

Airborne Imaging Supports New Smart Grid

High-fidelity 3D Representations of China's
Electricity Infrastructure



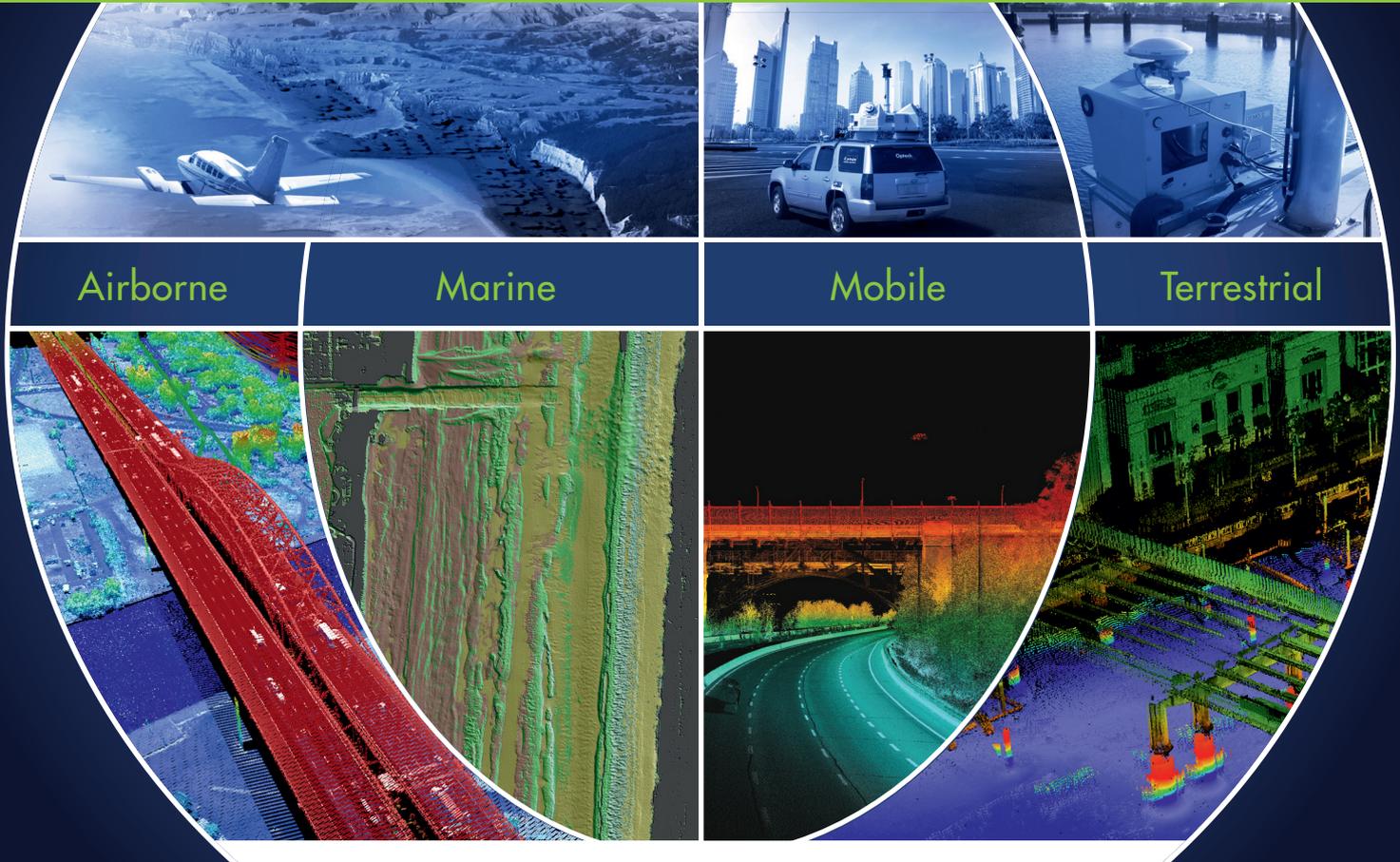
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Geomares Publishing
P.O. Box 112, 8530 AC Lemmer,
The Netherlands
T: +31 (0) 514-56 18 54
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gim-international@geomares.nl
www.gim-international.com



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Acceleration

As I write this, the Winter Olympics are still in full swing in the Russian resort town of Sochi. I'm not going to talk about the sports events themselves here, but rather about the effect that the Olympics can have on the economy – locally, regionally and even nationally – and what that causal link may hold for geomatics. Here in The Netherlands, numerous TV documentaries have examined how the choice for a city – in this case Sochi on the Black Sea – has resulted in changes to both the infrastructure of that city and also its surroundings. Not only have stadiums and an Olympic Village been built, but also a billion-dollar highway has been constructed from Sochi to the Olympic ski resort of Krasnaya Polyana in the mountains: houses have been destroyed and people have been displaced. While there can be drawbacks to hosting one of the world's largest sport events, there are evidently many positive effects on the economy. In Sochi, for instance, the conditions have now been created for the city to become a major ski resort that will attract visitors from both within

Russia and abroad in the future.

On a different note, but with the same effect, China's satellite navigation system Beidou-II or Compass is rapidly developing (it is already in use for commercial purposes) and is gearing up for global coverage in 2020 through more than 30 satellites. BeiDou is a classic example of a project picked by a government as a priority with tremendous effects on an industry. While I was visiting China earlier this year, I was struck by the immense optimism about the growth of geomatics both within and outside China – with BeiDou often mentioned as the boosting

factor. For sure, R&D departments within all manufacturers of positioning devices – not just in China but also in the United States, Japan and Europe – will be keeping pace with the developments in China, making their products BeiDou-compatible, anticipating that customers will be replacing their old receivers, handhelds and total stations. This editorial column is about neither the Olympics nor BeiDou; instead, it's about the positive effect of governmental measures, often paired with substantial funding, on industry growth (although I am not denying that an innovative private sector is equally necessary to capitalise on such measures). After the past five or six years of economic woes, we are increasingly hearing about a global recovery. Assuming that the economic climate continues to improve and as soon as funds become available again, I hope that government officials and representatives will realise the propellant effect of their decisions. It's up to the entrepreneurs in geomatics companies – big and small – to seize the opportunities without hesitation. The combined efforts of governments and the private sector will accelerate the growth of the entire geomatics sector.



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The front cover of the March 2014 issue shows an overhead power line. On page 18 you will find an article about new approaches to producing and transporting electric power in China, where advanced geospatial systems are supporting smart grid development.

(IMAGE COURTESY: FLICKR/IAN MUTTOO).

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GIM International, the global magazine for geomatics, is published each month by Geomares Publishing. The magazine and related e-newsletter provide topical overviews and accurately presents the latest news in geomatics, all around the world. *GIM International* is orientated towards a professional and managerial readership, those leading decision making, and has a worldwide circulation.

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► **INTERVIEW PAGE 14**
Oblique Imagery: The Standard for Mapping

GIM International Interviews Chris Barrow



► **INTERVIEW PAGE 18**
Airborne Imaging Supports New Smart Grid

High-fidelity 3D Representations of China's Electricity Infrastructure



► **INTERVIEW PAGE 23**
Oblique Airborne Photogrammetry

Automatic Building Detection and Verification

FEATURE PAGE 27

► **UAS in Farming**
 A Pilot Project in Cuba

COMPANY'S VIEW PAGE 30

► **Uniting Aviation with Data**
 Airborne Technologies

NEWS & OPINION	PAGE
Insider's View	6
News	7
Endpoint	13
INTERNATIONAL ORGANISATIONS	PAGE
FIG	33
GSDI	35
IAG	37
ICA	39
ISPRS	41
COLUMNS	PAGE
Editorial	3
OTHER	PAGE
Advertisers Index	42
Agenda	42

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The Quest for Capacity

The capacity to establish, maintain and sustain land administration systems varies from one country to another. In some developed countries the capacity is well established and enables maintenance and further innovation of advanced interactive land information systems. In most developing countries, however, the capacity is very sporadic in terms of both institutions and personnel.

When building land administration systems in developing countries, the quest for capacity development is fundamental. "Don't start what you can't sustain," – this simple phrase indicates that measures for capacity development must be established up front when starting a project to build sustainable land administration systems. The biggest challenge is often to ensure effective and efficient management of the systems once they are established and the donors have left the country.



PROF STIG ENEMARK
Honorary President, FIG, Denmark
enemark@plan.aau.dk

'Capacity' is the power of something – a system, an organisation or a person – to perform and produce properly. Capacity development is not only about human resources and skills; it is equally about building sustainable and trustable institutions for running the systems. Capacity development must be seen in a wider context of giving organisations and individuals the ability to perform functions effectively, efficiently and sustainably. This includes the requirement to address capacity needs at the institutional and, even more broadly, at the societal level.

Capacity development does not imply that there is no capacity in existence; this also includes retaining and strengthening existing capacities of people to perform their tasks and institutions to deliver services.

Educational and training measures are of course important at all levels, from university degrees to short-term programmes for training land clerks. They should ensure that there is a sustainable long-term capacity of educated and trained personnel available within the public as well as the private sector for operating the system.

Universities have a fundamental role in educating land professionals, but they should also undertake research and capacity development through interacting with government and society to develop adequate solutions to the core land issues. In some developing regions, such as Francophone Africa, this role of the universities is not well understood and should be improved, e.g. by establishing regional centres of capacity development.

There is a need to focus on pro-poor land administration approaches for providing more flexible and fit-for-purpose solutions to building sustainable systems for security of tenure and effective management of the use of land. The scale of this task is huge given that most developing countries have a cadastral coverage of less than 30 percent and which is based on systems established in colonial times and serving mainly the elite.

The quest for capacity in land administration is a fundamental issue for implementing sustainable land administration systems and, more generally, for meeting the overall global agenda in terms of economic growth, social equity and environmental sustainability.

Hexagon Acquires UAV Manufacturer Aibotix

The Hexagon Group from Sweden has acquired Aibotix, a company from Kassel, Germany, that is specialised in developing flying robots. Hexagon is a leading global provider of integrated design, measurement and visualisation technologies, with Leica Geosystems and Intergraph also belonging to the Hexagon Group. The takeover is clear recognition of the growing role of UAVs in the geomatics sector. ◀

▶ <http://bit.ly/1bhYpOK>



The Aibot X6 UAV also attracted attention at the Oldenburger 3D-Tag.

INSPIRE 2014: Call for Abstracts

The organising committee of the INSPIRE Conference 2014 has issued a reminder that time is running out for those who would like to submit an abstract. The deadline is set for 14 March 2014. The theme of this year's edition, which will take place from 16-20 June 2014 in Aalborg, Denmark, is 'INSPIRE for good governance'. ◀
▶ <http://bit.ly/1dL8jYF>



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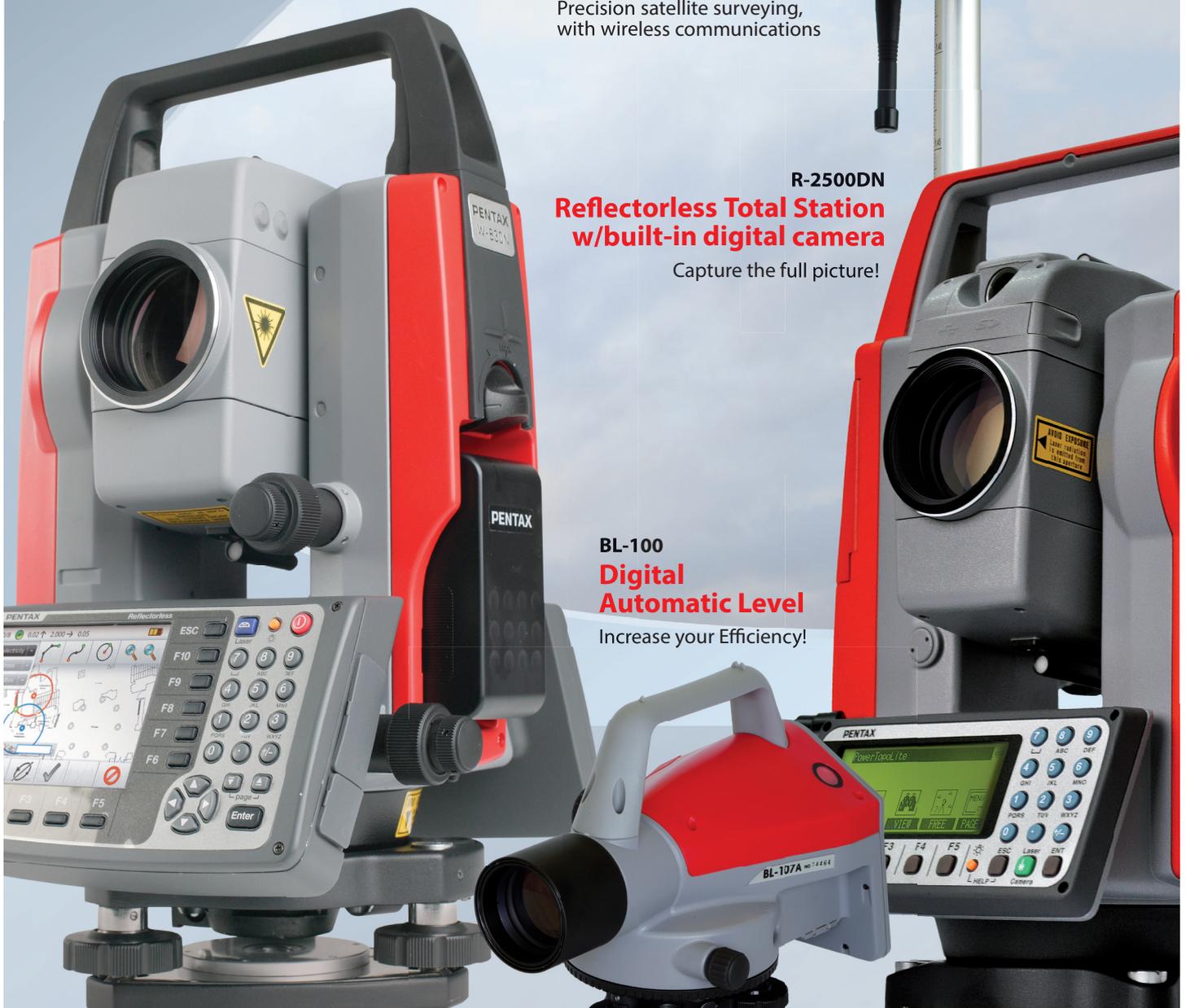
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Survey-grade Lidar Sensor for UAS

RIEGL Laser Measurement Systems has been developing its first survey-grade UAS Lidar sensor, the VUX-1. The VUX-1 was presented for the first time at ILMF, which was held in Denver, USA, from 17 to 19 February. By introducing the VUX-1, RIEGL now offers a Lidar sensor that has been especially developed for the UAS and RPAS markets. ◀

▶ <http://bit.ly/1dL94RI>



RIEGL VUX-1.



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Astrium Services Renamed as Airbus Defence and Space

Astrium Services, the global provider of satellite-enabled solutions, has announced that it will operate with immediate effect under its new name of Airbus Defence and Space, a division of Airbus Group. The change from Astrium Services to the new Airbus Defence and Space name is part of a rebranding throughout the wider EADS organisation. Earlier this year, EADS became Airbus Group, with three distinct divisions: Airbus, Airbus Defence and Space, and Airbus Helicopters. ◀

▶ <http://bit.ly/1dL8uTK>

26,000 Ground Control Points in a Commercial Archive

CompassData, a worldwide provider of high-quality ground control points (GCPs) for GIS, photogrammetric and remote sensing applications, has announced that its archive of commercial GCPs now exceeds 26,000 points. The archived GCPs have been collected in 100 countries across North and South America, Europe, Asia, Africa and the Middle East. ◀

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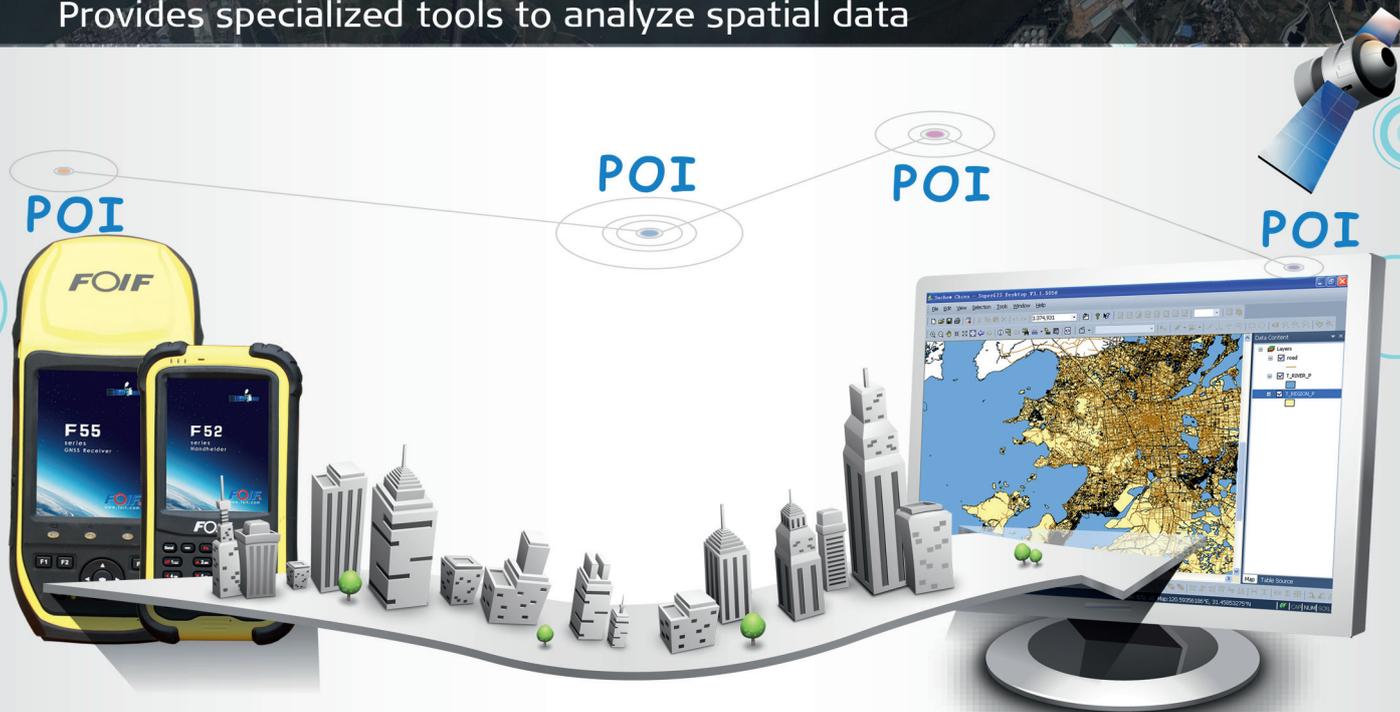
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Blackfly Cameras with New 1.2 and 2 Megapixel Global Shutter CMOS Sensors

Point Grey, a Canadian designer and manufacturer of high-performance digital cameras, has announced two new models in the Blackfly family of ultra-compact PoE GigE Vision cameras. The latest Blackfly models utilise leading-edge global shutter CMOS technology to capture crisp, distortion-free images of objects in motion, a critical requirement for applications such as factory automation or open road tolling. ◀
▶ <http://bit.ly/1dLa33X>



The latest Blackfly camera.

Bluesky Begins Night-time Aerial Photo Mapping Trials

Aerial survey specialist Bluesky is to conduct trials of the world's first integrated night-time mapping system combining a specially adapted camera with Bluesky's Lidar and thermal imaging sensors. It is hoped that the trials will produce essential data to help combat light pollution and energy wastage and to help manage urban habitats. The resulting map-accurate images will be a useful tool for managing street lighting operations and maintenance and as a resource for tackling energy inefficiency. ◀
▶ <http://bit.ly/1dLaU4I>

iXBlue and Septentrio Develop Position and Orientation System

iXBlue, a leading provider of navigation, positioning and mapping solutions, has launched its new ATLANS-C position and orientation system, developed in close co-operation with Septentrio Satellite Navigation. The system is designed to provide continuous and accurate positioning in urban environments, where global navigation satellite system (GNSS) signals are obscured, intermittent or possibly distorted by reflective surfaces. ◀
▶ <http://bit.ly/1dLbAXR>

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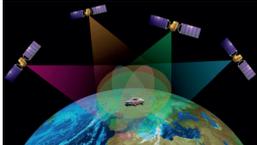
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ESA Helping to Prepare Satnav Mass Market for Galileo Services

With the first Galileo services set to begin later this year, ESA is working directly with European manufacturers of mass-market satnav chips and receivers to ensure that their products are Galileo-ready. The objective is to make sure, ahead of the EU's declaration of early

Galileo services, that mass-market devices are ready and able to make use of them, explained Riccardo de Gaudenzi, head of ESA's Radio Frequency Systems, Payload and Technology Division. ◀

▶ <http://bit.ly/1dLbMWZ>



Satellite navigation.



Shopping cart (courtesy: Caden Crawford/Flickr).

Philips Launches LED Lighting for Indoor Navigation

Dutch diversified technology company Philips is piloting an intelligent lighting system that adds a geomatics dimension to personalised shopping. The indoor GPS solution uses intelligent LED in-store lighting to communicate location-based information to shoppers via a smartphone app. The lighting communicates with the app to send relevant special offers and information to shoppers depending on where they are in the store. ◀

▶ <http://bit.ly/1dLbiQF>

UK Woodland Conservation with Cadcorp GIS

The UK's leading woodland conservation charity, The Woodland Trust, has deployed a next-generation corporate geographic information system from specialist British software developer, Cadcorp. The system will play a key part in helping the trust to manage its existing woodland sites and in supporting its role as the leading advocate for British woods and trees. It replaces a bespoke system which has been in use for the last 10 years. ◀

▶ <http://bit.ly/1eQpyTV>

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Geokno's StreetMapper mobile laser-mapping system.

StreetMapper Mobile Laser System to Map Indian Infrastructure

StreetMapper is being deployed to laser-map city centres and transportation networks across India. The StreetMapper mobile laser-mapping system has been purchased by Geokno, a technology company specialising in GIS, following the recent announcement of another USD400 million of funding to boost investment in Indian infrastructure. ◀

▶ <http://bit.ly/1dL8Mdo>

New Aerial System to Capture Accurate Aerial Imagery

Draganfly Innovations, Canada, has partnered with Pix4D, Switzerland, to combine the value of a Draganflyer sUAS (small Unmanned Aerial System) with the Pix4D software package. This results in a system capable of capturing highly accurate aerial imagery for mapping, surveying and creating 3D models. ◀

▶ <http://bit.ly/1eQr6Nz>



Draganflyer X4-ES.

Zooming in on the Details

Today's political trends focus on smart cities, sustainable mobility, quality of life and enhancing local features supposed to be unique in the world. Qatar, for instance, has major plans to host global sporting events. Shanghai is embracing its status as the world's largest harbour, while Hong Kong has surpassed Memphis as the world's busiest airport in terms of cargo traffic. The governing of metropolises and other densely populated areas calls for decisions which rely heavily on authoritative geodata. Since the resolves will shape the urban landscapes for years to come, the data has to be accurate, detailed and recent. In the meantime – to keep pace with political ambitions – the search for novel technologies to collect, store and spread geodata rushes on at breakneck speed. The resulting trends are: (1) rising collection of detailed data about buildings, infrastructures and agricultural land as well as their 2D and 3D property



MATHIAS LEMMENS
Senior editor, GIM International
mathias.lemmens@geomares.nl

boundaries; (2) rapid increase of small-scale surveys focused on a specific use; (3) blending of a diversity of geo datasets; and (4) providing focused services built on top of geodata. Such services are in great demand by planners, constructors, businesses and the general public. For example, inputting accurate spatial data into a Building Information System (BIM) requires detailed surveying of sites and objects. In turn, the need to raise output and cut costs is triggering the advance of innovative methods such as indoor positioning, unmanned aerial surveys and oblique aerial photogrammetry. At times these technologies are used on their own,

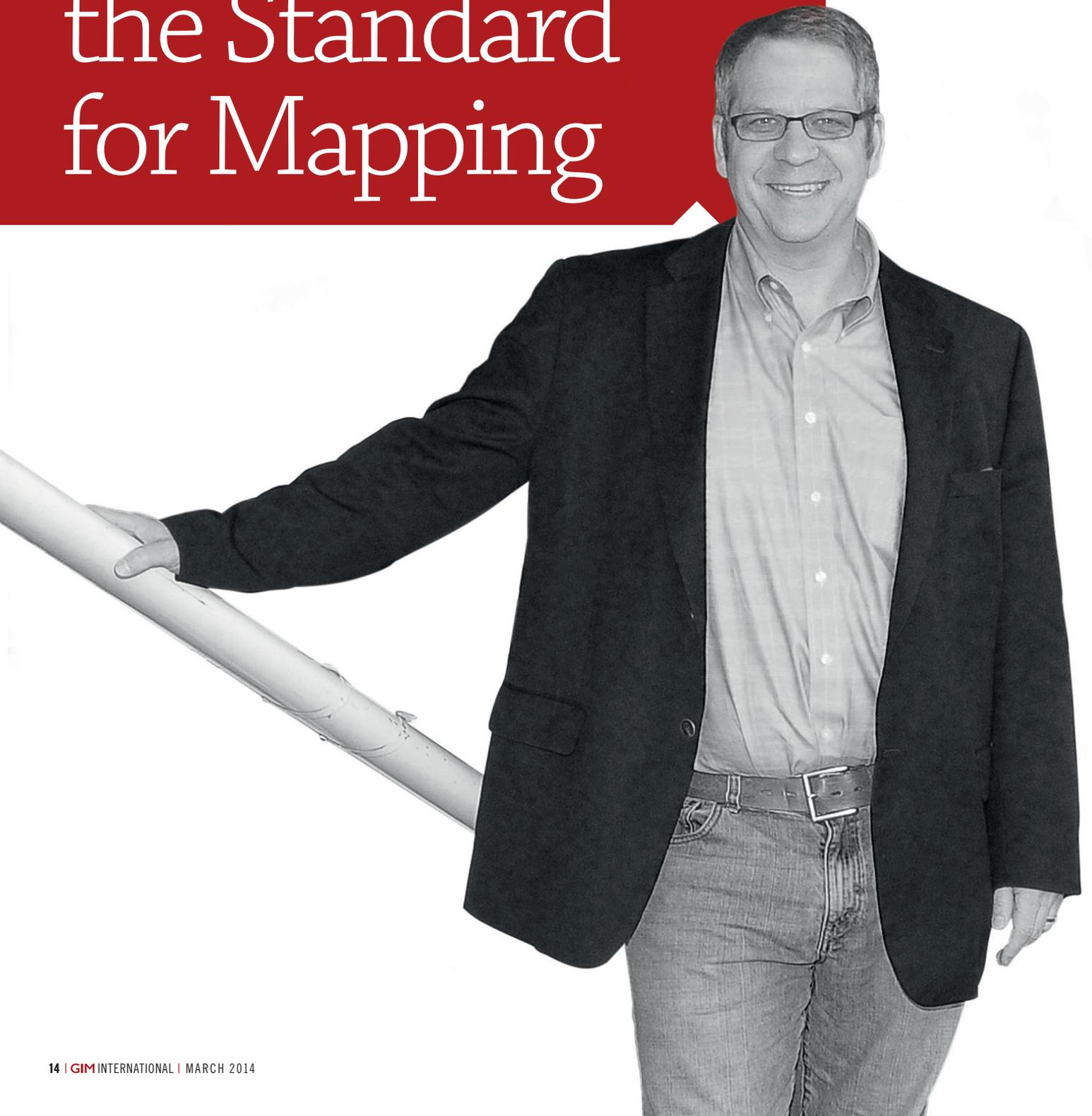
but they may also be added to proven techniques such as terrestrial laser scanning. Indeed, governments want to gather more and more facts about buildings and other constructions within their jurisdiction. The UK, for example, has defined six attributes (sub-structure, roof type, walls, age, land use and number of floors) for classifying commercial premises, community facilities and other kinds of non-residential buildings. The majority of this information can be derived from visual inspection of oblique aerial imagery.

The penchant for details is not limited to bricks and mortar alone. Foresters, for instance, are also keen to go down to the level of a single tree to monitor growth, health and logging. Full-waveform airborne Lidar combined with multi-spectral satellite imagery may satisfy that need. As the quality may be scant due to coarse resolution, an aerial survey which combines Lidar and multi-spectral imagery captured by (oblique) cameras may bring relief. Services that go beyond geodata are also in demand, as shown by British Geological Survey's recent launch of maps derived from the core geological dataset to serve planners and environmental researchers. Indeed, the way we collect, manage and use geodata is changing rapidly. Hence, geomatics will undoubtedly endure as a stirring expert field for researchers, practitioners and students alike, fuelled by the ever-growing call for zooming in on the details.



GIM INTERNATIONAL INTERVIEWS CHRIS BARROW

Oblique Imagery: the Standard for Mapping



In January 2014 EagleView Technology Corporation (EVT), the parent company of Pictometry, was acquired by Verisk Analytics, a NASDAQ-listed provider of risk information to the insurance, healthcare, mortgage, government and risk management industries. Prior to the acquisition, EagleView Technologies, which was established in 2008 and is regarded as the inventor of aerial roof measurements, and Pictometry had merged in 2013 to form a company with the ability to capture data from flight to final solutions. This, together with our series on Oblique Aerial Imagery which started in the January 2014 issue of *GIM International*, was reason enough for us to ask Chris Barrow, CEO of EagleView, about the takeover and his future plans regarding the use of oblique cameras to capture images of the world.

How does EagleView Technology benefit from the transfer to Verisk Analytics?

The acquisition affords our collective customers enhanced benefits from a fully integrated product suite, as well as a stronger balance sheet to support expanded R&D and new technology market growth.

Pictometry's camera design, based on a Maltese cross, may be considered as the rebirth of Fairchild's T3A, developed in the 1920s, which remained the precision-mapping camera of the US Army until 1940. What were the reasons for revitalising the Maltese cross concept?

The Pictometry PentaView capture system is not precisely a Maltese cross configuration like the Fairchild system, but the reason for our design was simple. We capture five views of every object: from directly above and from each of the four cardinal compass directions. The most efficient way to do this is to capture all five directions simultaneously. Our cameras have a higher oblique angle than the cameras in the Fairchild system. The result is five distinct image captures as opposed to the single Maltese cross appearance on the ground.

Which geo-related applications benefit from using oblique imagery?

The use of oblique imagery is becoming the standard for mapping due to the ability to see in three dimensions. The data collection that is available with oblique imagery cannot be matched by purely ortho views. As government and commercial uses of imagery grow, the ability to georeference all sides of a structure and then create the possibility of a georeferenced 3D model is catching on among many of the mapping software companies, as evidenced by a recent collaboration between EagleView and Esri.

What will be the role of oblique imagery for 3D modelling of the built environment?

Oblique imagery, when applied to the building geometry in a 3D model, provides textures that result in photorealistic models of as-built environments. The imagery adds detail without increasing

marketing, and in providing effective public communication surrounding development projects.

What is the profile of your present user base?

We have a very broad user base throughout North America. The largest segment is made up of users in the public sector including municipalities, counties, cities and provinces. The imagery and analytical tools are used throughout multiple departments such as public safety, assessment, economic development, public works and planning. Added to this, the infrastructure markets, in particular oil and gas utilities as well as electric utilities, are becoming large consumers of Pictometry oblique imagery and software tools. This market relies on the high-resolution, georeferenced images and tools to provide visual intelligence and data for vegetation management, corridor mapping,

The use of oblique imagery in 3D models will grow as these models play an ever greater role

geometric complexity. The use of oblique imagery in 3D models will grow as these models play an ever greater role in urban growth management and development, emergency planning, tourism and

design and construction as well as monitoring and planning in high consequence areas. The insurance and construction industries are also large consumers, using the information to manage risk, evaluate damage ▶

Chris Barrow



Chris Barrow has over 20 years of experience in the software, technology and services sectors. As CEO of EagleView since early 2008, Chris has helped to build one of the most exciting, dynamic companies in the technology sector. Prior to joining EagleView, Chris served as CEO of a publicly traded technology company in Orlando, USA. He has also served as executive VP of sales, marketing and business development for several companies in the US and Asia, including holding senior sales and business development roles at SITEL, 3Com and Compaq.



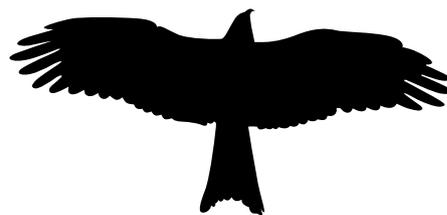
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and estimate repairs or other work needed on properties.

Do you see a role for oblique photogrammetry in establishing or improving cadastres in developing countries?

Oblique imagery is already playing a role in improving the collection of cadastral information in developing countries. In certain countries, especially in the Middle East and North Africa, Pictometry's collection is part of a number of contracted solutions that are designed to create a parcel-level database. The oblique imagery helps individuals better identify the nature of the property, the number of storeys and more.

Your company is a provider of images and products derived from these. Do you cooperate with producers of satellite images?

There is very little overlap between aerial imagery providers and satellite due to the vast differences in resolution, oblique views and imagery capture schedules.

Which major developments do you foresee in aerial and satellite images, in products derived from these and in the consumer base in the next five years?

The key growth element will be resolution. The higher the resolution of images, the more data that can be obtained including property changes, condition and damage. These are critical data elements that will continue to see increased demand across markets. Oblique views featuring high resolution and accuracy will be critical for the creation of 3D models which will see substantial growth over the next 5 years, not only in governmental and commercial use but also in the entertainment industry. ◀



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HIGH-FIDELITY 3D REPRESENTATIONS OF CHINA'S ELECTRICITY INFRASTRUCTURE

Airborne Imaging Supports New Smart Grid

Traditional methods for managing the electrical grid struggle to meet the needs of the power industry and its customers. One promising solution, the smart grid, offers economic and environmental benefits for producers and consumers of electricity. Advanced geospatial systems are providing essential information for smart grid development and operations in China.

The term 'smart grid' describes a modern power grid that uses blended technologies to provide more efficient operation and management of electricity. The smart grid combines remote sensing, communications, data analysis, decision-making and automated control to provide

new approaches in producing and shipping electric power. The smart grid can also enable consumers to better manage their individual power usage and improve their efficiency. The primary advantages include increased reliability, reduced costs for production and delivery, improved safety and reduced emissions through the increased use of clean or renewable energy sources. By using technologies for fault detection and network self-healing, the smart grid becomes less vulnerable to disruption caused by natural disasters or attack. When integrated into the existing power grid infrastructure, the smart grid will play a central role in distributing and managing electricity.

NEW SMART GRID

In China, work is already underway to implement a smart grid. As the world's largest consumer of electricity, China obtains 70 percent of its electricity from coal-fired power plants. Although its consumption of electricity is expected to triple by 2035, China has made a strong commitment to reduce its carbon emissions. The smart grid can play an essential part in meeting the nation's growing needs for electric power while increasing the amount of renewable energy used as a percentage of overall electricity consumption. Based on the country's existing energy infrastructure, China's new smart grid will address all aspects of electric power supply: generation, transmission, distribution, consumption and scheduling.

'ON-FOOT' INSPECTIONS

Transmission lines are an essential component of the power grid. China's rapid economic development has created increased demand for transmission lines to carry electricity over long distances. The terrain and topography of the transmission



Huaping Long received a master's degree from China University of Geosciences. He is currently working as senior engineer for Lidar data processing at Guangzhou Jiantong Surveying & Mapping Technology Development in China.

✉ lonkeping@qq.com



Jiangrong Zheng gained a master's degree from the University of Stuttgart, Germany. He is sales manager of geospatial imaging at Trimble in Beijing, China

✉ jiangrong_zheng@trimble.com



▲ *Figure 1, A field team conducts manual inspection and data gathering on high-voltage transmission lines. Use of airborne sensors produced substantial time savings and enabled inspection of lines in inaccessible locations.*

corridors have a huge impact on line alignment and safety operations. Many corridors are far away from urban areas and transportation lines, and traverse over mountains and other challenging terrain. Some corridors include so-called 'blind areas' which are remote or very difficult to access for inspection and maintenance. Traditional 'on-foot' methods (see Figure 1) of maintenance and data collection make it difficult for the power industry to meet requirements for safety and development of the smart grid. Hence, the power industry needs inspection methods that are safe, robust and efficient.

NEW APPROACHES

The emergence of airborne Lidar mapping technology has provided a new approach for effective inspection of transmission lines. The airborne systems integrate laser ranging technology, digital imaging, precise global navigation satellite system (GNSS) receivers and high-dynamic inertial measurement units (IMU). Operating in conjunction with China's regional networks of continuously operating GNSS

reference stations, airborne Lidar systems can collect georeferenced corridor point clouds and high-resolution aerial imagery. The data can provide 3D topography and precise locations of transmission line corridors. The system also delivers spatial information about objects within the corridor, including pylons, access points, wire sag, trees and buildings.

KNOWLEDGE OF THE EXISTING GRID

Currently, major power companies in China, including the State Grid and China Southern Power Grid, are working to implement smart grid technology. One of the first steps is to develop detailed knowledge about the existing grid facilities. However, because different institutions performed the initial line designs, information on field infrastructure is inconsistent and difficult to manage. For example, China does not have first-hand information on topography and terrain along many of its power transmission and distribution lines. Solving this requires field inspection, a bottleneck that makes it more challenging to implement China's smart grid. In order to improve the

▼ *Figure 2, Technicians install the Trimble Harrier system to a helicopter belly. The small unit can be installed without making changes to the airframe.*



performance of its power grid, China Southern Power Grid is conducting electricity technology transformation projects. One of the main projects is the China Southern Power Grid EHV (extra-high voltage) Transmission Line Informatization Project, which calls for the development of accurate information on the existing power lines and facilities. This work uses aerial remote sensing to collect spatial information about the transmission system. In addition to the airborne data collection, the effort includes data processing and analysis to produce point clouds, orthophotos, surface models and 3D objects and vectors.

SURVEYS

To conduct the aerial surveys, the Trimble Harrier corridor mapping system was selected. The airborne components include a wide-angle full-waveform laser operating at a 400kHz pulse repetition rate, a medium-format digital frame camera, position and orientation system unit and flight management system. The project deliverables include 3D point clouds in combination with high-quality, ▶

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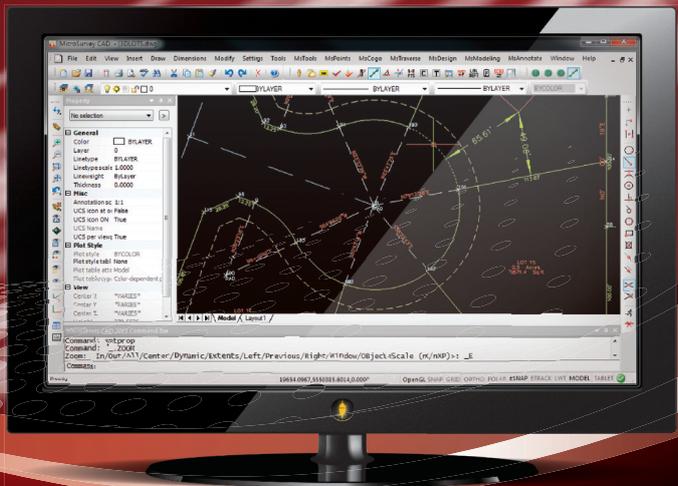
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georeferenced orthographic images. The project to collect data on the EHV lines kicked off in November 2009. The total length of the project is 14,500km of corridors, crossing Guangdong, Guangxi, Yunnan and Guizhou Provinces. The work included collecting 3D data on all AC and DC transmission lines operating at 500kV and higher, together with part of the network's 220kV lines. The project objectives called for detailed ground information and high-resolution images. The contractor, Guangzhou Jiantong Surveying Technology Development, decided to use helicopters (see Figure 2) as the data collection platform. Compared with fixed-wing aircraft, a helicopter is more flexible and can fly at a constant speed while maintaining low altitude. This minimises flying time, improves project efficiency and helps to ensure high-accuracy point clouds. Working in areas commonly covered by clouds, the helicopters had the added benefit of operating below the cloud cover, typically operating at 280m above ground level. During the two years of the project, the team conducted roughly 350 flight hours of observations. Because of precise GNSS onboard, the need for ground control was minimal. Pairs of points placed at 40km intervals provided sufficient control to produce accurate georeferencing for the point clouds and orthophotos.

DATA PROCESSING

During data post-processing, a team of 30 technicians used Trimble's processing software to classify objects within the 3D point cloud. The software produced information on ground points, buildings, natural features, vegetation, power towers and power lines. By using automated point-cloud classification algorithms, the need for human interaction could be significantly reduced. In addition, the high-resolution images could help technicians to identify attributes of ground objects and attach true colour to the 3D models. An approach was developed to use the dense Lidar



◀ Figure 3, A model of a transmission tower created using Trimble Inpho and Lidar images from the Trimble Harrier. Background image is based on the aerial imagery.

▶ Figure 4, A model of a transmission tower. Modelled insulators could be added by office technicians.



point clouds to quickly develop 3D models of pylons. The pylon models not only ensure accurate positioning, but also allow users to extract details of the power towers (see Figures 3 and 4). The models include the location and number of insulators on the power lines at each tower. All of the processed ground models, power lines and tower models are maintained in a unified 3D GIS management system. Using a GIS tailored to electric power distribution and operations, clients can remotely log into the system to obtain detailed information on power-line facilities, including location, status and surrounding environmental conditions.

CONCLUDING REMARKS

This project is the first effort by the Chinese power transmission industry to collect data over such long distances and large geographic areas. It is also the first to implement a 3D display of the entire line system, bringing excellent economic benefits for transmission-line management and maintenance. Managers expect to produce significant time savings while increasing information utilisation and management

efficiency. Decisions can be made in less time and with more accurate knowledge of existing conditions. In addition, the project promotes the future development of China Southern Power Grid. Because of the new information and methods for grid management, the management system has significantly improved the capacity to identify and correct problems. For example, wide areas of the transmission grid can be quickly reconfigured to prevent or limit blackouts. The system allows real-time monitoring of regional power outages and provides an overall improvement in monitoring accuracy. It has also helped to establish high-fidelity 3D representations of the country's electricity infrastructure, including digital models of power lines and towers together with images of the entire line system. As implementation of China's smart grid continues to move forward, the need for accurate mapping will expand. By combining Lidar, imaging and positioning with advanced software for processing and feature extraction, airborne corridor mapping will play an important role in bringing the smart grid to life. ◀



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AUTOMATIC BUILDING DETECTION AND VERIFICATION

Oblique Airborne Photogrammetry

Multiple view oblique imagery of very high resolution is a rich source of semantic information about buildings and other objects on the Earth's surface. The efficient extraction of semantic information from such imagery requires automatic scene analysis for which new methods have to be developed. Here, the authors present new methods for automatic building detection and verification from oblique imagery.

The popularity of systematic collection of oblique airborne images will increase rapidly as it becomes easier for humans to recognise lateral parts of buildings and other elevated objects. When covered from different angles, a quasi-3D impression can be

obtained. In research, automatic building detection and verification is mostly approached using Lidar point clouds, digital surface models (DSMs) or vertical airborne images. All these data sources have their own advantages and disadvantages. The

use of height data helps to identify buildings and other objects which extend above the ground. However, confusion between objects is still possible, and good ground representation remains essential. Aerial vertical images are cheaper ▶



Markus Gerke received an MSc degree in geodetic sciences and a PhD degree, both from the Leibniz University of Hannover, Germany, in 2000 and 2006 respectively. He has been assistant professor at the Faculty ITC, University of Twente, Enschede, The

Netherlands, since 2007. He focuses on capturing geometric and semantic information from images with the emphasis on automatic processing and interpretation of oblique airborne and UAS images. He is co-chair of the ISPRS working group III/4 and co-organiser of the ISPRS benchmark test on urban object detection and reconstruction.

✉ m.gerke@utwente.nl



Jing Xiao received her PhD degree from University of Twente, The Netherlands, in 2013 and is now a post-doc at the School of Computer Science, Wuhan

University, China. Her research interest lies in object extraction from image and video data, 3D reconstruction and data compression.

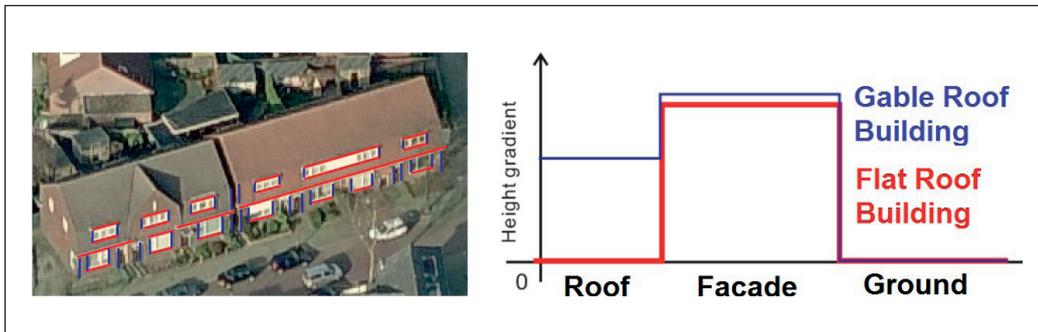
✉ jing@whu.edu.cn



Adam Patrick Nyaruhuma attained an MSc in geoinformatics from ITC in 2007 and a PhD from the University of Twente, Enschede, The

Netherlands, in 2013. His research focuses on oblique aerial photography for verification of urban geodatabases. He currently works for the Ministry of Lands, Housing and Human Settlements Development, Tanzania's National Mapping Organisation.

✉ nyaruhumaa@ardhi.go.tz



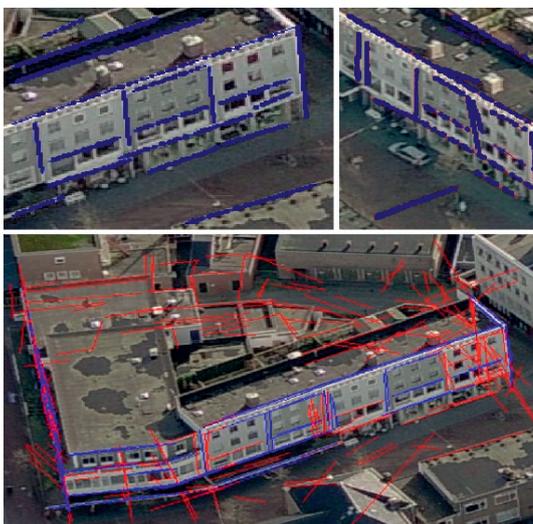
◀ Figure 1, Automatically detected horizontal and vertical lines (left) and a sketch of the height gradients computed from the dense point cloud.

than Lidar data and are in many areas the only data source available. However, if only a 2D representation is available, the risk is that building roofs will remain undetected or will be interpreted wrongly. Overlapping oblique images enable height information to be derived through image matching, and this would ease the task. Oblique airborne images allow views of facades from multiple angles to be exploited and, compared to vertical images, such multiple views improve object identification. In addition, the point

clouds created from dense image matching can be used.

Currently, facade information for building detection is exploited by using points or lines. If the points on facades obtained from dense image matching are projected onto the horizontal plane, they accumulate in a building outline. The point cloud can also be used to compute height gradients: assuming that buildings have vertical walls, the gradient must show up accordingly. One may also look for horizontal and vertical

line features in the images as they give strong evidence of the presence of buildings (Figure 1). The use of a combination of points and lines leads to results which are largely correct because the redundancy allows the efficient removal of wrong detections. However, the detection of all relevant buildings is not warranted as completeness depends on the scene characteristics and image configuration. Particularly, facades may be occluded through vegetation and high-rise buildings, which impedes proper detection.



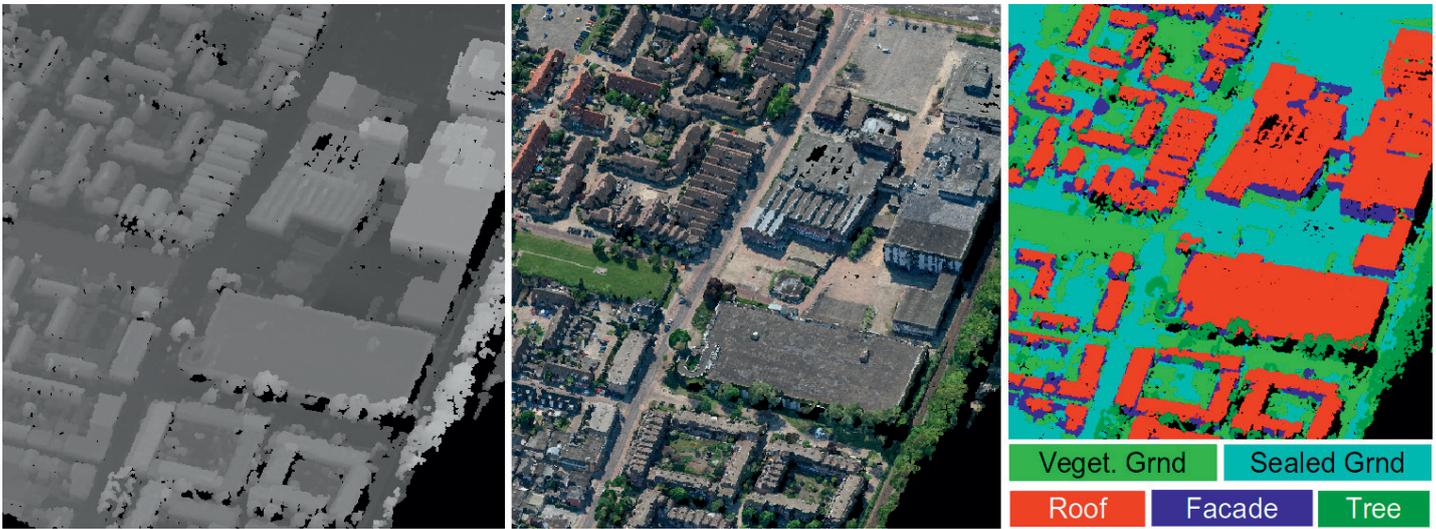
◀ Figure 2, Detected straight lines indicated in blue (top); some of them will intersect with the plane through the map building outline, others will not (bottom).

2D BUILDING MAP VERIFICATION

When the presence of buildings in a map needs to be verified, for instance as a pre-processing step for map updating, the facades depicted in the oblique airborne images may be used directly as evidence of whether a building is still there or not. The method expands the 2D map information by exploiting height information, obtained from point clouds created by dense image matching of overlapping oblique images or other sources. The height information enables vertical plane patches to be defined which are assumed to represent walls. Straight lines and other features extracted from different oblique views can be projected onto these patches. Those features will coincide in the planar patch if the building is still there and mapped correctly (Figure 2). This approach works best if at least two oblique images depicting the facade are available. Our experiments show that the reliability is quite high, with 90% correct decisions.

Series on Oblique Photogrammetry

The third contribution of this series on oblique airborne imagery concentrates on automated interpretation. The series is a joint initiative of EuroSDR Comm. 1, Delft University of Technology and University of Twente (ITC). Edited by Mathias Lemmens, the series is intended to cover concepts, applications and camera systems available on the market. You are cordially invited to contribute. To do so, please feel free to contact the editorial manager at wim.vanwegen@geomares.nl or the senior editor at m.j.p.m.lemmens@tudelft.nl.



SCENE ANALYSIS

Many applications require not only the detection of buildings but also of roads, trees, natural grounds and other objects. In remote sensing these are detected through supervised or

from the point cloud, such as normal direction of planar segments or height above the ground (Figure 3). The final result will be determined by not only the image resolution and overlap but also by the object

windows and other building elements result in complex 3D structures rather than a plane. These elements have to be explicitly modelled, otherwise the analysis may produce incorrect results.

▲ *Figure 3, Grey-coded dense point cloud (left) and colour-coded (middle) and the result of automatic classification in five classes using voxels.*

Balconies, bay windows and other building elements have to be explicitly modelled

unsupervised classification in which each pixel or cluster of adjacent pixels receives a semantic label based on spectral characteristics, texture or other features. In order to exploit the full information content of oblique images, such a procedure should be done per individual image. This is because images of the same scene taken from different viewing directions cannot be jointly analysed due to the significant relief displacement of elevated objects. An alternative is to assign semantic labels to voxels (volume elements: these are cubes, i.e. the extension of a raster into the third dimension). Similar classification techniques as for raster images can be conducted using colour or texture image features as well as features derived

definition, which is actually a key issue. For example, the definition of a facade as a vertical plane may be easily violated when balconies, bay

CONCLUDING REMARKS

To analyse oblique images, traditional terrestrial approaches – related to facade interpretation, for instance – need to be combined with geometric and topologic relations between the objects in the scene. Such advanced context modelling of large scenes should take into account the function and meaning of relations between facades and buildings on the one hand, and between buildings, roads, road furniture, etc. on the other. ◀

FURTHER READING

- Gerke, M. and Xiao, J. (2013) Supervised and unsupervised MRF-based 3D scene classification in multiple view airborne oblique images, *ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci.*, II-3/W3, 25-30, doi:10.5194/isprsannals-II-3-W3-25-2013, 2013.
- Nex, F., Rupnik, E. and Remondino, F. (2013) Building Footprints Extraction from Oblique Imagery, *ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci.*, II-3/W3, 61-66, doi:10.5194/isprsannals-II-3-W3-61-2013, 2013.
- Nyaruhuma, A.P., Gerke, M., Vosselman, G. and Mtaló, E.G. (2012) Verification of 2D building outlines using oblique airborne images. In: *ISPRS Journal of Photogrammetry and Remote Sensing*, 71 (2012) pp. 62-75.
- Xiao, J., Gerke, M. and Vosselman, G. (2012) Building extraction from oblique airborne imagery based on robust facade detection. In: *ISPRS Journal of Photogrammetry and Remote Sensing*, 68 (2012) pp. 56-68

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A PILOT PROJECT IN CUBA

UAS in Farming

The popularity of unmanned aerial systems (UAS) is on the rise in many countries for a multitude of applications. In one such development, the UAS is rapidly becoming a tool for crop monitoring and management, which is essential for food security. GeoCuba has been successfully testing UAS technology for farming purposes. Here, the authors describe a pilot project conducted in Cuba in co-operation with the Russian firm Uniintex-Ginus.

Cuba covers a land area of nearly 110,000 square kilometres, of which nearly two-thirds is cultivated. With an annual sugar production of 5 million tons, Cuba was once the largest sugar exporter in the world. Today, the production is just one-third of what it was in its heyday. Cuba prioritises food security, hand in hand with sustainability. The

country's main products currently include vegetables (tomato, onion and pepper), root crops (potato, sweet potato and taro), cereals (rice and maize) and banana. The typical size of an individual farmer's parcel is 10 to 15ha, while parcels owned by the state or by private agricultural companies may cover several hundred hectares. To plan optimal

dates for ploughing and sowing and to check crop health and the need for fertiliser and watering, farm land has to be inspected regularly.

CONVENTIONAL METHODS

Conventionally, Cuban farmers checked soil and crop conditions by walking or riding across their land. The former Soviet Union's Intercosmos programme introduced multispectral analogue photographs in Cuba which allowed inspection from above. At the end of the 1980s, digital satellite images became available which were processed and analysed with the help



Dayamit Ojeda Martínez gained an MSc in geomatics from Granma Naval Academy, Cuba, in 2008 and a postgraduate diploma from ITC, Enschede, The Netherlands, in 2011.

Presently she is an associate researcher specialised in remote sensing at GeoCuba.

✉ dayamit@uct.geocuba.cu



Alexis Fernández Sarabia gained a BSc in geography and specialised in photogrammetry at GeoCuba where he has been working for the past five years. Prior to this, he

spent nearly three years as a professor at various schools.

✉ alexis@uct.geocuba.cu



Sandra González García received a BSc in geodetic engineering from José Martí Technical Institute in 1980 and an MSc in geomatics from Granma Naval Academy, both in Cuba, in 2005. She

has been with GeoCuba for 30 years, currently as an assistant researcher in photogrammetry.

✉ sandra@uct.geocuba.cu



▲ Figure 1, Preparing the Delta-Photo system for flight.



of computers. Satellite imagery has been and still is widely used for planning and monitoring crop production and assessing yield, since it pairs high spatial resolution with high temporal resolution and extended coverage. In the early 1990s, Cuba gained access to SPOT, LANDSAT and NOAA AVHRR imagery which enabled a variety of information on crops to be determined by means of multispectral classification. Cuba has

▼ Figure 2, Manual launching.

neither Earth observation satellites

GeoCuba

GeoCuba Business Group, established on 1 May 1995, is the result of the integration of two Cuban institutes specialised in hydrography, geodesy and cartography. Today GeoCuba focuses on a variety of geo-related activities including topographic mapping, cadastre, marine studies, navigation, remote sensing and environmental studies. GeoCuba IC, based in the city of Havana, provides research and development support to the GeoCuba Business Group. The research centre also provides high-level education and training in the diverse fields of geosciences.

nor image receiving stations of its own, so satellite images have to be purchased; an expensive matter

associated with delays in delivery. Therefore, UAS appears to be a welcome alternative.



UAS

Compared to satellite imagery, a UAS offers the following anticipated advantages for agricultural applications: low costs and high flexibility in terms of time and date of data capture, thus enabling high temporal resolution. The spatial resolution is also high. A UAS can be deployed much more flexibly than conventional aerial surveys and has a lower dependence on weather conditions. Although the extent of the area covered by a UAS is limited, the above reasons were sufficient for the present test to be conducted. The UAS used was a Delta-Photo system from AeroKartaKompleks. This company manufactures UASs for various civilian applications. The aircraft of the Delta-Photo system weighs 5kg, is steered from a ground control station (GCS) and is equipped

with GPS/IMU (Figure 1). The system is accompanied by PhotoScanPro, a photogrammetric software package running on desktop computers. The maximum flight duration of the aircraft is 80 minutes and the cruise speed is 70km/h. The non-metric camera on board is a 16MP SONY NEX-5N which gives a ground sampling distance (GSD) of 4.8cm at an altitude of 100m.

SITE AND FLIGHT

The pilot site was an area of 3 square kilometres in Güira de Melena, a municipality where farming is the main economic activity and which produces nearly 50 thousand tons of potatoes and taro annually. However, the yield is less than the figures reported worldwide. The flights were conducted on 20 March 2013. To prepare the flight plan on site using the NEVA software Navigator module, a high-resolution

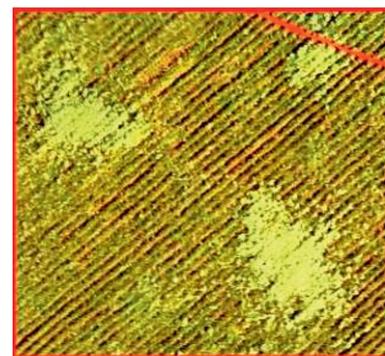
plan was wirelessly uploaded to the automatic pilot. The UAS was launched manually (Figure 2) and piloted remotely. The images were taken automatically at a rate of one image per two seconds. Nine ground controls points (GCPs), well distributed along the border of the area, were measured by RS-20 DGPS with a precision of 1mm.

RESULTS

After the flight, the imagery, GNSS/IMU data and the coordinates of the GCPs were loaded into PhotoScanPro allowing the highly automatic creation of georeferenced products, including 3D models, orthoimagery and DEMs. Just four computation processes were needed to generate the above products. Processing of the 1,192 images took 24 hours of continuous computing using an HP Elitebook with Intel I5 processor and 4GB RAM. An orthomosaic



◀ Figure 3, Orthomosaic (top) and detail.



Flexibility has its limits as permission for UAS use must be requested in advance

SPOT image with GSD 2.5m was uploaded to the GCS as backdrop. Furthermore, the software required elevation data, either in the form of digitised contour lines extracted from a topographic map or in the form of a digital elevation model (DEM). A DEM was uploaded in the form of the Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010). Further, the preparation of the flight plan needed input on the UAS type, average and maximum flying height, speed, landing site and a polygon demarking the borders of the area. Since the area was relatively flat, the along-track overlap was set at 72% and the across-track overlap at 52%. The number of images necessary to cover the area was 1,192. The flight

with a GSD of 10cm was generated (Figure 3). The differences in colour and shape of the same kind of crop are clearly visible in zoom-in at the bottom of Figure 3; light green indicates a healthy crop. The health differences can be caused by differences in groundwater level due to terrain undulation or by uneven spreading of fertiliser. This information is valuable as an alert to farmers so that they can determine the real cause by field inspection. Once measures have been taken, a second flight could check their effectiveness and also estimate the yield.

CONCLUDING REMARKS

A UAS offers great flexibility to

quickly acquire data in sufficient spatial resolution at low cost. However, the use of UASs is restricted to small areas. Moreover, flexibility has its limits as the use of a UAS for civilian applications is still subject to the same regulations as for manned aircrafts; permission must be requested a few days in advance.

ACKNOWLEDGEMENT

Thanks are due to Professors Yuri Vorobyev and Andrey Smolensk of UNIINTEC, and Alexey Pasumansky and Alexey Semenov of Agisoft. ◀

Uniting Aviation with Data

The Austrian company Airborne Technologies is specialised in two business fields: sensor integration/ aircraft modification, and data acquisition/data processing. With its own fleet of multi-mission aircraft and data processing systems, Airborne Technologies unites the competences of aviation, data capturing and data processing all under one roof.

Airborne Technologies (ABT) is a private limited company based at the Wiener Neustadt Airport near Vienna, Austria. The underlying business idea that led to the company being established was based upon two findings. The first of these was the shift of remote sensing technology from simple photogrammetric film cameras to a wide range of advanced digital sensors acquiring far more complex information. This trend has been accompanied by ongoing miniaturisation in the electronic industry. Sensors and storing devices have become smaller and lighter

enabling even small aircraft to be deployed for multi-sensor missions. This is making it possible to capture more information more efficiently, and the market demand is continuously increasing as a result. The second of the two findings was the lack of a company in the market with expertise in all three disciplines required to cover the entire workflow, from the integration of sensors in the aircraft up to data acquisition and data processing.

Wolfgang Grumeth, CEO of Airborne Technologies, recalls setting up the company: "I found financial and operational partners who shared my vision to unite interdisciplinary skills under one roof and within one team. The company was founded by seven leading experts in the field of aerial sensing, aviation, geodesy, data capturing and data processing, and it started operation in 2008. In times of economic crisis, these activities were observed with scepticism but the team didn't lose heart." Today, Airborne Technologies employs 35 people. It has doubled its turnover each year since the start, and further growth is forecast for the next two years. The management team now consists of Wolfgang Grumeth (CEO), Kristof Nagl (CFO), Marcus Gurtner (CSO) and Mario Rathmanner (COO).



▲ Wolfgang Grumeth, CEO of Airborne Technologies.

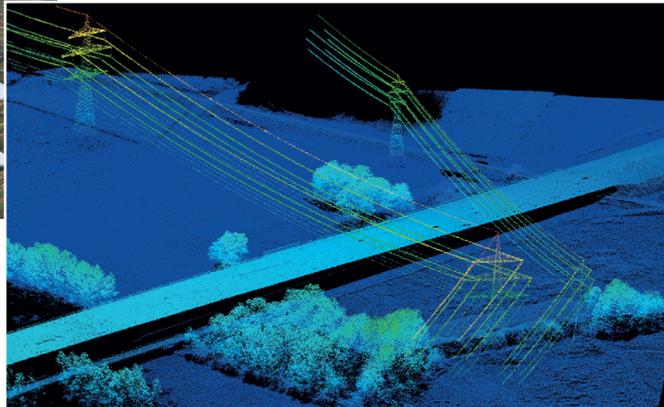
Airborne Technologies is an Aviation Authority-approved design organisation and owns and operates a fleet of four multi-mission aircraft carrying a wide range of sensors. The company operates independently of specific manufacturers but in close partnership with various established aircraft and sensor manufacturers (e.g. TECNAM, VULCANAIR, RIEGL, VEXCEL, IGI, L-3 WESCAM, FLIR Systems, EURONAV, CHURCHILL Navigation).

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.



▲ VULCANAIR MMA and TECNAM MMA.

▼ 3D point cloud.



DATA ACQUISITION & PROCESSING

The business activities of Airborne Technologies are arranged around two main divisions: data acquisition & processing services, and sale of turnkey surveillance solutions. The company's data acquisition and processing services are based on the following technologies: laser scanning, hyper-spectral imaging, thermal imaging and geophysical measurements (aeromagnetism, gravimetry, electromagnetics and radiometrics).

Airborne laser scanning (ALS) achieves maximum geometric accuracy and provides both surface information (first echo) and terrain information (last echo). Full-waveform processing provides vertical resolution and offers information about the vegetation between the forest canopy and the ground. ALS actively illuminates the scenery and is therefore less sensitive to weather and light conditions. Using bathymetric sensors, it is even possible to obtain information from below the water's surface. The various fields of application range from corridor mapping to flood simulation and environmental management.

Hyperspectral imaging reveals much more information compared to

common colour information gathered using photogrammetric methods. The measured spectral signature is unique and enables the identification of different materials on the Earth's surface. Examples of application fields include forest inventory, precision farming and environmental monitoring.

Meanwhile, airborne geophysical surveys are used to identify natural resources by interpreting anomalies in the Earth's magnetic field, gravity field, radiometric field and electromagnetic field.

Thanks to these multiple analysis methods, the services of Airborne Technologies meet the requirements of customers from many industries who need precise and up-to-date data, especially on a large scale at national or regional level. Applications include transport and infrastructure, rivers, forestry and agricultural lands, mining and exploration. A particular speciality of Airborne Technologies are multi-sensor applications with up to six sensors operating simultaneously during one flight. The company operates worldwide and has managed major projects in Europe, Asia and Africa.

TURNKEY SURVEILLANCE SOLUTIONS

ABT provides tailor-made, turnkey solutions for airborne surveillance and surveying systems for a wide range of new airborne platforms (fixed and rotary wing) as well as integration of sensor systems into existing customer aircraft. The company offers its airborne special programme to private businesses, governments and intra-governmental agencies.

FUTURE GOAL

Looking ahead to the future, Wolfgang Grumeth explains: "We are focused on flexible, customised solutions and see ourselves as a 'one-stop shop' in providing turnkey solutions and sensor integration for airborne police, military, environmental and mapping/exploration applications. Our goal is to be the technology leader for integrated system architecture in the field of airborne surveillance and surveying, and to be a well-known supplier of current, accurate and reliable geodata from point cloud to final product." ◀

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www.airbornetechnologies.at

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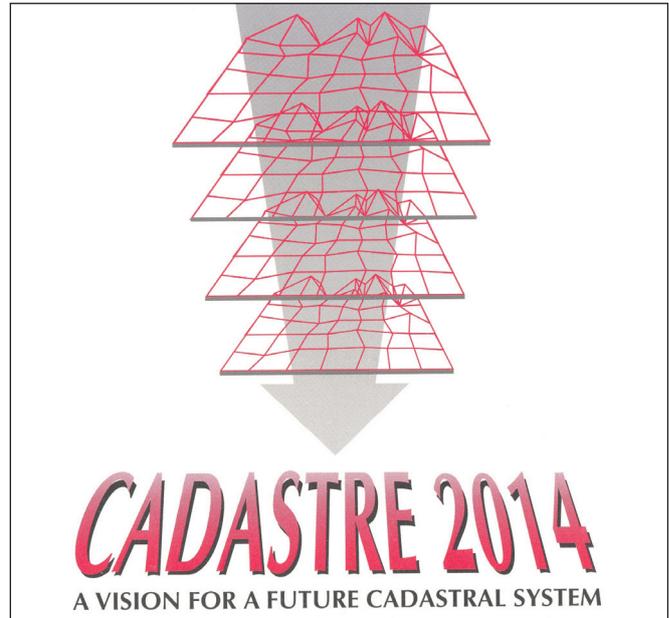
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Cadastre 2014 at the FIG Congress 2014

For many land professionals, the year 2014 will be a very special one: it is the year of *Cadastre 2014*. The FIG vision, *Cadastre 2014*, is without doubt FIG's most important milestone in recent decades. This vision on the future of land administration has received global attention from politicians, decision-makers, managers, scientists, NGOs and many professionals and their associations. The booklet outlining the *Cadastre 2014* vision has been translated into almost 30 languages and is regarded as a valuable reference work in many environments. Predicting future development is always of a sensitive nature. In case of the *Cadastre 2014* vision, it is astounding to see now, in 2014, how accurately and comprehensively the future was predicted back when it was published in 1998. This vision and way of thinking has been a key to the development of modern cadastres.

A Working Group of FIG's Commission 7, 'Cadastre and Land Management', started developing the vision in 1994. The group had the mandate to: "... study cadastral reform and procedures as applied in developed countries, take into consideration the automation of the cadastre and its role as part of a larger land information system, evaluate trends in this field and produce a vision of where cadastral systems will be in the next twenty years, show the means with which these changes will be achieved and describe the technology to be used in implementing these changes."

The authors of *Cadastre 2014*, Jürg Kaufmann and Daniel Steudler from Switzerland, state in their publication from 1998 that *Cadastre 2014* will be a complete documentation



Cadastre 2014: a globally recognised vision on Cadastre, by Jürg Kaufmann and Daniel Steudler, 1998.

of public and private rights and restrictions for land owners and land users. It is further stated that *Cadastre 2014* will be embedded in a broader LIS, fully co-ordinated and automated, without separation of land registration and cadastral mapping. Kaufmann and Steudler define *Cadastre 2014* as a methodically arranged public inventory of data concerning all legal land objects in a certain country or district, based on a survey of their boundaries. Such legal land objects are systematically identified by means of some separate designation.

What has been achieved? What can be further expected in relation to *Cadastre 2014*? This evaluation will of course be a subject of attention and discussion during the FIG XXV International Congress in Kuala Lumpur, Malaysia, held from 16-21 June 2014 at the Kuala Lumpur Convention Centre, during high-level special sessions on '*Cadastre*

2014 – From Vision To Practice And Beyond'. Several well-known authorities together with a group of young, dynamic professionals will give their views from a broad perspective in an attractive set-up. To mention a few: Paul van der Molen will speak about '*Cadastre 2014: A Beacon In Turbulent Times*', Abbas Rajabifard will present '*Cadastre 2014 In Relation To Spatial Data Infrastructure (SDI)*', Rohan Bennet will speak about '*Cadastre 2014 – Where To?*', and Stig Enemark will share his ideas on the subject of '*From Cadastre To Land Governance: A Cadastre 2014 Outlook*'. ◀

Don't miss this event and celebration!

MORE INFORMATION

www.fig.net
[www.fig.net/cadastre2014/
index.htm](http://www.fig.net/cadastre2014/index.htm)

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GSDI Strategic Planning: Two New North American Examples

Today, SDI efforts can be found at all levels of government and encompass a wide range of information products and shared services. Some involve inputs from private partners or even individuals. Moreover, with reliance on commercial services from the likes of Google and OpenStreetMap now embedded in everyday applications, the respective roles and influence of government, industry and individuals have changed profoundly over the past 20 years. That can make things uncomfortable for some organisations.

If it is even possible, how does an organisation or even a national community plan for what's coming next in terms of SDIs? Two recent North American initiatives are trying to do just that: the now-finalised National Spatial Data Infrastructure Strategic Plan 2014-2016 [1] from the US Federal Geographic Data Committee (FGDC), and the draft Pan-Canadian Geomatics Strategy [2] from the Canadian Geomatics Community Round Table (CGCRT) Steering Committee released in January.

Due to space limitations here, I will offer just a few early observations on the documents. They rightly steer away from a heavy emphasis on the data, technologies and applications involved. Many of the components they discuss are not new, but they have been updated to reflect better economic impact information becoming available and the very different collection of producers, users, institutions, policies, capabilities and attitudes that exists today. Benefiting from a clear organisational mandate and wide



David Coleman.

community feedback obtained in autumn 2013, the FGDC Report is tightly focused on US Federal Government initiatives and priorities. The short 'Strategic Plan Overview' section contains information relevant to most developed countries, and the authors are not shy about mentioning the challenges of providing federal leadership and sustaining shared values and practices in an era of tightened government spending. There is a clear connection between goals, objectives and anticipated outcomes. The final section briefly outlines how implementation will take place and performance will be monitored.

The Pan-Canadian Geomatics Strategy is more wide-ranging and ambitious. With early input from geospatial community leaders in government, industry and academia,

this draft document deals primarily with Canada's geomatics sector: providers of geospatial information products and services and those responsible for developing and delivering the country's SDIs. Early draft recommendations – especially around the market, leadership and capacity-building – are ambitious. It will be interesting to see what aspects evolve following the open Call for Comments and online discussions now underway.

Best wishes to the organisations in both countries for this work in influencing the next generation of SDIs and the communities they will support. It's no easy task to try and both predict and invent the future. Watch for follow-up information on both these initiatives in future articles. ◀

Dr David Coleman is president of the GSDI Association, a professor of geomatics engineering and dean of the Faculty of Engineering at the University of New Brunswick in Canada.

MORE INFORMATION

1. www.fgdc.gov/nsdi-plan
2. <http://cgcrt.ca/www.gsdi.org>

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Commission 1 activities and objectives deal with the theoretical aspects of how best to define reference systems and how reference systems can be used for practical and scientific applications. These activities complement the practical reference frame outcomes of IAG services such as the International Earth Rotation & Reference System (IERS) service.

Commission 1: REFAG2014 – Reference Frames

Commission 1 is the IAG component responsible for 'Reference Frames'. Accurate and stable spatial reference frames are fundamentally important for Earth science studies and precise positioning, in support of satellite orbits and missions, and for GNSS navigation. While they are crucial for satisfying important objectives of the Global Geodetic Observing System (GGOS), they also underpin many engineering applications relying on geospatial information as well as, increasingly, demanding commercial and industrial applications such as agriculture, aviation, construction, public safety and transportation.

One of the most important activities of Commission 1 in 2014 is organising the symposium called 'Reference Frames for Applications in Geoscience & Georeferencing' (REFAG2014), which will be held in Luxembourg from 13-17 October.

The primary goal of REFAG2014 is to bring together: 1) individuals and government representatives responsible for funding, installing and maintaining the global International Terrestrial Reference Frame (ITRF) infrastructure, 2) geoscientists who use it, and 3) representatives from the geospatial user industries, to address the issues that this disparate community must consider regarding theoretical and practical implementation of improved reference frames. Sessions have been designed to address the most relevant questions – not simply to report results. The programme will address the underlying limiting factors, systematic errors and novel approaches for future improvements to the ITRF. Additionally, an articulation of reference frame requirements for geoscientific and geospatial applications will be a central theme of the symposium.

Programme Outline

Session 1: Theory and Concepts

- Including: adequacy of present reference frame theory, potential mismatch between long-term linear theoretical frames and the reality of constantly moving stations, uncertainties in geocentre motion, and limitations of fundamental physical standards.

Session 2: Geodetic Measurement Techniques

- Including: meshing the strengths and weaknesses of current technologies to improve the ITRF, the present geophysical model limitations, the rapidly expanding volume of geodetic data, the promotion of synergistic and multi-technique analysis approaches, quantifying the limiting factors of the legacy network and deployment of next-generation systems.

Session 3: Regional Reference Frames

- Including: future role for sub-global reference frames of high accuracy, removal of large-scale tectonic effects, and co-ordination of national and regional frame efforts.

Session 4: Celestial to Terrestrial Frame Transformations

- Including: improving the value of EOPs in monitoring the Earth system, the need for additional, non-geodetic data, the optional delivery of EOP results, the adequacy of the interaction between the geodetic EOP community and groups engaged

MORE INFORMATION

www.iag-aig.org
<http://dgk.badw.de/index.php?id=775>



The symposium will be held at Meliá Luxembourg.

in modelling large-scale terrestrial fluids, and aligning ICRF implementation with the ITRF and EOPs.

Session 5: Usage and Applications of Reference Frames in Geosciences

- Including: service to geoscientific applications, current limitations of the geodetic observing systems, integration of geodetic and gravimetric systems, and balancing societal needs (e.g. natural hazard monitoring) with basic scientific goals.

Session 6: Georeferencing in Practice

- Including: high-accuracy requirements of commercial geodetic applications, addressing commercial requirements without undermining basic research needs, sustaining the basic infrastructure observing systems in the face of the growing importance of commercial applications, and the need for large-scale changes in the national, regional, and global geodetic frameworks.

The organisers of REFAG2014 wish to extend an open invitation to all geospatial professionals to attend this symposium. More details can be found on the symposium website. ◀



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History of Cartography

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Map Projections

mlapaine@geof.hr

Theoretical Cartography

qydu@whu.edu.cn

Data Quality

chenxy@ecit.cn

Atlases

peter.jordan@oeaw.ac.at

Mapping from Remote Sensor Imagery

xyang@fsu.edu

Geospatial Analysis and Modeling

bin.jiang@hig.se

Geovisualisation

gennady.andrienko@iais.fraunhofer.de

Maps and the Internet

rcammack@mail.unomaha.edu

Ubiquitous Cartography

arikawa@sis.u-tokyo.ac.jp

Digital Technologies in Cartographic Heritage

liver@topo.auth.gr

Open Source Geospatial Technologies

suchith.anand@nottingham.ac.uk

Generalisation and Multiple Representation

dirk.burghardt@tu-dresden.de

Planetary Cartography

hhargitai@gmail.com

Mountain Cartography

karel.kriz@univie.ac.at

Neocartography

s.l.chilton@mdx.ac.uk

Maps and Graphics for Blind and Partially Sighted People

acoll@utem.cl

Maps and Society

chris.perkins@manchester.ac.uk

Use and User Issues

elzaker@itc.nl

Cartography and Children

jesus@map.elte.hu

Education and Training

dave.fairbairn@newcastle.ac.uk

GI for Sustainability

vstikunov@yandex.ru

Map Production and Geobusiness

philippe.demaeyer@ugent.be

Cartography in Early Warning and Crises Management

undatra@yahoo.com

Geoinformation Infrastructures and Standards

acooper@csir.co.za

GIM CORRESPONDENT

David Fairbairn, Newcastle University, UK

Art and Cartography – Addressing Creativity and Mapping

The ICA's Working Group on Art and Cartography (extant from 2008 to 2011) was transformed into a mature Commission at the last General Assembly, giving it a four-year period (2011 to 2015) to address a number of terms of reference and develop a programme of activities. The commission is led by Canadian geographer Sébastien Caquard, with Barbara Piatti of ETH Zurich Institute of Cartography and Geoinformation as vice-chair.

The commission last met at the Dresden ICC in August 2013. In a pre-conference workshop, run jointly with the Commission on Maps and Society, the links between maps and the artistic elements of video games and 'other worlds' construction were explored. As digital and mobile-based gaming becomes more sophisticated and more content-rich, the need to create artificial or augmented environments becomes more important, and the resultant maps of such environments are interesting additions to the cartographic oeuvre. The use of games to help in teaching geography and introducing schoolchildren to the concepts of mapping and GIS was also considered at the workshop.

In addition to contributing several papers to the main conference proceedings, the commission took the opportunity of having the world's cartographers in Dresden to present a session entitled 'Movie Cartography and Narratives'. This included a collective film 'MDMD – A Multi-Dimensional Mapping Device' showing the opportunities for developing cartographic representation and communication through the medium of film. The interaction of art and artistic



The Reformed World, by Ruth Watson (installation at a previous Art and Cartography meeting, Vienna, Austria, February 2008).

endeavour with cartography was explored in additional sessions which examined how map production and map design could benefit from the widening possibilities which artistic influence can bring. There were further presentations on the relationship between mapping and non-graphical artistic work, including written literature and the recording of emotions and other senses (including smell).

The commission's terms of reference include developing and publishing books and a recent volume, *Locating the Moving Image: New Approaches to Film and Place* edited by Julia Hallam and Les Roberts, gives an opportunity for cartographers from the commission to reach out more to the film community.

The commission will organise a symposium this year investigating further aspects of the relationship between literature and cartography. *Mapping stories: Methodological and Technological Issues* will take

place at Concordia University, Montréal, Canada on 12-13 May [1]. It will address questions such as 'What are the strengths and limitations of numerical approaches for mapping emotions and senses?', 'How can new methods for automatic recording and objective analysis of stories and literature still preserve the individuality expressed therein?', and 'How can we reconcile the abstract and imaginary space of stories with reality, its topography and its maps?'. This colloquium will be presented in French, in an attempt to widen the scope of the commission's work, and examine the wide-ranging French-language literature which has a long tradition of writing stories with topographic and place-related themes.

The commission is charged with promoting diverse activities and outcomes (e.g. festivals, public lectures, performances, exhibitions, screenings, etc.). This includes facilitating installations with associated annotated catalogues, developing multiple forms of expression (e.g. blogs, exhibits), and facilitating and disseminating a range of further publications [2]. ◀

MORE INFORMATION

1. <http://bit.ly/1jKXoyD>2. <http://artcarto.wordpress.com>
www.icaci.org

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28 Lianhuachixi Road Haidian District,
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SECRETARY GENERAL
Leibniz Universität Hannover
Insitut für Photogrammetrie und
GeoInformation (IPI)
Nienburger Str. 1,
30167 Hannover, GERMANY
Email: isprs-sg@ipi.uni-hannover.de

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1ST VICE PRESIDENT
Istanbul Technical University Faculty of Civil
Engineering
Department of Geomatic Engineering
34469 Ayazaga-Istanbul, TURKEY
Email: oaltan@itu.edu.tr

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Center for Geospatial Research (CGR)
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The University of Georgia
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LENA HALOUNOVA

CONGRESS DIRECTOR
Czech Technical University
Faculty of Civil Engineering
RS Laboratory
Thakurova 7 166 29 Prague,
CZECH REPUBLIC
Email: Lena.Halounova@fsv.cvut.cz

JON MILLS

TREASURER
School of Civil Engineering and Geosciences
University of Newcastle
Newcastle upon Tyne,
NE1 7RU UNITED KINGDOM
Email: jon.mills@ncl.ac.uk

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Photogrammetric Computer Vision (PCV) 2014



PCV 2014 is the mid-term symposium of ISPRS Technical Commission III, 'Photogrammetric Computer Vision and Image Analysis', to be held in conjunction with the European Conference on Computer Vision from 5-7 September 2014 in Zurich, Switzerland. We are looking forward to welcoming researchers in photogrammetry, remote sensing, computer vision, image analysis and related fields to present and discuss their work. A single-track programme with keynote talks and oral and poster presentations will provide ample opportunities for scientific exchange and discussion.

PCV 2014 is now inviting submissions of high-quality research results as either full papers or abstracts. Topics include, but are not limited to:

- sensor orientation and surface reconstruction
- integrated sensor modelling and navigation
- 3D point cloud processing

- image sequences and multi-temporal analysis
- scene analysis and 3D reconstruction
- graphics and visualisation techniques for remote sensing
- pattern analysis for remote sensing and mapping

Full-paper submissions will undergo a selective double-blind peer-review process, normally by three members of the international reviewing committee, and will be published in the ISPRS Annals. Abstract submissions provide an opportunity to discuss late-breaking results and research in progress, and will be published in the ISPRS Archives. ◀

Important deadlines:

- full-paper submissions:
13 April 2014
- abstract submissions:
19 June 2014

MORE INFORMATION 
1. www.isprs.org/pcv2014

For further information, please visit  1. We are looking forward to your contributions and to welcoming you in Zurich! ◀

*Konrad Schindler (TC III president,
conference director)*
*Nicholas Paparoditis (TC III vice
president)*
*Wilfried Hartmann (TC III secretary,
local organiser)*





Future events

► **MARCH**

Geospatial Conference in Tunis (GCT)
Tunis-Gammarth, Tunisia
from **17-21 March**
For more information:
E: GCT@3g-consult.de
W: www.gct-tunisia.com

ICRS 2014: International Conference on Remote Sensing
Dubai, United Arab Emirates
from **19-20 March**
For more information:
W: www.waset.org/conference/2014/03/dubai/ICRS

4th edition of the Specialised Salon GeoExpo
Sofia, Bulgaria
from **19-22 March**
For more information:
E: buildingweek@iec.bg
W: www.buildingweek.bg

ASPRS 2014
Louisville, KY, USA
from **23-28 March**
For more information:
E: hstaverman@asprs.org
W: www.asprs.org

World Bank Conference on Land and Poverty
Washington, DC, USA
from **31 March-03 April**
For more information:
E: landconference@worldbank.org
W: http://go.worldbank.org/522XXPNXSO

► **APRIL**

Bristol International UAV Systems Conference
Bristol, UK
from **07-08 April**
For more information:
E: admin@bristolusconference.co.uk
W: www.bristolusconference.co.uk

AAG Annual Meeting 2014
Tampa, FL, USA
from **8-12 April**
For more information:
W: www.aag.org/annualmeeting

ENC-GNSS 2014
Rotterdam, The Netherlands
from **14-17 April**
For more information:
W: www.enc-gnss2014.com

10th Annual GEOINT Symposium
Tampa, FL, USA
from **14-17 April**
For more information:
W: http://geoint2013.com

SPAR International 3D Measurement & Imaging Conference
Colorado Springs, CO, USA
from **14-17 April**
For more information:
E: ldehaan@divcom.com
W: www.SPARPointGroup.com/international

Interexpo GEO-SIBERIA-2014
Novosibirsk, Russia
from **16-18 April**
For more information:
E: argina.novitskaya@gmail.com
W: http://bit.ly/1a328gN

Intergeo Eurasia 2014
Istanbul, Turkey
from **28-29 April**
For more information:
E: ofreier@hinte-messe.de
W: www.intergeo-eurasia.com

► **MAY**

Geospatial World Forum 2014
Geneva, Switzerland
from **05-09 May**
For more information:
E: info@geospatialworldforum.org
W: www.geospatialworldforum.org

Esri Africa User Conference 2014
Cape Town, South Africa
from **06-08 May**
For more information:
E: auc@esri.com
W: www.esri.com/events/auc

MundoGEO#Connect Latin America 2014
Sao Paulo, Brazil
from **07-09 May**
For more information:
E: connect@mundogeo.com
W: http://mundogeoconnect.com/2014/en

GEOBIA 2014
Thessaloniki, Greece
from **21-23 May**
For more information:
E: igitas@for.auth.gr
W: geobia2014.web.auth.gr

GEO Business Show 2014
London, UK
from **28-29 May**
For more information:
E: info@geobusinessshow.com
W: http://geobusinessshow.com

► **JUNE**

GEO Summit 2014
Bern, Switzerland
from **03-05 June**
For more information:
E: dkatzer@geosummit.ch
W: www.geosummit.ch/de/index.html

5th International Conference on Cartography & GIS
Riviera, Bulgaria
from **15-21 June**
For more information:
E: bgcartography@gmail.com
W: http://iccgis2014.cartography-gis.com/home.html



XXV FIG International Congress 2014
Kuala Lumpur, Malaysia
from **16-21 June**
For more information:
E: fig@fig.net
W: www.fig.net/fig2014

► **JULY**

AfricaGEO 2014
Cape Town, South Africa
from **01-03 July**
For more information:
E: aparker@ruraldevelopment.gov.za
W: www.africageo.org

► **OCTOBER**

Intergeo 2014
Berlin, Germany
from **07-09 October**
For more information:
E: dkatzer@hinte-messe.de
W: www.intergeo.de

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Trea Fledderus, marketing assistant, email: trea.fledderus@geomares.nl

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IGI, www.igi.eu	32	Seafloor Systems, www.seaflorsystems.com	9
KCS TraceMe, www.trace.me	40	SOUTH Surveying, www.southsurvey.com	36
Kolida Instrument, www.kolidainstrument.com	26	Spectra Precision, www.spectraprecision.com	4
KQ Geo Technologies, www.kanq.com.cn	34	Supergeo, www.supergeotek.com	32
Leica Geosystems, www.leica-geosystems.com	16	TI Asahi, www.pentaxsurveying.com/en	8
MicroSurvey, www.microsurvey.com	20	TI Linertec, www.tilinertec.com	12
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