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THE GLOBAL MAGAZINE FOR GEOMATICS
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Intergeo 2015

Your Independent Guide to the World's Number One Geomatics Event

MANAGING MASSIVE POINT CLOUDS Performance of DBMS and File-based Solutions

MAPPING INDOOR SPACES Creating, Visualising and Navigating

GIM INTERNATIONAL INTERVIEWS RAY O'CONNOR Topcon Positioning Systems

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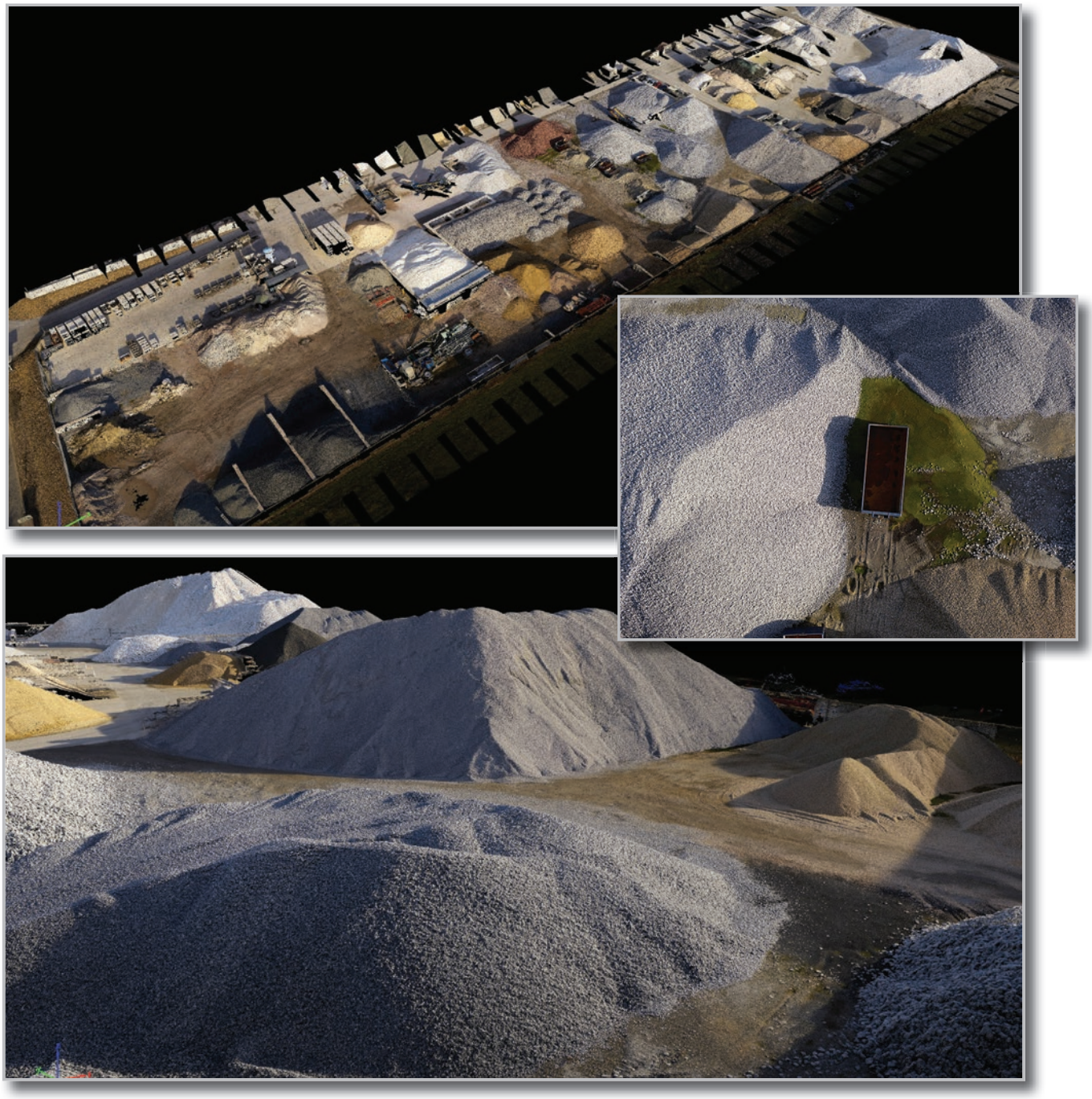

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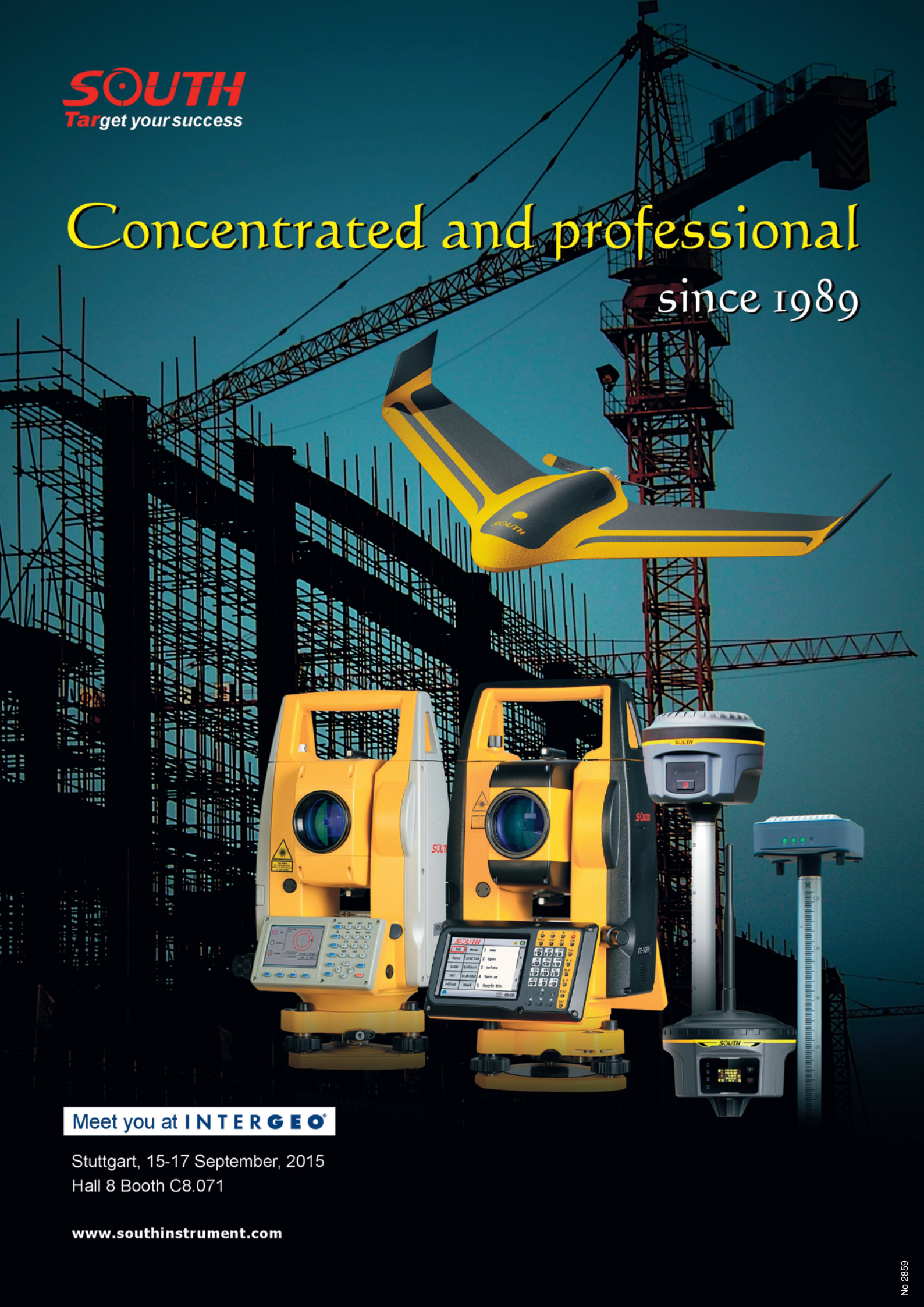
No 2863

The front cover of this bumper-packed September issue – focused on this year's Intergeo – shows the skyline of the dynamic city of Atlanta, Georgia, USA. Intergeo 2015 will be a showcase of innovative topics such as advancements in smart cities, 3D mapping, digital construction, and mobility and autonomous driving.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BPA WORLDWIDE BUSINESS

Full

This is a very full issue of *GIM International*. During the summer we have been preparing lots of content to fill this bumper-packed issue and we are happy to finally reveal it to you! Much of the content revolves around the biggest tradeshow of the year – Intergeo – taking place in Stuttgart, Germany, from 15-17 September. This edition contains a preview in which more than 120 exhibitors at this year's Intergeo share details with you of what they are presenting at the show. It's an excellent way to prepare for your visit to the show, but even if you are unable to travel to Stuttgart it makes for an interesting read and brings you up to date at the same time. We've also prepared a Product Guide to Intergeo on Geo-matching.com, highlighting the products that will be on display in Stuttgart. In addition to checking out those products on Geo-matching.com, you can see, touch and discuss them at the show. But besides Intergeo, there's lots more happening in this issue. You can find updates on the UN Initiative on Global Geospatial Information Management together with Five Questions to Vanessa Lawrence who is stepping down as co-chair of UN-GGIM. Dr Lawrence has played a truly tremendous role in getting the UN-GGIM up to speed, and professionals in the geomatics world and beyond should be grateful for the ambassadorial role she has played – and will no doubt continue to play in her future roles. The Fifth Session of the Committee of Experts of UN-GGIM has further established the initiative, and the UN-GGIM looks likely to become a permanent body of the UN next year. Geoinformation is now widely recognised as driver of economic growth and social development and moreover as being critical to the successful implementation of the newly identified and agreed sustainable development goals. Many of the professionals at Intergeo and other events are not concerning themselves with the meetings, decisions and deliberations at the UN. Nevertheless, it is good that delegates of Member States of the UN – often with strong links to mapping agencies and cadastral organisations – are creating a strong foundation for a long-lasting place for geoinformation. To bring you news from the industry this month, we have included an interview with Ray O'Connor, CEO of Topcon Positioning Systems (see page 18), by Monique Verduyn, contributing editor. O'Connor shares his views on the ongoing transformation of the geospatial industry and the growth strategy that he has helped to shape for the 82-year-old company. He stresses that the future for the surveyors is bright, although their role is changing into one of consultant rather than data gatherer. Topcon's CEO calls for new, qualified and above all enthusiastic people to enter the industry to get the most out of the exciting times ahead. And there's much more in this edition: feature articles on indoor mapping, point cloud processing, a new geodetic datum for Oman, etc., etc. As I mentioned at the start, this is a very full issue of *GIM International* with too much to mention here, but I am sure you will find it a worthwhile read. By the way, if you are going to Intergeo, the *GIM International* and Geo-matching.com team will be out in force in Stuttgart. Please stop by our stand (F8.059) or send us an email to make an appointment beforehand.


Photography: Arie Bruinsma

▲ *Durk Haarsma, publishing director*

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No 2880

Contributions of the Geospatial Sciences to Urban Sustainability

It has been recognised over recent decades that actions by humans have modified and altered the energy and mass exchanges that occur between the atmosphere, oceans and biota, and that the changes being wrought on the planet could be beyond the resilience of natural systems to absorb them. The consequence of these changes can be a loss of, or a severe decline in, the ecosystem services on which we rely, thus impacting on our quality of life and security of well-being.

The growth in cities is placing many aspects of the urban environment under increasing stress. According to the World Health Organization 54% of the global population in 2014 lived in cities, and that percentage is growing annually at a rate of more than 1.5%. Some scientists believe that the end of the 20th century was a turning point in the history of human civilisation and that serious steps need to be taken to improve the sustainability of the planet. There has been considerable work undertaken over the past 20 years in assessing sustainability using indicators for a range of environments but there have been few studies for urban environments.

Sustainability of urban areas should define sustainable urban forms when viewed from a planning perspective, a sustainable urban form being defined by its compactness, mixed used, density, sustainable transport, diversity and greening. Therefore, compactness is one of the design concepts for a sustainable city. More compact cities result in less travel and hence lower energy consumption.

Administrators and residents in urban areas must become more conscientious of the need for sustainability of their environment, since the overall sustainability of the planet will be dependent on actions taken within urban areas where more than half of humanity lives. Furthermore, urban regions cannot achieve sustainability without considering the hinterland because urban dwellers depend on resources from within the hinterland, sometimes stretching globally through exports and imports. Assessing sustainability through indicators should be a multi-disciplinary task involving scientists with a range of skills, including experts in remote sensing and GIS technologies who are able to interpret and extract relevant spatial information from images and represent that information for use by other specialists.

▲ *John Trinder*

There are a large number of examples in the literature of the use of remote sensing technologies to determine sustainability indicators, especially in agriculture and forestry. However, there have been few examples of the applications for assessing urban sustainability and especially of the determination of sustainability indicators for urban areas. This is becoming increasingly important as urban populations increase. While the availability of remote sensing data was limited to medium resolution until little more than a decade ago, the currently available remotely sensed data should enable much more detailed monitoring of urban environments.

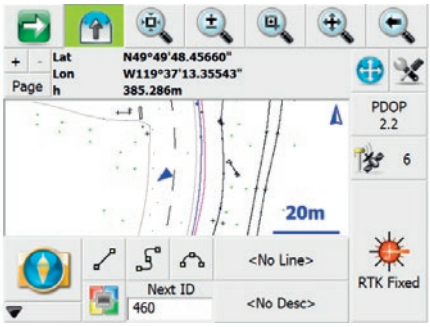
It is suggested that the contributions of remote sensing technologies for determining indicators for urban sustainability include: determining the balance of impervious surfaces versus open space; time-series studies of the transformation of green spaces into impervious surfaces; assessments of compactness and effective and environmentally sound transportation systems for the inclusion of healthy, safe and pedestrian/cyclist-friendly neighbourhoods; assessments of the rate of consumption of natural resources from the hinterland of an urban area and its impact on the environment; determining the effects of urbanisation on biodiversity; and determining the extent of the release of emissions and waste, especially into waterways and the atmosphere. The majority of these tasks can be assessed by remote sensing technologies. While some aspects of these measures have been researched, considerable work is still required before the application of geospatial data can demonstrate appropriate applications of indicators for assessing the progress of urban sustainability.

Integrated Fixed-wing UAV and LidarPod Solution Pushes Boundaries in Surveying

The Routescene proposition to transform the approach to surveys across the world is taking hold. Collaborating with Hanseatic Aviation Solutions, Mapix Technologies – the company behind Routescene – has jointly developed an integrated fixed-wing UAV and LidarPod solution, which is one of the first such products to become commercially available in the world.

▸ http://bit.ly/1LeNAex

LidarPod.



FieldGenius 8.

MicroSurvey Releases FieldGenius 8 Survey Software

MicroSurvey has announced the release of FieldGenius 8, the newest version of the company's survey data collection software. Developed through close market collaboration and feedback from users, FieldGenius 8 provides tight control over crucial aspects of field data collection through expanded toolsets and an enhanced user experience.

▸ http://bit.ly/1LeNxzx

Geo-matching.com

Geo-matching.com Adds Thermal, Multi- and Hyperspectral Imaging

Geo-matching.com has recently added thermal, multi- and hyperspectral imaging to its broad spectrum of product categories. Teledyne Optech is the first supplier in this category with the CS-MS 1920. In addition to general specifications, detailed information is give about camera unit and sensor characteristics. Geo-matching.com (www.geo-matching.com) is the independent geomatic and hydrographic product comparison website featuring detailed spec-based comparisons and user reviews for more than 945 products in 39 product categories. The website guides users through the maze of specifications and gives them the opportunity to compare products from different suppliers.

▸ http://bit.ly/1LeNtzE

Most shared during the last month from www.gim-international.com

1. Bringing Geography into Everything: Ed Parsons Interview - http://bit.ly/1PC2QmF
2. Google Launches Project Sunroof - http://bit.ly/1PC3dhf
3. Dutch PM Embraces Tygron's Digital Urban Planning System - http://bit.ly/1eIZ7qQ
4. Pioneering Location with an Out-of-the-box Approach - http://bit.ly/1PC3OiO
5. How a Well-Functioning Cadastre Can Help Greece to Solve the Crisis - http://bit.ly/1gsLEoC

First ICA European Symposium on Cartography

The International Cartographic Association (ICA) and the Vienna University of Technology are inviting professionals in the broad field of cartography to the 1st ICA European Symposium on Cartography, which will take place in Vienna from 10-12 November 2015. The organising committee aims at bringing together cartographers and those working in related disciplines with the goal of offering a platform of discussion, exchange and stimulation of research and cooperation. More than 70 oral presentations and 20 posters have been accepted for the symposium, which covers different aspects of modern cartography.

▸ **http://bit.ly/1LeNqDX**

Eora 3D scanner.

Australian Start-up Unveils Smartphone-powered 3D Scanner

Australian tech start-up Eora 3D recently unveiled a new kind of 3D scanner which is completely driven by a smartphone and requires only a one-time calibration. 3D models are rendered in-app, from which users can view, edit, share or export them in high resolution. The scanner has a range of up to 1 metre and captures in full colour.

▸ **http://bit.ly/1LeNCTV**

AscTec Falcon 8.

GAF and Partners Monitor Changes at Natura2000 Sites

As part of the Copernicus Land Monitoring Service's local component, a European consortium headed by GAF AG is conducting a detailed assessment of land cover/land use changes at more than 750 European Natura2000 sites, on behalf of the European Environment Agency (EEA) and funded by the European Union.

▸ **http://bit.ly/1LeNFPr**

Detailed land cover/land use around a Natura2000 site.

Topcon Joins Forces with Ascending Technologies for UAS Distribution

Topcon Positioning Group has announced a worldwide distribution partnership with UAS provider Ascending Technologies. The agreement gives Topcon exclusivity for the global distribution of the AscTec Falcon 8 rotary-wing model, the GeoEXPERT and the InspectionPRO sensing and feature packages.

▸ **http://bit.ly/1Le02cL**

Connecting Societal Challenges with the Geomatics World

Due to the rapid growth of the world's population, our planet will face several major challenges in the decades ahead. Urbanisation, climate change, water scarcity, growing pressure on land rights and the challenge of feeding a global population of more than 9 billion by 2050 are just some of the key issues we need to resolve. The geospatial sector can play an important role in helping to overcome these challenges. Read the online article to learn how.

▸ **http://bit.ly/1LeNSCb**

Planet Earth.

Chintergeo 2015 Invites Geospatial Industry to China

Chintergeo will be held from 7-9 November in the city of Ningbo, Zhejiang province, China. Chintergeo is the largest and most influential Chinese exhibition in the field of surveying and mapping equipment and geographical information software, and the event is attended by many companies. This year's event is expected to comprise an area of 22,000 square metres.

▸ **http://bit.ly/1LePyf6**

Chintergeo 2014.

CloudCities: 3D Smart City Service

CloudCities.

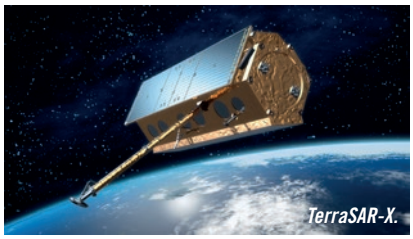
SmarterBetterCities has announced the public release of CloudCities: an intuitive 3D city service with features for community engagement, easy city data sharing and analytics. Stakeholders can easily explore new city developments or observe the existing places in which they live and work. Dashboards provide detailed information about space allocation, energy consumption and costs.

▸ **http://bit.ly/1gsMdyK**

Sharing Geospatial Experiences with Hexagon Smart M.App

Hexagon Geospatial has announced the introduction of the Hexagon Smart M.App, providing a new way to understand and share geospatial experience. These new lightweight applications cohesively combine data, workflows and analytics. Hexagon Smart M.Apps are creatively designed maps to solve distinct business problems. Our world is more dynamic than it has ever been, said Mladen Stojic, president of Hexagon Geospatial, and this requires a different approach to maps. The future lies in the ability to build and deploy highly customisable apps that provide true operational and business value, and the company sees Hexagon Smart M.Apps as a way of providing a better experience.

▸ **http://bit.ly/1LePRX2**



TerraSAR-X.

TerraSAR-X Satellite Feeding of Copernicus Data Warehouse Extended

Airbus Defence and Space, owner of the commercial distribution rights for TerraSAR-X data, and ESA have signed a contract securing the continued supply of TerraSAR-X data for the Copernicus Data Warehouse. The agreement is valid until the end of 2020, thus continuing the successful cooperation between Airbus Defence and Space and ESA that dates back to 2008 for the provision of TerraSAR-X data to public institutions across Europe.

▸ **http://bit.ly/1LeVCUX**

Nokia to Sell HERE to Automotive Industry Consortium

A TRUE car.

Nokia has announced an agreement to sell its HERE digital mapping and location services business to a consortium of leading automotive companies comprising Audi, BMW and Daimler. The transaction, which values HERE at EUR2.8 billion, is expected to close in the first quarter of 2016.

▸ **http://bit.ly/1LeVTqW**

Improving People's Understanding of the Everyday Relevance of Geographic Information

The geomatics sector provides geographic information-based products and services, leveraged by a broader geospatial user community to enable decision-making and policy planning. The term 'geomatics' first appeared in France during the 1970s but did not have much significance until it appeared again in Quebec, Canada, in 1981 (coincidently without actually knowing of any similar use in France). It served as a broad term that encompassed all geographic-related methods and tools, and was never meant to replace the existing disciplines it represented. Using a term in plural form helped indicate that these traditional sciences continued to exist on their own while sharing a common vision with familiar issues resulting from a new digital era.

Now, several decades later, the term 'geomatics' has been adopted worldwide by the International Standards Organisation, Royal Institution of Chartered Surveyors, universities, colleges, scientific and professional journals, governments and industry. However, similar to the situation we saw with the introduction of the metric system, there are often different preferences in the United States, where predominantly the term 'geospatial' is used instead of 'geomatics'.

Widely recognised as the birthplace of GIS thanks to Dr Roger Tomlinson, a visionary geographer, Canada has a large and unique geography and prides itself on geomatics developments. However, Canadians are often highly influenced by the United States and, over the years, this close influence has led to many debates about whether Canada should be using the term 'geomatics' or 'geospatial' to describe the sector. Such debates on terminology have even brought about fragmentation in the geomatics sector and introduced additional geo-based terms, causing a need to communicate a more cohesive and compelling geomatics story in Canada.

In 2010, the Canadian Geomatics Community Round Table (CGCRT) was created as an open informal forum to allow representatives from industry, academia, associations and governments to examine common issues of national importance to the geospatial community and to develop a geomatics strategy to help re-position the geomatics sector for future success. In 2014, over 100 influential leaders representing a broad spectrum of the geomatics sector (private, public and not-for-profit organisations) came together to create the strategy document and initiate an action plan based on seven distinct yet related strategic dimensions to help implement it:

'The Pan-Canadian Geomatics Strategy presents a vision, mission and guiding principles for the Geomatics Sector. It proposes a set of recommendations to address key issues facing both the Geomatics Sector and the broader Geospatial Community. The key focus is the Geomatics Sector, which is seen as spatially enabling the broader Geospatial Community of users and a "geospatially-enabled society"'(source: www.CGCRT.ca, 2014).

The strategy stated that the focus must move away from debating terminology to instead concentrate on what the sector is actually accomplishing and what the sector is capable of accomplishing in the future. It defined the scope of the geomatics sector as "anyone needing to use geospatial information in their daily lives and work" and described the uniqueness and importance of enabling the broader geospatial community. It determined that there was a need for the sector to articulate an easily understood and compelling identity that helps create a positive image with government, decision-makers and the general public.

Working groups were created to help implement the various components of the strategy. Earlier this year, a group of influential leaders representing the Canadian geomatics sector came together once again in Ottawa to finalise the work of the CGCRT and proposed a new national umbrella organisation: GeoAlliance Canada.

▲ *Ted MacKinnon*

GeoAlliance Canada is Canada's approach to national policy design and delivery resulting from years of CGCRT discussion and debate. The volunteer-run organisation made up of representatives from government, academia, non-profit associations and the private sector plans to help the geomatics sector, increase domestic awareness and execute actions allowing the geomatics sector to move forward as a more cohesive whole. There is no intention to replace or compete with any existing geomatics organisations but instead to collaborate and build upon established accomplishments.

Now, after five years of CGCRT and 40-plus years of using the term 'geomatics', hopefully GeoAlliance Canada will be able to bring the sector together and improve cohesion through greater collaboration amongst all levels of government, industry and academia. Then, with any luck, people will have a better understanding of the relevance and importance of geographic information in their everyday lives.

@tedmackinnon

Bridging the Gap between the Geospatial Sector and Society's Global Challenges

Faced with such an abundant choice of trade shows, conferences and events, geospatial professionals often find it difficult to decide which ones to attend. The majority of those events are focused on the industry from the inside – by geoprofessionals, for geoprofessionals – which means that truly new insights can be hard to find. By launching an out-of-the-box conference based on the concept of 'inside looking out', *GIM International* – the global magazine for geomatics – aims to fuel new discussion, inspiration and enthusiasm within the sector. After all, if we as an industry are to help the world overcome the many challenges that lie ahead, a closer link between society's needs and geospatial solutions is more imperative than ever before.

Based on the overarching theme of 'Seeking Space for Future Development', the GIM International Summit is being organised with the role of geoprofessionals as 'caretakers of the Earth' in mind. The GIM International Summit will take place in the heart of Amsterdam from 10-12 February 2016. The Dutch capital will be an excellent venue to discuss the future of geomatics, for educational institutes, industry members and policymakers alike. The discussion will be driven by speakers from outside the traditional geomatics world, all of whom are experts in their own field. At the event – whether during the workshop sessions or while enjoying a boat trip on Amsterdam's famous canals, for example – key opinion leaders and decision-makers from inside and outside the geospatial sector will have plenty of opportunity to exchange thoughts and ideas with one another.

Three full days of insights are guaranteed at the GIM International Summit thanks to the involvement of numerous high-profile speakers, including: Ed Parsons, geospatial technologist at Google, data visionary Hans Rosling, and Morten Jerven, author of the books *Africa: Why Economists Get It Wrong* and *Poor Numbers: How We Are Misled by African Development Statistics and What to Do About It*. Delegates are assured of being part of inspirational discussions about innovation, change management and the future role of geomatics in the wider world.

Ed Parsons Confirmed as Keynote Speaker at GIM International Summit

The organising committee of the GIM International Summit 2016, the brand-new event for the geospatial community, is proud to announce Ed Parsons as a keynote speaker. Parsons is geospatial technologist at Google, with responsibility for evangelising Google's mission to organise the world's information using geography.

In this role Ed Parsons maintains links with universities, research and standards organisations which are involved in the development of geospatial technology. Parsons, who describes himself as a "geographer at heart", says what he is trying to do is to bring a bit of geography into everything. "We need to make small elements of geospatial technology accessible and available to everybody, but they don't necessarily need to understand it," he said in an exclusive interview published in the August 2015 issue of *GIM International*.

EyesMap.

E-Capture Launches 3D Tablet for Architects and Archaeologists

E-Capture R&D, a Spanish technology-based company, has introduced a new 3D accurate measuring tablet: EyesMap. The Spanish enterprise intends to revolutionise the world of measuring with this next generation of portable, easy-to-use and highly accurate instruments, optimal to fulfil most of the challenging architecture, design and archaeology jobs. EyesMap has an excellent capacity for modelling 3D scenes, both indoors and outdoors, as well as for 3D capture, ranging from large objects such as buildings to small objects such as coins. According to E-Capture, EyesMap is the only device in the market with this all-round capacity and versatility.

http://bit.ly/1LeWcIA

5 Questions to...

Dr Vanessa Lawrence

As a member of the Bureau of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), Dr Vanessa Lawrence is a well-known and widely recognised representative of our profession. *GIM International* asked her 5 questions about achievements and developments.

Why does UN-GGIM exist?

UN-GGIM acts as the formal intergovernmental mechanism to discuss, enhance and coordinate global geospatial information management activities by involving the Member States of the UN at the highest political and official level. It plays a leading role in making joint decisions and setting direction on the use of geospatial information within national, regional and global policy frameworks through its very effective regional structure. UN-GGIM works regularly with governments to help them improve their knowledge of appropriate policies, institutional arrangements and legal frameworks. In addition, it addresses global issues and contributes to collective knowledge. This is presently most notable with the Post-2015 Sustainable Development Agenda. UN-GGIM is also working towards developing a comprehensive knowledge base and it has established and recommended standardised approaches that should be taken to assist development of a country's geospatial infrastructure. Finally, it provides a forum to liaise and coordinate between the Member States and relevant international organisations such as FIG, ICA, GSDI and ISPRS.

How big is the support for this development?

As well as having a formal mandate from the Economic and Social Council of the United Nations, UN-GGIM is guided by the UN-GGIM Bureau who are all elected by the Member States. Working alongside me on the Bureau are Dr Li Pengde from China, Dr Eduardo Sojo from Mexico and Mr Sultan Mohamed Alya from Ethiopia. 134 different UN Member States have participated in the Committee of Experts to date, including many ministers and directors-general. This sends a very strong and positive signal that what is being discussed is important.

What are the achievements so far?

One of the initial focuses for UN-GGIM was to draw together a fragmented geospatial community; this has gone well thanks to UN-GGIM's ability to connect geospatial information management to policymakers and leaders at all levels within a country. Another significant achievement is the endorsement by the UN General Assembly of the resolution on a Global Geodetic Reference Frame for Sustainable Development. This is the first resolution recognising the importance of a globally coordinated approach to geodesy. A further achievement has been the publication and endorsement of the report 'Future trends in geospatial information management: the five to ten-year vision'. The report provides expert opinion on the developments in geospatial information and is seen as a strategic guide for governments wishing to invest in a geospatial infrastructure.

What's currently on the agenda?

The priorities and work programme are driven by UN Member States themselves. Much of the focus currently surrounds the formulation of the Sustainable Development Goals that will be ratified by the UN General Assembly in September 2015. UN-GGIM has been very engaged with ensuring that it is well understood that in order to evaluate, measure and monitor these important goals and their targets, effective geospatial information must be used in many aspects. Some of the discussion topics include: sustainable development and the Post-2015 Development Agenda; the application of geospatial information for land administration and management; integrating geospatial, statistical and other information; and developing the global geodetic reference frame implementation roadmap.

Would a 'land administration layer' be a good idea?

UN-GGIM recognises the importance of land administration as both a driver of economic growth and social development and as being critical to the successful implementation of the sustainable development goals, which is why a new work item was proposed and introduced. Since August UN-GGIM has been working with Member States and a number of key international organisations to scope and prepare the work. This has included working with land and tenure experts from the World Bank, FAO, FIG and UN-Habitat.

A3 Edge camera.

A3 Edge Digital Mapping System Upgrades Oblique Capabilities

VisionMap has announced the introduction of upgraded oblique capabilities to its A3 Edge Digital Mapping System. The A3 Edge camera, well-known for its high capture productivity, now utilises a proprietary roll stabilisation technology that increases its efficiency, particularly for oblique projects.

▸ **http://bit.ly/1LeWqJh**

Hans Rosling to Share Unique Insights into Global Change at GIM International Summit

Hans Rosling.

The conference committee of the GIM International Summit is excited to announce that Hans Rosling will be appearing at the conference as a keynote speaker. The professor of international health in Stockholm, Sweden, is a high-profile public speaker on global change, and *Time Magazine* listed him among the 100 most influential people in the world. Thanks to his inimitable style of presenting data and information, delegates at the GIM International Summit in February 2016 are in for a real treat.

▸ **http://bit.ly/1MJVfnj**

Google Launches Project Sunroof

Google has launched a new service that allows homeowners to calculate how much energy they can generate by installing solar panels on their roof. With this service Google aims to help people decide whether it is interesting for them to switch to solar power. 'Project Sunroof' puts Google's expansive mapping data and computing resources to use in order to help homeowners calculate the best solar plan for them.

▸ **http://bit.ly/1PC3dhf**

Project Sunroof.

Gexcel LineUp Notes.

Gexcel Launches New Lidar Software and Hardware Solutions

Gexcel, Italy, has announced a new series of software and hardware solutions for the Lidar market able to cover a large range of applications. The range is compatible with all the main laser scanner sensors available in the market such as FARO, Teledyne Optech, Stonex, RIEGL and Zoller + Fröhlich. At Intergeo, Gexcel will present the new release of LineUp Pro, a targetless registration tool, featuring bundle adjustment.

▸ **http://bit.ly/1Fj2yMc**

Archaeologists to Reconstruct Syrian Heritage Using 3D Cameras

Palmyra, the City of a Thousand Pillars.

Following reports that the Islamic State (IS) terror group has begun destroying the historic ruins in Syria's ancient city of Palmyra, a group of archaeologists have come up with the idea of installing thousands of 3D cameras in conflict regions in the Middle East. Capturing digital images of cultural heritage sites will enable historic monuments to be reconstructed if they are destroyed by IS. The plan is to place the 3D cameras close to Roman ruins and other ancient relics so that the recorded data can later be used to recreate them precisely. The academics from Oxford University in the UK and Harvard in the US intend to install 5,000 cameras in 2015 and to have captured a million images by the end of 2016.

▸ **http://bit.ly/1NUUhVM**

Photon Lidar

Airborne Lidar has matured over the last two decades into a mapping technology routinely used for 3D modelling of urban areas, capturing boreal forests, seabed mapping and many other applications all over the world. The speed with which the laser pulses are fired continues to soar and for a number of commercial systems it has reached the impressive number of one million pulses per second. Multiple pulses in air and (full) waveform digitisation are other developments which found their way to the users in recent years. Last year Optech introduced Titan, the world's first multispectral airborne Lidar. Without doubt the enhancements and advances will continue to emerge. One seemingly promising recent advance for mapping applications is photon Lidar (also known as Geiger-mode Lidar). But what is photon Lidar?

In conventional Lidar systems one pulse provides data on the reflectivity, the range and, when using (full) waveform digitisation, the surface structure of the footprint of the single pulse on the object – one pulse results in an information nucleus for *one* object point. The return signal contains thousands of photons. In contrast, the photon Lidar approach creates an array of points from a single pulse fired by the system – one pulse is divided into dozens or hundreds of sub-pulses. The partition of one pulse into many is enabled through the use of diffractive optics which split the outgoing pulse into an array of sub-pulses. The optics can be tailored to the needs of the user; the size of the array may be, for example, such that a quadrangle of 10 by 10 sub-pulses is generated from one pulse emitted by the sensor. The partition of the pulse in a 10 by 10 array enables one pulse to capture a point cloud of up to 100 points. The returns from the individual sub-pulses are captured by a receiver also consisting of a 10 by 10 array. So, one pulse does not cover one footprint, as conventional airborne Lidar does, but rather captures multiple individual adjacent points resulting in a high point density. The sensitivity of the sensor is so high that the range to the surface of an object can already be determined even if just one photon is present in the return signal. Therefore, it is of no great concern if many photons in the fired pulses or return signals get lost in the atmosphere. As a result, the distance from sensor to the object may be much larger than for conventional Lidar. Similarly the swath width may be larger which reduces the number of flight lines, and hence data acquisition time, without affecting point density. A typical conventional airborne Lidar survey may be flown at 1,000m to 1,500m while a photon Lidar survey may achieve equivalent point densities at a flying height of 4,000m to 5,000m and the number of flight lines may be reduced by a factor three.

Are there no snags? Yes, there are. Photon Lidar detects only photons and registers the time of flight but not the strength of the return signal and thus no waveform digitisation is possible. By using RGB and NIR cameras the first shortcoming can be compensated for while the reconstruction of the surface structure, which is the main asset of waveform digitisation, can be derived from the dense point cloud. The ability to operate at low power levels is an advantage but requires on the other hand highly sensitive sensors which may wrongly detect solar photons as return signals. The effects of this type of noise may be diminished by careful design of beam divergence, spectral width, filters and other system parameters. Up until now, photon Lidar is not in use for the commercial collection of geodata. Before it can become a proven technology, further research is required to obtain thorough insight in the accuracy and reliability characteristics and into the ways to improve these major surveying parameters. ◂

GIM INTERNATIONAL INTERVIEWS RAY O'CONNOR

Innovation at the Heart of **Geospatial Growth Strategy**

The geospatial industry is involved in an ongoing transformation. From its headquarters in Livermore, California, USA, Topcon Positioning Systems (TPS) manages 31 operations located in 15 countries on five continents, employing more than 2,100 people. Here, we speak to Ray O'Connor, CEO of TPS, on the role his company is playing by providing connectivity with software and precision-measurement hardware for a range of market sectors.

What is TPS's growth strategy?

Topcon has an 82-year history and remains a major player in optical surveying instruments. When I joined the company in 1993, there was a major drive to identify areas for growth, with an emphasis on helping people to improve productivity in the surveying, construction, agriculture, civil engineering, mapping and GIS sectors. That drive continues to develop markets for our new products and to diversify, ensuring there are always areas for advancement. Connecting 3D modelling with data was the genesis of real growth for our company and has driven its expansion over the last two decades. In 1993, even though Topcon enjoyed a strong market share, particularly in the surveying sectors, our sales were a fraction of what they are today. This growth is, of course, influenced by advances in our GNSS machine automation, scanning and collaborative software systems — but our growth strategy is not strictly technology-based. It is society–based: realising that the demands for affordable infrastructure and sustainable agriculture will insist on the efficiencies that our solutions provide.

Which are the most important regions for Topcon?

We have a relatively strong presence in every region of the world, supporting approximately 2,000 distributors. Honestly, in today's economy, there is no such thing as an unimportant region. For example, areas that have been slow to adopt our construction-machine control or scanning technologies are in some cases our fastest growth areas in precision agriculture.

On which applications is the business focusing its research and development?

We have developed great applications that add real value across every segment of the business. In the geomatics segment we have seen substantial growth in vehicle-mounted 3D mobile mapping systems. With scanning at 1.5 million points per second, the level of accuracy is unparalleled. There is also an ongoing demand for field-ready traditional surveying instruments, as well as the design of new instrumentation. What really powers each of these is the unprecedented productivity that is realised through the rapid integration of data that our software provides, regardless of application.

Our unmanned aerial systems (UASs) are providing exciting promise for automated mapping of construction sites, pipelines, disaster areas, mines and other sites where terrain may be difficult to navigate. These drones are fitted with hyperspectral imaging cameras with excellent image quality. These are fully integrated systems that have all the software needed to acquire and analyse hyperspectral data. It's one of the most innovative and exciting areas we are involved in.

We are also promoting our OEM integration in the construction sector, and expanding our market and strengthening our OEM business by introducing innovative new products to the agriculture sector. There is much room for growth in agronomy especially with precision solutions for crop and farm management – helping to boost farming efficiency and increasing crop health and yield.

I'm fascinated by how the iPhone changed everything. It ushered in a new era of intelligent, connected devices that have had an enormous impact on consumers' lives. The new computing power, this democratisation of data, has enabled consumers to help drive the development of applications that advance efficiency in virtually all industries. Coupled with the increasing affordability and miniaturisation of technology, and of memory in particular, computing power has altered our world in ways that were once unimaginable.

What is land surveying's position in the company's spectrum of applications?

High-precision land surveying is the foundation upon which this business was built, and it remains extremely important. The most significant developments in this area of the business are being driven by mass data and content accessibility, and how they are being applied in order to very precisely measure large distances and activity across the planet in order to manage its development and sustainability.

What's the current status of surveying?

It remains a very traditional business. As an industry, we need to do a better job of educating surveyors about adopting new technology. There is a perception that machines are taking over and that surveyors' jobs are under threat. That is simply not true. While there may be less physical surveying required, surveyors have a major role to play in data management and analysis. The construction industry, for example, will continue to rely on professional surveyors because of the particular set of skills they bring to projects. Technology is helping them to do their jobs better – it's not placing them at risk. We need to edify the industry and help people to see progress in that light.

How do you see the role of surveyors in the future?

The future of the surveying profession is bright. As I just mentioned, new technologies require new training. Instruments like 3D laser scanners are providing solutions to many of the challenges land surveyors have encountered in the past. No longer are they functioning as data gatherers; their role is expanding into consulting with clients. They can concentrate on what the data means rather than on the data collection itself. 3D modelling also gives surveyors greater flexibility, as they no longer have to work around obstacles to measure properties. Because 3D laser scanning is so accurate, surveyors can provide clients with a precise picture of each property – with speed and clarity that only elevates their position within the new domain of information modelling.

Do you believe the economic crisis is over? And have geospatial businesses learned anything from it?

In the US, yes, the recession is behind us. Europe is still suffering from its sting, especially in specific regions. The slowdown in China is worrisome and could slow the overall recovery if its economy weakens much further. From TPS's point of view, China's current balancing act is impacting the mining and commodities industries in Australia, but we have definitely seen business improving worldwide as recovery continues to take place.

The GIM International Summit is a brand-new event for the geospatial industry. Building on 30 years of leadership as a global geospatial publication, *GIM International* is now leveraging its print and online prowess to facilitate a cutting-edge forum for thought-leaders and decision-makers. The event will go beyond industry borders, challenge conventions and look ahead to the future. Influential speakers from both within and beyond the sector will provide an inspiring practical perspective on the spatial dimension of global development.

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I'm not sure if all businesses, as well as many governments, have learned from the crisis. It's amazing to see how quickly we seem to have forgotten those difficult years. I think a big takeaway is to be very cautious of seemingly limitless expansion. We all need to be more conscious of the realities that surround us and scale our plans according to what we see happening globally. It's critically important in today's economic environment to be able to make adjustments to business models and strategies when necessary. Agility is key, but it must be balanced to help ensure that investment for long-term growth stays planted as our core obligation to our customers and society as a whole.

What is Topcon's message to the geomatics world?

I have a saying that usually results in looks of confusion: "You don't know what you don't know." I've been in this industry for more than three decades and I have never seen change take place at the rate we are witnessing right now. The pace of development over the last five years has been simply phenomenal. I find that speed of innovation incredibly exciting. We have systems that can measure up to 1.5 million unique Lidar points per second. That's 300 percent more than ten years ago, when we thought it couldn't get any faster. Thankfully, we didn't know what we didn't know. Now I know to never underestimate the unknown and do all I can to not just be prepared for it – but also to create it!

Today, surveyors have the ability to measure complex areas more quickly, accurately and safely than ever before. We've all heard the old business adage, "If you can't measure it, you can't manage it." But in today's surveying industry, it's more a case of "What you can't measure in real time, you can't manage in real time". Today we process measurement data in real time, in a single application. In the past, surveyors would go out into the field, measure vertical and horizontal positions and reference systems, repeat that manual process for hours on end, then go back to the office and analyse their findings, hoping they hadn't missed any critical point or corrupted their data. Now all of that happens in real time.

There are even more exciting times ahead. One of the challenges, however, is to ensure we have not only qualified, but also enthusiastic people entering the industry. That's where the real future lives. That's where new ideas are generated. The geomatics industry needs to do a better job of promoting itself. We recognise the value of strong educational programmes in the areas of surveying, engineering, GIS, agriculture and construction technology, and we have partnered with more than 600 colleges, universities and trade schools around the world to help educate the future leaders of our industries. New technologies are bringing exciting opportunities for the surveyor to move beyond the traditional surveying activities. It should not be difficult to attract people to this industry – everything on the planet needs to be mapped and the job opportunities and career options are virtually limitless.

On a practical level UASs, or 'drones', used to be the stuff of science fiction. We need to be out there showing students how marvellous the technology is and what fun they could be having in the real world, making real contributions with these and other amazing tools. Geomatics is a sector that impacts every aspect of our lives, from environmental management to urban planning and disaster informatics. Can you tell I'm excited? When I was a student, I was frustrated at how antiquated everything seemed; now I know that the possibilities are endless. ◀

Ray O'Connor

Ray O'Connor is president and chief executive officer of Topcon Positioning Systems (TPS), a position he has held since 2002. He is also general manager of the Positioning Operating Company, one of three companies that form Topcon Corporation, where he serves as senior managing executive officer. Additionally, he has served as chairman of the Topcon Europe Positioning business since 2005, and he is a director of Topcon America Corporation. After joining Topcon in 1993, O'Connor led the growth of TPS through strategic initiatives beginning in 1995. Since then, TPS revenue has grown tenfold, and he continues to lead the company in its mission to help meet the increasing demand for sustainable agriculture and modernised infrastructure. Most recently he directed the acquisition of four global manufacturers: Digi-Star, headquartered in the United States; RDS Technology, headquartered in the United Kingdom; Wachendorff Elektonik, headquartered in Germany; and NORAC, headquartered in Saskatchewan, Canada.

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PERFORMANCE OF DBMS AND FILE-BASED SOLUTIONS

Managing **Massive** Point Clouds

Today Lidar and photogrammetry enable the collection of massive point clouds. Faced with hundreds of billions or even trillions of points, the traditional solutions for handling point clouds usually underperform. To obtain insight into the features affecting performance, the authors carried out tests on various systems and identified pros and cons.

Point clouds have traditionally been processed into grids, vector objects or other types of data to support further processing in a GIS environment. Today point clouds are also directly used for estimating volumes of complex objects, visibility analysis, roof solar potential analysis, 3D visualisations and other applications. In archaeology, for example, point clouds are crucial for 3D documentation and analysis of sites. In addition to using data management solutions to manage grids, vectors or TINs, users are increasingly demanding that they can handle massive point clouds. The performances of the various current systems for managing point cloud data were investigated in the 'Massive Point Clouds for eSciences' project, a collaboration between Rijkswaterstaat, Fugro, Oracle, Netherlands eScience Center and TU Delft.

SYSTEMS

Since there is a continuous debate about whether database management systems (DBMSs) are suitable for managing point cloud data, the project considered both DBMS and file-based solutions. In the latter, points are stored in files in a certain format and accessed and processed by solution-specific software. In DBMSs, two storage models can be distinguished:

- Blocks model: nearby points are grouped in blocks which are stored in a database table, one row per block
- Flat table model: points are directly stored in a database table, one row per point, resulting in tables with many rows.

All file-based solutions use a type of blocks model. It was decided to test the widely used LAStools by Rapidlasso with both LAS and compressed LAZ files. The blocks model DBMSs tested were Oracle and PostgreSQL. Flat table model DBMSs in the tests were Oracle, PostgreSQL and MonetDB, which organises data per column instead of using the classic row storage architecture.

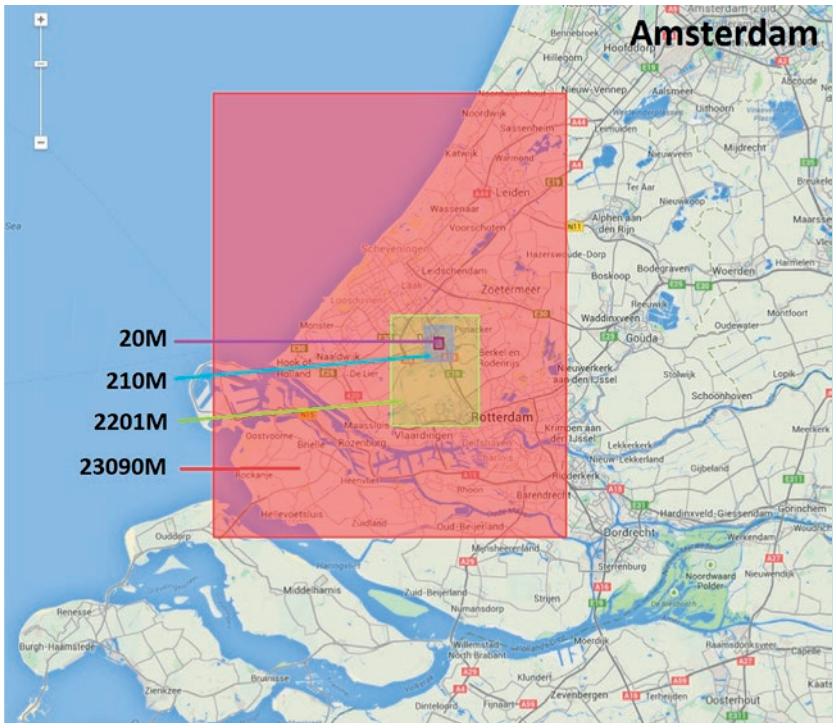

Figure 1, Areas covered by the four subsets and the number of million points in each area projected on Google Maps.

BENCHMARK

Initially the wishes of users in government, industry and academia were inventoried using structured interviews. The highest-ranked features were investigated using datasets varying from a few million points to several hundred billion points. The point clouds were subsets of AHN2, the second National Height Model of the Netherlands, which consists of 640 billion points (Figure 1). All systems run on the same platform, a HP DL380p Gen8 server with 128GB RAM and 2 x 8 Intel Xeon processors E5-2690 at 2.9GHz, RHEL 6 as operative system and different disks directly attached including 400GB SSD, 5TB SAS

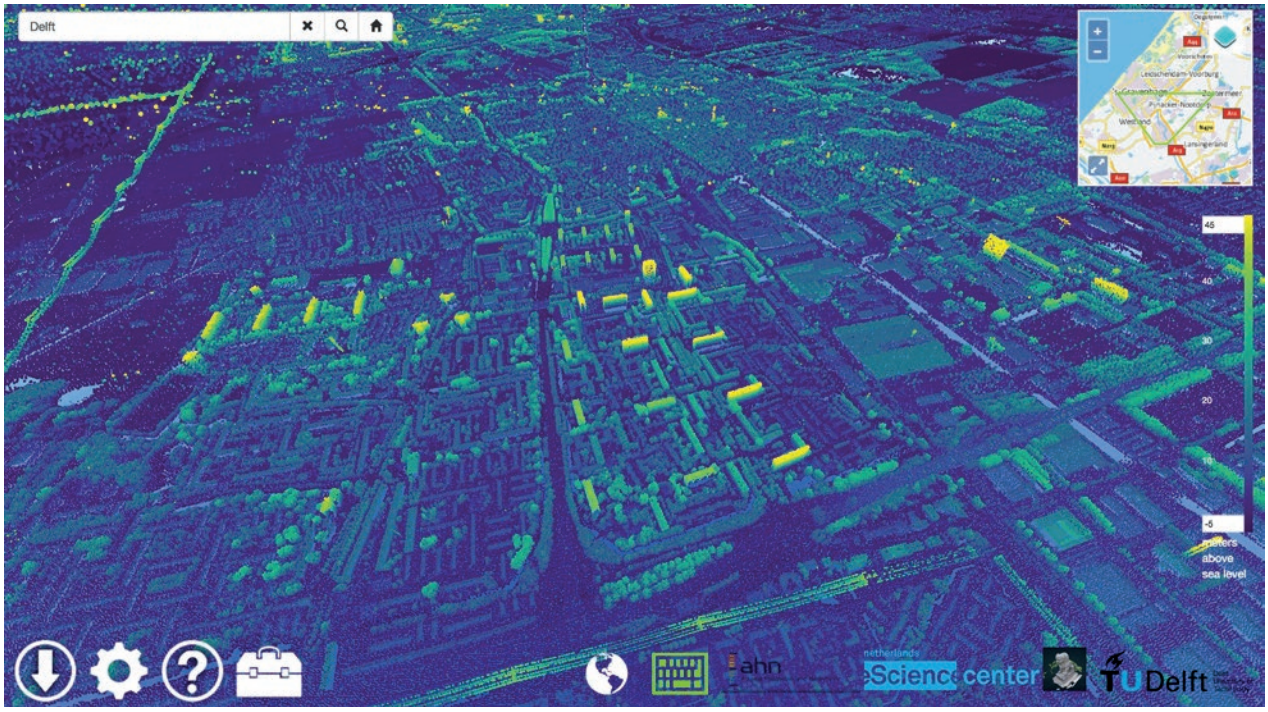

Figure 3, Visualisation of a small part of AHN2, representing the city of Delft using Potree; the colours represent elevation rather than strength of the reflected pulse, which is not present in AHN2.

15,000rpm in RAID 5 configuration (internal), and 2 x 41TB SATA 7,200rpm in RAID 5 configuration (in Yotta disk cabinet).

STORAGE, PREPARATION AND LOADING

Compared to flat table systems, the blocks model DBMSs are faster and compress the data better during preparation and loading. Flat table systems enable modifications of the table definition or the data values as in any database table. This is more complicated in the blocks model. For both, the integration with other types of data is straightforward and all the key features of DBMSs are present, i.e. data interface through the SQL language, multi-user access, transaction processing, remote access and advanced security. LAStools prepares data faster than any DBMS since no loading is needed, only resorting and indexing. The storage requirements of the compressed LAZ format are lower than those of the DBMSs, but with its fixed file format the data model loses flexibility as one is restricted to the specified format. For example, the standard LAS format allows only one byte for user data.

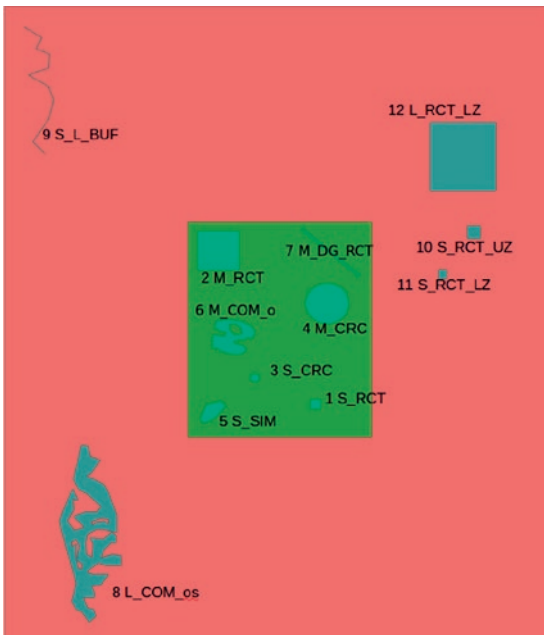

Figure 2, Data retrieved from selected rectangles, circles and simple and complex polygons.

RETRIEVAL

Data retrieval was tested by selecting points within rectangles, circular areas and simple and complex polygons (Figure 2). Also tested were nearest neighbours queries and simple operations such as the computation of minimum, maximum and average elevation in an area. Blocks model DBMSs performed well on larger areas or complex polygons, independent of the point cloud size. However, the blocks model added an overhead which affects simple queries most. The flat table model DBMSs performed well for simple queries on small point clouds, but for large point clouds the native indexing methods became inefficient. Alternative flat table models based on space-filling curves provided nearly constant response times, independent of the stored point cloud size. The file-based solution using LAStools performed best for simple queries. The queries to LAZ data were slower than to LAS data because of the need to uncompress the data. In addition, massive point clouds required an external DBMS to maintain good performance.

ORACLE EXADATA

An implementation of the flat table model in Oracle was also tested in Oracle Exadata X4-2 hardware, Oracle SUN hardware designed for the Oracle database with an advanced architecture including hardware hybrid columnar compression (HCC), massive parallel smart scans/predicate filtering and lesser data transfer. Storage requirements, speed of loading and data retrieval were comparable to LAStools but complex queries ran significantly better because of massive parallelisation.

SUGGESTIONS FOR IMPROVEMENT

If a file-based solution fulfils the user requirements it is recommended to use that solution. However, if more flexibility, other types of (spatial) data and/or more advanced functionality are required, DBMSs are advisable. Point cloud support is steadily improved in most DBMSs and could be further improved by using the PDAL library which provides faster loading with more compressed data as well as faster data retrieval. Most systems miss two important features. Firstly, although data preparation and loading can be easily parallelised with additional tools only MonetDB supports native efficient parallel processing. The performance of DBMSs for which parallel algorithms for data retrieval were explored improved significantly. Oracle is currently adding parallel query support based on similar algorithms. Secondly, crucial for visualisation is support of level of detail, i.e. the ability to display points which are close to the viewer with higher density than those

further away. Plas, Potree and other recent web-based frameworks have developed own data structures for visualising point clouds. Figure 3 shows a part of AHN2 visualised by Potree. These frameworks also run into difficulties with massive point clouds, and solutions are currently being sought. The authors are presently exploring alternatives for adding an efficient level of detail support in generic DBMSs. Standardisation of point cloud data at web-service level is the topic of ongoing debate.

ACKNOWLEDGEMENTS

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More information

http://potree.org/
http://plas.io/

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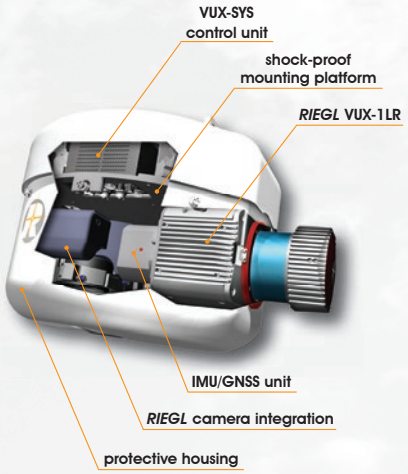

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A MODERN SURVEYING INFRASTRUCTURE FOR GNSS USERS

Oman Launches New **Geodetic Datum**

Today GNSS is widely used in Oman. High and homogeneous quality of GNSS positioning requires a geocentric datum attached to the International Terrestrial Reference Frame of which the parameters are regularly revised. The authors describe the creation of the new Oman National Geodetic Datum which is attached to ITRF2008.

Each station was occupied for one to three weeks.

Measuring a point on the coast of Oman.

A national network-based real-time kinematic GNSS service provides a single standard for the acquisition and use of geodata by multiple users. Added to this, Oman aims to establish a network of continuously operating reference stations (CORS) that provides GNSS positioning to a broad range of users including surveyors, GIS professionals, engineers, scientists and the public at large. The International Terrestrial Reference Frame (ITRF), which is the most accurate of all reference systems, is increasingly used by countries as the basis for their national reference systems. Due to plate tectonics and tidal deformation, the parameters of ITRF regularly need upgrading. Thus, a national geocentric datum also needs regular revision. The datum used in Oman was previously based on ITRF89 and was created in 1994, but it was updated to ITRF2008 epoch 2013. This new geocentric datum, known as Oman National Geodetic Datum (ONGD14), was launched in December 2013 at the Oman Geospatial Expo in Muscat and now provides GNSS users with a modern surveying infrastructure.

NATIONAL SURVEY AUTHORITY OF OMAN

The National Survey Authority (NSA) of Oman, established 1984, is responsible for all survey activities for assembling and maintaining Oman's geographic archives. NSA creates and enforces standards for topographic surveys and mapping; manages and maintains the national archive of geographic materials; revises and provides maps, air charts and other geoinformation; and establishes and maintains horizontal and

▲ *Electricity was provided by solar panels and a power generator.*

vertical control points. NSA has technical and HR capabilities for the production of geodata and performance of the mandated survey activities. NSA employs about 180 technical staff.

HISTORY OF DATUMS IN OMAN

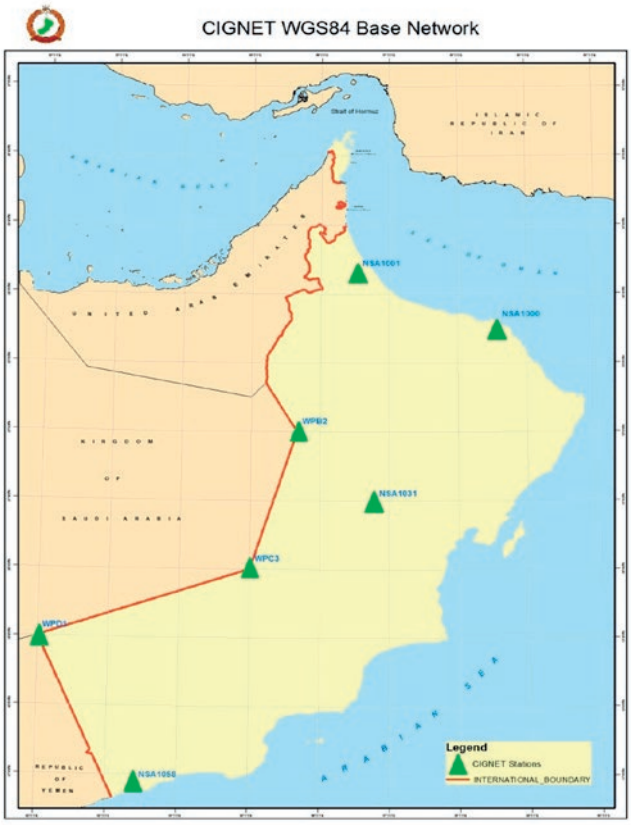
The oldest datum is the Fahud Geodetic Datum of 1954 which was established for the oil industry. It is based on the Clarke 1880 reference ellipsoid and is a horizontal (2D) datum. The first geocentric datum was created through a Doppler satellite campaign in 1979, which connected 42 Fahud Datum points to WGS72.

To migrate this system into the geocentric coordinate system of ITRF89, seven Doppler stations were remeasured in 1993 and connected to the Cooperative International GPS Network (CIGNET) through an adjustment to the Fundamental Station Wettzell located in Germany (Figure 1). The coordinates of the Fundamental Station Wettzell were referenced to ITRF92 and the solution was transformed into ITRF89. The First Order GPS Network, consisting of 79 GPS control stations, was connected to ITRF89, which adopts WGS84 reference ellipsoid. The Second Order GPS network was gradually established and completed in 2010, resulting in 494 stations. The coordinates were determined by 2-to-4-hour sessions of GPS observations, depending on the length of the baseline.

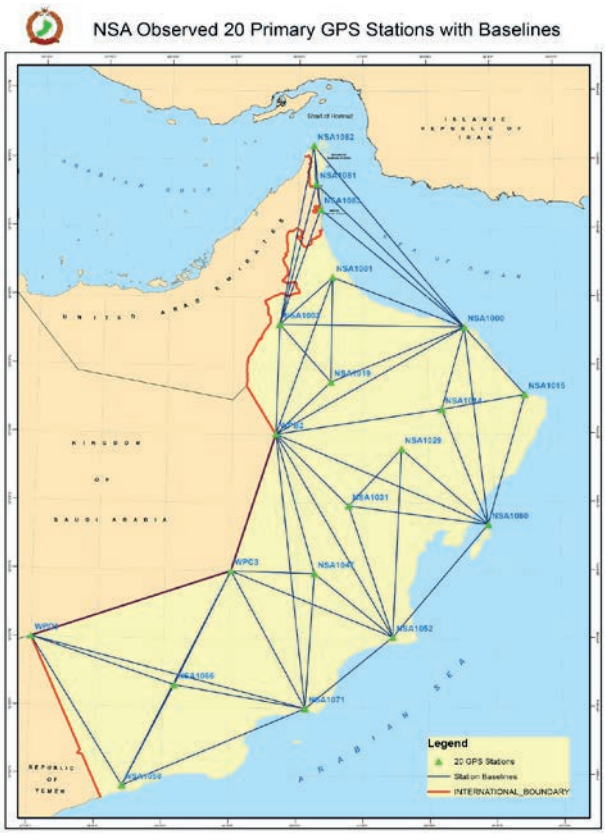
FIVE FIELD TEAMS CONDUCTED GPS OBSERVATIONS DURING 59 DAYS ON SEVEN PRIMARY AND 13 FIRST-ORDER GPS STATIONS

FROM ITRF89 TO ITRF2008

Five field teams conducted GPS observations during 59 days, from 26 January 2013 to 25 March 2013, for 20 NSA stations using Trimble 5700 GPS receivers with Zephyr antenna. The stations comprised seven primary and 13 first-order GPS stations (Figure 2). Each station was occupied for between seven and 23 days using five GPS



▲ *Figure 1, GPS primary network in Oman.*



▲ *Figure 2, 20 primary GPS stations with baselines.*

receivers. The 20 stations were connected to nearly 50 IGS stations in the vicinity of Oman and, through adjustment, ONGD14 was connected to ITRF2008 frame epoch 2013, known as IGb08. To determine the accuracy of the network with respect to IGb08 a comparison of IGS coordinates fixed at 24 February 2013 was made, resulting in an RMSE of 3.9mm, 5.5mm and 8.3mm for the northing, easting and height components, respectively. The accuracies of the NSA stations with respect to IGb08 with free network adjustment are 5.9mm to 8.4mm in the horizontal component and 12.6mm in height. The multisession repeatability of all stations has an RMSE of 2.0mm, 2.9mm and 4.3mm for the northing, easting and height components, respectively.

To convert the new geocentric datum coordinates to the older geocentric datum and vice versa, the relationship between ITRF2008 period 2013 and ITRF89 has been derived (Table 1).

	PSD93→WGS84	Fahud→WGS84	WGS72→WGS84	ITRF89→ITRF2008
ΔX	-182.046m	-333.102m	0m	819.0mm
ΔY	225.604m	-11.020m	0m	-576.2mm
ΔZ	173.384m	230.692m	4.500m	-1644.6mm
Rx	0.616”	0	0.000”	0.00378”
Ry	-1.655”	0	0.000”	0.03317”
Rz	+8.378”	0.554”	0.554”	- 0.00318”
δS	16.867ppm	0	0.22700ppm	0.0693ppm

▲ *Table 1, Transformation parameters, translation (ΔX, ΔY, ΔZ), rotation (Rx, Ry, Rz) and scale factor (δS), between the various datums in use in Oman.*

CONCLUDING REMARKS

Survey instruments and GIS software from vendors such as Leica, Trimble, Topcon, Intergraph and ESRI are widely used in Oman. Users of ONGD14 would benefit tremendously when vendors would include the transformation parameters to the new datum in their products. ◀

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No 2965

TROLLEY EQUIPPED WITH LASER SCANNERS, CAMERAS AND ADVANCED SOFTWARE

Mapping **Indoor** Spaces

Few museums, shopping centres, airports and other indoor spaces have been mapped, although the demand for detailed 3D models of such spaces is accelerating rapidly. Here, the authors present a trolley-based system equipped with laser scanners, cameras and advanced software aimed at creating, visualising, navigating through and exploring detailed and accurate 3D models of indoor spaces. The system can capture up to 50,000m² daily. To date, ten mapping trolleys are operational; two are operated by NavVis and eight by other companies. The potential is huge: according to estimates, at least 50 billion square metres of interior space will be mapped within the next five years.

The heart of the system is the proprietary, patent-pending 3D Mapping Trolley M3 equipped with three laser scanners, six 16-megapixel cameras and an inertial measurement unit (IMU) (Figure 1). Additional sensors record Wi-Fi, Bluetooth, and magnetic fields. The cameras capture high-quality images even under bad light conditions. The maximum range of the laser scanners is 30m and their accuracy is 2cm. The cameras and scanners capture space horizontally and vertically in 360 degrees, i.e. all the way round. The lightweight trolley can go up and down easily, its operation does not require specific knowledge or skills, and it takes just a few minutes to assemble.

TROLLEY SOFTWARE

Combining laser data, IMU data and images through a 2.5D simultaneous localisation and mapping (SLAM) algorithm, the trolley constantly orients itself in the space (see [1] for a brief explanation of SLAM). Software stitches the images together into panoramic views. The trolley software post-processes the raw data fully automatically to create products suitable for publication on the web. The results are available within hours instead of the weeks or months required in the case of conventional mapping systems, thus enabling new applications – such as mapping a trade show the night before its opening so that visitors can explore the 3D model the very next day. The viewer is built on HTML5 and WebGL and does not require any additional software or plug-ins. It can therefore be easily integrated into a website and allows the virtual models to be displayed on any device – computer, tablet or smartphone – at any time. Text, audios, videos, live chats or other content can be added to the 3D model as points of interests (POIs). Clicking on a POI causes its content to pop up. A search bar helps users to find specific POIs quickly. For monitoring purposes, heat maps can be created which indicate how long and how often users look at objects or POIs. Detailed photorealistic 3D models are created by combining panoramas and laser point clouds. The user can look around, navigate to desired locations, interact with POIs and, by clicking on points in the panoramas, conduct accurate linear measurements using the underlying point cloud. An open API enables partners to integrate or link the IndoorViewer, which is part of the system software, to their e-commerce or ERP systems. Typical applications in facility and building management are documentation, inventory, construction progress monitoring, factory planning, path finding and task management.

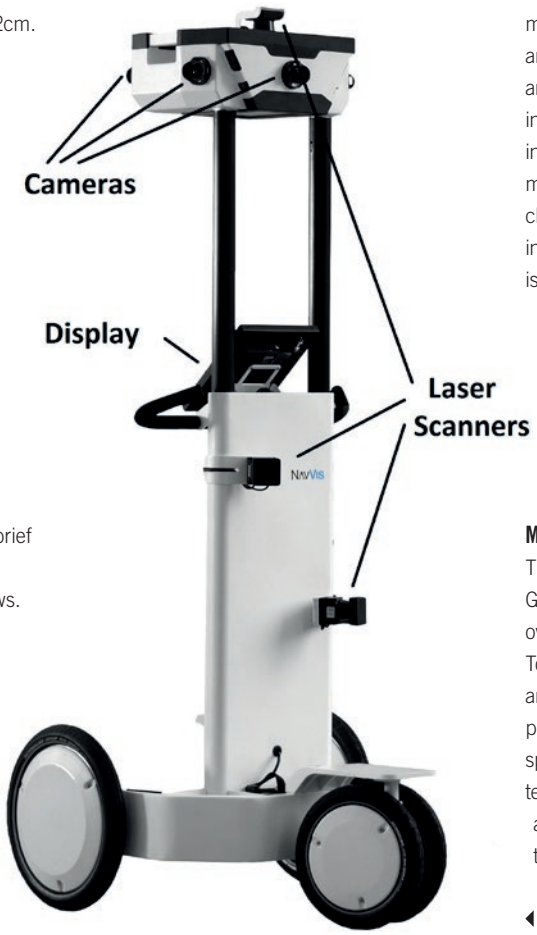

Figure 1, 3D Mapping Trolley.

MUNICH AIRPORT

The indoor space of Munich Airport, Germany's second-largest airport, covers over 20ha of public and non-public areas. To serve the airport's customers, passengers and facility managers, the authors created photorealistic 3D models of the huge indoor space based on recordings performed by a team of airport employees using one of the authors' trolleys. The 3D models enable travellers to explore the airport 'virtually'

▲ *Figure 2, Point cloud overlaid with images of the shipping exhibition at the Deutsches Museum.*

and to plan the route to their gate from the comfort of their own home, for example. Facility managers and external maintenance personnel who are unfamiliar with the layout of the airport are able to find their location quickly and can even prepare for repair work in advance, saving time and money on job-site inspections. To keep the 3D model updated, the airport bought its own Mapping Trolley for operation by a team that recaptures areas whenever changes occur.

DEUTSCHES MUSEUM

The Deutsches Museum in Munich is the world's largest museum of science and technology. As a first step towards creating 3D models of the interior, the 'Shipping' section was recorded (Figure 2). Visitors can now take a visual tour on the museum's website [1], and the many POIs give access to such a wealth of information that users almost feel as if they are actually walking through the shipping exhibition itself. For example, there are audio files about the Santa Maria, the small ship that Christopher Columbus brought to America in 1492, and about the luxurious amenities in the express steamer owned by Kaiser Wilhelm II in 1903. On site, visitors can use their own smartphones or tablets to access an audio guide. Data ownership remains with the Deutsches Museum, as stipulated in the contract.

CONSTRUCTION SITES

Monitoring the construction progress of factories, office buildings and other objects poses several challenges. For example, the contractor's office may be located a considerable distance away from the site. To save time and money, photos of the site – sometimes taken using smartphones – are regularly sent to the experts in the office. However, it is more efficient to create 3D models of the site at various stages of construction showing where pipes are situated, which materials are being used or how the wiring has been done. Then, if an element breaks or if a warranty claim arises after completion, it is possible to retrace what has been done and how.

▲ *Founders of NavVis grouped around the 3D Mapping Trolley. From left to right: Robert Huitl, Sebastian Hilsenbeck, Dr Georg Schroth and Dr Felix Reinshagen.*

SMARTPHONE APP

The next generation of the system will enable navigation through indoor spaces via a smartphone app. Unlike most indoor navigation systems, and similar to human orientation, this visual positioning technology does not require any additional infrastructure such as Wi-Fi hotspots, RFID or Bluetooth to locate the user. Instead, the user is located autonomously with an accuracy of one metre by comparing the 'visual fingerprint' of their smartphone camera with the data captured earlier. The user's viewing direction is also determined. If available, the app will

also register Bluetooth and Wi-Fi signals and use further smartphone sensors such magnetometers to improve accuracy.

PARTNERING

Solutions tailored for specific user cases are currently being developed together with partners. For a seamless integration of indoor and outdoor mapping and navigation, the authors teamed up with Esri. The first result is Campus Navigator, a browser-based app which allows visitors to navigate to rooms and find people on a campus. Cooperation with Intershop will result in a solution which enables users to navigate through a physical shop and select products by clicking on POIs of products on the shelves: an easy-to-use solution for retailers that want to combine the advantages of online and offline shopping. The authors are also looking for partners active in computer-aided facility management (CAFM) systems, since the integration of the IndoorViewer into a CAFM system. ◂

FURTHER READING

1. Robotics Mapping, *GIM International*, February 2014, p. 11.
www.navvis.com

WEBSITE

1. www.deutsches-museum.de

FELIX REINSHAGEN

Felix Reinshagen, CEO, holds an MSc degree in computer science and a PhD in economics. After six years at McKinsey, an award-winning project resulted in him co-founding NavVis, a spin-off of the Technical University of Munich (TUM), Germany, which focuses on mapping, visualisation and navigation of indoor spaces. Since being founded in 2013, the company has grown into an international team comprising 45 highly qualified scientists, engineers and business builders.
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Georg Schroth, co-founder and managing director, holds a PhD in electrical engineering from TUM and graduated with an honours degree from the master-level graduate programme of the CDTM Munich. He joined the GPS Lab in 2007 and the Information Systems Laboratory (ISL) at Stanford University, USA, in 2010.
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BRADARSAR – A NEW APPROACH FOR MAPPING AND CHANGE DETECTION

Sensing Change underneath Vegetation

Already established as a cartographic mapping system, high-resolution X- and P-band airborne radar interferometry and imagery overcome several optical imagery limitations. Today, they provide valuable inputs for recurrent landscape monitoring through change detection algorithms that are able to detect, among other things, deforestation, illegal settlements and soil erosion, to mitigate environmental impacts from hydropower reservoirs and to monitor third-party interference in pipelines. An innovative X- and P-band radar, the BradarSAR, which is deployable on aircrafts with hatches already certified for cameras, promises to make this technology accessible worldwide.

Mapping the landscape has been the primary application of airborne radars. Since they are independent of weather and light, airborne radars reliably collect data from the landscape for a variety of purposes. Multi-band radar complex data, i.e. X- and P-band, amplitude and phase data, provides a great deal of landscape information. Today's reached quality of artificially coloured X/P radar images meet the needs of those accustomed to working with optical imagery. Additionally, when high-resolution airborne radar images are acquired with the same geometry at different times, very small changes in the landscape can be detected.

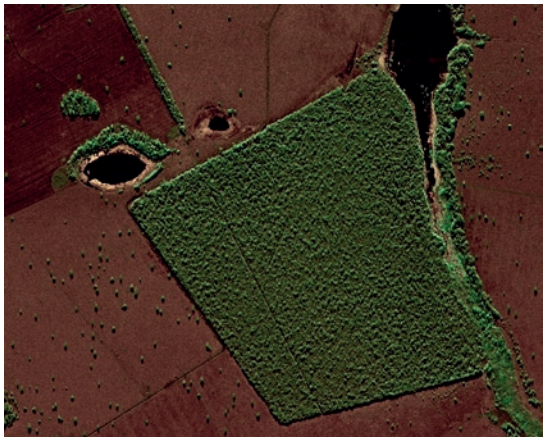
Bradar – a member of the Embraer group and specialised in designing radars and providing radar remote sensing – has mapped about two million square kilometres in the Amazon region including Brazil, Colombia, Venezuela and the entire Panama territory with its X- and P-band SAR radar OrbiSAR. Combining both bands is critical to obtain geographical information of the terrain and vegetation; the X-band cannot penetrate foliage while the P-band can, which allows the generation of a precise digital terrain model (DTM) below the densest forests. Advances in Bradar's radar processing technology as well as the development of a compact radar system, the BradarSAR, makes a variety of airborne radar imagery applications possible.

Weighing 60kg, BradarSAR can be installed like digital cameras or Lidar systems in aircraft with certified hatches, enabling the technology to be shipped and used on a contract basis for mapping and monitoring projects anywhere in the world. The current BradarSAR 3000 version installed in a single-engine Cessna 182P collects radar data at between 1,500 and 3,000ft of altitude with swaths of between 1,500 and 4,000m on both sides of the aircraft. This radar can be fitted into larger platforms as well, such as a two-engine Navajo, Vulcanair P68 and similar aircrafts, to collect data at 10,000ft with much larger swaths. The system thus reduces costs by optimising flight characteristics with respect to aircraft operational costs. For example, while larger projects requiring high data-acquisition rate can employ costlier aircraft and wider data collection swaths, smaller projects might reduce costs by employing a single-engine aircraft and narrower swaths.

DETECTING DEFORESTATION

In the Amazon region, Bradar's airborne InSAR system, the OrbiSAR, is being used

Figure 1, BradarSAR operating in a Cessna.



▲ *Figure 2, Artificially coloured high-resolution X/P radar image.*

to monitor 2,800km^2 of protected area at the Santo Antônio hydropower plant on the Madeira River to detect not only deforestation, illegal invasions and settlements but also flooding events, dying vegetation and growth of aquatic plants. Illegal deforestation usually starts with selective logging followed by forest degradation and the establishment of agriculture and/or pastures. Currently, forest monitoring in the Amazon region is performed with low-resolution optical satellite images which are able to record past deforestation during the dry season, but not to prevent it from happening. To effectively counter illegal deforestation, early identification of selective logging is necessary. These are precise changes in the forest canopy, and high-resolution X-band images are ideal for detecting the removal of single trees in a dense forest.

ILLEGAL SETTLEMENTS

The P-band enables the detection of activity underneath the forest canopy, like the construction of fences, tracks and roads. Such information can be tied to an alerting system for dynamic forest monitoring. The environmental police of the Brazilian state of São Paulo (southeast region) employs the OrbiSAR for a monitoring application every 45 days in a coastal area of 8,000km^2 covered by the Atlantic rainforest. Here, deforestation results from the illegal sprawling of slums which usually start with the construction of a single house under vegetation, often invisible to conventional optical monitoring systems. Deforestation also results from the predatory exploitation of forest resources such as palm heart. In this case, rather than deforestation itself, a monitoring system is aimed at detecting illegal activities in and around the forest.

FOREST FLOOR DTMS

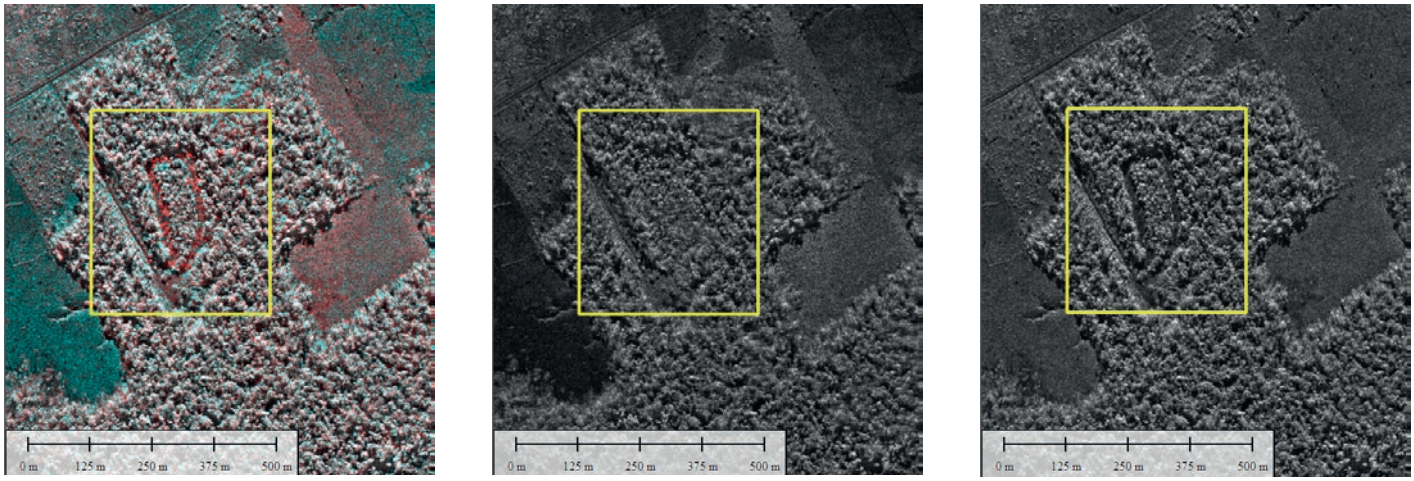
The construction of water reservoirs in the Amazon region for hydropower generation usually requires flooding of extensive forested areas. Removing the forest in these areas before flooding events avoids an excessive amount of decaying organic matter that depletes dissolved oxygen in the water, causing fish mortality and radically altering the aquatic ecosystem. Conventional techniques employed to create DTMs for water reservoir projects might be subject to precision and interpolation errors due to their incapability of penetrating dense forest vegetation. DTMs created with imprecise data result in inadvertent flooding of portions of forested areas that will contribute to altering the aquatic ecosystem after the reservoir has been filled.

Conversely, P-band-based DTMs allow the precise determination of future reservoir limits below the forest, so that measures are taken to mitigate impacts before filling the reservoir. If the reservoir is already established, P-band imagery can still be used to obtain the spatial limits of forested areas that were unintentionally flooded. Belo Monte, currently the largest hydropower plant project in the world, uses Bradar radar imagery to perform mapping before flooding, and monitoring during flooding and operation, for this purpose. As a result, the Brazilian National Agency for Electric Energy (ANEEL) already includes this technique in the national standard for creating and managing artificial water reservoirs.

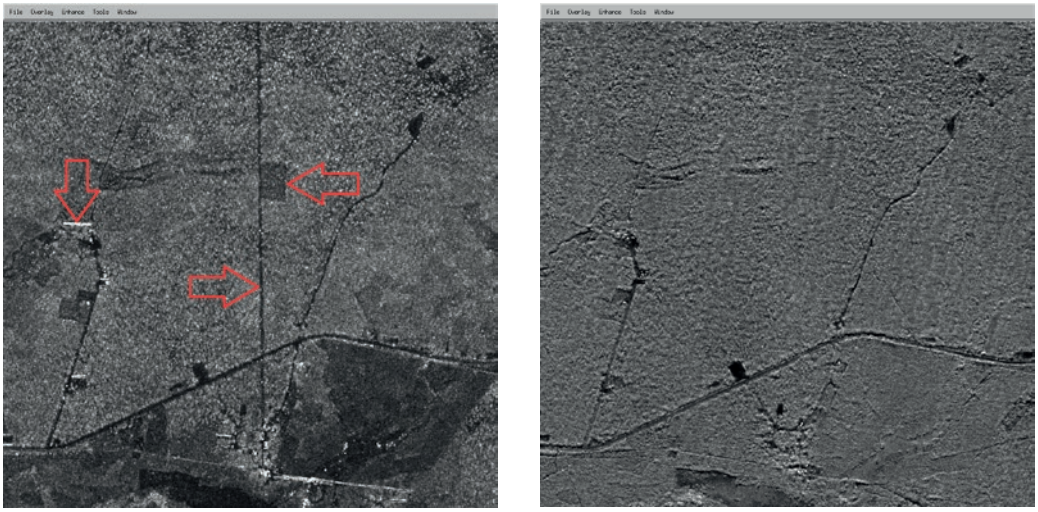
MONITORING EROSION

Erosion is a problem in the tropics because it removes the fertile soil top layer and, depending on its intensity, can substantially alter the landscape. The flipside is that sedimentation results from deposition of eroded soil. Currently, the technique of differential interferometry based on satellites (DInSAR) employs mainly X-band data, which allows only the quantification of terrain changes in constructed or open areas without any vegetation.

The DInSAR technique employs phase difference in a different way from regular interferometry. Regular interferometry uses the phase difference of data taken of the same point in the landscape from different points in space, providing height information and generating DTMs. DInSAR uses the phase difference of data taken of the same point in space but at different times to gain relative information of terrain movement up to millimetres. By monitoring the landscape with airborne DInSAR, one can pinpoint critical erosion-prone areas where actions need to be taken to prevent the situation from worsening. P-band DInSAR allows the quantification of erosion and/or sedimentation in areas covered by vegetation where other bands lose their coherence between the measurements.

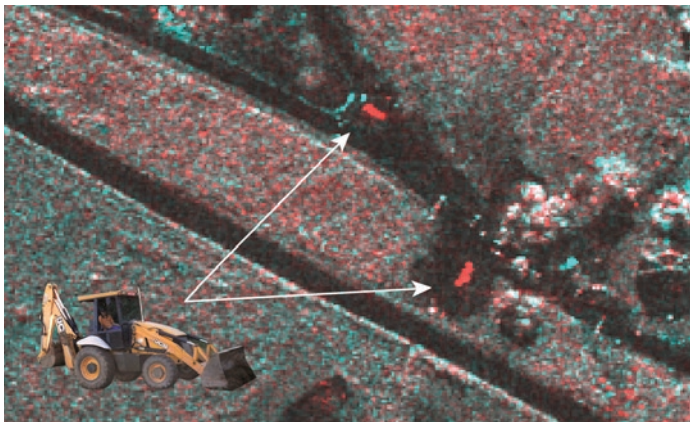


▲ *Figure 3, Illegal logging detected with X-band images taken one month apart in the Amazon. The image on the left is an RGB combination of the middle and right-hand images.*



◀ *Figure 4, Comparison of P- (left) and X-band (right) images of the same area. The P-band image clearly shows a road invisible in the X-band and optical images.*

▲ *Figure 5, Detected flooded area under forest in the Amazon region. Green areas depict areas covered by forest over dry land. Light-blue areas depict areas covered by forest but flooded. Dark-blue areas depict water bodies not covered by forest.*



▲ *Figure 6, Multi-temporal coherence images, indicating third-party interference in a trial field.*

FUTURE DEVELOPMENTS

Third-party interference is a major cause of oil and gas pipeline damage that ends up costing millions of dollars annually. Thus, monitoring the landscape in and around pipelines is a priority to pipeline operators. Test results have supported BradarSAR's high-resolution monitoring capability. By combining the analysis of the amplitude and phase, BradarSAR detected controlled changes, ranging from holes of 0.5 x 0.5m to vehicles, created between two subsequent data-collecting flights. While amplitude images clearly detected vehicles that appeared in or disappeared from the area of interest, coherence images (the complex correlation coefficient involving both coherence and phase) detected small details of the landscape on a fine scale, such as tracks in the trial field created by cars that crossed the field during the experiment.

In this application, a monitoring system using the X- and P-bands is able to detect minor changes in the landscape and to monitor the entire pipeline area with high frequency and reliability. As opposed to satellite sensors, one can design an airborne radar-based monitoring system with as many radars and aircraft as necessary, which allows optimal data acquisition geometry, monitoring frequency and detection power. This could also open up opportunities for other industries such as mining, roads and railways and help their assets to be planned and monitored more effectively. ◀

FURTHER READING

The May 2014 issue of *GIM International* included another article written by the same authors, titled 'Mapping the Amazon – X- and P-Bands Used to Detect Illegal Logging and Assess Biomass'. Read the article online via http://goo.gl/vlpcKp.

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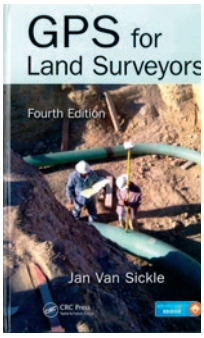
No Formulas Needed



In June 2015, CRS Press released the 4th edition of GPS for Surveyors written by Jan van Sickle. The 2nd edition was published in 2001 and the 3rd in 2008. Apparently the revision cycle is seven years. The 4th edition starts with a chapter on the main features of the GPS signals which are broadcast in the microwave part of the electromagnetic spectrum. Page 1 gets straight to the point: "Millions of GPS receivers may monitor the satellite's signals without danger of overburdening the system." This distinct pro is accompanied by the burden that GPS positioning necessitates the gathering of abundant signals and advanced processing. After understanding the signals and how pseudoranges, ranges and positions are related to phases and codes, Chapter 2 clarifies that all this know-how is of little value when the surveyor does not grasp the bunch of errors introduced by satellite orbital biases, clock offsets, ionospheric and tropospheric delays, multipath and receiver noise and how to manage and (partly) eliminate these. Surveyors may complain that new technologies enable laymen to do the job, thus jeopardising their profession, but Chapter 2 elucidates that the profession is shaped not by technology but rather by knowledge and skills.

The modelling of GPS signals and the many error sources requires a lot of mathematics. However, formulas are just modestly scattered throughout Chapters 1 and 2 as the book aims to reveal the basics of GPS, receivers, surveying methods, survey design, planning and measuring without pages full of complex maths. The calculations seem more abundant than they actually are, since the pseudorange equation on page 27, with all the variables explained, is repeated on page 41 and the same is true for the carrier phase observable equation depicted on page 36. The equations are not numbered as this is a practical book "intended to be neither simplistic nor overly technical".

Chapter 3 first focuses on the historical evolution of GPS by discussing its forerunners. Next, the space segment including the effects of the distribution of the satellites along the sky on the quality of the position, i.e. dilution of precision (DOP), is considered.

The user segment is the subject of Chapter 4 which elaborates on receivers – categorised in recreation, mapping receivers and surveying receivers – and the methods to obtain positions from the complex observation data. Positions are expressed as coordinates in a reference system. Planar rectangular systems, 3D Cartesian coordinates, ellipsoids, geoid, map projections and the International Terrestrial Reference System (ITRF) are scrutinised in Chapter 5. This chapter demonstrates that the book is primarily aimed at readers from North America; it contains no less than three maps of the US. In Chapter 6, covering Static GPS Surveying, the practical part of the book starts: measuring in the field. Chapter 6 focuses on precision surveys in which the positions are calculated during post-processing most often applied in control work. But today "most common methods utilise receivers on reference stations that provide correction signals." The corrections are transmitted by internet, radio signal or cell phone. When this is done instantaneously the method is called real-time kinematic (RTK) GPS, which is the subject of Chapter 7. The final chapter focuses on recent developments, including a comprehensive treatment of novel signals on new blocks of GPS satellites (L5 and L2C). Compared to the 3rd edition most of the content of Chapter 8 is new.

The book provides both 'need to know' and 'nice to know' information. Page 77, for example, explains the letter codes used to name the radar bands, introduced during World War II. As the 23cm wavelength used for search radar was long compared to the 10cm wavelength introduced later, it was called the L-band and the shorter wavelength became known as the S-band. The Germans used the 1.5cm wavelength which they called the K-band derived from *kurz* ('short'). The wavelengths in between long and short were considered a compromise and hence called C-band. The first wavelengths used in radar were of metre length. They were not called XL or XXL but coded as P-band, derived from 'previous'. The origin of X-band – wavelength 5cm – remains untouched.

I have never read the forerunners of this book, but this edition pleasantly surprised me. Last year I complained in this magazine: "It is becoming increasingly seldom that a textbook is written by one or a few authors… Today it is not unusual when 25 authors, or more, are involved… The topics covered are complicated and specialised." None of that applies to this book. It is written by one author and aimed not at researchers but at practitioners. The author is not driven by impressing peers but is resolute in offering knowledge and skills to the reader. Indeed, the book has been written for land surveyors by a land surveyor, who has practised surveying for over 40 years combined with teaching at universities and institutes of technology. He is determined to lead the reader through the nitty-gritty and pitfalls of GPS. Often he further explains a subject with a follow-up sentence starting "In other words…" which is sometimes even repeated twice. Concepts are frequently explained by metaphors, e.g. the working of Kalman filtering is illustrated by comparing it to a car driver who interacts with the speedometer by depressing the accelerator. No formulas needed.

GPS for Land Surveyors, Fourth Edition, Author: Jan Van Sickle, Published by CRC Press, 368 pages, ISBN 9781466583108, GBP54.39.

REVIEW OF 5TH MEETING OF UN-GGIM COMMITTEE OF EXPERTS IN NEW YORK

Geospatial Data to **Support Achievement** of **Sustainable Development Goals**

The 5th meeting of the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM) made firm steps towards establishing itself as a permanent UN body. It once again emphasised the crucial role of geospatial information, especially in terms of achieving the Sustainable Development Goals agreed by the Member States of the UN and also economic growth for citizens in the developing world.

The 5th session of UN-GGIM concluded its deliberations on 7 August 2015 with 13 intergovernmental decisions being unanimously adopted. This followed a week that featured 27 well-attended and interactive side events, including technical workshops and information sessions as well as a map/poster exhibition, and the formal review of 13 substantive reports. This year's session of the Committee brought together over 290 participants consisting of ministers, heads of national mapping agencies, geospatial information management authorities and industry observers from over 85 countries.

2030 SUSTAINABLE DEVELOPMENT AGENDA

The Committee discussed ways to achieve greater integration of information systems in support of the 2030 Sustainable Development Agenda. In order to effectively measure, monitor and mitigate sustainable development it is necessary to use geospatial information to link together demographic, statistical and environmental data. The Committee of Experts has been monitoring the dialogue surrounding the Sustainable Development and Post-2015 Development Agenda from a geospatial perspective. The current debate on a new United Nations Development Agenda provided a unique opportunity for the Committee to raise the visibility and awareness of the importance of geospatial information as an enabler of sustainable development. In fact, the importance of geospatial data for the Post-2015 Development Agenda was acknowledged and understood when 193 Member States agreed on the new UN Sustainable Development Agenda. Geospatial information features twice in the so-called outcome document entitled 'Transforming our World: The 2030 Agenda for Sustainable Development'. While encouraged by the increasing recognition of geospatial information, the Committee of Experts agreed that the understanding and use of geographic and geospatial information in sustainable development, particularly at the policy and decision-making levels, needs to be further enhanced, and encouraged Member States to ensure that the initiatives and activities related to sustainable development include geospatial information within their respective national frameworks.

▲ *Prominent role for* GIM International*: observer to the UN-GGIM in New York.*

MANDATE AFTER 2016

UN-GGIM is working on a 5-year review report to be presented to the Economic and Social Council of the UN (ECOSOC), as the umbrella under which it is currently acting, in the spring of 2016. According to the delegates, UN-GGIM is well placed to continue to contribute even more to the work of the United Nations, especially in the context of the implementation of the Sustainable Development Agenda and the follow-up to the World Conference on Disaster Risk Reduction. The Committee agreed that a strong mandate after 2016 is appropriate and

necessary in order to interact more effectively on coordinating the field of geospatial information management in the broader UN system.

GGRF AND SHARED GUIDING PRINCIPLES

Following the General Assembly resolution on a Global Geodetic Reference Frame (GGRF) for Sustainable Development in February 2015 – which was the first geospatial resolution to be adopted – the Committee is now working on an implementation strategy. In other areas, the Committee also concluded several years of work by adopting a statement of shared guiding principles for geospatial information management and technical guides on the use of international geospatial standards.

LAND ADMINISTRATION

Land administration has been acknowledged by UN-GGIM as an important topic for its next meetings since the level of land administration and governance varies greatly across Member States. An expert group will prepare all the work needed to increase and strengthen the role of land administration and good land governance within UN-GGIM, while at the same time looking to cooperate with other UN bodies and international organisations.

UN-GGIM AFRICA

The Committee created UN-GGIM: Africa as its fifth regional chapter and thus completed its regional support architecture in line with the UN Regional Commission structure. In this context the Committee welcomed the offer by the Economic Commission for Africa to host next year's UN-GGIM High-Level-Forum in Addis Ababa, Ethiopia, from 20-22 April 2016, with an overarching theme on land administration and management.

▲ *Committee meeting during the fifth UN-GGIM session.*

FUNDAMENTAL DATA THEMES

The Committee considered a proposal put forward by UN-GGIM Europe on the determination of fundamental data. UN GGIM Europe proposed that national and regional examples of fundamental data theme initiatives should be the basis for developing agreement on a set of global fundamental geospatial data themes. These themes should be harmonised in order to be able to measure, monitor and manage sustainable development consistently over time and for evidence-based decision-making and policymaking. The proposal received the support of the UN Member States and it was agreed that the determination of global fundamental data themes should be added as a work item for the Committee to take forward for the coming year, led by UN-GGIM: Europe.

NEXT SESSION

The sixth session of the Committee of Experts will be convened at United Nations Headquarters in New York from 3-5 August 2016.

ACKNOWLEDGEMENT

Thanks are due to Greg Scott, Inter-Regional Advisor, UN-GGIM at United Nations. ◀

ESRI USER CONFERENCE 2015

Seeding Ideas on How to Apply Geography Everywhere

Exactly where in a field should a farmer plant a particular type of seed and in what time window so as to maximise the crop yield? Where should a developer build a housing community to avoid the area's flood zones? Where are wildfires burning, and how will the weather affect what will happen next?

These are just a few of the questions that geographic information system (GIS) technology can answer, as demonstrated at the 2015 Esri User Conference (Esri UC) with presentations by Beck's Hybrids, Southwest Florida Water Management District (SWFWMD) and the State of Victoria (Australia) government. Esri UC was held from 20-24 July in San Diego, USA, and drew a record crowd of 16,500 people for the event. The keynote speaker was former Maryland governor Martin O'Malley, who talked about the need for data-driven decision-making in government.

The theme of this year's conference was 'Applying Geography Everywhere'. "GIS, in its digital manifestation of geography, goes beyond just the science," said Esri president Jack Dangermond in his opening presentation at the San Diego Convention Center. "It provides us a framework and a process for applying geography. It brings together observational science – measurement – and integrates it with modelling and prediction and analysis and interpretation so we can understand things. And understanding can be integrated into designing and planning things and making decisions and ultimately [taking] action. This virtuous cycle is at the heart of what GIS is about."

▲ *Jack Dangermond addressing the Esri User Conference audience.*

The Plenary Session presentations on 20 July showed how various organisations follow this process and how comprehensive and innovative GIS solutions, many of them web-based, can foster better-informed decisions. The talks revolved around the themes of earth, water, air and fire, which constitute the four elements in classical thought.

GIS: MAKING A DIFFERENCE FOR FARMERS

Farmers today are looking for ways to increase the yield of their crops. Beck's Hybrids of Atlanta uses GIS to help farmers with precision agriculture and better management of the sale of seeds. The company demonstrated FARMserver, a GIS-enabled web application from Beck's Hybrids that helps farmers keep costs low and boost yields. Using maps, spatial analysis and big data from live sensors and farm equipment, software users can monitor data such as soil composition and weather information to ensure that seeds thrive.

▲ *Mansour Raad delivered another major announcement.*

▲ *Esri User Conference attendees.*

MANAGING WATER RESOURCES WITH GIS

Although the Southwest Florida Water Management District has been using GIS to balance agriculture, development and the environment for three decades, the agency saw it needed to do more to support Florida's water needs. It has therefore integrated GIS into all of the district's scientific and business processes and systems. GIS analyses are used to develop new water-use and well-construction rules that allow the farmers to protect their crops and to ensure that homeowners have a dependable water source. The agency's "most important map" is an online form that makes it easy to apply for well, water-use and construction permits. The district also maps floodplains in southwest Florida and uses GIS to model surface water and subsurface infrastructure such as pipes and storm water drains. "Developers are able to use our models to identify where to place homes so they are not in the flood zones," said the district's bureau chief, Steve Dicks. Furthermore, the district has used GIS in its efforts to clean up the highly polluted Tampa Bay and bring back ecologically important seagrass.

FIGHTING FIRE WITH GIS

Victoria, Australia, is one of the most bushfire-prone areas in the world. To improve preparation for wildfires, agencies across the state worked together to create eMap, a collaborative, cross-departmental emergency mapping system for fire-related information. Using one map built on a common geodatabase and accessible on any device, the State of Victoria government can now proactively respond to and manage wildfires using near real-time imagery and a fire modelling and prediction system called Phoenix Rapid Fire. Even though the number of fires in the state of Victoria is up this year, there has been considerably less devastation because responders can act more quickly thanks to this predictive technology. "It provides our users access to information that's relevant, timely and tailored," said Anthony Griffiths from Victoria's Department of Environment, Land, Water and Planning. eMap also enables the creation of paper maps which may be needed by firefighters 'just in case'.

TECHNOLOGY MOVES FORWARD AT A FAST PACE

The conference audience also got a preview of technology that Esri has been busily working on recently. Esri's Chris Andrews showed the crowd ArcGIS Earth, a lightweight app that will let users visualise their 2D and 3D data and imagery. ArcGIS Earth can display millions of KML files and services, Andrews said as he demonstrated the app, which is scheduled for release later this year.

Nate Bennett of Esri gave the audience a sneak peek of fast, responsive vector tiles and Esri's Steve Kopp announced an initiative to build a collaborative community for R (an open-source programming language for statistical analysis) and ArcGIS users. "Now R users can directly access all their organisation's GIS data, and ArcGIS users can directly integrate R into their geoprocessing workflows," Kopp said.

Esri's Tony Mason also gave a preview of Esri's new mapping app for drones which, he said, "streamlines the processing of drone data". Within 83 minutes of collecting still imagery of Oatlands Historic House and Gardens in Leesburg, Virginia, with a drone, the raw data from an SD memory card was loaded, verified, processed, turned into a tile cache and shared via an ArcGIS Online portal. "The app built a stunning mosaic from hundreds of images collected by the drone," Mason said. "The imagery is so detailed, you can even see individual plants."

Esri's Mansour Raad delivered another major announcement: the release next year of Big Data GeoAnalytics for ArcGIS for Server, which will be used to analyse very big data. Raad demonstrated how Big Data GeoAnalytics was used to analyse where to plant 87 varieties of corn hybrids, sold by Beck's Hybrids, based on soil type, a specific time window and heat and soil moisture.

"We modelled those requirements by spatially joining 12 million soil polygons with 365 days of weather data," said Raad. "When we [did] this for all the 87 hybrids, this added up to 300 billion spatial and temporal calculations. We did these calculations in 10 minutes. Pretty cool."

The calculations showed the best locations for planting each of the corn hybrids, said Raad. "So when small seeds are analysed using Big Data GeoAnalytics, it yields big understanding," he continued. "And we believe that Big Data GeoAnalytics will unleash new ways of looking at our world." ◀

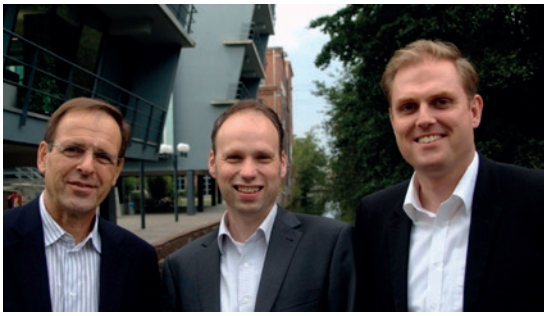
More information
www.esri.com/events/user-conference

P3D SYSTEMS

Capturing the Physical Reality in 3D

p3d systems is an innovative high-tech company based in Hamburg, Germany, specialised in the field of kinematic laser scanning (KLS). p3d systems develops, builds, sells and supports highly flexible KLS hardware and software products and solutions to capture the physical reality in 3D for customers around the globe in various industries and with different applications utilising their own scanners. The hardware and software solutions from p3d systems put emphasis on accuracy, productivity and flexibility in producing accurate 3D representations of reality in the form of high-density point clouds.

p3d systems was founded in November 2011 as a spin-off after years of research work at the Leibniz University in Hanover, Germany, by Dr-Ing Christian Hesse and Dr-Ing Harald Vennegeerts. By combining inertial navigation systems with terrestrial laser scanners and additional positioning technologies they created an innovative, portable, efficient and precise solution that captures reality in 3D. After successfully raising seed money in May 2013 from the Innovationsstarter in Hamburg and the High-Tech Gründerfonds in Bonn, p3d systems moved to Hamburg and Dr Erwin A. Frei joined the company as an investor and the new CEO. Subsequently, p3d systems focused on the development of a first generation of hardware and software solutions and further developed those solutions into marketable and sellable products.



▲ *Figure 1, (from left to right) The partners at p3d systems: Dr Erwin A. Frei, Dr-Ing Harald Vennegeerts and Dr-Ing Christian Hesse.*

Every month *GIM International* invites a company to introduce itself in these pages. The resulting article, entitled Company's View, is subject to the usual copy editing procedures, but the publisher takes no responsibility for the content and the views expressed are not necessarily those of the magazine.

SMART AND SIMPLE

Dr-Ing Christian Hesse describes the initial spirit of the company: "We were poised to break the productivity and flexibility limitations of terrestrial laser scanning by combining different technologies and measuring sensors in a new, smart and high-performing way to contribute to the growth and advancement of the reality-capturing market."

The mission of p3d systems is to provide solutions that capture the physical reality in 3D in the form of accurate, high-density point clouds for indoor and outdoor environments on a global level with the best cost-per-point ratio. Besides accuracy and reliability, the products of p3d systems also emphasise the simplicity and ease of use of the hardware and software products.

LEAN MANAGEMENT

Although the company is a true start-up, the management team combines more than 50 years of leadership and management experience in the industry. Following the basic principles of Lean management, p3d systems concentrates on the customer in every aspect and process of the business. Partnering with leading companies in the industry is as important as building and maintaining a strong network with universities, trade associations and opinion leaders.

With the second generation of the ProScan and the p3dSW, which were launched at Intergeo 2014 in Berlin, p3d systems has started to actively market and sell its products around the globe, with a focus in Europe and the United States. The company is expected to reach its break-even point in 2015.

CIVIL ENGINEERING

Since the ProScan works with most of the high-precision terrestrial laser scanners available in the market, every current owner of a terrestrial laser scanner is a potential customer for a ProScan and the p3dSW. Thanks to the unique combination of high accuracy and high productivity the products of p3d systems are a clear solution of choice for civil engineering applications. In particular roads, pavements, bridges, parking structures, tunnels (roads and railways), train stations, airports and runways are applications for which the technology is being used with significant benefits. There are several additional markets benefiting from the strengths and characteristics of p3d

Figure 2, Typical 3D point cloud from an indoor project.

systems' KLS technology, including: asset & facility management, building & construction, monitoring, general engineering and mining & exploration.

Due to the fact, that the ProScan system and the p3dSW can be universally applied to many different vehicles and platforms, the possible applications are endless.

Dr Erwin A. Frei, CEO, comments on p3d systems' marketing approach: "Wherever there is a necessity to capture reality in 3D with high accuracy and at the lowest possible cost, our products and solutions are serious contenders. Even though these unique performance characteristics are an ideal fit for most of the current surveying and mapping applications, the true benefits and the added value potential of this KLS technology go way beyond the traditional surveying and mapping applications."

KINEMATIC LASER SCANNING

With the increasing demand for timely, accurate and cost-effective digital information about our surroundings spearheaded by various movements such as the 'digital factory', the 'Industry 4.0' or indoor navigation, to name but a few, the availability of fast, flexible and very productive 3D reality-capturing technologies will be paramount in order to succeed against the backdrop of these developments. KLS technology will be one of the key enablers for these broader movements in different industries and communities. Speed, accuracy and time to results are key drivers to push such initiatives forward.

Dr-Ing Harald Vennegeerts, CTO of p3d systems, comments on these developments: "KLS in its current stage of development is already changing the way 3D point clouds are being utilised for different applications and markets. The future combination of KLS technology with images and image-based tracking technologies for indoor and outdoor applications will improve the performance characteristics as well as the ease of use for these combined technologies even further."

GROWTH

p3d systems plans to significantly increase its sales and marketing presence in the main markets, especially in Europe and the United States, to keep pace with the increasing demand. The commercialisation of the current second-generation products has just started and will be accelerated by adding the required talent and capacities to the company. The ongoing release of new functionality will improve the productivity even further and maintain the company's momentum in marketing its products as an innovative solution at the beginning of the technology curve.

Figure 3, The ProScan at work.

p3d systems intends to grow significantly and establish the company as a leader in the 3D reality-capturing market with its KLS technology. It will pursue developments in combining KLS with image-based tracking technologies as well as the smart data mining of point clouds in order to maintain its technological edge and leadership in these markets.

Figure 4, The p3d systems ProScan for different carrier platforms and applications.

More information
www.p3dsystems.com

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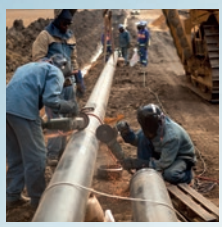


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No 2820

Workshops on Disaster Risk Reduction and Crowdsourcing of Land Information

POST-2015 NEPAL EARTHQUAKE WORKSHOP

In the context of the earthquakes that occurred in Nepal from 25 April 2015 onwards, an international workshop on the role of land professionals and of spatial data infrastructure for disaster risk reduction will be held in Kathmandu in late November 2015.

The main objective of the event is to exploit international expertise for enhancing the professional capacity to contribute to disaster risk reduction efforts in the situation as it currently stands in Nepal. The event further aims to explore opportunities for strengthening and promoting good practices in professional geospatial education and for advancing SDI concepts and spatially enabled societies, and thus to give the profession a key role in providing expertise to aid coordination of the rescue services.

This workshop will bring together surveying, mapping and land administration professionals from Nepal and different parts of the world. The combination of high-level specialists from all over the world and the recent experiences and local expertise of the Nepalese professionals will offer a unique platform for knowledge exchange and learning.

FIG strongly supports the workshop in its role to provide a platform for exchange of experience and ideas, and this will be continued during the FIG Working Week 2016 in New Zealand. The FIG Young Surveyors Network in Nepal and Kathmandu University will share their experiences with Open Street Map in relation to the earthquake.

The Nepal Institution of Chartered Surveyors (NICS) and Nepal Remote Sensing and Photogrammetric Society (NRSPS) is organising this event together with FIG Commissions 2 and 7, and ISPRS. This workshop will be held at Radisson Hotel, Kathmandu, from 25-27 November 2015 and is supported by the Nepalese Ministry of Land Reform and Management, Survey Department, and Land Management Training Center of the Government of Nepal. ◂

CROWDSOURCING OF LAND INFORMATION WORKSHOP

Through crowdsourcing /volunteered geographic information (VGI), citizens are increasingly sharing their knowledge about land and topography and devoting their personal time and energy to using online tools to deliver data and information, to obtain input and to stimulate action.

Crowdsourcing has only recently been directly applied to the capture of information about and to the management of land rights within the land administration sector. The workshop on the crowdsourcing of land information will explore how we can engage citizens within a new collaborative model for land administration purposes. The crowdsourcing model would be much more inclusive for the disadvantaged and vulnerable, while at the same time increasing access to land information, to land markets and to secure rights and thus helping to reduce poverty. The workshop will also discuss challenges in handling big data and finding the balance between publicity and personal data protection.

The workshop will have two major themes representing the interests of FIG Commissions 3 and 7:
Commission 3: 'The Role of Citizens and Experts in Sensing Geographical Information'
Commission 7: 'Crowdsourcing of Land Information'

The workshop, which includes the Annual Meetings of Commissions 3 and 7, will be held from 16-20 November 2015 at Le Méridien St. Julians Hotel in St. Julians, Malta. ◂

Liza Groenendijk, Commission 2
Enrio Rispoli, Commission 3
Gerda Schennach, Commission 7

More information
www.workshopnepal2015.com.np
www.fig.net/organisation/comm/3
www.fig.net/organisation/comm/7
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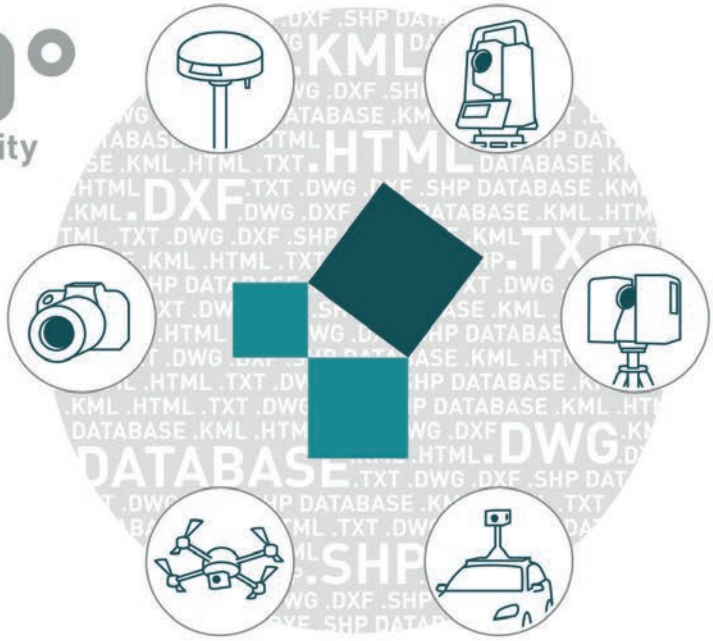

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GSDI Support to SDI in Africa

Among GSDI's objectives are SDI capacity building and providing support to developing nations in defining and implementing their National Spatial Data Infrastructures (NSDIs). This involves support to the government agencies with the legal mandate to create NSDIs and to other organisations and institutions participating in SDI actions, including citizens and businesses – in fact, the whole of society. Many GSDI members have been involved in SDI-related development work in Africa over the past decade.

The Association is engaged in GIS and SDI-related capacity building in various ways, including:

- Via the GSDI Societal Impacts Committee, the Taiwan Ministry of the Interior has sponsored two-week International Center for Land Policy Studies and Training (ICLPST) training seminars on Geographical Information Systems and Land Management annually since 2012. In the past two years, GSDI individual members from Kenya, Ethiopia and Nigeria have attended the seminars, all expenses paid
- The GSDI SDI-Africa discussion list is the largest of the five regional SDI information forums maintained by GSDI, with over 725 members
- Of the 400+ GSDI Individual Members, 195 are from African states
- Several hundred of the Personal Profiles in the GSDI GIKnet Registry [1] are from Africa.

GSDI Organisational members based in Africa include:

- UN Economic Commission for Africa (UN ECA), a GSDI founding member, based in Addis Ababa, Ethiopia
- EIS-Africa is a pan-African membership NGO based in South Africa, working to improve use of geospatial and environmental information in Africa and organiser of the AfricaGIS conferences
- The Regional Centre for Mapping of Resources for Development (RCMRD), based in Nairobi, Kenya, is an inter-governmental organisation with 20 Contracting Member States in Eastern and Southern Africa Regions, formed in 1975 under the auspices of the UN ECA and the African Union.

▲ *Namibia NSDI Secretariat workshop, Okahandja, 28 July.*

UN ECA [2] and EIS-Africa [3] co-hosted the GSDI 2014 World Conference in Addis Ababa in November 2013, held in parallel with AfricaGIS 2013. In December 2012, UN ECA hosted an experts meeting focusing on legal and policy issues for implementing a pan-European SDI, with experts from several GSDI members. UN ECA, EIS-Africa, GSDI (with financial support from member FGDC) and ITC cooperated in creating the SDI Africa: Implementation Guide [4].

RCMRD [5] administers the SERVIR-E & S Africa Project which includes Small Grants and Small Scale Applications Programmes that have awarded nine Small Grants and support for five Small Scale Applications projects.

Other GSDI members working in Africa, typically conducting training programmes and land registry consultancy work, include:

- International Institute for Geoinformation Science and Earth Observation (ITC), University of Twente, the Netherlands
- Dutch Kadaster, which conducts training and consultancy work Africa
- Apex Spatial Tech Solutions Private Limited, an India-based geospatial solution provider.

Apex is working for in the Karas Region of Namibia for the Directorate of Water Supply and Sanitation Coordination, Ministry of Agriculture, Water and Forestry, and is also involved in economic mineral mapping, mineral exploration, EIA and EMP work in Namibia. Apex has successfully completed geology and mineral mapping and exploration projects in Sudan, Tanzania and Uganda.

In April 2015, GSDI secretary-general Roger Longhorn led a one-day workshop on Marine/Coastal SDI Best Practice prior to the CoastGIS 2015 Conference hosted in Cape Town, South Africa, by CSIR and Stellenbosch University. In July 2015, Longhorn began a consulting assignment to support development of the NSDI in Namibia, working with the Namibia Statistics Agency (NSA). The current work focuses on developing the NSDI Strategy and Action Plan 2015-2020, to be adopted in October 2015. Work at the NSA's NSDI Secretariat focuses on standards development, creating the national geoportal for discovery metadata and capacity building within all government ministries who need help in making their contributions to the national initiative. ◀

Roger Longhorn is GSDI secretary-general and can be reached at rlonghorn@gsdi.org.

More information

www.gsdi.org
[1] gikent.org
[2] uneca.org
[3] eis-africa.org
[4] www.giknet.org/depot/index.php?docid=103
[5] rmcrd.org

Levallois Medal Awarded to Professor Reiner Rummel

The Levallois Medal was established in 1979 to honour Jean-Jacques Levallois for his long service from 1960 to 1975 as secretary general of the International Association of Geodesy (IAG), and is presented every four years "in recognition of distinguished service to the association and/or to the science of geodesy in general". This year the Levallois Medal was awarded to Reiner Rummel during the opening ceremony of the IAG symposia at the International Union of Geodesy & Geophysics' General Assembly, from 20 June to 2 July 2015, in Prague, Czech Republic.

After gaining his PhD degree in 1974 Reiner became a post-doctoral researcher in the Department of Geodetic Science at the Ohio State University, where he launched his geodetic career. Even at this early stage it was noted that uniquely his profile was "an amalgam of European geodetic theory and US geodetic practice".

After a period as a researcher in Munich, first with the German Geodetic Research Institute and then with the Geodetic Commission of the Bavarian Academy of Sciences and Humanities, he was appointed professor of physical geodesy at the Delft University of Technology, where he served for 13 years. In 1993, he was appointed professor and head of the Institute of Physical and Astronomical Geodesy at the Technical University of Munich (TUM), a position he held until his retirement in 2011. He is now Professor Emeritus at the TUM and a Carl von Linde Senior Fellow of the Institute of Advanced Study.

Reiner's role in science has been that of a visionary, whose ideas and originality have greatly contributed to modern geodesy.

▲ *Reiner Rummel at IUGG after receiving the Levallois Medal.*

Among his many contributions, three are noteworthy: his central role in the modernisation of the IAG, as an initiator of the IAG's Global Geodetic Observing System (GGOS), and his role in the realisation of the European Space Agency's Gravity field and steady-state Ocean Circulation Explorer (GOCE) satellite gradiometry mission. The GGOS is intended to monitor the Earth system by geodetic methods and by all the IAG entities. The GGOS concept is ambitious and its realisation is a major challenge. However, the original idea is due to Reiner Rummel.

Reiner Rummel devoted more than ten years of his career to the realisation of the GOCE mission. Reiner was its principal investigator and the coordinator of the GOCE HPF (High-level Processing Facility) of ten European institutions collaborating to provide the official GOCE products and to scientifically exploit the applications enabled by GOCE.

In addition, Reiner Rummel has been an outstanding teacher. His natural gift for lecturing inspires his audience with stimulating, and at times unconventional, presentations. His initiative and ideas led to the establishment of the ESPACE Masters Curriculum at TUM, providing fundamental knowledge in space engineering and satellite applications related to navigation, remote sensing and Earth system science.

His list of honours includes the Heiskanen Award of the Ohio State University (1977), the Vening Meinesz Medal of the European Geophysical Society (1998) and the Bavarian Order of Sciences and Arts (2010). He is a member of the Royal Netherlands Academy of Sciences (1989), the Bavarian Academy of Sciences (1997), an honorary member of the Hungarian Academy of Sciences (2001), the Deutsche Akademie der Naturforscher Leopoldina (2004) and the Leibniz Sozietät Berlin (2008). He has been awarded honorary doctorate degrees from the Technical University of Graz (2005), the University of Bonn (2005), the Ohio State University (2013) and the Aristotle University of Thessaloniki (2014).

Reiner Rummel is one of the outstanding geodesists of the late-20th/early-21st century. The award committee concluded its report with the following statement: "It has been our pleasure and honour to write this citation for Reiner Rummel – an outstanding geodesist and a dear friend". ◀

More information
www.iag-aig.org

The mission of the Association is the advancement of geodesy.

IAG implements its mission by:

- advancing geodetic theory through research and teaching,
- collecting, analysing and modelling observational data,
- stimulating technological development, and
- providing a consistent representation of the figure, rotation and gravity field of the Earth and planets, and their temporal variations.

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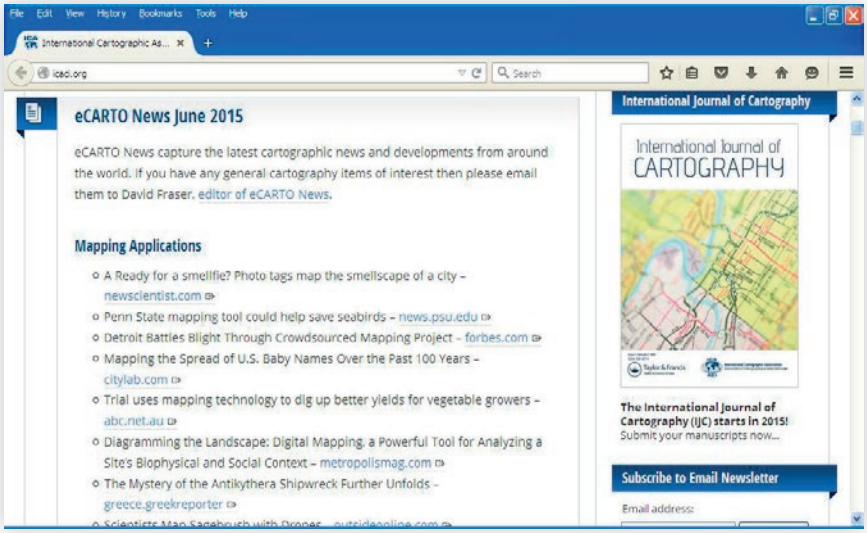
Worldwide Cartography on the World Wide Web

The increasing pervasiveness of the cartographic paradigm in the modern information-handling environment which characterises contemporary society is strongly demonstrated in the *eCarto News* section of the ICA website. Delivered monthly, *eCarto News* is an eclectic collection of news and media items which focus on maps and mapping. Trawled from the vast wealth of online material, *eCarto News* paints a dynamic, extensive and sometimes idiosyncratic picture of how the world works and the role of mapping in ensuring that it does.

Although sourced primarily from English-language sources, the breadth of cartographic and cartography-related activity reflected in the items gathered into *eCarto News* is evidence of a universal fascination with, and utilisation of, maps in all their diverse glory. The reach of the web into all corners of the globe and human society is demonstrated by the multifarious sources of material considered for inclusion.

The topic areas indicated by the subheadings in *eCarto News* reflect that glorious diversity. In the past few months, categories have included standard items under headings such as 'Industry News', 'Opinions', 'Country-specific Cartography', 'People in Cartography' and 'Technology'. However, the editor of *eCarto News* has also recognised 'Wow-factor Cartography' and 'Alternative Cartography' as valid topics and, in addition, has gathered much more specific collections of items under headings such as 'Sound Mapping', 'Mapping with Drones' and '3D Printer Mapping'. Each class has a listing of live links to online items, compiled from media outlets throughout the world (print, broadcast and internet-based), giving both breadth and depth to the survey of cartographic activity which *eCarto News* presents. These are not academic surveys of published research in cited journals – the items addressing issues of cartographic practice and application would be read by the 'intelligent man in the street' in everyday media. As such, they give an indication of the place of cartography in the real world and of how our discipline resonates with the general public.



▲ eCarto News *is accessible through the main ICA website.*

The first *eCarto News* was placed on the ICA website in April 2013 by the ICA webmasters and since then new editions have been released on a monthly basis. All are invited to contribute comments or any general cartography items of interest by emailing them to the editor at editor.ecartonews@mappingsciences.org.au. The editor is Dr David Fraser, who has developed this broad-ranging electronic newsletter from the specific regular newsletter he produced when chair of the ICA Commission on Education and Training during the period 2007-2012. When David retired from this position, the ICA president persuaded him to expand and re-design the newsletter as a list of themed links, and to give it maximum exposure by presenting it on the main front news page of the ICA website. *eCarto News* provides a comprehensive and fascinating overview of cartographic activity around the world. ◀

More information
www.icaci.org

XXIII Congress of the International Society for Photogrammetry and Remote Sensing Less than One Year Away

Prague will host the XXIII Congress of the International Society for Photogrammetry and Remote Sensing.

The XXIII Congress of the International Society for Photogrammetry and Remote Sensing (ISPRS) will be held in Prague, Czech Republic, in July 2016, which is now less than one year away. The ISPRS Council and presidents of the International Program Committee have already prepared the guidelines for the reviewing process including the time schedule.

One of the main thresholds has recently been passed: the opening of Full Paper and Abstract Submission. When and what are authors going to submit? ISPRS publishes two types of proceedings – The ISPRS Archives and The ISPRS Annals – which are both explained below.

The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences [1] are proceedings with papers whose abstracts were reviewed. Authors can submit abstracts for review until the deadline of 13 December 2015.

The ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences [2] are proceedings comprising papers which were submitted as full papers and which were double blind reviewed. The deadline for submission of full papers is 30 November 2015.

The XXIII ISPRS Congress web page [3] provides details and links for all who are interested in participating in the event and who would like to be one of presenters during all sessions. The Congress will offer not only papers of authors who submit their papers to individual Working Groups (Technical Sessions), but also of those who submit papers to sessions dedicated to selected topics (Theme Sessions) focused on new and attractive ideas. Sister organisations will prepare Special Sessions – like GEO, ICA, Galileo and EEA, EARSeL and others. Authors can find the complete list via the Submit Contribution button at [4].

ISPRS would like to wish all authors success in writing innovative and high-quality papers with clearly presented content which comprises a relevant subject. If all the papers will have those attributes, the reviewers will have an easy task and it will be a pleasure to prepare the final scientific programme of the congress.

More information

1. www.isprs.org/publications/archives.aspx
2. www.isprs.org/publications/annals.aspx
3. www.isprs2016-prague.com
4. www.isprs2016-prague.com/program/calls/paper_submission

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ISPRS HEADQUARTERS
see address of secretary general

INTERGEO®
Conference and trade fair for geodesy, geoinformation and landmanagement

21st Edition of Intergeo: **Providing Solutions for Planet Earth**

This year the city of Stuttgart, capital of the German state of Baden-Württemberg, will be the centre of the geomatics community – at least from 15-17 September. The growing importance of the geospatial industry will be reflected at both the trade show and the conference. With many challenges lying ahead for Planet Earth, the importance of aligning geospatial solutions with society's needs is more visible than ever before. I believe that Intergeo offers an excellent platform for this.

Some of the buzzwords at this year's Intergeo will be Geospatial 4.0, the digital economy, transformation through digitisation, big data, the Internet of Things, digital infrastructures and smart cities. These are all related to ways in which the geoindustry can help to tackle the challenges of the 21st century, and hence they are highly relevant topics for Intergeo. Furthermore, they are topics which we have regularly covered in *GIM International*, and which we will continue to report on in the future.

I wish all our readers an inspiring Intergeo 2015. I hope this preview helps you to experience the world's largest geomatics trade show to the max so that you head home filled with many new insights.

Wim van Wegen
Editorial manager, *GIM International*

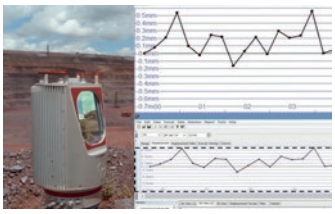
@Wimgeomares

3D LASER MAPPING

3D Laser Mapping specialises in providing solutions that capture the world in 3D and deliver information for making decisions. Those solutions include a wide range of applications, covering mobile mapping, airborne, terrestrial scanning, monitoring systems and UAVs. Listening to the needs of the client and customising systems to meet them has always been a guiding philosophy for 3D Laser Mapping. That has been responsible for the early developments of the solutions sold today, and one which continues to drive the company.

www.3dlasermapping.com

Stand no. B4.025.



SiteMonitor solution. Market-leading solutions for mobile mapping and monitoring.

ADTOLLO

Adtollo is an experienced software supplier, developing its own systems for those who build society. Topocad is easy to use and provides a powerful CAD system for all requirements when it comes to technical survey calculations integrated with data import, CAD, net adjustment, civil planning, engineering, point cloud and machine control data. At the moment Adtollo is developing a function to convert point clouds to vector models, as the company has noticed a need for this in the industry.

www.adtollo.se

Stand no. F8.001

Topocad.

ADVANCED NAVIGATION

Advanced Navigation is an Australian company that specialises in the development of navigation technologies and robotics. The company has a focus on generating products of the highest quality standard, both in terms of hardware and software. The company's founders came from a background in mission-critical robotics built to military specifications and this can be seen through Advanced Navigation's products. Advanced Navigation's engineers have specialised expertise across a broad range of fields including sensors, GNSS, inertial navigation, RF technologies, acoustics, robotics, AI and algorithms. At Intergeo, Advanced Navigation will be demonstrating its market-leading inertial navigation systems, including the new high-performance Spatial FOG Dual.

www.advancednavigation.com.au

Stand no. F4.059

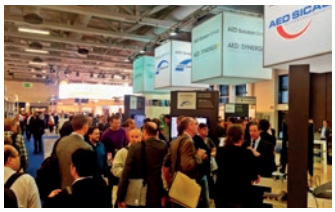
Topocad.

AED SOLUTION GROUP

AED Solution Group is the common market appearance of the leading GIS solution providers AED-SICAD, AED-SYNERGIS, ARC-GREENLAB and BARAL Geohaus-Consulting. Harmonised solutions, combined experience and regional presence create great benefits for customers. The group develops innovative standard applications and branch-specific solutions and offers individual services from project management and consulting, customisation and localisation to technical support and training. The portfolio contains applications for server, desktop, mobile and web. The GIS platform for all activities is ArcGIS from Esri. The group's international activities are focused on the utility market with the ArcFM UT product suite and WebOffice implementations.

www.aed-solution-group.de

Stand no. F6.037



AED Solution Group's stand at Intergeo 2014 in Berlin.

AEROSCOUT

Aeroscout located in Lucerne, Switzerland, provides industrial, unmanned aerial vehicles (UAVs) with high payload capacity (18kg) and long fight endurance (90min). The Scout B1-100 UAV helicopter has proven to be an attractive UAV platform carrying different kinds of aerial laser scanners combined with highly accurate OXTS IMU/DGPS systems. Various demonstrations have already been done and 3D laser data has been recorded. There is also the Aeroscout unmanned, autonomously flying Scout B1-100 UAV helicopter carrying the new RIEGL VUX-1 UAV laser scanner as well as the SPECIM KESTREL10 hyperspectral camera. The Scout B1-100 UAV helicopter will be shown at Intergeo.

www.aeroscout.ch

Stand no. F4.079 / F8.027

Scout B1-100 UAV.

AEROVIZIJA

Aerovizija is focused to the world from above in an alternative, environmentally friendly and energy-saving way. With new technologies in aviation, optics, digital recording and detection, and especially ultralight and high-performance aircraft, the company offers a complete, eco-friendly system for aerial survey. The GEONISS survey system includes hardware and software for simple and professional automatic data acquisition with various sensors from photo and Lidar to pollution detection. No big, loud and strong planes or helicopters, no illegal drones, just very light (300kg) fuel-efficient (15km/l of mogas), silent, fast (250km/h) and slow (80km/h) beautiful composite birds for small and large-scale mapping.

www.aerovizija.com

Stand no. A8.041

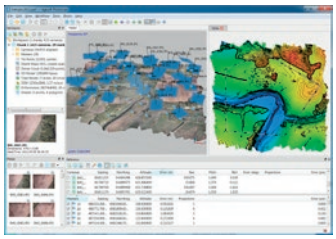
Complete aerial survey system for ultralight aircraft.

AGISOFT

Agisoft is an innovative research company developing 3D modelling and mapping solutions based on digital photogrammetry and computer vision technologies. Agisoft PhotoScan is a stand-alone software product that performs photogrammetric processing of digital images and generates 3D spatial data to be used in GIS applications, cultural heritage documentation and visual effects production as well as for indirect measurements of objects of various scales. Some specifications of Agisoft PhotoScan v.1.2.0 are aerial and close-range triangulation, dense point cloud generation and classification, true orthomosaic and DSM/DTM generation, orthomosaic seamlines editing, elevation level contour lines generation, georefencing using flight log/GCPs and many more.

www.agisoft.com

Stand no. E4.093



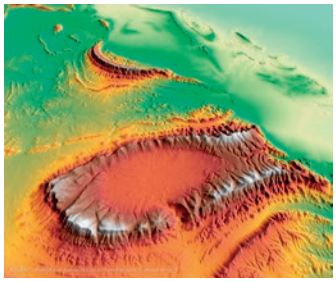
Agisoft PhotoScan Project.

AIRBUS DEFENCE AND SPACE

Airbus Defence and Space delivers an extensive portfolio of products and services ranging from data acquisition and processing, data management and hosting to sophisticated geoinformation solutions. The company will be presenting WorldDEM, Street Factory and its radar satellite constellation at Intergeo 2015.

www.airbusdefenceandspace.com

Stand no. G6.021



WorldDEM of Wilpena Pound, South Australia, Australia.

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ALBERDING

Alberding is a leading developer and distributor of professional GNSS system solutions supporting precise positioning, GIS and navigation applications. The company provides GNSS raw data management, processing, monitoring and distribution software applications for GNSS infrastructure operators and system developers. On display at Intergeo will be the brand new Alberding aGIS field data collector software and the A07-MON surface deformation monitoring system including the L1 GNSS receiver and additional external sensors (e.g. weather station). It will also be possible to test drive the customised central software solutions e.g. the Alberding Ntrip Caster, Alberding-QC and the Alberding Monitoring Software.

www.alberding.eu

Stand no. C8.085

Alberding A07-MON autonomous monitoring system.

ALTIGATOR

AltiGator will be exhibiting a fully integrated solution for aerial laser scanning. The YellowScan ultralight stand-alone Lidar system is embedded on the OnyxStar FOX-C8HD UAV, one of the professional drones designed and manufactured by AltiGator. This equipment is particularly suitable to perform mapping, environmental and archaeological monitoring on areas of a few square kilometres, which are too small for traditional airborne surveys. With a total take-off weight of 9kg, the aircraft can navigate autonomously, by programming waypoints flights, for up to 25 minutes.

www.altigator.com

Stand no. F8.091

OnyxStar FOX-C8HD UAV.

APPLANIX

Applanix, a wholly owned subsidiary of Trimble, develops, sells and supports advanced products and scalable solutions for the most efficient mapping, surveying and autonomous navigation in any environment. At this year's Intergeo visitors can see the latest in hardware for high-productivity indoor mapping and modelling ; discover how to improve the accuracy of post-processed DGNSS using the new cloud-based SmartBase service; learn how Applanix continues to lead the way in land-based positioning; discuss new developments in OEM products for air and land; and find out about POSPac MMS, the company's powerful GNSS/inertial processing software suite.

www.applanix.com

Stand no. C8.047

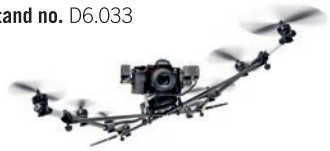
Applanix products.

ASCENDING TECHNOLOGIES

Ascending Technologies is a leading UAS developer and manu¬facturer of technology for professional, civil and research UAV/drone use. Well above 1,000 of the company's unique aircraft solutions are in frequent operation worldwide. Intergeo visitors can profit from the expertise of pioneers in unmanned aviation and experience advanced German engineering. The commercial UAS AscTec Falcon 8 is designed for industrial inspection, monitoring and surveying applications such as land cover classification, mapping, building stock condition survey and structural health monitoring. At Intergeo 2015, the company is presenting the first AscTec Falcon 8 including an integrated Intel RealSense technology for fully automated collision avoidance.

www.asctec.de

Stand no. D6.033



Falcon 8.

BEIJING QIYUE XINGCHEN TECHNOLOGY

Beijing Qiyue Xingchen Technology, located in the hinterland of Beijing, China, is an independent third-party company specialised in surveying equipment after-sales service. So far, the company has provided professional maintenance of surveying GPS and total stations, as well as sales and service of GPS accessories. In pursuit of win-win development of the company, employees and customers, the aim is to provide top-quality service at a reasonable price to satisfy customers and to create a bright future together with them. The company is looking forward to building a long-term partnership with friends both at home and abroad.

www.survey-acc.com

Stand no. E4.003

Qiyue Xingchen products.

BENTLEY SYSTEMS

Bentley Systems is the global leader dedicated to providing architects, engineers, geospatial professionals, constructors and owner-operators with comprehensive software solutions for advancing the design, construction and operations of infrastructure. Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley's solutions encompass MicroStation applications for information modelling, ProjectWise collaboration services to deliver integrated projects and AssetWise operations services to achieve intelligent infrastructure – complemented by worldwide professional services and comprehensive managed services. Bentley's BIM portfolio includes scalable solutions for design, analytical, construction, reality and asset performance modelling, along with project delivery and collaboration.

www.bentley.com

Stand no. C4.049

ContextCapture is digitalising buildings of a city.

BLUESKY INTERNATIONAL

Bluesky International is a leading aerial survey company using the most up-to-date and advanced equipment available. Taking a fresh approach to aerial survey, the firm has built its processes and workflows from scratch, based on new and cutting-edge techniques making the company fast, efficient and extremely competitive. Bluesky International is able to offer flexibility and accuracy using: Microsoft Vexel UltraCam Eagles with Ultramount, Optech Orion M300 LiDAR Airborne Lidar system, Optech LW640 Thermal Camera and Optech CS1000 digital metric aerial photography cameras.

www.bluesky-world.com

Stand no. G6.081

Bluesky is specialised in aerial surveying.

BOFEI

Beijing Bofei Instrument is a high-tech state-owned enterprise mainly engaged in the R&D, production, sales and comprehensive service of equipment and software for surveying and mapping geographic information. Bofei and BOIF have grown into well-known global brands in the surveying and mapping industry. In recent years Bofei has accelerated its approach to the geographic mapping information industry and is focused on developing advanced surveying and mapping equipment and measuring systems such as high-performance automatic total stations, gyroscopes, theodolites, automatic digital levels and compass RTK receivers. The company is steadily becoming a leading professional supplier, providing customers with solutions for all types of products combined with comprehensive service.

www.boifgeo.com

Stand no. F8.053

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Perfectly bundle your devices with all-in-one SuperGIS Mobile Apps
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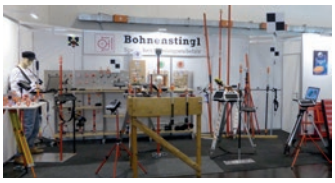
No 2849

BOHNENSTINGL

Bohnenstingl's special surveying accessories include monitoring, laser scanning, tripod, computer holders, prisms of every kind and many more products. One of the company's goals has always been to increase the economy and the effectiveness of geoengineers working in the field. Therefore Bohnenstingl guarantees high quality at a good price and special solutions for special problems, putting all its experience into the development. The company is celebrating its 30-year anniversary this year in Stuttgart.

www.bohnenstingl.de

Stand no. E8.034



Bohnenstingl stand.

CARLSON SOFTWARE

On display at the Carlson Software booth will be the company's newest developments in software or hardware for land development projects, from data collection to design to construction. Products to be highlighted at this year's Intergeo include: TopoWorx, affordable and precise office CAD software for land surveying; Carlson's revolutionary Precision 3D-Culverts software, an easy-to-use program for designing stormwater-related systems; and the newest Carlson-branded GNSS receivers and data collectors. Carlson Software specialises in CAD design software, field data collection, and machine control products for the surveying, civil engineering, construction and mining industries worldwide, providing easy-to-use one-source technology solutions.

www.carlsonsw.com

Stand no. C8.017

The Carlson Surveyor2 pictured with the Carlson Brx5 GNSS receiver.

CHC NAVIGATION

CHC Navigation designs, manufactures and markets a wide range of professional GPS/GNSS solutions employing more than 800 professionals worldwide. At Intergeo, CHC will be showing its UAV Ground Control Kit, a complete GNSS system. Low cost and easy to use, the CHC UAV Ground Control system is a necessity for any UAV manufacturer or operator who is interested is promoting/proving the high accuracy of their deliverables. Further the company will be exhibiting the LT500 Data Terminal, a GNSS handheld RTK. The LT500 series covers three accuracy ranges from sub-metre to centimetre accuracy and is the most cost-effective full-GNSS (GPS+GLO+BDS+GAL) positioning solution for survey, construction and GIS professionals.

www.chcnav.com

Stand no. D8.010

LT500 GNSS handheld RTK.

COMNAV

As a leading high-precision GNSS manufacturer, ComNav never stops bringing surprises to users. Its newly developed products – CORS receiver (M300 Pro) and OEM Board (K7 series) – will be officially released during Intergeo 2015. Targeted at demanding CORS projects, the M300 Pro can support all constellations with multiple external device input, web service and remote control, and also possesses a built-in lithium battery, which is considered to be ideal for CORS projects. Based on ComNav's self-developed baseband chips, the K7 series represents a breakthrough in stability, compatibility and functionality (accuracy, data output speed, power consumption and signal tracking).

www.comnavtech.com

Stand no. B6.043

ComNav M300 Pro.

CYCLOMEDIA

CycloMedia is market and technology leader in large-scale systematic visualisation of environments, making 360° panoramic images from public roads and waterways, combined with aerial images. The in-house-developed and patented technology allows the accurately positioned panoramic imagery to be produced on a nationwide scale in a highly automated production and quality control process. Customers today perceive CycloMedia's images as maps in which they can easily pinpoint the exact location of objects, identify objects automatically and calculate the dimensions of the objects selected. CycloMedia's Web App for ArcGIS Street Smart has been nominated for the Wichmann Innovations Award 2015.

www.cyclomedia.com

Stand no. B4.026

CycloMedia has 30 years' experience in developing street-level recordings with GIS accuracy.

DIAMOND AIRCRAFT INDUSTRIES

Diamond Aircraft Industries is an Austrian composite aeroplane manufacturer. The company builds the safest, most efficient piston aircraft flying today for flight schools, private operators, governmental organisations and remote sensing companies. The DA42 MPP is the most capable remote sensing platform in its class with an incredible endurance of up to 12 hours while burning only 6.4 US gallons. Powered by multi-fuel turbo-diesel engines, it offers the ultimate in deployment flexibility. At Intergeo 2015, Diamond Aircraft will be showing economic solutions for surveying cities, land areas, critical infrastructure, glaciers, snowfields, mineralogy or environmental applications.

www.diamond-air.at

Stand no: F4.090

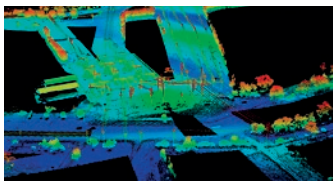
Diamond's DA42 MPP GEOSTAR.

DIELMO3D

DIELMO3D has more than ten years' experience developing GIS software tools and processing data. The ability to adjust its software to provide customised Lidar and GIS solutions enables the company to bring the best expert solutions to any project. Visitors to the stand will be inspired by ways to get more from their data. DIELMO3D's most demanded services and solutions are: power lines and offending vegetation projects, basic and advanced Lidar processing services, 2D/3D GIS web portals and exclusive servers for Lidar and geospatial data.

www.dielmo.com

Stand no. A4.005



DIELMO3D provides customised Lidar and geospatial solutions.

DIGITERRA

DigiTerra is a known GIS applications' development company. The company's major mobile GIS software, DigiTerra Explorer, is a highly productive, device-independent solution for mobile field mapping, GIS data collection and maintenance along with field-to-office workflow. The latest version, DigiTerra Explorer 8, comes with a new graphical user interface; support for adding OGC standard WMTS data sources; and WFS for online vector-based mapping. In addition the company is releasing an Android-based map viewer for v8. In order to serve its reseller partners in more comprehensively, DigiTerra has started a cooperation with CHC Technology for worldwide hardware distribution.

www.digiterra.hu

Stand no. A6.083

DigiTerra Explorer.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GPS
COMPASS
BAR
IMU
• Improved speed and range
• Supports LaserControl® registration
No 2854

DISY

Disy Informationssysteme, leading provider of GIS and reporting solutions in Germany, will be showing its latest range of GIS solutions at Intergeo. One of the highlights presented will be the new version of GIS 2go for offline editing, redlining and viewing. The new version of the software includes support for smartphones (iPhones, Android), tablets (iPad, Android) and a new add-in for ArcGIS Desktop to create offline maps.

www.gis2go.com

Stand no. F6.015

Offline maps for smartphones available with the new GIS 2go release.

DOTPRODUCT

DotProduct develops high-performance, easy-to-use solutions for capturing 3D data. The company's technology is designed for mobile professionals who need high-quality spatial data, instantly. The Phi.3D software turns an Android tablet into a 3D-capture and -processing solution; the results are available on the worksite. Phi.3D-powered tablets simplify, augment and in some cases can replace laser scanning and photogrammetry-based work processes. Visitors to the stand will have the chance to experience handheld 3D scanning first-hand with the DotPoduct DPI-8 Kit, Phi.3D 2.0 and more.

www.dotproduct3d.com

Stand C4.091

DPI-8 scanner.

DRONEDEPLOY

DroneDeploy is a cloud-based drone management platform that helps businesses solve critical problems using drone technology. The platform offers a powerful range of products that enables its customers to easily collect and analyse aerial data. The early successes of the company have come from solving a range of problems in the commercial agriculture, mining and construction industries. The DroneDeploy platform is built to be simple, safe and powerful – controlling multiple drones from anywhere, on any device. At Intergeo, DroneDeploy will be providing live demos of the fastest map processing times in the industry at its stand in the InterAerial Solutions Zone.

www.dronedeploy.com

Stand no. F8.075

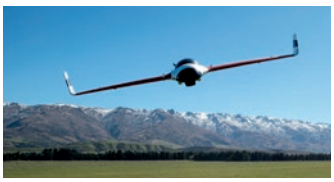
DJI vineyard map.

DRONEMETREX

DroneMetrex specialises in photogrammetric mapping using TopoDrones. DroneMetrex developed from the start the true UAV mapping system based on photogrammetric principles and only then adapted it to an airframe. The TopoDrones capture aerial data with unsurpassed accuracy: 10mm horizontal and better than 25mm in height. At Intergeo, visitors can see the TopoDrone-100 and learn about its unique features: dynamic-stabilised active mount to ensure near-nadir position of each with no 'crab'; calibrated mapping camera with Zeiss lens; direct georeferencing solution – mapping without ground control; and from the same camera: NIR imager and mapping under water.

www.dronemetrex.com

Stand no. F6.058



TopoDrone-100.

DRONESQUARE

DroneSquare is the first German online marketplace for professional drone services. This innovative online platform for B2B customers matches supply and demand for drone projects. Implemented special features like mapping tools facilitate the user's job management and flight planning. In addition, standardised forms help clients to create new UAV job descriptions easily, and drone service providers will acquire more projects with less effort. The bottom line is: DroneSquare creates added value and a win-win-situation for both sides.

www.dronesquare.de

Stand no. C8.085

DroneSquare is an online B2B platform.

DT RESEARCH

DT Research designs and manufactures rugged GNSS tablets that feature the integration of brilliant touch displays, high-performance processing and high-accuracy GNSS. With major operating systems, these GNSS tablets are compatible with existing GIS software for surveying and mapping applications, bringing together the advanced workflow for data capture, accurate positioning and data transmitting in harsh, mission-critical environments. Other products from DT Research include rugged tablets, point-of-service handhelds, compact modular systems, display-integrated information systems and digital signage solutions that can be remotely managed with the comprehensive WebDT Device Manager software.

www.dtresearch.com

Stand no. A4.035

Rugged GNSS tablets by DT Research.

E-CAPTURE

e-Capture Research and Development, a Spanish technology-based company, is introducing its latest version of the EyesMap 3D multi-sensor tablet. This next-generation mobile survey tool allows capturing and processing of small, medium and large objects easily, in real time and all in one device. EyesMap can be used both outdoors and indoors, using different technologies like photogrammetry, an infrared depth sensor, GPS and IMU movement sensor, while achieving survey-grade accuracy (up to mm). The result is a dense and accurate point cloud and 3D model. Distances, coordinates and areas can be calculated right in the field. It is especially convenient for unreachable spots.

www.ecapture.es

Stand no. F8.018

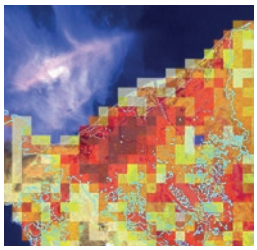
EyesMap 3D tablet in action.

EAST VIEW GEOSPATIAL

East View Geospatial procures and produces authoritative maps and geospatial data including vector and raster data, DEMs, satellite and aerial imagery, topographic maps, nautical charts, geological maps and atlases. When anyone in the world needs geospatial information, East View Geospatial has been the right partner since 1989.

www.geospatial.com

Stand no. A6.007.



East View Geospatial offers the LandScan Global Population Database.

EOS POSITIONING SYSTEMS

EOS specialises in the design and manufacture of high-accuracy GNSS receivers for GIS mapping. The Arrow series products are leading-edge GNSS receivers that incorporate bullet-proof Bluetooth connectivity, advanced sub-metre and centimetre real-time accuracy, long battery life and compatibility with every mobile device used in the field, including iOS,

Android and Windows. They set a new standard for high-accuracy Bluetooth receivers in supporting multi-constellation (GPS, GLONASS, Galileo, BeiDou, QZSS), universal Bluetooth (iOS, Android, Windows) up to 1km in addition to being lighter and more affordable than any high-accuracy Bluetooth receiver available on the market today.
www.eos-gnss.com
Stand no. B8.080

The Arrow series.

ESRI DEUTSCHLAND

For spatial analysis, planning and decision-making, the geoinformation solutions based on Esri's ArcGIS platform are the first choice in the private and public sectors as well as education and science. Adaptable and intuitive with integration options, industry-standard ArcGIS can be used on mobile devices, desktops and servers and is highly appreciated by more than one million users worldwide. As a distributor and systems house, Esri Deutschland GmbH, member of the Esri Deutschland Group GmbH, based in Kranzberg near Munich, sells the products of Esri Inc. on an exclusive basis at eleven locations in Germany and Switzerland. Esri provides support to users with a wide range of training, support and consultancy backed by combined experience and expertise of over 500 employees in the Esri Group.
www.esri.de
Stand no. F6.025

ArcGIS for Desktop.

ETERNIX

Eternix is an industry leader in geospatial visualisation products and solutions. The Blaze family of products provides a comprehensive geospatial visualisation and editing solution with capabilities ranging from DEM analysis tools to rendering the highest quality of stereoscopic 3D scenes. The company's products cater to a diverse range of GIS needs, leading the industry in both speed and user accessibility. The products are intuitive and innovative, arming users with a dynamic set of instantly applicable features that maximise the value of top-quality GIS images.
www.eternix.co.il
Stand no. F6.068

On-the-fly representation of 3D data in multiple layers (here: raster, DEM and point cloud).

FARO

FARO is the world's most trusted source for 3D measurement technology. The company develops and markets computer-aided measurement and imaging devices and software. At Intergeo, FARO will showcase the latest news in its 3D documentation product range. Visitors will be able to discover how they can benefit from the integration of the software partner Kubit, the latest member of the FARO family. But not only new software solutions which simplify the whole workflow, but also innovative features for laser scanning solutions will be presented at Intergeo.
www.faro.com
Stand no. B4.012

ARO offers laser scanning solutions for a wide range of applications.

FLYTECH

FlyTech is an emerging market leader in civilian applications of UAS with a focus on introducing aerial innovation into a broad scope of aerial works. Multifunctional photogrammetric equipment under the name Fenix is the main product that will be shown at Intergeo. Refined in great detail and tested to the extreme, the Fenix system is capable of providing its full operational potential even in harsh weather conditions. Its efficiency and reliability comes from the mixture of high-precision inertial and optical sensors packed into a proven and capable aircraft. Fenix and other exiting UAVs will be on display at the stand.
www.flytechuav.com
Stand no. F8.075

Fenix.

FOIF

Light and compact are top trends for new-generation surveying instruments. FOIF's new-generation A50 RTK receiver is a compact, lightweight and easy-to-handle receiver with new features such as Wi-Fi, USB OTG and a tilt sensor. It can work with Carlson SurvCE and Mircosurvey FieldGenius for field solutions. The RTS160 total station also features excellent handling; it is lightweight and comfortable for faster and easier working. It is equipped with a 6-line display screen so that more information can be seen directly. The RTS010 high-precision total station offers 1500m reflectorless distance, 1" angle measurement and 1mm+1ppm distance measurement.
www.foif.com
Stand no. F4.019

A50 GNSS receiver.

FORSBERG

Forsberg is a European navigation systems integrator and OEM component supplier. Originally a navigation consultancy, the company has been a successful NovAtel outlet since 1997 with offices in the UK and Germany. Forsberg has strong engineering experience in navigation, specialising in PCB, software and mechanical design. The navigation products offer market-leading GNSS and inertial technology. Thanks to extensive experience and a dedicated team of systems engineers, Forsberg is able to provide specialised technical assistance and bespoke solutions to fit customer requirements. The company provides customers with the best economical solutions using OEM, system design and manufacturing expertise and is certified to ISO9001:2008.

www.forsbergservices.co.uk

Stand no. D4.061

Forsberg's product range.

FPM

FPM is a German manufacturer of high-quality precision surveying instruments. As a second field of business it also produces parts based on drawings on its modern and highly efficient CNC turning and milling machines. The main customers are reputable companies worldwide that deal with micro-analysis instruments and other opto-mechanical components. At this year's Intergeo, the company is showcasing its series of internationally successful optical and laser zenith/nadir plummets, its vintage assortment of surveying instruments, special products and solutions used for deformation monitoring as well as a wide range of further accessories for its high-quality instruments.

www.fpm.de

Stand no. G4.093

FG-L30 – optical nadir and zenith plummet.

GAF

'Get informed directly' is the slogan being used this year at GAF's stand at Intergeo. Once again, the stand shared with e-GEOS, European Space Imaging, BlackBridge and the Verband Runder Tisch GIS will form a central point of interest for services related to satellite data and geoinformation. In the centrally integrated presentation area, GAF and its partners will be providing information about recent technical innovations/trends and developments. Speakers and colleagues will be on hand to enter into lively discussions on application-related questions.

www.gaf.de

Stand no. C6.059

30 years of GAF: more than 1,000 projects in over 100 countries.

GENEQ

For more than 15 years Geneq has been a leading developer and manufacturer of the famous GPS SXBlue GNSS family. With revolutionary technology, these mapping grade receivers are the first to achieve sub-metre in real time without post-processing. The new iSXBlue+ II GNSS sub-metre accuracy is compatible with ESRI ArcGis and Collector for iOS, when using an iPad or iPhone. A new standard is set with the new SXPro RTK all-in-one handheld, L1 and L2 from GPS and GLONASS plus the E1 from Galileo delivers the quickest and most reliable RTK for 1-2 centimetre accuracy.

www.geneq.com

Stand no. F4.093

SXBlue III+ GNSS.

GEO-FENNEL

With its precise and high-quality laser measuring tools, electronic theodolites, surveying instruments, GPS systems and laser distance meters, as well as a wide range of measuring accessories, geo-FENNEL ensures that everything comes together as it should on construction sites. The professional craftsperson will find everything he/she needs for levelling and measuring operations. geo-FENNEL products are considered to be particularly innovative, robust and reliable. Users engaged in the most diverse trades are able to rely on the precision and proven quality of geo-FENNEL. Irrespective of the challenge that awaits, geo-FENNEL products ensure that users are optimally equipped for any task.

www.geo-fennel.com

Stand no. F4.050

Utilisation of geo-FENNEL TheoDist FTD 05 for controlling measurements inside a rail tunnel.

GEOCART

At Intergeo 2015, Geoact, a surveying service provider located in Germany, will be presenting results from the all-new Lidar in combination with high-resolution UltraCam imagery. For the very first time UCFalcon images with 3cm GSD together with high-density point clouds from LiteMapper 7800-400 have been captured simultaneously in one flight. Besides this, oblique imagery as well as thermal infrared images will be shown at the trade fair in Stuttgart.

www.geocart.de

Stand no. C6.022

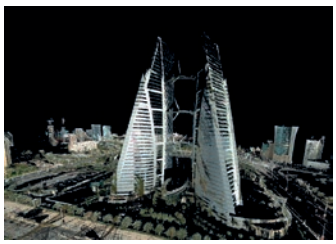
UltraCamEAGLE F100 and F210.

GEODEZIA INTERNATIONAL

Geodezia International is among the largest geodesic and geographic information companies in Europe focusing on GIS data collection, undertaking complete implementation of complex, customer-designed, unique geographic information solutions (from database-building to system operation). In the data processing centre of the 65-year-old company, 40 highly trained and experienced engineers work constantly to process the data extracted. Thanks to the use of innovative geographic information technologies the company takes on special cartographic jobs , besides classic geodesic assignments. Since the Middle East-GCC region is the most important international market, the company has recently established a regional office in Manama, Kingdom of Bahrain.

www.geodezia.hu

Stand no. D8.015



Complete geospatial solutions for GIS data collection.

GEOMAX

GeoMax is an international company based in Europe that develops, manufactures and distributes quality surveying and construction equipment and integrated solutions at the best price-to-performance ratio. The comprehensive portfolio includes total stations, GPS/GNSS, 3D survey and 3D measuring, data loggers, field software, optical and digital levels, lasers, machine guidance and cable locating systems, and accessories. Intergeo visitors will discover the products that are freshening up the surveying industry, such as GeoMax Zoom90 robotic total station, GeoMax Zoom3D 3D measuring and micro robot, GeoMax Zentih35 GNSS receiver and Zeta125 & 150 pipe lasers, as well as Zoom300 and X-PAD MPS: 3D survey solution, EzDig machine guidance system and GeoMax Zoom20 accXess total station.

www.geomax-positioning.com

Stand no. F6.094

GeoMax product range.

GEOMER

Geomer provides services in geographic information systems, software engineering and geodata in the fields of natural hazards, risk provision and location analytics. This year at Intergeo, the company will highlight its heat demand map that shows the heat requirement of residential buildings. Further on display will be EmoCityMap, a technology that unfolds people's emotions in space, and last but not least sd-kama, a government-funded project for disaster management. It focuses on the integration, processing and analysis of large amounts of heterogeneous data in real time.

www.geomer.de

Stand no. D6.093

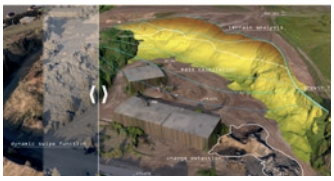
Geospatial knowledge is fundamental to sustainable development.

GEOMON

GeoMon – the drone experts is a specialised service provider offering solutions for aerial image acquisition, maps and analysis, geodata consulting and Agisoft online training. The company deals with aerial images, 3D models, derived maps and analysis. The data is used for surveying, land management, road construction, surface mining, disposal sites or renaturation. Typical clients are engineering companies in the field of surveying or any type of ecological matters and public authorities. GeoMon's unique selling proposition is – besides the drone technology – that, as drone experts, the company provides professional high-resolution geodata and a unique, expert service.

www.geomon.info

Stand no. C8.085



Geodata analysis in a 3D model derived from UAV data.

GEOTRADE

2015 marks the 18th successive year at Intergeo for Geotrade, a Dutch authorised performance dealer of Leica surveying equipment. In that time, GeoTrade has become one of the world's leading resellers of used surveying equipment of all brands. All instruments on sale are completely reconditioned in the company's in-house service centre (authorised by Leica Switzerland). Instruments are shipped worldwide. Thanks to GeoTrade's location close to the borders with Germany and Belgium, the authorised service centre could be a perfect alternative for customers in those countries. A wide variety of surveying instruments, from Distos to GPS, of all major brands will be on display at Intergeo.

www.geotrade.nl

Stand no. D4.020

GeoTrade van.

GERMAP

GerMAP is a young company which draws on 25-plus years of combined professional geomatics experience of its founders. Special areas of interest are UAV mapping technology, aerial image data processing and handling of complex projects. For the UAV mapping segment, GerMAP develops, sells, and applies UAVs which execute aerial imaging flight missions fully automatically. Training and maintenance are also part of GerMAP's UAV mapping sales portfolio. In terms of services, GerMAP executes UAV aerial imaging flight missions and processes aerial images originating from either UAV platforms or manned aircraft. Further core competences of GerMAP's engineers include the generation of orthoimages (true and regular), terrain and surface models, volumes, contours and other spatial information.

www.germap.com

Stand no. A8.089

G220 UAV.

HARXON

Harxon Corporation is one of the world's leading suppliers in satellite positioning and is focused on the research and manufacture of antennas for GPS/GLONASS/Galileo/BD systems. Today, Harxon has grown into a major supplier of global satellite positioning GPS antennas and aims to be the main supplier in the field of wireless data transmission in China. The company mission to drive industry progress with industry-leading technology and enhance clients' value with excellent-quality products. The company vision: to be a leader in the field of global satellite positioning and communication.

www.harxon.com

Stand no. B8.056

Harxon GPS antenna.

HEIDELBERG MOBIL

Heidelberg Mobil is a solution provider for location-based services in challenging spatial situations, especially indoors. At Intergeo 2015 the company will be presenting the latest version of its premium 3D indoor mapping solution, Deep Map, which facilitates efficient navigation in multi-floor buildings. Visitors to the stand can experience how indoor location-based services can help to grow their business.

www.heidelberg-mobil.com

Stand no. D6.093

Deep Map 3D indoor mapping solution.

HEXAGON GEOSPATIAL

Hexagon Geospatial will be showcasing its latest innovations and insights at Intergeo 2015, together with Hexagon Geosystems, Intergraph SG&I and its business partner Geosystems, under the Hexagon banner. Most notably, the company's latest geospatial innovations including Hexagon Smart M.Apps, Producer Online and the Power Portfolio 2015 will be highlighted in executive-level presentations. On Wednesday 16 September (14:00 - 15:30) Mladen Stojic, Hexagon Geospatial president, will explain how geospatial availability and analytics are key to unlocking the potential within geospatial big data.

www.hexagongeospatial.com

Stand no. D4.035

Mladen Stojic.

HI-TARGET

At Intergeo 2015, Hi-Target, a professional high-precision geographic instrument solution provider, will be presenting its high-end surveying, marine and scanning instruments including V90 Plus, HS 450 and iBeam, solutions for precision agriculture, etc. To provide customers with in-depth knowledge about these new products, the company will be holding a free presentation which will give a detailed introduction. Visitors are welcome to communicate with experts and experience these innovative instruments at the stand on 15 September. The schedule is as follows: 14:30-15:00, HS450 laser scanner; 15:15-15:45, V90 Plus GNSS RTK; 16:00-16:30, iFarm application – navigation of agricultural machinery.

www.zhdgps.com/en/

Stand no. B8.041

V90 Plus.

HISYSTEMS

HiSystems has been developing and distributing hardware and software for multicopters since 2008. The development, final assembly and testing of the MikroKopter is done in Germany. Key components and the electronics are also manufactured in the region. When selecting suppliers of components for the MikroKopter, the company strives to use local businesses. In the past years the company's focus has shifted more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www.taxusit.com.pl
The new, complete, professional mobile mapping solution for Android devices
GPS DGPS
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Maps
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Vector data (shp, dxf)
Online maps (WMS, TMS)
OSM vector data (tCloud)
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KOLIDA K5 ROVER
THE PURSUIT TO
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13.4cm
11.8cm
1kg
Tilt survey
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Build-in Radio
Dual Bluetooth
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No 2860

towards professional applications, so that the core clientele is now in commercial and scientific areas. HiSystems continues to supply many other drones providers, who use its electronics with success in their multicopter solutions.
www.mikrokopter.de
Stand no. F8.091

6sGEO UAV.

HOPONG

A globally innovative micro oblique photography system will be presented at Intergeo 2015 by Hopong, the leading pioneer in the field of UAV oblique photography technology development in China. Hopong will be displaying its flagship product, which includes a self-designed electronic multi-rotor UAV and a patent-protected micro oblique camera platform, at Intergeo 2015. Visitors will be available to see this innovative product and talk with the company president about the future of the geographic information industry. Hopong encourages visitors not to miss this revolutionary product that it claims might change the world.
www.hopong.com.cn
Stand no. D8.001

Hopong's micro oblique photography system.

HORUS

Horus delivers hardware-indepedent software for a video-based mobile mapping platform. This software can be added to existing mobile mapping systems or can be used as a low-investment alternative. Georeferenced video software is very easy to use and creates a lot of value for non-geo specialists. At Intergeo, the turnkey solution 'Citymapper', geo-editing software Horus Movie Player and the new web-based Horus Movie Player will be demonstrated.
www.horus.nu
Stand no. G6.090

Horus Movie Player.

IGI

IGI is one of the world's leading geospatial companies and conducts business worldwide. The success of IGI is driven by its people and its commitment to get results the right way — by operating responsibly, executing with excellence, applying innovative technologies and capturing new opportunities for the best possible accuracy. The purpose of IGI is to provide smart geospatial solutions. IGI helps people and organisations work together efficiently and use equipment effectively to stay ahead of the competition. At Intergeo 2015 IGI will showcase the new IGI Quattro-DigiCAM-300 and new Cavalon Aerial Survey capabilities.
www.igi.eu
Stand no. B4.025

IGI Quattro-DigiCAM-300.

IMAJING

imajing is a worldwide provider of innovative imagery and geopositioning technologies for simple, accurate and economic large-scale surveying of road and railway infrastructures, 3D mapping and monitoring. imajing technology is based on a revolutionary concept for mobile mapping systems, where devices and software are sized and developed to give flexibility and ease of use to users. Applications are varied among navigation maps, asset inventories for GIS and infrastructures assessment. The tool chain is composed of a mobile mapping technology (imajbox), a photogrammetric GIS data production software (imajview) and a field data-sharing web service (imajnet), providing an end-to-end solution.
www.imajing.eu
Stand no. G6.036

imajbox.

IMAR

iMAR is a leading provider of inertial measuring and navigation systems for land, sea, air, sub-sea and space. The applications and tasks comprise navigation, stabilisation, survey, control and automisation of platforms. In-house test equipment includes several two/three-axis turntables, temperature chambers and a 40kN shock/vibration test platform. The certifications according to ISO9001, EN9100 and EASA Part21G guarantee the high level of process stability in development and production. The exhibit at Intergeo will comprise the full range of navigation and stabiliszation systems for automotive, airborne, sea and land applications. The company will present the new iTraceRT-family as well as the new iNAT-family of systems.
www.imar-navigation.de
Stand no. C8.090

Advanced Navigation and Timing (NAT).

IXBLUE

At Intergeo, iXBlue, a global leader in navigation, positioning, and imaging systems, will be featuring the ATLANS-C, a high-performance all-in-one navigation solution for both land and airborne mobile mapping applications. ATLANS-C provides an integrated smart coupling technique between iXBlue fibre-optic gyroscope (FOG) inertial navigation system (INS) and integrated real-time GNSS data. It provides extremely robust continuous positioning in GNSS-denied environments like urban canyons. With its small size, low weight, low power consumption and low integration effort, it is optimised to meet the demanding high-quality mobile mapping needs. It comes with an iXBlue exclusive 5-year warranty and 24/7 support and is ITAR-free.
www.ixblue.com
Stand no. D4.018

ATLANS-C.

JUNIPER SYSTEMS

Juniper Systems designs and manufactures rugged handheld computers for use in highly rugged environments. The Archer 2 and Mesa Rugged Notepad are perfect for intensive data collection in the geomatics, mapping and high-precision surveying industries. Some key-features: built-in RFID is featured in the Mesa Rugged Notepad; the new Archer 2 is now certified for use in hazardous locations; in response to customer needs, the company has introduced the CT-7 and CT-4 handhelds, based on the Android OS; Juniper Systems provides superior customer service, world-class design and ultra-rugged, intuitive handheld computers.
www.junipersys.com
Stand no. G4.026

Juniper Systems' rugged handheld computers.

KOLIDA

Kolida Instrument is a leading manufacturer of precision surveying equipment. It offers a large collection of GPS and GNSS systems, total stations, lasers, optical instruments and software for surveying and civil engineering applications. Kolida has

Made Simple

Features

- **Survey Pro**
  - Powerful field data collection
  - Full featured
  - Market leader for 20+ years
  - Productivity made for you
- **Spectra Precision Central**
  - Cloud computing made for you
  - Web portal
  - Smart phone apps
  - Spectra Precision Central Sync
  - Survey Pro integration
- **Spectra Precision Survey Office**
  - Easy data management
  - Fast and powerful GNSS processing
  - Survey deliverables

Spectra Precision Software Solutions

Surveying is anything but simple

Sometimes, it's a blank slate with infinite possibilities. Sometimes it's a problem with no defined solution. In either case, Spectra Precision is here to help you stay ahead of the job, get the work done, and deliver a professional result to your customers. Building a business is always a challenge – Spectra Precision software is there to help you accept and surpass that challenge. Field to office and back again, the full workflow, easily managed – that's innovation that matters. You work hard for your customers – you owe it to yourself to let Spectra Precision help.

- **Survey Pro** will help you get it done in the field. The results will be consistent, reliable, trustworthy and complete while being innovative enough to ensure a competitive edge.
- **Spectra Precision Central** enhances today's connected world. Central provides an easy to use pathway to data exchange and management that easily integrates into your daily workflows.
- **Spectra Precision Survey Office** is a powerful and flexible surveying software that can either put the finishing touch on a complex project, or it can aid in doing those little things that are key to successful job completion.

Spectra Precision Software : Integrated Software Solutions Designed for You

More information on

www.spectraprecision.com
www.spectraprecisioncentral.com

AMERICAS

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ASIA-PACIFIC

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Singapore PTE Limited.
80 Marine Parade Road
#22-06, Parkway Parade
Singapore 449269, Singapore

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No 2879

dedicated itself to developing quality products and providing fast, efficient service to customers. KOLIDA products are used in over 70 countries around the world. At Intergeo 2015 Kolida is bringing several new products to users: a total station with 1,000m prismless measurement range, auto pressure/temperature sensor and colourful LCD screen; and K5 and S680, two rugged and intelligent GNSS receivers which integrate the latest positioning technology.
www.kolidainstrument.com
Stand no. B8.063

Kolida's K5 Plus.

LASER TECHNOLOGY
Laser Technology, Inc. (LTI) will be demonstrating 'How to empower your GIS data collector' utilising the TruPulse 360 laser rangefinder. Performing a GPS/GNSS laser offset saves time and simplifies positioning and attribute data collection. All of the most popular GIS hardware and software already has an LTI laser interface feature so anyone can increase their field efficiency, simplify the work flow and collect accurate offset data from a safe location. Visitors can attend LTI's Trend Forum presentation for more details and stop by the stand to see if they are laser-ready. There will also be a 'top secret' campaign revealing LTI's latest technological development.
www.lasertech.com
Stand no. C4.039

TruPulse 360 laser rangefinder.

LASERSCANNING EUROPE
Laserscanning Europe specialises in laser scanning technology and offers a comprehensive service around the world. Based on the customer intimacy and the long-term experience of the company's experts, Laserscanning Europe has been able to successfully establish itself as a leading and independent system house. It offers laser scanner hardware, laser scanning software, scanner accessories (such as tripods and reference spheres) as well as training and 3D modelling services. Together with PointCab, the company will be presenting an interesting agenda including software and hardware demonstrations at Intergeo 2015.
www.laserscanning-europe.com
Stand no. F4.011

Laserscanning Europe at Intergeo 2014.

LEAD'AIR
Lead'Air, the US-based manufacturing successor to the renowned Track'Air product line, is a precursor and innovator in the field of digital oblique photography. From its beginnings in The Netherlands over two decades ago, Lead'Air has leveraged its US technology base and its in-house, precision-engineering and manufacturing facility to grow to today's market leader, with over a hundred mapping-grade systems in use worldwide and millions of images produced yearly to the highest resolution and scientific quality in the industry. Lead'Air will be exhibiting the UAM, miniaturised mapping system for UAV or conventional aircraft, alongside its famed MIDAS oblique systems.
www.trackair.com
stand no. B8.012

MIDAS 5 oblique acquisition system.

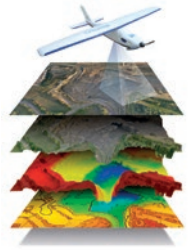
LEICA GEOSYSTEMS
Having been revolutionising the world of measurement and survey for nearly 200 years, Leica Geosystems, part of Hexagon, creates complete solutions for professionals across the planet. With precise and accurate instruments, sophisticated software and dependable services, Leica Geosystems delivers value every day to those shaping the future of our world. At Intergeo, visitors can experience the latest reality-capture solutions, such as the new family of Leica ScanStations and the touch-technology software Leica Captivate, creating real digital worlds. By providing a world-class brand portfolio, the company helps its customers to make the best decisions for their unique needs.
www.leica-geosystems.com
Stand no. F4.049

Leica CS35.

LIDARUSA
LidarUSA will be co-exhibiting with OxTS at Intergeo 2015, showcasing the OxTS xNav INS along with a Quanergy M8 scanner on an RF70 fixed-wing UAS. LidarUSA integrates a variety of systems and components together to create off-the-shelf and customised mobile mapping systems for virtually any moving platform for mapping from the ground, water or air using laser scanners and 360-degree or directional cameras.
www.lidarusa.com
Stand no. F8.027

LidarUSA RF70 Lidar mapping UAV.

MAVINCI
MAVinci is a German manufacturer of unmanned aerial systems for surveying and mapping applications. With its leading technology in both software and hardware MAVinci aims to meet customer needs with innovative features adding more value to their projects. The Sirius UAS is simple to handle, especially in large and dangerous areas. It delivers accurate results even in bad weather conditions. Complex data can easily be turned into informative insights.
www.mavinci.de
Stand no. C6.031



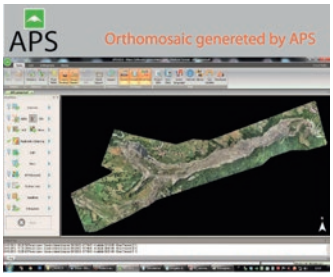
Sirius UAS.

MENA3D
As a leading company in 3D measurement, Mena3D offers complete 3D measurement and geospatial solutions for broad range of applications. Mena3D's strength is its knowledge in 3D technology and its expertise in developing the 3D market, especially in the Middle East and North Africa. Mena3D is focused on offering solutions and support that enable customers to accelerate their product quality and productivity. At the Intergeo stand, visitors can expect to see traditional as well as innovative surveying technologies including GPS, airborne/UAV scanning and 3D laser scanning.
www.mena3d.com
Stand no. F6.058

Geospatial solutions for a broad range of applications.

MENCI
Menci Software, founded in 1999, is an Italian software developer and provider of products used for survey, mapping and photogrammetry applications. One of Menci's main product is APS, the photogrammetry software that transforms UAV images into metric information. APS enables aerial triangulation, DSM, point cloud, mesh, DTM, contour lines, orthomosaic, etc. Menci produces additional specialised modules: TerrainTools, StereoCAD and Agritools. At Intergeo 2015 Menci will anticipate APS10, the new UAV mapping concept, and Agritools which

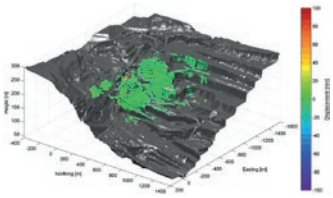
is specially designed for precision agriculture.
www.menci.com
Stand no. C8.077



APS orthomosaic model starting from UAV images of a landslide.

METASENSING

MetaSensing is an innovative company providing proprietary sensors for data acquisition and post-processing services. MetaSensing radars can be applied to several fields, both commercial and scientific: SAR mapping, security & surveillance, structure monitoring and weather radars. Such sensors are compact, high resolution and low cost. The reduced size allows for different applications, also within restricted conditions while the performance is still very high. Each sensor is customised according to the requirements in order to fulfil every need. The FastGBSAR is an example of the company's versatile and customisable products: a compact and light sensor for structure monitoring capable of performing data acquisitions in less than 10 seconds, hence providing more coherent data and decreasing the time necessary to detect changes.
www.metasensing.com
Stand no. A6.005



Displacement monitored by FastGBSAR in open-pit mine working area.

MICROSOFT

Visitors to the Microsoft UltraCam stand at Intergeo 2015 can learn about new, enhanced UltraCam digital aerial camera systems as well as new UltraMap releases featuring capabilities that are sure to delight. The company will also be showcasing the current UltraCam product line – the UltraCam Osprey nadir/oblique digital aerial camera, the UltraCam Eagle, the UltraCam Falcon and the UltraCam Hawk – along with its UltraNav direct georeferencing and flight management system, the UltraMount 4000 and the remarkable features of UltraMap software which can now be licensed on a subscription basis.
www.microsoft.com/ultracam
Stand no. F4.080

Microsoft UltraCam product line.

MYZOX

For more than 50 years, Myzox has been supplying its products, which are filled with the Japanese 'Monozukuri spirit' and in keeping the Japanese quality standard, to customers all over the world. It is the company's mission to contribute to the further development of society with its products, which are created in response to customers' voices. Visitors to the stand will be able to see a variety of unique products and learn more about the company.
www.myzoxjapan.com
Stand no. D8.011

Myzox product catalogue.

NAVCOM

NavCom Technology, a John Deere company, is a leading provider of advanced GNSS products for OEMs, VARs and system integrators requiring high-performance RTK systems, global 5cm-level GNSS satellite corrections with the StarFire network, geodetic quality GNSS receivers and engineering consulting in the areas of precise positioning, wireless communications and robotics.
www.navcomtech.com
Stand no. C4.079

SF-3050 GNSS receiver.

NCTECH

NCTech designs and manufactures 360-degree imaging systems that can be used repeatedly, accurately and consistently by anyone, anywhere. The NCTech iSTAR is a rugged 360-degree camera designed for use within the surveying, construction engineering and architectural sectors. iSTAR captures high-quality, accurate 50MP spherical images with excellent high dynamic range, providing stand-alone panoramic imaging for visual documentation of a location or as an HDR camera addition for laser scanning systems. The new iris360 is a fully automatic 360-degree camera, originally designed for Google's 'Trusted Photographers' and now providing all the same benefits to others needing automated 360 imaging.
www.nctechimaging.com
Stand no. D4.061

iris360.

NEDO

Nedo is one of the leading manufacturers of high-quality surveying equipment. Geodesists all over the world rely on the company's high-precision invar levelling staffs, tripods and prism poles. Intelligent lasers and innovative measuring tools round off the range. For more than 110 years, the Nedo brand name has been synonymous with uncompromising quality made in Germany. The new Industrial Line shaft tripod was designed especially for the use of 3D laser scanners in shaft applications. The toothed column, which extends to almost any length, allows 3D scanners to be inserted through shaft covers into the shaft compartment.
www.nedo.com
Stand no. C4.059

Industrial Line.

NORTHROP GRUMMAN LITEF

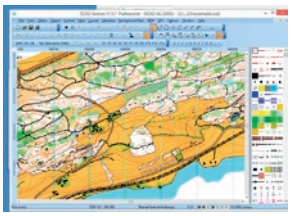
The company may not always be visible, but its technology is all pervasive: Northrop Grumman LITEF is a global leader in inertial sensors, reference and navigation systems. For over 50 years, its broad product range has been a stable player in the aviation, land, marine and space sectors. Northrop Grumman LITEF provides customer-specific solutions for measurement, inspection, survey, stabilisation, north-finding and navigational tasks that require maximum precision and reliability, especially in challenging environments. Its fully-integrated fibre-optic and micro-mechanical LCI, ISA and µIMU family will meet customer requirements: visitors to the Intergeo stand can name their challenge and Northrop Grumman LITEF will provide the solution.
www.northropgrumman.litef.com
Stand no. G4.022

LCI-100 high-precision FOG-based IMU.

OCAD

OCAD is more than map-drawing software – it provides a powerful software package for producing any kind of maps, by interchanging within the following fields: geodata capture, import and export of geodata, desktop publishing and creating web maps. A new version of OCAD will be released in the autumn of

2015 with the following editions: OCAD 12 Professional – efficient for professional map making; OCAD 12 ThematicMapper – create thematic maps; OCAD 12 Mapping Solution – topographic and thematic maps from one hand. For more than 25 years, OCAD has been continuously developing its software OCAD for cartography, by welcoming and incorporating customer requests.
www.ocad.com
Stand no. A8.007



Create thematic maps with OCAD 12 ThematicMapper.

OXTS

Visitors to the OxTS stand at Intergeo this year can take a look at the survey-grade inertial navigation systems on offer. For mobile mapping, there is the Survey+ giving accurate position and trajectory data that is robust against GNSS blackouts in cities, under trees or through tunnels and bridges. The Inertial+ is the world's first Locata-compatible INS, combining the benefits of an inertial system with the GPS-complimentary local positioning system Locata. For UAV applications, the xNAV will be on show, along with guests Aeroscout and LidarUSA who will be showing their UAV-based laser scanning systems.
www.oxts.com
Stand no. F8.025

OxTS survey products.

PHASE ONE

Visitors can see the world's smallest, lightest 80-megapixel medium-format aerial camera — one of the newest members of Phase One Industrial's range of highly flexible aerial cameras. Design permits stand-alone use or integration into gimbals/pods, quadcopters or as part of an oblique/nadir array. Camera features include: interchangeable leaf shutter Schneider-Kreuznach and high-performance Rodenstock lenses; forward-motion compensation option; USB 3.0 for high-speed, direct transfers to computer; GPS/IMU data written directly to image files. Software applications include iX Capture and Capture One Pro. SDK kit is available.
industrial.phaseone.com
Stand no. B4.039

Image from Phase One iXA 150 aerial camera.

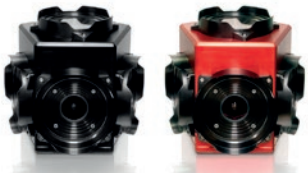
PIX4D

Pix4D is expecting an exciting and full Intergeo this year, as it will be showcasing the new 2.0 versions of both Pix4Dmapper software and the Pix4Dmapper Capture App. Among other things, Pix4Dmapper will highlight its new inspection and video processing capabilities, and the Capture App will exhibit its new drone compatibility. Attendees can expect to see flying demonstrations using the app, along with various demos of Pix4Dmapper software. There will also be a user workshop: a half day of training on the software, mapping and the principles behind it.
www.pix4d.com
Stand no. D8.085

The Pix4D team.

POINT GREY

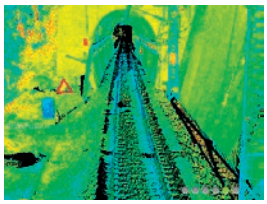
Point Grey will be showcasing the Ladybug 5 spherical imaging camera streaming 30MP, 12-bit panoramic video in real time using 6 x 5MP Sony CCD sensors. Precision factory calibration, 100% user-controlled image processing, a 5Gbit/s USB 3.0 interface and a ground-breaking post-processing workflow for superb image quality and high dynamic range make the Ladybug5 ideal for GIS applications. Visitors will also see the new Grasshopper3 USB3 Vision camera featuring high resolution 12.0MP using Sony ICX834 global shutter CCD sensor and high dynamic range. It is well suited for a wide variety of demanding applications including 3D scanning and mobile mapping.
www.ptgrey.com
Stand C6.206



Ladybug5.

POINTSHAPE

DREAMTNS, South Korea, supplies the globally proven high-performance 3D modelling software PointShape which can deliver high-quality 3D models from any Lidar systems' point clouds such as RIEGL, Leica, Trimble, FARO, etc. PointShape is the first 3D modelling add-in program which can cover all applications from MicroStation to AutoCAD series. PointShape is mainly focused on road, infrastructure, plant and 2D drawing applications. In 2015, PointShape is presenting a new tunnel management feature which allows analysis and comparisons between scanned tunnel data and its CAD. This new feature provides calculations of over-/underbreak area as well as deviation display and volume of concrete lining, enabling a reduction in construction costs.
www.pointshape.com
Stand no. E6.001



PointShape 3D modelling software.

PYTHAGORAS

Pythagoras focuses on delivering to its users the best CAD & GIS experience possible. Supporting a variety of import formats, which form the start of any project; providing incredibly powerful drawing and calculation tools, allowing handling of all data types and transforming them into a complete project plan; and providing solutions for surveying, infrastructure, construction, agriculture and dredging in an all-in-one package makes Pythagoras truly '360° compatible'. Datasets coming from total stations, GPS instruments, laser scanners, mobile mappers, UAV and drones, single and multibeam systems and other CAD and GIS software packages can be handled and processed with ease.
www.pythagoras.net
Stand no. A8.034

Pythagoras CAD and GIS.

QUESTUAV

QuestUAV is a UK-based manufacturer of small, fixed-wing unmanned aircraft that are designed to carry sensors such as high-resolution cameras, infrared cameras, multispectral cameras and video surveillance cameras. The aircraft are operated autonomously in that the route is planned before flight and then, following launch, the aircraft will automatically fly the route, operating the cameras automatically and then return to an automatic landing or parachute landing. Crew on the ground have control over the aircraft at all times and can intervene if required. The aircraft have inbuilt safety systems and fail-safes to cope with emergencies.
www.questuav.co.uk
Stand no. D4.061

Q-200 Surveyor Pro Lite.

RACURS

Since its foundation in 1993, Racurs has been developing innovative digital mapping software for processing aerial, space and terrestrial imagery. The flagship product PHOTOMOD was one

of the first digital photogrammetric systems on the market. Today DPW PHOTOMOD is the most popular photogrammetric software in Russia and well known all over the world. An international dealer network helps Racurs to market, sell and support its products in 70 countries. The new PHOTOMOD 6.1 offers significant improvements in UAS data processing, unique DSM algorithm, more blunder detection tools in the Bundle adjustment module and new localisation architecture including the English, Chinese, Spanish, Greek and Russian languages.
www.racurs.ru
Stand no. G4.036

PHOTOMOD dense DSM.

REDUCT

Recently adopted regulations for accuracy of underground utility location, such as PAS-128 (UK) and Wion (NL), add an additional task to the service portfolio of surveyors, subsurface utility engineers and geophysicists. To ensure that compliance with new regulations can be achieved efficiently and at an incremental cost, Reduct introduces the As-Built-Maker (ABM) pipeline mapping range that ends the perception that gyro-mapping is complex and expensive. Measurement data includes XYZ coordinates, azimuth and inclination degrees, and can be directly uploaded to all common GIS platforms such as AutoCAD, Esri and Microstation.
www.reduct.net
Stand no. A8.042

ABM pipeline mapping range.

RIEGL

Intergeo attendees can meet the international RIEGL expert team at the stand to learn about the comprehensive, advanced RIEGL product portfolio including the latest Lidar sensors: the VUX-1 series of high-performance Lidar sensors for kinematic laser scanning, the VP-1 ultra-compact helipod, fully integrated with VUX-1LR sensor, camera and IMU/GNSS integrated for airborne surveying, and the VMQ-450 mobile laser scanning system featuring a single scanning head for cost-effective mobile mapping.RIEGL experts will be on hand throughout Intergeo in Stuttgart to introduce visitors to the complete RIEGL solutions portfolio in hardware and software.
www.riegl.com
Stand no. E4.079

RIEGL's RiCOPTER.

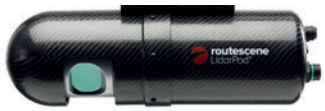
RMDATA

rmDATA has been a leading provider of surveying software in Austria since 1984, based on top-quality products and professional services aimed at 100% customer orientation. This is a great challenge – particularly in niche markets characterised by high technical standards. To meet this challenge, the company offers an extensive range of software solutions that are perfectly tailored to the practical requirements of niche markets. rmDATA software thus covers all the surveying tasks that may be needed by customers, who in turn benefit from an optimal workflow that results in sustainable productivity increases.
www.rmdata.at
Stand no. D4.019

Simple and intelligent software for generating plans and capturing geodata. © A. Bruckner

ROUTESCENE

The Routescene LidarPod is market-leading 3D mapping technology designed specifically for use on unmanned aerial vehicles (UAVs). Developed to save time and improve efficiencies and productivity, it allows surveys to take place that previously would have been cost or time-prohibitive. The LidarPod is a turnkey system. Quick to deploy, it decreases time in the field and reduces data download time, ensuring users have resulting datasets within hours. Surveying is more accessible and can be applied to more scenarios, and customers are able to allocate budget more effectively. Applications include power-line inspections, forestry biomass volumes, mining cut and fill analysis, highway mapping and surveys.
www.routescene.com
Stand D4.061



LidarPod.

RUIDE

Established in 1995, Ruide is an R&D and production-oriented enterprise focusing on precise surveying equipment and solutions. Ruide offers a complete product line with cutting-edge technologies, including GNSS positioning systems, total stations, digital levels, auto levels, handheld distance meters, etc. In recent years, Ruide has released new products and solutions to meet higher market demands, such as a total station with 1" accuracy and 1km reflectorless range, one of the smallest GNSS receivers in the industry with intelligent functionalities, a digital level with 0.3mm accuracy, as well as a UAV imaging and scanning system and laser machine control system.
www.ruideinstrument.com
Stand no. B8.063

Nova R6.

SAFE SOFTWARE

Safe Software helps companies unlock the full potential of their data with FME. With a drag-and-drop interface, this flexible toolset lets users connect data from 335-plus sources including GIS, CAD, BIM, point cloud and database applications. FME transforms data exactly as needed and automates data processing to save users hours, if not days. Trusted by over 20,000 organisations worldwide, FME provides complete data flexibility. Visitors to the stand will learn how FME can help them to connect, transform and automate their data.
www.safe.com
Stand no. D6.025

FME.

SANDING

Over the past 20 years of dedicating itself to R&D in the precise surveying sector, Sanding has grown to be one of the most significant suppliers of surveying instruments and solutions in the world. Today, the company has 5 production bases, focused on R&D and production of a full range of surveying equipment: total stations, electronic theodolites, digital levels, handheld distance meters, auto levels, laser levels, prisms and relevant accessories like tripods, staffs and poles. Right from the start and to this day, the company insists on 'Precision + Cost-effectiveness', aiming to enable its users to create maximum value with minimum investment.
www.sandinginstrument.com
Stand no. B8.063

Sanding total station.

SATEL

With the lowest connectivity life-cycle cost with robust products for mission-critical applications, Satel

radio modems and modules provide high reliability, minimal reaction time and last-mile connections in remote locations. This applies to all applications for which controlling, monitoring, metering or alert sensor systems are part of the operation. At Intergeo Satel will be introducing a new radio module with additional data speed in the air, a new radio with integrated battery, new frequency bands for existing radio modules and new supported protocols.
www.satel.com
Stand no. G4.020

Satel product range.

SATLAB

At Intergeo 2015, Satlab will be presenting its largest stand ever, next to the UAV demonstration area, with a range of new and upcoming products on display. Attendees will be able to talk to Satlab about mobile mapping, UAV technology, GIS and marine and land surveying. The company is still adding to its expanding global dealer network and is keen to talk about how visitors can grow their business by representing the expanding product line. On Wednesday evening Satlab will be serving custom-brewed Czech beer, which it guarantees is as good as its products!
www.satlabgps.com
Stand no. E8.071

New Satlab SLC tablet RTK receiver accessory.

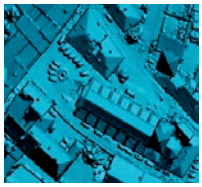
SCAN&GO

The Scan&Go system is a new method for topographical surveys using a 3D laser scanner combined with GPS receivers and a total station. The system, installed in 'Stop&Go' vehicle mode, is designed to obtain a three-dimensional centimetre-level definition of individual scans in a single reference system. The Scan&Go system allows perfectly levelled scans, an increase of the range of measurements, less stationing, reduced survey time, increased detail and optimal measurement quality. Combining the Scan & Go system with the Level-Lift Roof 32Evo enables the scanner to be brought to more than 5 metres in height, thus significantly increasing the range of measurement.
www.scan-go.eu
Stand no. D6.092

Scan&Go system.

SIMACTIVE

SimActive is the developer of Correlator3D software, a patented end-to-end photogrammetry solution for the generation of high-quality geospatial data from satellite and aerial imagery, including UAVs. Correlator3D performs aerial triangulation (AT) and produces dense digital surface models (DSMs), digital terrain models (DTMs), point clouds, orthomosaics and vectorised 3D features. Powered by GPU technology and multi-core CPUs, Correlator3D ensures matchless processing speed to support rapid production of large datasets. SimActive sells Correlator3D to leading mapping firms and government organisations around the world, offering cutting-edge photogrammetry software backed by exceptional customer support.
www.simactive.com
Stand no. C8.023



Correlator3D.

SITECO

Siteco has developed the first scalable, high-performance, fully integrated mobile mappaing system (MMS) which allows the flexible interchangeable use of FARO, Z+F, RIEGL and other scanners. This year a new Road-Scanner Compact model is being introduced. The system includes comprehensive project planning, execution and analysis features with data output to almost any standard GIS and CAD format. Powerful additional software for roadway pavement management, asset management and airport pavement management is fully compatible with MMS scanners such as Teledyne Optech's Lynx, Trimble MX series, Topcon IPS-3 and others.
www.sitecoinf.it
Stand no. E4.088

Road-Scanner4 with 2 RIEGL VQ450 laser scanners.

SOMAG

SOMAG, headquartered in Jena, Germany, designs, manufactures and sells gyro stabilisation devices which carry airborne sensors and cameras for aerial photography or geospatial data acquisition. At the Intergeo in Stuttgart this year, SOMAG will be presenting the GSM 4000 and the CSM 130. The GSM 4000 is the company's latest device and the successor of the globally known GSM 3000. Visitors to the stand can discover the benefits and advantages of the devices.
www.somag-ag.de
Stand no. F4.090

GSM 4000 and CSM 130.

SOUTH

Concentrated on surveying industry since 1989, SOUTH has developed strongly into a professional manufacturer and geographic information group and has steadily occupied the leading position in China. After years of unremitting efforts, SOUTH has expanded its seamless coverage to more than 120 countries all around the world. This year, the brand-new SOUTH GNSS Receiver Galaxy series and SOUTH's new UAV AS120 will make their first appearance at Intergeo. Upgraded total station NTS-360R6, total station NTS-380R10 and NTS-391R10 with 1,000m reflectorless measurement range are definitely not to be missed. In addition, some classical instrument, laser products and accessories will be on display at the SOUTH stand.
www.southinstrument.com
Stand no. C8.071

SOUTH stand and product range.

SPECTRA PRECISION

Spectra Precision offers a complete product portfolio focusing on the specific needs of the surveying, construction and GIS markets: GNSS receivers, motorised and mechanical total stations, data collectors and software solutions. Intergeo 2015 will be the place to see the brand-new SP60 GNSS receiver designed to meet the evolving needs of surveyors. It is a versatile solution combining next-generation Spectra Precision GNSS technology, a high level of configuration flexibility and an innovative design. Additionally, Spectra Precision is the worldwide distributor of Nikon optical survey equipment, renowned for its precision and reliability.
www.spectraprecision.com
Stand no. A6.067/A6.072

SP60 GNSS receiver.

SURESTAR

Surestar focuses on developing and producing Lidar for efficient imaging, measurement and surveying. Surestar is committed to providing Lidar with satisfactory range, weight, laser frequency, FOV and software package. Visitors to the stand can see and touch

the products including A-Pilot airborne scanners, R-Angle mobile scanners and U-Arm terrestrial scanners.
www.isurestar.com
Stand no. E4.017

Surestar Lidar products.

TALLYSMAN

Tallysman designs and manufactures high-performance GNSS antennas at economical prices. At this year's Intergeo, Tallysman will be introducing four new antennas. The marque antenna is the VeraPhase 6000 which is based on patented technology providing the lowest axial ratios and tightest PCV from horizon to horizon of any antenna on the market through all GNSS and L-band correction service frequencies. Three other new antennas extend Tallysman's Accutenna line, adding L-band capabilities to the Accutenna family. Tallysman has antennas well suited for CORS, RTK and UAV applications.
www.tallysman.com
Stand no. E8.038

VeraPhase 6000.

TAXUS IT

Taxus IT is an SME company located in Warsaw, Poland. Its focus is on new technology and software and the newest product is the tMap app. tMap is mobile field mapping software for Android devices. tMap allows users to display, collect and edit geospatial data. It is a complete software solution that provides immediate access to maps and reliable geospatial data on mobile devices. tMap is an effective mapping tool that integrates GPS receivers and rangefinders. The tMap solution allows users to create maps, collect data and share them with other users quickly and easily. Interested attendees and prospective dealers are welcome to visit the stand.
www.taxusit.com.pl
Stand no. A8.063

tMap.

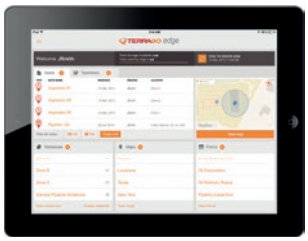
TELEDYNE OPTECH

Teledyne Optech will be announcing new products at Intergeo 2015. Visitors to the stand can learn about leading airborne Lidar solutions such as the Galaxy with its continuous operating envelope powered by PulseTRAK technology, the multispectral Titan and the award-winning CZMIL Nova bathymetric system. They can also see the latest solutions in the Lynx series of mobile scanners with expanded options to fit the relevant application, learn about advances in terrestrial scanning technology – including fully integrated UAV photogrammetry – and experience Teledyne Optech workflows with intuitive planning tools, real-time results for in-field QA and automated processing that ensures quality data.
www.teledyneoptech.com
Stand no. C4.019

Teledyne Optech stand.

TERRAGO

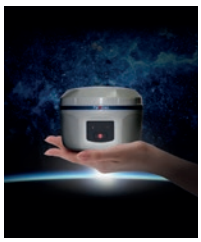
Visitors to the stand of TerraGo Technologies at Intergeo can see live demonstrations of TerraGo solutions such as the GIS-Lite applications for creating intelligent, portable GeoPDF maps with TerraGo Publisher and sharing rich, interactive maps from ArcMap with anyone, anywhere, including non-GIS users. Also showcased at Intergeo will be the Mobile GPS Data Collection app which enables users to collect and share field data from a mobile device and synchronise location notes with headquarters in real time using TerraGo Edge.
www.terragotech.com
Stand no. D4.061



TerraGo Edge.

TEXCEL

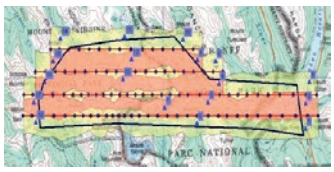
Texcel is headquartered in Guangzhou, China. With its solid foundation, advanced technology and many years of quality testing in domestic and international markets, Texcel has already become one of the very few international survey instrument companies who have mastered the Absolute Encoding technology, dual-axis compensation, reflectorless total station, digital levelling measurement, GPS technology, etc. Texcel's key products include: GPS, total stations, electronic theodolites, auto levels, handheld laser distance meters, cross-line lasers, echosounders, prisms and other survey accessories. The company is dedicated to offering a complete surveying solution for all customers and strives to be the best choice.
www.texcelinstrument.com
Stand no. B8.063



TX10 surveying system.

TOPOFLIGHT

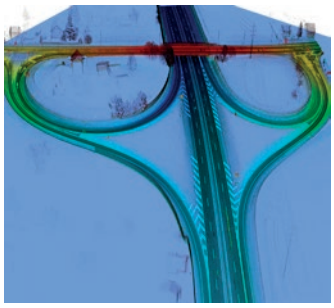
New Tech Services specialises in the sale and marketing of the TopoFlight mission planning program and the flight management system 'Navigator'. TopoFlight is a powerful, 3D flight planning tool for which also calculates the exact amount of images needed for the next project. The 'Navigator' is a flight management system which assists the pilot in navigating the aircraft and which automatically triggers the sensor at pre-defined positions.
www.topoflight.com
Stand no. B8.019



TopoFlight.

TOPSCAN

The focus of TopScan's activity has been the planning, realisation and evaluation of laser scanning projects: airborne and mobile laser scanning. These methods allow the cost-efficient collection of measurement data required for digital modelling with sufficient accuracy and in a reasonable time. Digital elevation models – which are standard products of land surveying – are used for a multitude of applications. In addition to the generation of digital models of terrain surfaces and object surfaces, TopScan offers further processing of the collected data: measuring – digitizing – modelling – visualising.
www.topscan.de
Stand no. C6.024

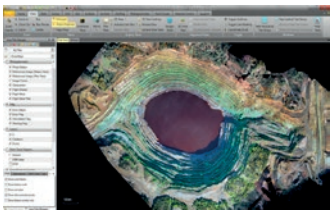


Intensity-coloured MLS point cloud.

TRIMBLE

Trimble will be showcasing its complete portfolio of solutions for survey and engineering, local government, land administration, mapping and GIS, natural resources, photogrammetry and remote sensing, and more. Several new solutions will be on

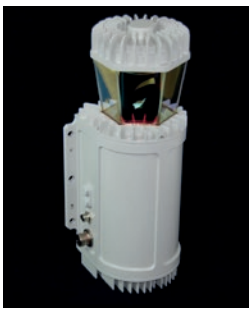
display, including the latest unmanned aircraft system (UAS) solutions, new total station portfolio, Trimble R8s GNSS receiver, scanning and imaging solutions, cloud solutions and field and office software. Visitors to the Trimble stand can learn how these solutions make it faster and easier to do their job. Live software workshops will be offered, and the company's latest UAS solutions can be seen in action in the outdoor Flight Zone.
www.trimble.com/Intergeo2015
Stand no. E8.047



Orthomosaic of Rio Tinto mine.

TYTO LIDAR

Tyto LiDAR was founded in 2012 and was built on the simple proposition that a Lidar sensor with world-class performance and an affordable price is the key to solving geodesists' and their clients' most challenging data collection problems. Sub-centimetre accuracy and precision ranging are critical qualities of a professional-grade instrument, and the OWL 1.0 provides both in a rugged waterproof housing. The technology enables geospatial companies to develop new platforms for measuring and documenting the Earth. Tyto LiDAR's headquarters is located in the San Francisco Bay area, California, USA.
www.tytolidar.com
Stand no. A4.083



OWL 1.0 Lidar sensor.

UNICORE

Unicore, a one-stop provider of GNSS products with accuracy ranges from metre and sub-metre to centimetre and millimetre level, is exhibiting at Intergeo 2015. One focus of the exhibits will be Unicore's Nebulas and Humbird series of BeiDou-enabled multi-system, multi-frequency, high-precision and high-reliability GNSS SoC chips. Another attraction sure to be popular is Unicore's latest high-precision positioning boards with various dimensions, functions and application fields. Unicore's products boast excellent performance at an amazing price.
www.unicorecomm.com
Stand no. E8.002

Unicore GNSS products.

UNISTRONG

Founded in 1994, Beijing UniStrong Science & Technology is a professional listed group focusing on the GNSS industry in China. At Intergeo the company will show its high-precision RTK G970, G990, the new G10 with tilt surveying auxiliary, and high-precision handheld GNSS including A5, G128BD, MG858S and MG868S, of which MG868S is equipped with the latest 372-channel GNSS mainboard and compatible with all the constellations. Furthermore, the CORS Net20 plus will also be on display.
www.unistrong.com
Stand no. G6.060

G10 GNSS receiver.

VIAMETRIS

Viametris creates 2D and 3D mapping software and hardware systems for outdoor and indoor environments. The company's continuous scanners (based on SLAM technologies) are designed to fit narrowly with professional needs and achieve the ideal ratio of productivity and accuracy.
www.viametris.fr
Stand no. B4.049

iMS 3D, the continuous 3D scanner for inside buildings.

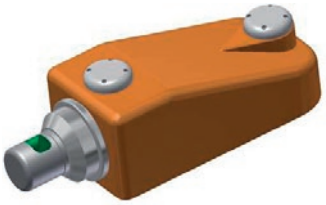
VISIONMAP

VisionMap, a leading provider of aerial survey and mapping systems, will be exhibiting its latest innovations at this year's Intergeo. On display will be A3 Edge, VisionMap's flagship digital mapping system that takes survey and processing productivity to new heights. The A3 Edge System now features upgraded oblique capabilities. A3 Edge is an all-in-one system for large-format mapping, oblique projects and high-resolution 3D modelling. VisionMap will also be exhibiting MIST, a state-of-the-art thermal airborne imaging system for UAVs and manned aircraft. Combining high productivity, high resolution and high thermal sensitivity, MIST identifies the smallest objects of interest.
www.visionmap.com
Stand no. E4.087

VisionMap A3 Edge digital mapping system.

ZENITH GEOSYSTEMS

Zenith Geosystems is a joint venture between Jonah and iLinks International. With 75 years' combined experience in precise positioning and geospatial data collection business, Zenith has designed and developed some of the most innovative mobile mapping systems available today. The Zenith Z-720 mobile mapping system represents the very latest in dynamic geospatial data collection technology. The system comes fully calibrated and ready to operate, complete with its own 3D data acquisition and visualisation software. Delivering up to 720,000pps, the system can be used at near-highway speeds and is ideally suited to any number of applications.
www.zenithgeosystems.com
Stand no. A4.045



Z-720 mobile mapping system.

ZOLLER + FRÖHLICH

Zoller + Fröhlich is a leader in the field of laser measurement technology (hardware and software). At Intergeo 2015 the company will be presenting new hardware and software solutions, enhancing the applications and opportunities of laser scanning. One of them is the new Z+F IMAGER 5010X, which comes with a unique navigation system. It estimates the scanner position and orientation in order to support the registration algorithms in automatically finding the correct alignment – thus it also works indoors. The Z+F IMAGER 5010X unfolds its full potential together with the software Z+F LaserControl Scout.
www.zf-laser.com
Stand no. C6.049

Z+F allows full scanner control in the field.

SEPTEMBER

PHOTOGRAMMETIC WEEK 2015
Stuttgart, Germany
from 7-11 September
For more information:
W: www.ifp.uni-stuttgart.de/phowo

INTERDRONE 2015
Las Vegas, NV, USA
from 09-11 September
For more information:
W: www.interdrone.com

INTERGEO 2015
Stuttgart, Germany
from 15 -17 September
For more information:
W: www.intergeo.de

SUMMIT ON EARTH OBSERVATION BUSINESS (PART OF THE WORLD SATELLITE BUSINESS WEEK)
Paris, France
from 17-18 September
For more information:
E: joly@euroconsult-ec.com
W: www.satellite-business.com

CONVENTION OF SURVEYING "AGRIMENSURA 2015"
Havana, Cuba
from 23-26 September
For more information:
E: silvia@unaicc.co.cu
W: www.agrimensuracuba.com

OCTOBER

REGIONAL CONFERENCE SURVEYING AND DEVELOPMENT
Sharm El-Sheikh, Egypt
from 03-06 October
For more information:
E: sdconf@sd2015-eg.org
W: www.sd2015-eg.org

COMMERCIAL UAV EXPO
Las Vegas, NV, USA
from 05-07 October
For more information:
E: lmurray@divcom.com
W: www.expouav.com

INTERNATIONAL SYMPOSIUM OF DIGITAL EARTH 2015
Halifax, Nova Scotia, Canada
from 06-10 October
For more information:
E: sponsorship@digitalearth2015.ca
W: www.digitalearth2015.ca

GEODESIGN SUMMIT EUROPE
Salzburg, Austria
from 11-13 October
For more information:
E: europe@geodesignsummit.com
W: http://geodesignsummit.com/europe/

ACRS 2015: THE 36TH ASIAN CONFERENCE ON REMOTE SENSING
Quezon City, Philippines
from 19-23 October
For more information:
E: acrs2015.ph@gmail.com
W: www.acrs2015.org/

NOVEMBER

CHINTERGEO
Ningbo, China
from 07-09 November 2015
For more information:
W: www.chintergeo.com

2ND COSPAR SYMPOSIUM
Foz do Iguaçu, Brazil
from 09-13 November 2015
For more information:
E: cospar@cosparbrazil2015.org
W: http://cosparbrazil2015.org

1ST ICA EUROPEAN SYMPOSIUM ON CARTOGRAPHY
Vienna, Austria
from 10–12 November 2015
For more information:
E: info@eurocarto.org
W: www.eurocarto.org

GEOTECHRWANDA 2015
Kigali, Rwanda
from 18-20 November 2015
For more information:
E: conference-ur-itc@utwente.nl
W: www.geotechrwanda2015.com

3RD EUROGRAPHICS WORKSHOP ON URBAN DATA MODELLING AND VISUALISATION
Delft, The Netherlands
23 November
For more information:
W: https://3d.bk.tudelft.nl/events/udmv2015

CAPTURING REALITY FORUM
Salzburg, Austria
from 23-25 November 2015
For more information:
W: www.capturingrealityforum.com

DECEMBER

MMT2015: THE 9TH INTERNATIONAL SYMPOSIUM ON MOBILE MAPPING TECHNOLOGY
Sydney, Australia
from 09-11 December 2015
For more information:
E: jinling.wang@unsw.edu.au
W: www.mmt2015.org

CALENDAR NOTICES

Please send notices at least 3 months before the event date to: Trea Fledderus, marketing assistant, email: trea.fledderus@geomares.nl

For extended information on the shows mentioned on this page, see our website: www.gim-international.com.

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Imagine needing just one total station on the job site to perform all of your data capture. Imagine just one powerfully equipped total station to handle scanning, imaging and surveying. A total station you can use to create 3D models, process highly accurate visual site documentation, point clouds, and much more. That total station is the Trimble® S7.

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Total Station

- Perform feature-rich scans with Trimble SureScan™
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- Produce comprehensive geospatial deliverables in Trimble Business Center

See the Trimble S7 at INTERGEO 2015: Hall 8, Stand E8.047
or learn more at Trimble.com/geospatialTS

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No 2878

KCS TraceME

LoRa ™ Internet of Things

KCS has extended their successful TraceME product line with an advanced module, targeted for worldwide mobility in the Internet of Things era. The latest development of the TraceME GPS/GPRS Track and Trace module will combine the RF location based positioning solution with the LoRa™ technology. This combination offers 'smart objects' being even smarter, since LoRa™ enables long range, battery friendly communication in a wide variety of (M2M) applications. Supporting GPRS/SMS and optional 3G, Wi-Fi, Bluetooth LE, ANT/ANT+ and iBeacon™ provides easy integration with existing wireless networks and mobile apps. Other variants in the high/mid-range and budget-line will follow soon.

ANTI-THEFT module based on RF

KCS TraceME product line offers an intelligent location based positioning solution for indoor and anti-theft applications.The solution is based on RF with an intelligent algorithm of measuring the propagation time of transmitted (proprietary protocol) signals. Unique features are: minimum size (46x21x6.5mm), weight (7 grams for fully equipped PCB) and a standby battery lifespan of more than 10 years.'Listen before talk' algorithm makes it practically impossible to locate the module, which secures the valuable vehicle or asset. Supporting GPRS/SMS and optional 3G, Wi-Fi, Bluetooth LE, ANT/ANT+ and iBeacon provide easy integration with existing wireless networks and mobile apps.

www.Trace.ME

No 2798