress test! For the equipment, as well as the team!' iOpener CEO Andy Lüring says. 'And we are really satisfied with the results.' One of the main concerns was whether all in-car equipment would hold out for 24 hours, and it did. 'Surviving 24 hours of shocks and the heat, sometimes reaching above 70 degrees, gives us confidence that the equipment will perform in all other race conditions', Lüring adds.

'The reason for Moritz Racing Team to cooperate in testing the iOpener technology is that we are a team that stands for the improvement of motorsports in general', driver and team owner Bert Moritz explains. 'And we (Moritz Racing) believe that iOpener has an application that if used wisely by the race association will stimulate a new channel to attract a new younger target group to motorsports'. Moritz is

convinced that this immersive feature will attract more sponsors to the motorsport. He adds: 'Personally, I also really like that iOpener's technology can be used to train young drivers and optimize their driving skills.'

Last year iOpener Media, a spin-out of the European Space Agency Incubator Programme, received EUR 4.1 Million from Triangle Venture Capital Group to make its technology ready for market introduction. Currently iOpener is in negotiation with most of the major race associations, as well as most of the major game publishers/developers. Some of the race associations, game publishers and developers, as well as the press tend to agree already that the iOpener feature is the next "killer application" in games. The first iOpener-enabled game is expected to be launched in early 2009. [www.iopenermedia.com](http://www.iopenermedia.com)



Couch potatoes vs. professionals – GPS-enabled real-time racing

## Europe improves the GPS signal

The EGNOS system qualification is now complete

*With the assistance of Thales Alenia Space, the European Geostationary Navigation Overlay Service (EGNOS) successfully passed its qualification review.*

This essential milestone was reached in mid-September 2008 at the Paris-based headquarters of the European Space Agency. Along with the ESA, the European Commission, ESSP, Eurocontrol, and Civil Aviations attended the review.

Continuing to pave the way to Galileo, EGNOS is Europe's first step in GNSS (Global Navigation Satellite Systems). EGNOS augments GPS signals and improves their performance down to meter-level accuracy. It also improves and

provides reliable information on positioning in terms of availability, continuity, and integrity.

A wide variety of applications can now benefit from EGNOS signals – from civil aviation to agriculture and sciences, from any mode of transport (aviation, roads, railways, maritime) to any application requiring positioning accuracy and reliability.

The EGNOS signal is totally free of charge and broadcasts all over Europe. Every affordable mass-markets GPS device brought to

market in the past two years is compatible with EGNOS, and the market demand for these receivers goes growing.

### EGNOS: A forerunner of Galileo

EGNOS relies on a network of 40 ground stations monitoring GPS signals, four processing and monitoring stations, and three geostationary satellites broadcasting the signal over Europe. As of today, the improvements offered by EGNOS

are bringing services with the highest possible added value to users. A precursor to Galileo in a variety of domains infrastructure industry, standards, markets, etc.) EGNOS enables Europe to develop the technologies, services and institutional framework necessary to the success of Galileo and all other large satellite-navigation programmes in the world.

### EGNOS: Main players

EGNOS is led by the European Space Agency (ESA), with Civil Aviations, Eurocontrol, and the European Commission as key contributors. The European Satellite Service Provider (ESSP) is responsible for system operations.

Thales Alenia Space is the Prime Industrial Contractor. A leader in European satellite navigation, Thales Alenia Space heads a European consortium of 40 companies in 11 member-states in Europe.

### EGNOS: Main achievements

This important milestone concludes six years of development activities (from 1999 to 2005), and three years of necessary evolutions and updates (from 2005 to 2008).

## EGNOS//



Jean-Claude Dardelet, Vice President Institutional Business at Thales Alenia Space

Dardelet will provide more details on EGNOS as chairman of the dedicated Navigation World session on October 22<sup>nd</sup>, 10:30 a.m. – 12:30 p.m.

Based on its successful review, EGNOS can now begin its certification process, opening the door to uses in civil aviation.

*Thales Alenia Space is a co-enterprise of Thales (67%) and Finmeccanica (33%). Forming the Space Alliance with Telespazio, Thales Alenia Space is a worldwide reference in a number of fields in civil and defence telecommunications, earth observation and optical radars, navigation, and science. With 7,200 employees and 11 industrial sites, Thales Alenia Space is present in France, Italy, Spain and Belgium.*

[www.thalesaleniaspace.com](http://www.thalesaleniaspace.com)



© bilderbox – Fotolia.com



# From mercator to digitalisation

*Mapping is an ancient craft, with two early map makers, Mercator and Ortelius, providing much of the foundation for the mapping profession.*

Over the last two decades, mapping has been extensively transformed by advances in computers and information systems. Today, map data, also referred to as spatial data (data that reference location) are the fuel for location-enabled applications. With robust map data underpinning their software applications, users can view maps and do much more:

- Plot a route to a destination
- Sort categories by time and distance from the user's location



NAVTEQ has a dedicated software toolkit and comprehensive specification that detect possible errors and performs hundreds of validations.

## DIGITAL MAPS & LBS//



Peter Beaumont, Marketing Director for Enterprise EMEA at NAVTEQ will chair the session on Digital Maps at October 21<sup>st</sup>, 3:30–5:30 pm.

- Dynamically modify a route to avoid obstructions
- Pinpoint the locations of fleet vehicles, and dispatch the nearest vehicle or the one most likely to arrive first

For database management, these points, lines, polygons, and associated attributes have data structures, additional data elements, and/or processing methods

that make their data processing faster, less resource intensive, and easier to manage/update in order to complete their transition to map data.

These include:

- Spatial topology
- Geocoding
- Linear reference
- Dynamic segmentation
- Overlaying
  - Routing network data
  - Cartographic data

## The core process to building a map

Maps are built through sourcing, field collection, and continuous validation of the data.

Sourcing is an efficient way to begin growth of coverage. NAVTEQ e.g. draws on thousands of data sources as its raw map data material. Key dimensions to successful sourcing include:

- Thousands of sources
- Robust supplier quality management
- Dedicated large scale production facility
- Automated processing tools

Sourcing is a start, but is not good enough. Sourcing has its limitations, including notorious variability in quality/accuracy and inability to capture navigable attributes. That is why you need a local field staff, to develop and use:

- Local presence to create pride of ownership
- Relationships with local sources
- Sophisticated collection technology

Mercator made his maps on bed sheets; modern mapmakers use slightly more sophisticated tools and techniques. Key dimensions to successful field validation include experienced field teams, advanced tools and technology, committed database investment, local ownership as well as eyes on the road.

## Auditing the build process

In Mercator's day, required precision could be measured in miles if not tens of miles. Today, it is possible to build maps that are relatively accurate down to one meter.

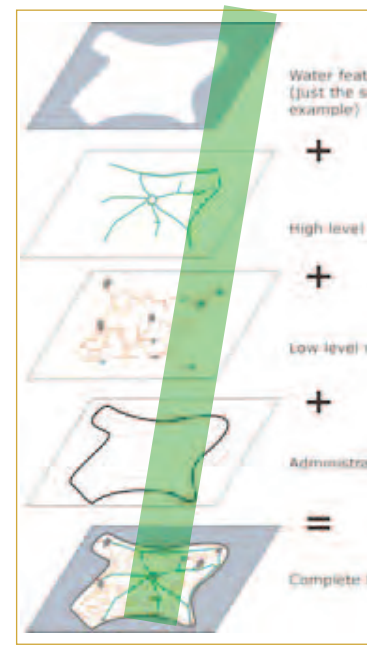
NAVTEQ ensures accuracy of its map data by spending tens of thousands of hours and driving hundreds of thousands of miles each year for field validation and build auditing.

[navteq.com](http://navteq.com)

## Structure and Attributes of Navigable Maps

NAVTEQ has a number of key map data dimensions, including:

- Unique, powerful structure
- Unique geodesic reference system (WGS 84) with longitude and latitude in decimal degrees (10<sup>-5</sup>)
- Contiguous country borders
- Cross-border road networks
- Over 200 attributes



Example of overlaying a number of data layers

Wolf Kunert

## Connected navigation

Midmarket opportunities from and within the cloud

### From the cloud: connected navigation

The term "connected navigation" refers to the practice of outfitting mobile phones with navigation functions and sending and receiving information with navigation devices. Data on where a person is and where he or she is going can be utilised for targeted product placement.

### In the cloud: portals and communities

Web communities now offer the best and most cost-effective means of reaching customers with products based on certain situations and interests. The combination of various functions and providers is producing new applications and giving rise to a new trend: cloud computing.

### In the cloud: corporate applications

Consumers are not the only ones shifting important functions and data from their own computers to the Internet ("the cloud"). Companies are also finding the cost, availability, and flexibility of such solutions attractive.

### Cloud-hopping: mashups

Mashups provide simple methods of using data and functions in the cloud for one's own unique

applications. Emerging technologies are causing small and midsize companies to take notice of such solutions, as well – such as for integrating field personnel.

### More effective use of advertising budgets: personalised advertising

Still more intriguing are opportunities in placing targeted advertising. Personalisation enables the midmarket in particular to address local target groups in a highly specific manner, even on tight budgets.

### Clearing away the fog: gathering information, seizing opportunities

New technologies are presenting the midmarket with a number of ways to optimise processes and target customers with new products and services without breaking the bank. Need a tip? Dive right into the Internet and get to know these services. You'll come up with ideas for your own business developments in no time.

Wolf Kunert is managing director of Mobile Solution Factory GmbH.  
[www.mobilesolutionfactory.com](http://www.mobilesolutionfactory.com)

# A turning point for location-based services

*Whether it's a business trip, holiday getaway, or just an afternoon outing, travelling to uncharted environs usually rouses the desire to become more familiar with one's surroundings. Experts estimate that the number of GPS-enabled devices sold will increase 18-fold over the next five years. In 2007, this number was already 175 million.*

The field of mobile navigation has existed in Germany since the mid-1990s. In 1997, the Bosch company was already presenting market-ready systems with detailed maps (enabling special uses, such as for golf courses) at the ITS World Congress in Berlin. Significant market penetration, however, was first achieved by nomadic devices. Mobile navigation devices for cars have already become a classic example among GPS applications. In 2008, Germany will witness the sale of a projected 3.2 million devices – an increase from two million in 2006 and around half a million in 2005. In terms of revenue, the market for such devices reached the billion-euro mark for the first time in 2007.<sup>1</sup>

Increasing along with the demand for GPS devices is the interest in new location-based services. Such services have already existed for a number of years, but have not yet had the success many initially anticipated. The market has now reached its turning point: the number of customers utilising location-based services is projected to grow

from 16 million in 2007 to more than 43 million this year – an increase of just under 168 per cent.

Location-based services are no longer just about traditional navigation – finding out where you are and how to reach your destination. The focus is rather on enriching the current location of a person or ob-

ject with content and information on value-added services. In doing so, location-based services collect data on the current environment, whether between skyscrapers, pedestrian areas, or on the golf course. [bitkom.org](http://bitkom.org)

<sup>1</sup> Survey conducted for BITKOM by the GfK

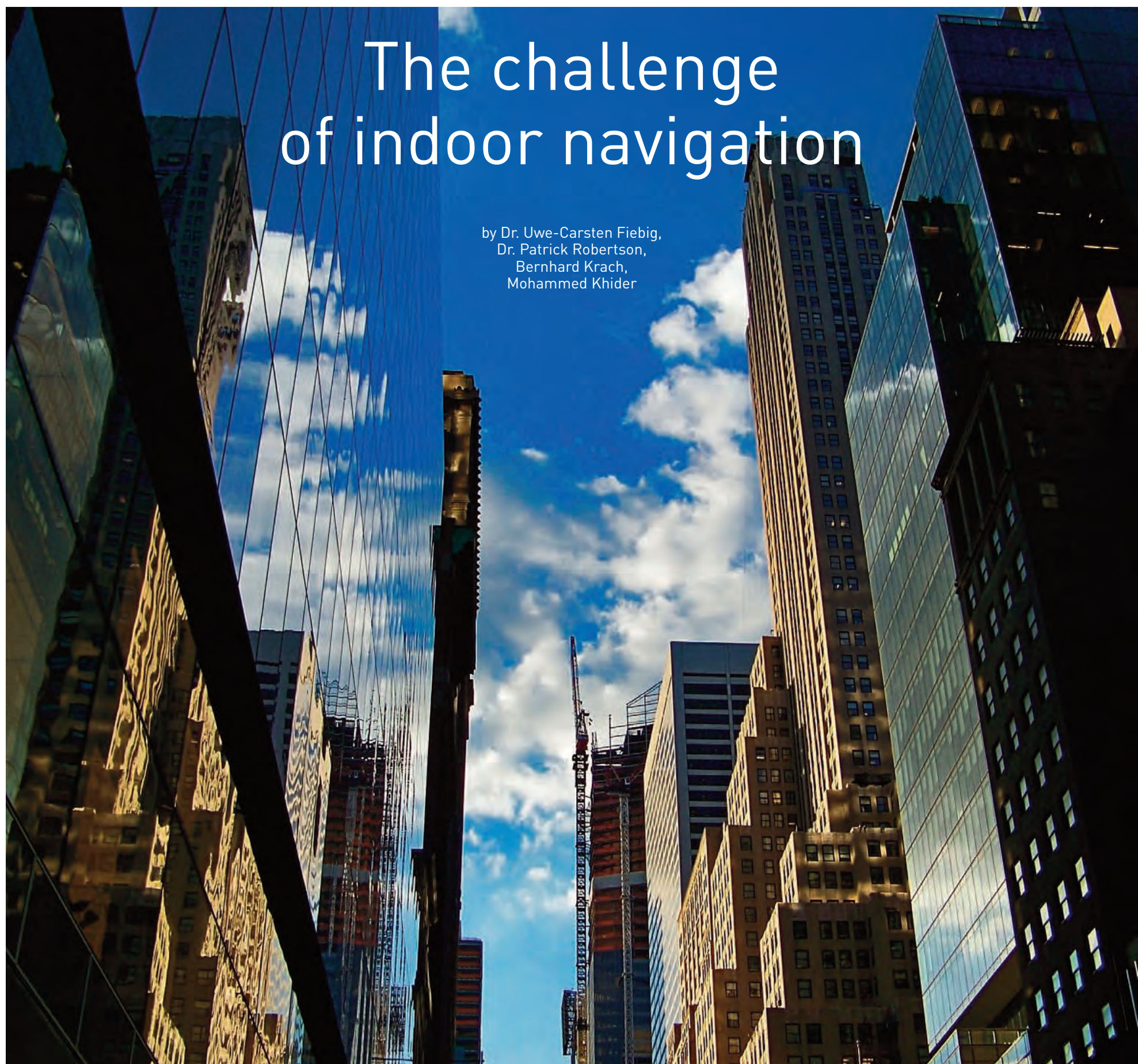
## Sales of portable navigation devices surpass 3 million mark





# The challenge of indoor navigation

by Dr. Uwe-Carsten Fiebig,  
Dr. Patrick Robertson,  
Bernhard Krach,  
Mohammed Khider



© Snezana Skundric/Fotolia.de

*To provide reliable, accurate navigation within buildings, such systems must be combined with external complements such as sensors, WLAN, Bluetooth, and RFID. The goal is to achieve a configuration that is seamless in terms of systems as well as navigation: The customer should not recognise when which system is providing the positioning data. Indoor navigation has particular potential for use in car parks, factories, and building management.*

## Services and indoor positioning

Several key technologies will substantially change the mobile experience in the next years: higher data rate mobile communications, satellite navigation, mobile computing platforms, and emerging web-services standards. These technologies will enable a new class of mobile services: those that are classified as context or situation aware. They began their evolution from simple location based services. The location of a mobile user is perhaps the most powerful service and content discriminator. The European satellite navigation system Galileo will significantly contribute to new location and context-aware services. Together with GPS, Galileo will drastically increase the availability in critical environments such as urban canyons. Galileo will also provide more signal power at the user's device than GPS and will transmit two open signals. Thus, Galileo will further open the door for applications

inside buildings. And as a consequence, Galileo prepares new mass market service scenarios in which the navigation device is no longer fixed inside the car but ubiquitous on everybody's personal mobile device. However, since people on the move are often inside buildings requiring precise positioning, new technical solutions to enable accurate indoor positioning and navigation have to be developed.

### INDOOR NAVIGATION //



Dr. Uwe-Carsten Fiebig, Head of Department, Institute of Communications and Navigation – Communications Systems at the German Aerospace Center (DLR) will chair the Navigation World session on Indoor Navigation at October 21<sup>st</sup>, 10.30 am–12.30 pm.

## Reliability and accuracy within buildings

GPS has made outdoor localization broadly available and is commonly employed for automotive navigation by a very large number of users. Low cost devices available on the mass market are currently able to track satellite signals down to a signal power of  $-159$  dBm. With these high sensitivity devices, receiving (i.e. acquiring) GNSS signals in indoor environments becomes possible. However, buildings mostly prevent navigation receivers from receiving line-of-sight signals; in fact the received signals are the result of reflections and diffractions by various elements of neighbouring buildings and objects and the building the user is located in. Thus, these signals can hardly be used for accurate positioning. The compensation of the resulting positioning errors is still an unsolved challenge today.

## Satellite-to-indoor propagation

A key issue to make satellite based indoor navigation more accurate is the detailed assessment of radio wave propagation mechanisms inside buildings and from outdoor to indoor. Even today various aspects of satellite-to-indoor propagation are still an open research topic which reflects the difficulty to describe a general propagation model for electromagnetic waves into and inside buildings.

The main problem is the variety of building structures, building materials, layout of rooms, interior and the environment of the building. Thus, measurements conducted in the same category of buildings may substantially differ from each other. Another problem are strong spatial changes of the propagation conditions; within one meter propagation conditions may change drastically.

These features of the propagation mechanisms have been ob-



served by many researchers. The detailed results of wideband indoor measurements show a large dependence of the power delay profile on the room layout, furnishing and type of construction material.

It is reported that even small metallic obstacles like window handles result in a reflective and diffractive source for electromagnetic waves. Similarly it was noticed that rooms which are equipped with a lot of metallic objects like factory plants yield a substantially larger delay spread. Directivity of waves in corridors as well as preferred directions of incident waves through less absorbing materials like doors or windows compared to walls has been observed by many measurements.

All these effects are easy to explain. But the problem remains, that the large variety of different indoor environments results in a large variety of effects on the signal propagation.

Therefore it is very hard for satellite navigation receivers to cope with these highly varying propagation effects.

🍏🍏🍏+1

## Low-cost inertial sensors for personal dead-reckoning

The use of fully self-contained inertial sensors is promising for pedestrian navigation, in particular for indoor applications. Basically two approaches can be distinguished.

The pedometer approach employs an accelerometer for detecting individual steps whilst the stride length and stride direction are themselves estimated using additional sensors, such as GNSS, or a priori information. Given a detected step, its length and its direction, a person's position

can be determined by dead-reckoning. The latest approaches are based on full six degree of freedom inertial navigation. A miniature foot-mounted inertial platform comprising triads of accelerometers and gyroscopes is used to dead reckon via a conventional inertial navigation algorithm.

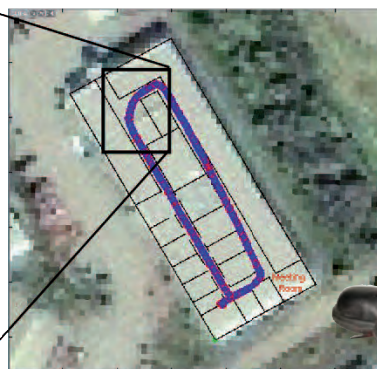
Rest phases of the foot, which are detected from the accelerometer signals, trigger zero-velocity (virtual) measurements that are used to update an adjoint Kalman

filter (ZUPT). Due to the regular ZUPT measurements it is possible to estimate and correct the drift errors, which accumulate in the inertial navigation solution.

It was shown that this approach can achieve a very good performance of only 1% to 3% of travelled distance even with today's low-cost micro-electro-mechanical sensors (MEMS) because commonly the ZUPTs are so frequent that errors build up only slowly during each step the pedestrian makes.



— Stride • Rest phase



IKN building TE02

Dead-reckoning performance when using foot-mounted MEMS inertial sensors at the Institute of Communications and Navigation of DLR.



DLR's prototype of a shoe with built-in MEMS inertial sensors

## Future indoor applications

Once the indoor navigation problem is solved technically, a plethora of novel indoor applications becomes feasible: Precise monitoring and guidance of rescue teams, fire-fighters, and other relief units as well as, amongst many others, the interactive museum guide, personal travel assistance, sports applications, and assisted living for elder people.



The WayWatch is DLR's application target for personalised navigation. It will show not just time, but also the way to go in form of pictograms showing the next steps on an itinerary such as how to get to the right departure gate, to a certain office room, or to a product in a department store.

## Combination of personal dead-reckoning and map-matching

A particularly powerful autonomous combination is the use of inertial step measurements in conjunction with map information. The researchers at DLR could show that such a system can converge to the correct position after less than a minute of motion.

DLR has developed a two-layer real-time sensor fusion platform that operates with a Kalman filter

for the stride estimation, and which fuses other sensors and maps at a higher-level, lower rate, particle filter. The platform is computationally efficient and flexible to join data of a variety of heterogeneous navigation sensors. In buildings, a few dispersed RFID tags or even moderately GNSS reception can significantly aid the overall positioning.

## Application constraints

Today it is a common understanding in the scientific community that global navigation satellite systems (GNSS) alone are not sufficient to provide accurate indoor localization. Other techniques or additional sensors should be considered. There is a variety of alternatives each with different features in terms of costs, infrastructure requirements, accuracy, volume, stability and privacy constraints. There also exists a potpourri of different applications ranging from warehouse logistics to emergency services and from professional to mass

market applications. Each application has its own constraints. We do not see that there will be one solution which fits all these constraints. E.g. an emergency service shall provide the floor of the person in trouble and the room; the user's device shall be a low cost one; infrastructure to support localisation cannot be used; the service shall be operational globally.

On the other hand, in industrial applications robots or goods shall be located with sub-dm precision; the technical solution can be more expensive, proprietary and local; infrastructure is feasible.

The technical solutions encompass the use of Pseudolites, ultra

wide band (UWB), the use of mobile radio signals, RFID, Bluetooth, and WLAN together with fingerprinting. Amongst others dedicated indoor solutions are the systems Active Badge, Cricket, LEASE, Topaz, and the Thinking Carpet.

The Institute of Communications and Navigation of DLR focuses its indoor navigation activities on techniques for applications where people are on the move. DLR therefore investigates promising approaches which apply several sensors together with GNSS: Inertial systems (INS), compass, RFID tags, and altimeter; furthermore, appropriate movement models and maps are of great importance.

## The role of movement models to predict human behaviour

Pedestrian movement models can be used to predict the human behavior. The aim of the model is to characterize the pedestrian movement as life-like as possible. A movement model that really imitates the real pedestrian movement can be used for society planning, evacuation plans, buildings construction, human like robots movement and indoor/outdoor navigation.

Human movement is parameterised by physical parameters like speed, direction and as a result the position. However, speed and direction are affected by several human states. For example, a pedestrian trying to catch a train is faster compared to a pedestrian who is shopping.

Examples of other parameters that affect the pedestrian movement are age, activeness, arousal and emotions. Some of these parameters affect the movement more than the others. Also the building layout very much affects the movement of the pedestrian. It is clear that a pedestrian can not cross a wall.

Movement constraints that control these physical parameters are categorised into two groups. The first category includes parameters that can be determined accurately such as age, weather, time of day and weekday and parameters that can be derived from external data such as ground steepness or obstacles at the pedestrian's position.

The second category encompasses parameters that are varying according to the human behavior. Examples are activity, disorientation, activeness, arousal and emotions.

The movement model is a prerequisite in Bayesian algorithms which are applied in DLR's sensor fusion algorithms. The prediction stage depends entirely on the movement model to predict where most probably the pedestrian will be at the next time step. With a good movement model, one can predict accurately the position of the pedestrian at the next time step. This will decrease the dependency on the measurements for estimation.

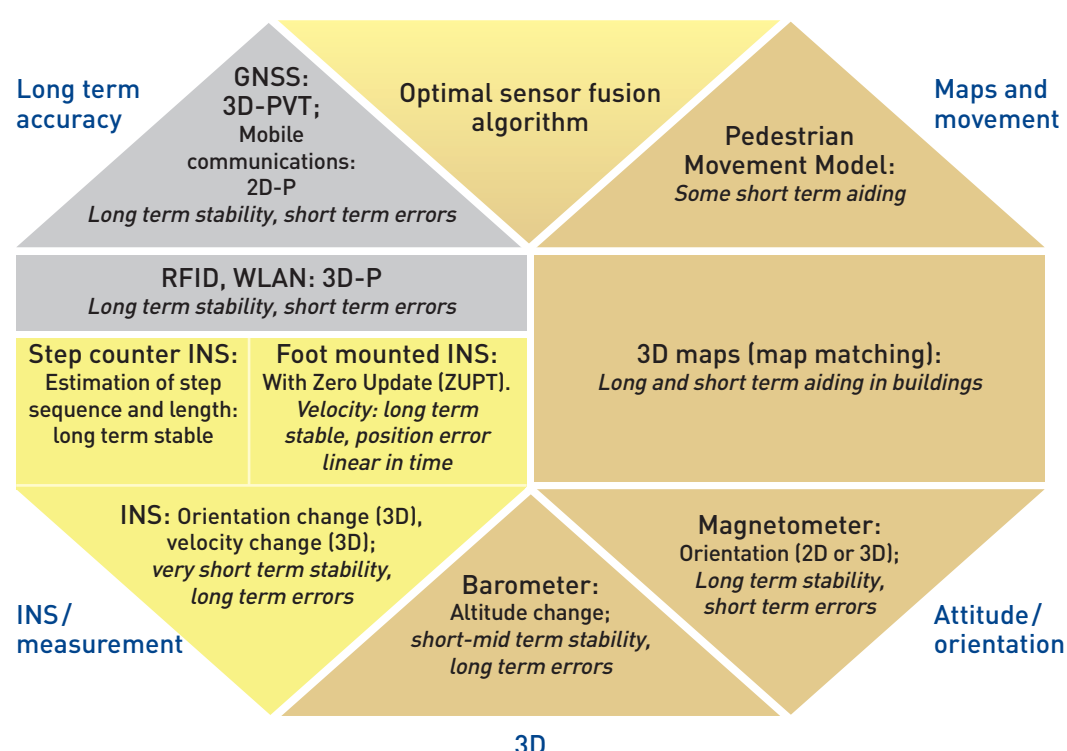
It will also allow the system to take correct decisions regarding the position of the pedestrian at the prediction stage, since we will have less contradiction between the prediction and the measurements later on. According to the application, different implementation types of movement models may be used. For example one may use a statistical model for people who are shopping.

On the other hand, a more deterministic model is adequate for navigating people. Additionally, special movement actions have to be considered for specific applications. For example a movement model for fire-men or rescuers has to consider special actions such as sliding, jumping and rolling.

## Combining complementary sensors

Positioning in buildings and other environments will not only require a combination of sensors but also other information such as building plans in order to provide a high accuracy. Sensor fusion approaches that combine several complementary sensors such as GNSS, mobile radio positioning, WLAN, RFID, foot mounted inertial sensors, electronic compasses, baro-altimeters, and maps are promising candidates to solve the indoor positioning problem. A central role here plays the development of optimal sensor fusion algorithms, which make a joint system superior to the sum of its components due to synergetic effects, which arise from the complementary properties of the respective sensors and subsystems.

### Personal navigation sensors and their properties







To promote the integration of web-services in the car and to accelerate related business opportunities, the Network of Automotive Excellence (NoAE) initiated a series of workshops on connecting the vehicle to the driver's interactive mobile world. The working group is being co-ordinated by Microsoft and open to any interested party.

## Where the car is just another device

### Web-Services in the Car

Mobility is the new paradigm of our modern, intelligent society. The evolution of mobility is giving the average individual the ability to use new technologies in efficient ways. As a result, we are enjoying a higher quality of life – more mobility, security, flexibility, optimised resources, and comfort – and witnessing significant changes in how we get around in our largest cities. People and our desire for freedom

are set to be integrated into the networked world, giving us the chance to explore the worlds of tomorrow. But only by implementing high-quality information and communication technologies and providing for the intelligent networking and integration of various transport systems can the organisations involved ensure that individual mobility remains affordable. One prerequisite of this is planning that goes beyond the personal vehicle; planning that is supported by a portable system and utilises both interfaces within the car and other transfer media. At the same time, adhering to the route in question must be the main priority, followed by the integration of transport schedules and other services. The challenge now is to define and support this chain of processes such that all of the interfaces involved work together seamlessly and always ensure the integrity of every individual's privacy.

[www.noae.com](http://www.noae.com)

### AUTOMOTIVE SOLUTIONS//



Gerion Wolff,  
Senior Vice  
President Marketing & Strategy  
at MATERNA  
Information &  
Communications  
will chair the  
session on Automotive  
Solutions at October 22<sup>nd</sup>,  
1 pm–3 pm.

## Crash data helps reduce costs for eCall false alarms

The automotive industry is working fervently to implement telematic applications into their 2010+ vehicles in order to follow the eCall programme of the European Commission, led by Viviane Reding. Approximately 700.000 telematic units were sold in Europe in 2007. By 2012 the annual number is expected to be over 17 million and economies of scale will result in much cheaper hardware. "The eCall unit itself is just a small fraction of the cost," says Harald Trautsch, Executive Vice President of Octo Telematics, Europe's leading provider

of insurance telematics and automotive telematics services. "False alarms increase real costs tremendously and may have a significant negative impact on the eCall initiative." With more than 650.000 cars already equipped with eCall-enabled systems, Octo Telematics has analyzed nearly 20.000 real crashes. Says Trautsch, "Our experience with crash data is used to constantly improve our software and push the number of false alarms to less than 1 %, but there is still a great deal of work to do."

[www.octotelematics.com](http://www.octotelematics.com)



### Imprint news 3/2008

**Publisher:** Anwendungszentrum GmbH  
Oberpfaffenhofen  
Application Center for Satellite Navigation  
Gebäude 319, Sonderflughafen  
Oberpfaffenhofen, D-82205 Gilching  
Phone: +49(0)8153-987510  
Fax: +49(0)8153-987555  
[www.anwendungszentrum.de](http://www.anwendungszentrum.de)  
**Editorial staff:** Ulrike Daniels,  
[daniels@anwendungszentrum.de](mailto:daniels@anwendungszentrum.de)  
Phone: +49 (0)8152-9099047  
**Advertising:** Gaby Herbrecht,  
[g.herbrecht@herbrecht-verlag.de](mailto:g.herbrecht@herbrecht-verlag.de)  
**Layout:** © Herbrecht Verlags- und  
Werbeagentur mbH

**Production:** Herbrecht Verlags- und  
Werbeagentur mbH,  
Birkenweg 19, D-87719 Mindelheim,  
+49 (0)8261-731760; [hvm@herbrecht-verlag.de](mailto:hvm@herbrecht-verlag.de)  
**Printing:** Kessler-Druck, Augsburg, Germany  
**Place of fulfilment and place of jurisdiction:**  
Gilching, Germany

All contributions in this newspaper are legally  
copyrighted. The photos were kindly provided  
by the respective companies. All further use is  
only permitted on written approval.  
This applies for reproductions of any kind,  
digitalisation and the placement into data-  
bases or other electronic media.

© 2008 Anwendungszentrum GmbH  
Oberpfaffenhofen

## CONFERENCE PROGRAMME NAVIGATION WORLD CONFERENCE FORUM 2008

TIME	Tuesday 21.10.08	Wednesday 22.10.08	TIME
09.30-10.00	Registration	Registration	09.30-10.00
10.00-10.30	Welcome, Thorsten Rudolph, Anwendungszentrum GmbH Oberpfaffenhofen	Welcome, Thorsten Rudolph, Anwendungszentrum GmbH Oberpfaffenhofen	10.00-10.30
10.30-10.50	Introduction to the Session <b>"Indoor Navigation"</b> by the Chairman Dr. Uwe-Carsten Fiebig, German Aerospace Center (DLR)	Introduction to the Session <b>"EGNOS"</b> by the Chairman Jean-Claude Dardelet, Thales Alenia Space	10.30-10.50
10.50-11.10	INDOOR – Galileo/GPS Indoor Navigation & Posi- tioning with Particular Respect to Security-Sensi- tive Applications, Elmar Wittmann, Ifen GmbH	The European GNSS Programme EGNOS, Prof. Dr. Werner Enderle, European GNSS Supervisory Authority (GSA)	10.50-11.10
11.10-11.30	Indoor Localisation Based on UWB: Technology and Applications, Dr. Jaouhar Jemai, Ubisense AG	Winner of the GSA Special Topic Prize on EGNOS	11.10-11.30
11.30-11.50	Indoor GPS - Applications of Assisted-GPS and Indoor Position Fixing, Moni Malek, eRide Europe GmbH	GNSS Introduction in the Aviation Sector in Europe - The GIANT Project, Luis Chocano, INECO	11.30-11.50
11.50-12.10	Transparency, Security and Process Optimisation through Indoor Localisation, Julius Rupf, T-Systems Enterprise Services GmbH	EGNOS for Safety & Security, Heiko Thölmann, Presentec GmbH	11.50-12.10
12.10-12.30	Panel Discussion <b>"Indoor Navigation"</b>	Panel Discussion <b>"EGNOS"</b>	12.10-12.30
12.30-13.00	Lunch		12.30-13.00
13.00-13.20	Introduction to the Session <b>"GPS Gaming &amp; Sports"</b> by the Chairman Dr. Wen-jean Hsueh, Industrial Technology Research Institute (ITRI), Taiwan	Introduction to the Session <b>"Automotive Solutions"</b> by the Chairman Gerion Wolff, MATERNA GmbH Information & Communications	13.00-13.10
13.20-13.40	Winner of the ITRI Special Topic Prize on GPS Gaming	Web Services in the Car - Technical Challenges, Jonas von Paulgerg-Nyrén, ESG Elektroniksystem- und Logistik - GmbH	13.10-13.25
13.40-14.00	Tourality - Outdoor GPS Multiplayer Game for Mobile Phones, Klemens Zleptnig, creative workline	Future Mobility Concepts Based on Networked Transportation Systems, Dr. Heiko Seif, CNX Partners	13.25-13.40
14.00-14.20	Location-Based Games - how User Generated Content Drives the Market, Georg Broxtermann, Orbster GmbH	Mobility - Networked for the Future, Andreas Hein, Microsoft Deutschland GmbH	13.40-14.00
14.20-14.40	The Next Trend in Games; Integration of Real Objects in the Virtual World, Andy Lüring, iOpener Media GmbH	Driving Optimisation for Reducing Fuel Con- sumption and CO <sub>2</sub> Rejections, Dominique Clarac, NODBOX	14.00-14.20
14.40-15.00	Panel Discussion <b>"GPS Gaming &amp; Sports"</b>	Panel Discussion <b>"Automotive Solutions"</b>	14.40-15.00
15.00-15.30	Coffee break		15.00-15.30
15.30-15.50	Introduction to the Session <b>"Digital Maps &amp; Location Based Services"</b> by the Chairman Peter Beaumont, NAVTEQ	Introduction to the Session <b>"Mobile Solutions"</b> by the Chairman	15.30-15.50
15.50-16.10	Google Deutschland (tbc)	Mobile Marketing, Erik Pellemeier, MATERNA GmbH Information & Communications	15.50-16.10
16.10-16.30	Virtual Earth – Digital Map Solutions from Micro- soft, Michael Amrehn, Microsoft Deutschland GmbH	Connected Navigation: Opportunities for the Midmarket from and within the Cloud, Wolf Kunert, Mobile Solution Factory GmbH	16.10-16.30
16.30-16.50	Beyond 2D-Mapping: Innovative Products and Rich Content, Dr. Matthias Bachmann, GeoContent GmbH	Garmin - Competence in Automotive, Outdoor, Marine & Aviation, Peter Förster, Garmin Deutsch- land GmbH	16.30-16.50
16.50-17.10	Intermap (tbc)	The Next Generation Mobility Solutions Platform: Accelerating Deployment, Erno Hempel, Jentro Technologies GmbH	16.50-17.10
17.10-17.30	Panel Discussion <b>"Digital Maps &amp; LBS"</b>	Panel Discussion <b>"Mobile Solutions"</b>	17.10-17.30

## WHAT MAKES VDI NACHRICHTEN FOR ENGINEERS GERMANY'S MOST EXCITING WEEKLY NEWSPAPER? \*

### SEE FOR YOURSELF.



When it comes to important information  
on new technologies and markets or  
suitable vacancies for technical specialists  
and managers, there's only one thing that  
engineers have eyes for: VDI nachrichten.  
Up to date. Comprehensive. Indispensable.  
Every Friday. Read now, subscribe soon.

\* 72 % of VDI nachrichten readers hold  
salaried management positions. 34 % are  
technical managing directors. (LAE 2007)

VDI Verlag GmbH

VDI nachrichten

Phone +49 (0)211 61 88-441

Fax +49 (0)211 61 88-209

[vertrieb@vdi-nachrichten.com](mailto:vertrieb@vdi-nachrichten.com)

[www.vdi-nachrichten.com/abo](http://www.vdi-nachrichten.com/abo)

**VDI nachrichten**  
The essential. Weekly.