



UAS as a Tool for Surveyors

Experiences with UAS (4)



GIM International Interviews

**Jacqueline
McGlade**

**Piloting the Social
Tenure Domain
Model in Uganda**

**UN-GGIM
Forum Doha**

Read the report on page 35



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New Reality

It's a hard message for the geospatial community to hear: step out of your comfort zone and step out of the circle of the elite! Professor Jacqueline McGlade, who remains executive director of the European Environment Agency in Copenhagen until May this year, is clear about the need to review the role of individual professionals and the institutes where they work, often national mapping agencies or cadastral organisations. The consequences are clear: "If this community doesn't adapt and come out of its shell, it will be left behind". McGlade is interviewed about her impending departure from the EEA in this issue of *GIM International* on page 16. McGlade admits that hers is a challenging message, because people have invested many years in building their careers and in developing the technology to create today's products.

To adapt to a new reality requires vision and a fearless attitude towards the future. Luckily, in order to underpin her rather difficult and unsettling message, McGlade is shedding light on at least some of the directions national mapping agencies and cadastres

could – and should – take. McGlade sees a "lack of institutional fit" since these bodies often originated in the 20th century. As she sees it, the world is changing at such a fast pace that there's no chance of the institutionalised geospatial castles adapting to reality quick enough to be able to play a fitting role again. The biggest change, of course, is amongst users of geospatial information. Young people know no better than to have maps at their fingertips, every waking minute of their lives: where am I, where are you, and what else is there to do or see where I am or where you are? Some of us remember the days when looking at



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Photography: Arie Bruinsma

a map was an 'activity', such as when reading the road atlas while travelling in a car. The users of today demand different products than users of yesterday. Moreover, there is an increasing shift from being merely a 'user' to being a 'producer' too; by georeferencing all kinds of information, users of geospatial information are simultaneously producing new geoinfo themselves. They may take the availability of maps for granted, but they are always ready to play a role in creating new maps as well. The biggest paradigm shift mapping agencies and cadastres are currently facing is to make a distinction between physical mapping and map distribution. In other words, the emphasis has shifted from producing the data used to create a map to gathering that data – irrespective of who is producing it – and subsequently distributing the resulting maps, like a broker or a clearing house. For a mapping agency, this means moving from a central role to a distributor role in order to continue to play a prominent part in the future.

Professor McGlade underlines the potential consequences of changing user behaviour and offers pointers for the geospatial industry. It might not be an easy message to swallow; after all, 'mapmaking' has always been the geospatial professional's *raison d'être*. But nor is the thought of being left behind appealing. And as is so often the case when one is forced to reconsider, it might just open up a wealth of new and prosperous horizons!

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The image on this issue's front cover was taken in November 2012 during a photogrammetric mission at the A1 motorway construction site near Toruń (Poland). The image shows the moment right after the AVI has been landed by its operators: pilot Adam, (left) and ground station operator Anna (right). The A1 mission to document the road-building stage covered a stretch of 30km (at 5cm ground resolution).

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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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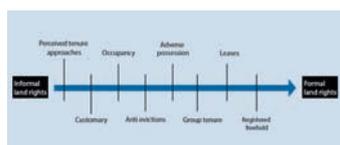
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The size of the GI sector and the R&D investment required

In recent years, Geoinformation Business Netherlands (GBN), the umbrella organisation for the private sector within the Dutch geoinformation (GI) industry, has been regularly publishing a market monitor reporting on the size and activities of the GI industry in The Netherlands. One of the most recent reports estimated that the sector currently employs somewhere between 8,000 and 9,000 people and generates an annual turnover of some EUR900 x 10⁶.



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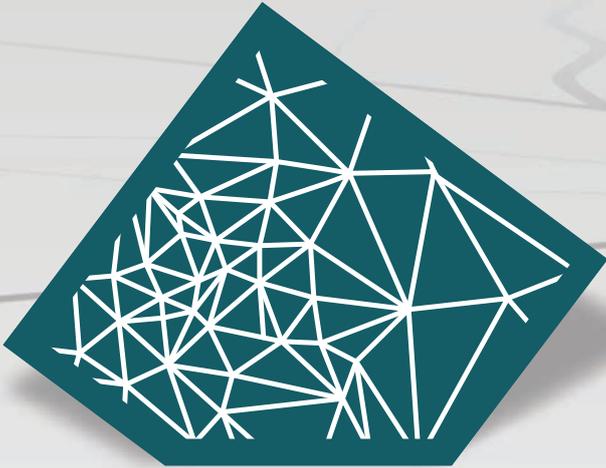
The total population of The Netherlands is 16 million, the working population is 7.8 million and the GNP is EUR630 x 10⁹. This implies that, based on the total population, about five out of every 10,000 inhabitants are working in the GI sector, which is equal to 0.12 percent of the working population. These numbers refer to workers at all levels, ranging from technical and vocational training to academic education. We also see that this sector produces 0.14 percent of the Dutch GNP, which is above average. However, that can be explained if we realise that:

a) This sector is knowledge

intensive, which means that workers in this sector have a relatively high level of training and/or education. Therefore they are more expensive to employ.

b) This sector is innovative, which means that it requires permanent investment in new technology, in new working procedures and in the development of new products and services. These numbers are interesting if we compare them with the soft statistics gathered over several decades by staff from the Faculty of Geo-Information Science and Earth Observation (ITC) at the University of Twente in The Netherlands. Our experience indicates that the number of people working in a country's GI sector (or what was previously known as the survey sector) varies between 2 and 5 per 10,000 inhabitants. The actual number depends on the level of economic and technical development of that country. This shows that the Dutch numbers are at the top end of this range and, indeed, information density is high in The Netherlands. It would be interesting to see comparable statistics for other countries.

The average level of investment in R&D in OECD countries appears to be just under 2% of GNP; the actual range is roughly between 1.5% and 3.5%. So a country with a strong GI sector should spend about 3.5% of that sector's annual turnover on R&D, and countries that want to maintain a relevant level in the sector should spend around 2% of their industry's annual turnover. For the GI sector in The Netherlands, the average 2% R&D investment level would equate to approximately EUR20 x 10⁶ and the high 3.5% level would be about EUR35 x 10⁶. I have not been able to verify these numbers, but I am sure that the Dutch investment in R&D does not reach the high level. It may be that it reaches the lower level, but I am far from certain about that.



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- Calculate accurate volumes

TerraImaging and Aerodata Surveys Join Forces

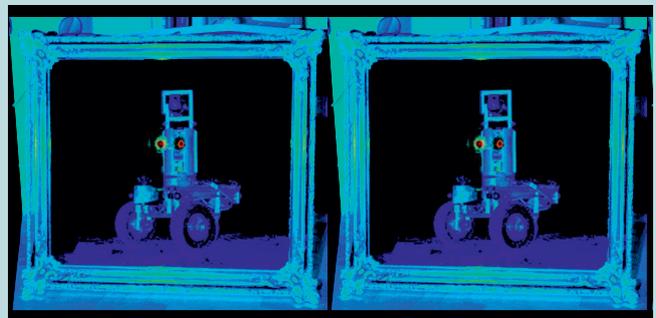
Two years ago, Aerodata International Surveys started a close co-operation with TerraImaging via a majority shareholding in the company. Since then, the two companies have realised many Lidar projects together in various countries in Europe and beyond. To achieve their ambitions, the companies decided to change their names as of 1 March 2013 to Aerodata Surveys Nederland and Aerodata Surveys Deutschland respectively. ◀
▶ <http://su.pr/2THZ8p>

Call for Papers: GSDI and AfricaGIS Conference

The GSDI World Conference (GSDI 14) and AfricaGIS 2013 will be jointly held at the UN Economic Commission for Africa Conference Centre in Addis Ababa from 4-8 November 2013. AfricaGIS is the largest regularly occurring GIS conference in Africa, and attracts participants from across the whole of the continent. The GSDI World Conference is known for its quality of content and moves around the globe to offer geospatial specialists in all parts of the world opportunities to exchange ideas and learn from global peers about building spatial data infrastructures. ◀
▶ <http://su.pr/2cOYHh>

Jacobs University Students Win Lidar Art Contest

Students from Jacobs University (Bremen, Germany) successfully participated in the recent 2nd edition of the 'Lidar as Art' contest, which was held in conjunction with the International Lidar Mapping Forum (ILMF) in Denver, USA. PhD student Jan Elseberg won the contest with an image called 'Self Portrait with Duckling'. ◀
▶ <http://su.pr/2euwhL>



'Self Portrait with Duckling'.



Most Shared

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

1. COWI Authorised to Use UAS for Commercial Purposes
- <http://su.pr/7cCvdI>
2. Jacobs University Students Win Laser Imaging Art Contest
- <http://su.pr/2euwhL>
3. UAS Conducts Survey at 4,300m above Sea Level
- <http://su.pr/2cewST>
4. Two Days Full of 3D Measuring
- <http://su.pr/6RUFQ9>
5. 10 Million Square Kilometres of High-resolution Aerial Views
- <http://su.pr/1qV99Q>

Carlson 30th Anniversary User Conference

The Carlson 30th Anniversary User Conference will be held from 7 to 10 April 2013 in Cincinnati, Ohio, USA. The three-day conference is designed to provide the tools its attendees need to be at the forefront of the rapidly changing technical aspects of the land development and mining industries. ◀
▶ <http://su.pr/1U286X>

Details of LASzip Lidar Compressor Published

Technology start-up rapidlasso GmbH has published the details of its popular LASzip Lidar compressor in the February 2013 issue of the ASPRS journal *PE&RS – A Special Issue on National Scale 3D Mapping* edited by Jason Stoker of the USGS. LASzip compression technology squeezes ASPRS LAS files into LAZ files which are 5 to 13 times smaller without any loss of quality, and has become the de facto industry standard for compressed Lidar. ◀

▶ <http://su.pr/2tdwgi>

First Autonomous Real-time Galileo PVT Calculation from IOV Satellites

Septentrio, Belgium, has announced that it has obtained, based on live ICD-compliant Galileo messages from the four Galileo IOV satellites, a first autonomous real-time Galileo PVT calculation. The stand-alone position was calculated from in-orbit navigation messages using a standard PolARx4 GNSS receiver equipped with commercially released firmware. ◀

▶ <http://su.pr/Ah0SXn>



PolARx4 GNSS receiver.



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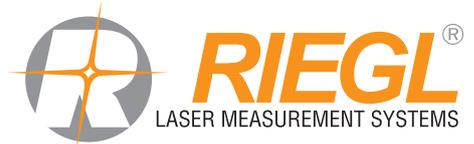
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DigitalGlobe is Platinum Sponsor of International Forum

Sovzond, the Russian integrator in the field of geoinformation technologies, has announced that DigitalGlobe, a global leader in Earth imagery and geospatial analysis, will be participating as Platinum Sponsor at the first International Forum, 'Integrated Geospatial Solutions – the Future of Information Technologies', to be held from 17 to 19 April 2013 at the Atlas Park Hotel in Moscow. ◀
▶ <http://su.pr/17zX10>

E. Lynn Usery Elected as ASPRS Vice President

E. Lynn Usery, U.S. Geological Survey, has been elected as vice president of the American Society for Photogrammetry and Remote Sensing (ASPRS) for 2013. With the installation of officers at the ASPRS Annual Conference in March, Stephen D. DeGloria moves into the position of president, Stewart Walker becomes president-elect, and Roberta Lenczowski becomes past president. Pierre le Roux was elected as assistant director of the Primary Data Acquisition Division (PDAD). ◀
▶ <http://su.pr/2SNVkm>



E. Lynn Usery.

COWI Authorised to Use UAS for Commercial Purposes

COWI, headquartered in Denmark, has been authorised to use unmanned aircraft systems (UAS) for commercial purposes. The company believes that this will make airborne mapping of small geographical areas, recording of environmental changes in the landscape as well as energy-efficient renovation of buildings a lot easier in the future. ◀
▶ <http://su.pr/7cCvdI>



The UAV is programmed on-site from a portable PC.

New Image Analysis Services for the Cloud

Exelis Visual Information Solutions, a subsidiary of ITT Exelis, has released new technology that makes it possible for organisations to easily extend image analysis capabilities to an entire user base through a cloud or enterprise framework. The new product, ENVI Services Engine, is based on the scientific algorithms in ENVI image analysis software. ◀
▶ <http://su.pr/67mMI7>

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GeoStar Purchases Correlator3D Software

SimActive, a prominent developer of photogrammetry software, has announced that Chinese firm GeoStar has purchased its Correlator3D product. The software will be used to generate surface and terrain models, orthophotos and mosaics. The transaction was brokered by Vexcel Spatial Information Technical (Vexcel-China), SimActive's partner in China. ◀

▶ <http://su.pr/1LPtxu>

Prestigious Award for Superstorm Sandy Response

The efforts of the Federal Emergency Management Agency (FEMA) to assist after the destruction of Superstorm Sandy – including FEMA's first-of-its-kind mapping platform, the GeoPlatform – were recognised by Esri at its annual Federal GIS Conference held in Washington DC, USA, in February 2013. The company honoured FEMA with its prestigious 'Making a Difference Award', which recognises organisations doing exemplary work using geospatial technology. The award was presented at a special ceremony that was also attended by FEMA

management and Esri president Jack Dangermond. ◀

▶ <http://su.pr/1S4yws>



Jack Dangermond presents the 2013 Making a Difference Award to Christopher Vaughan, FEMA geospatial information officer, and FEMA administrator Craig Fugate

Trimble Increases Functionality across GNSS Survey Receivers

Trimble has announced functionality updates to its integrated GNSS survey receiver portfolio, which includes the Trimble R4, Trimble R6, Trimble R8 GNSS systems and is rounded out by the recently released Trimble R10 GNSS system. The updates include increased satellite tracking and Real Time Kinematic (RTK) performance. These improvements have modernised the integrated receiver portfolio to add functionality, flexibility and capability as well as more options for surveyors. ◀

▶ <http://su.pr/1N12BE>

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FARO Offers Platform for 3D Experts

FARO, the company specialised in portable measuring technology, is once again organising the FARO 3D Documentation User Meeting, which will this year be held on 13 and 14 June at the Convention and Conference Centre in Strasbourg, France. The main topic will be 3D documentation generated with the help of laser scanning. ◀

▶ <http://su.pr/1uvFmH>



The event brings together specialists from different sectors.

Upgrades and New Features for VisionMap Image Processing Suite

VisionMap, a leading provider of aerial survey and mapping systems, has released a new version of its A3 LightSpeed image processing suite. The new version includes several upgrades and new features. First is a new and improved task management mechanism which is used for parallelisation of processing computations. ◀

▶ <http://su.pr/1DoEmG>

60MP Achromatic Aerial Camera System Launched

Phase One Industrial, the Danish manufacturer and provider of medium-format aerial and industrial digital photography equipment, has announced the launch of its iXA 160 Achromatic aerial camera system. The core of the Phase One iXA 160 Achromatic is a 60MP sensor that has been optimised for aerial photogrammetric applications and offers high sensitivity to visible light, including UV and IR ranges. ◀

▶ <http://su.pr/7cxJly>



iXA 160 Achromatic aerial camera system.

Rx Networks Announces Release of XYBRID Cloud

Rx Networks, the Canada-based mobile location technology company, has announced the upcoming release of XYBRID Cloud 1.0, scheduled for release on 1 May 2013. XYBRID Cloud is a hosted GNSS that applies the power of cloud processing to determine a location even when only a few snapshots of weak GNSS signals are available. ◀

▶ <http://su.pr/7KfmAs>

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Racurs Conference 2013 Venue Unveiled



Château de Fontainebleau.

The 13th edition of the annual Racurs Conference will be held from 22 to 26 September 2013 in Fontainebleau, which is located about 50km southeast of the centre of Paris, France. The full name of the event is the International Scientific and Technical Conference, 'From imagery to map: digital photogrammetric technologies'. ◀

▶ <http://su.pr/1zg7DK>

Workshop on Remote Sensing

The 6th International Workshop on Remote Sensing and Environmental Innovations in Mongolia will be held on 10-11 June 2013 in Ulaanbaatar, the country's capital. The NUM-ITC-UNESCO Remote Sensing and Space Science Laboratory of the National University of Mongolia is the local organiser of the workshop. ◀

▶ <http://su.pr/1xJqS0>



Satellite view of Ulaanbaatar and surroundings.

Voyager

With the rise of Terrestrial Laser Scanning a decade ago and more recently Unmanned Aerial Systems (UAS), which are also called drones, the differences between how geodata is obtained by the surveyor in the field and by the photogrammetrist are fading. Conventionally, the crisp boundary separating the tasks of these two practitioners is as follows: the surveyor uses GNSS devices, mobile GIS handhelds, total stations and other tools while walking through the real landscape to collect the coordinates of characteristic points of features of interest. The photogrammetrist pushes buttons to digitise coordinates while sitting in the office in front of a Digital Photogrammetric Workstation (DPW).



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Today's photogrammetric software allows the highly automated creation of virtual landscapes. Added to this, the recent rocketing in popularity of UAS offers an alternative to surveying in the field. The data necessary for creating virtual landscapes can now be acquired from the air without requiring a huge budget. For the first time in the long history of photogrammetry, small areas can now be reliably captured by aerial surveys for an affordable price. By overlapping images, Digital Elevation

Models (DEM) and orthomosaics – which are images with the geometric properties of topographic maps – can be generated highly automatically. An orthomosaic draped over a DEM results in a virtual 3D landscape which can be observed from many viewpoints and at many levels of detail by zooming and panning. From the comfort of an office chair, the surveyor can measure coordinates simply by clicking with the mouse. All this has become tangible because of the rapid advances in micro-electronics and subsequently sensor technology.

When the use of a new technology burgeons, citizens and professionals alike may feel concerned and even threatened. What does the use of drones by the military, homeland security and the police mean for the right to privacy? Today, discussions on violation of rights and legitimacy are tumbling over each other in the public domain. In terms of geomatics, practitioners may fear that new tools could lead to the extinction of their profession, since laymen will be able to take over their jobs. The sentiment that a new type of device presents a threat rather than an opportunity is nothing new. Let us subdue those primal feelings. The production of geoinformation consists of many actions, and the entire chain cannot be conducted blindly. Indeed, anybody can collect geodata, but the core challenge is to arrange the individual steps such that the quality of the end product is ensured while entailing a minimum amount of time and money.

Tools, skills and knowledge are the tripod of any proper geodata acquisition. Anyone can purchase the tools, but skills and knowledge demand huge investments in time and brain power to absorb the theory and to gain skills. Tools are the aid, but knowledge is the golden key. Undertake the voyage.



GIM INTERNATIONAL INTERVIEWS JACQUELINE MCGLADE

Cadastrals Need to Rethink Role



Mapping and cadastral agencies will need to reconsider their changing roles in the near future. One of the most important challenges will be their ability to manage near real-time data and information. After ten years as director of the European Environment Agency in Copenhagen, professor Jacqueline McGlade will be leaving the position in May 2013. At the High Level Forum of the United Nations Global Geospatial Information Management Initiative (UN-GGIM) which took place recently in Doha, Qatar, she spoke to *GIM International* and explained in more detail her call for mapping agencies and cadastres to reflect on how they will need to change in order to respond to future economic and societal trends.

First of all, what do you think of the United Nations adopting geospatial as a major point of focus through the UN-GGIM Initiative?

It's long overdue, and therefore a very good initiative. The spread of geospatial thinking is a powerful unifier to make progress on delivering sustainable development around the world. Whilst everyone's location can be found on a map, the map itself could be a good or an inaccurate map, depending on how a country has invested in such activities as mapping, cartography and geodesy. However, with the growth in satellite programmes and the science and knowledge that is now available, the emancipation of geospatial knowledge has become a reality. I would like to suggest that today more than ever, geospatial information is rapidly becoming a tremendous tool for social change.

You've seen the use of geospatial information change in the last ten years. What has been the most striking shift?

The biggest shift has taken place across generations. Young people are taking it absolutely for granted to have a map instantaneously available and on hand, to which they can upload all kinds of data and information and turn into relevant, geolocated information for themselves and their peers. This transformation has been happening over the last two to three years, but was already building up in the years before as a spin-off of Moore's Law and the fact that geographic information and analytical tools and techniques have become increasingly more accessible, cheaper and more powerful. In general, the constellation of what we have at our fingertips has driven a massive amount of innovation during the last few years.

Are national mapping agencies and cadastres taking on these changes well enough, in your view?

No. One of the biggest problems we are experiencing these days is a lack of institutional fit for the real world. Many of the agencies were created as separate institutions and as such

'hold the pen' on all things geographic. However, this has meant that many of these institutions are far removed from the centre of decision-making as well as from the daily lives of citizens. This lack of institutional fit can be rather dangerous because it creates the nightmare scenario of a fragmentation of values, such as whether or not to support open data, to the point where the institutes end up delivering completely inferior solutions to users, and not least to citizens.

How can this be avoided?

The European Environment Agency has evolved from being not only a provider of information generated through its own analysis but also increasingly into a broker of information, working in the mode of a re-distributor rather than a centraliser. This has helped the EEA and Eionet to improve the solutions space for environmental issues, allowing communities to discover solutions and avoid problems which may only occur infrequently by gathering knowledge using a highly distributive model.

What would moving to a distributive role mean in practice for national mapping agencies or cadastres?

The biggest change is to separate the idea of the physicality of mapping from the concept of using intelligent maps to respond to the multiplicity of reasons why people want geospatial data. Denmark's national mapping

agency has already made just such a transition; it has been placed at the centre of government, to enable the actions of citizens, households and businesses to be geocoded and linked in a multifunctional database. Using this multiplicity and multifunctionality, the agency has been able to create a range of services, become an important information broker and clearing house, and ensure streamlining across government departments to avoid bottlenecks and duplication. It was a huge step forward in thinking and it absolutely revolutionised the mapping agency itself. Agencies in Ireland and some other European countries have also shown similar signs of moving from simple mapping to forming a national spatial data infrastructure.

Many mapping agencies see themselves as an authority – they want to be the ones to gather and certify the data. Do you see that as a major task of a mapping agency too?

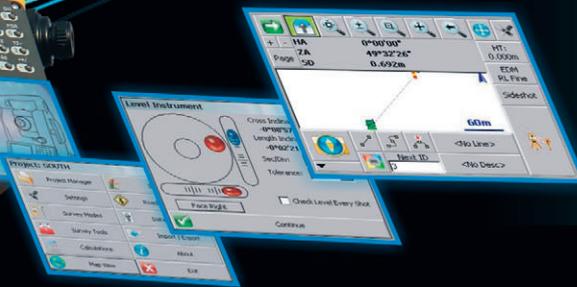
While running an agency myself, I have always stressed the need to ensure the quality of the data that we publish and make available: in some instances, it is imperative. However, there is less and less reason for the mapping agencies to see themselves as the only source of authentic data with high integrity. Why do I say this? Well, for many purposes in daily life 'fit for purpose' could mean simply taking a photograph and placing it on an open data map. Of course, we still need authoritative, high-accuracy data ▶

Jacqueline McGlade

Jacqueline Myriam McGlade has been executive director of the European Environment Agency in Copenhagen, Denmark, since 2003, and will come to the end of her mandate at the end of May 2013. Before that McGlade, a British-born Canadian, was professor of environmental informatics at the Department of Mathematics at University College London. Prior to that, she was director of the Centre for Coastal and Marine Sciences of the National Environment Research Council in the UK, professor of ecosystems analysis and management at the University of Warwick, UK, director of theoretical ecology at the Forschungszentrum Jülich in Germany and a senior scientist in fisheries and oceans for the Federal Government of Canada. Her research focused on the spatial and non-linear dynamics of ecosystems, climate change and scenario development. Professor McGlade completed her BSc in marine biology, biochemistry and soil science at the University College of North Wales, UK, in 1977, and obtained her PhD in aquatic sciences and zoology from the University of Guelph in Canada in 1980.

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– in court cases on boundary issues, for example, or when a major oil or gas pipeline is to be built somewhere. But then you have the possibility of having high-level expert groups coming in who are going to check the maps anyway. So the role of the mapping agency in the 21st century is to place what I would call ‘quality assurance codes’ on those things that absolutely demand precision and may even end up in a legal setting. But for the vast majority of uses by the general public, ‘good enough’ means that there is no need to look for high-resolution and accurate, quality-assured solutions in every instance.

Won't your comments upset many leading figures within national mapping agencies?

Rest assured, there is still a need for highly qualified cartographers, because every country will need to identify its boundaries. There's also a whole set of environmental issues – climate change, hazard mapping, changing geology, etc. – that will require the skills of a cartographer. Sometimes it's the natural landscape that needs far more attention than the built one.

What is your message to the geospatial community at large?

The geospatial community needs to step out of the circle of the technical elite and make the tools and data readily available for all. I know this is a really difficult challenge because people have invested years and years in building their careers and developing the technology, and have put so much energy into creating many of today's products. But if the community doesn't adapt, doesn't come out of its shell and work with everybody, it will be left behind. I hope your readers will take this message on board without seeing it as a complete revolution; there are some ‘halfway houses’ along the way – maps made by professionals will be needed and used in numerous areas for many years to come. But there has to be a shift in mindset from simply creating maps to delivering services. This will be an essential step for the future survival of mapping agencies.



You're leaving the European Environmental Agency in May 2013. What have you been most proud of in the last 10 years?

Without a doubt, Eye on Earth as a real manifestation of the principles of SEIS (Shared Environment Information System) – an initiative that has been spearheaded by the EEA over the past 10 years. The first Eye on Earth User Conference has just concluded with the Dublin Statement [431], representing a real commitment to bringing to life the sharing of environmental, societal and economic data and information. It was a watershed event where we could see the emergence of an amazing movement based on powerful alliances of government institutions, researchers, business and communities and citizens. The participants, who came from more than 75 countries, agreed to build up the collective knowledge of solutions about sustainable development using the Eye on Earth Network. They also agreed to empower local, regional and global communities to manage, exchange and facilitate access to information and to undertake their own spatial and geolocated assessments using the opportunities afforded by the rapid advancement of information and communications technologies, especially geographic information systems.

Are you optimistic about geomatics as a field?

Very much so. Geomatics is the

field that will bring us into a wrap-around world, where information about environmental conditions at a particular location – such as air pollution, noise, biodiversity and water quality – can be combined with a person's social setting. Communicating across the world will be based on the next evolutionary

The geospatial community needs to step out of the circle of the technical elite

step in using the internet; even when we are separated by distance, we will be able to experience each other through a three-dimensional world, bringing our personal data in from the cloud as we need it and combining it with local data shared by a wide community of information providers to give a deeper, more contextual feel when we are connected digitally. ◀

MORE INFORMATION

1. www.eyeonearth.org/en-us/Pages/Home.aspx

FROM TRIPODS AND TRUCKS TO VIRTUAL SURVEYING

UAS as a Tool for Surveyors



▲ Figure 1, 3D representation of a quarry generated

Since 2011, the use of Unmanned Aerial Systems (UAS) as complementary surveying devices has mushroomed. With resolutions as high as 1cm, the resulting imagery enables the highly automated production of detailed elevation data, orthophotos and 3D virtual landscapes. However, the gains in efficiency during data acquisition are accompanied by data management challenges and processing efforts which surveyors often underestimate. Here, the authors demonstrate how surveyors can make UAS technology economically feasible by balancing massive data volumes without compromising the quality of feature extraction.

The field surveyor intelligently selects lines and points to correctly and economically capture terrain features in three dimensions. His main task is to balance level of detail (or number of points) and quality. Choosing too many points adds to costs, yet too few points will impede completeness and accuracy. Finding the proper balance relies on the human capacity to analyse the terrain while standing

in the midst of it. Field surveys directly result in vector data: point features such as lamp posts or property corners, line features such as tops of ditches or centres of roads, and polygons such as property parcels and lakes. Vector data requires minimal post-processing in the office to obtain the specified end product; the field work itself is the most labour-intensive part.

VIRTUAL SURVEYING

UAS surveys do not directly produce vector data. The survey starts with flight planning and aerial survey, resulting in digital images which cover the selected area at approximately equal resolution. Unlike with field surveys, no lines and points are captured during an aerial survey. Instead, this job has to be conducted in the office afterwards using



Tom Op't Eyndt is owner and manager of GeoID bvba, a company established in 2005 and focusing on geographic visualisation technology to support better management of the environment. Since graduating as a bio-engineer in land and forest management from Leuven University, Tom has worked on numerous

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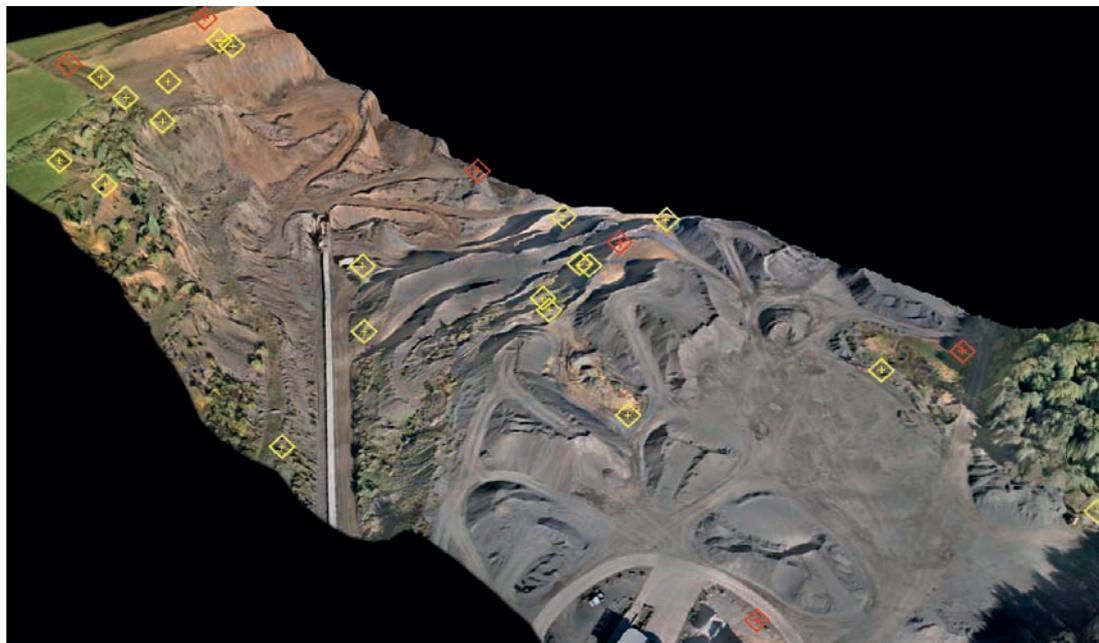


Walter Volkmann is a land surveyor with roots in Southern Africa. He is the founder and CEO of Micro Aerial Projects LLC in the US, and currently consults to the Kassel-based UAV manufacturer Aibotix GmbH on geospatial applications of UAV-based mapping operations.

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by draping an orthophoto over a DEM.



▲ Figure 2, GCPs (red) and check points (yellow) distributed over a quarry.

orthophotos and Digital Elevation Models (DEM), both of which can be generated automatically using the proper software.

A typical ground sampling distance (GSD) of a few centimetres results in massive data volumes even when the area to be covered is just a few hectares. For example, a GSD of 2cm results in 2,500 pixels per square metre, which is equivalent to 25 million pixels per hectare. The challenge is to balance data volume with efficiency in feature extraction without loss of quality. Virtual surveying is a solution to

this challenge. An easy-to-learn user interface allows intelligent, efficient and accurate feature extraction from realistic visualisations of topographic data (Figure 1).

SURVEYING IN THE MODEL

Virtual surveying is done in a 3D model which resembles the actual terrain. The surveyor can navigate through the model and measure points by clicking the mouse, just as if he were placing a survey rod over a terrain point. A virtual environment shows the orthophoto draped over the DEM and enables the landscape to be viewed from many different

viewpoints. The combination of orthophoto and DEM offers many advantages compared to 'heads-up' digitisation of orthophotos alone. The viewpoint can be easily changed to obtain an optimum perspective of the feature of interest, and zooming and roaming enables terrain features to be interpreted reliably and measured accurately. The surveyor can easily move around or jump over houses, trees, hedges and other obstructions. Furthermore, the 3D representation enables much easier detection of features than the conventional photogrammetric approach. The result is a better and more efficient

▼ Figure 3, Horizontal error vectors (left) shown in yellow and vertical error vectors (green: positive; red: negative) at check points superimposed on an orthophoto and scaled by a factor of 1,000.



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identification and measurement of features compared to field surveying or conventional photogrammetry.

ACCURACY

UAS workflows have many steps, and each step contributes to the error budget of the end product. Consequently, quality assessment is rather complex. This can be illustrated by the accuracy assessment of a model of a 16.5ha quarry located near Kassel, Germany, for example. This was generated from 330 images with GSDs varying between 2cm at the top and 4cm at the bottom of the quarry (Figure 2). The red points represent Ground Control Points (GCP) for georeferencing to WGS 84 UTM. The 20 yellow points represent check points. Their 3D coordinates (E, N, H) were determined with RTK GNSS (accuracy better than 2cm) in the field and through virtual surveying. The resulting root-mean-square errors of the differences are: RMSE E = 4.8cm, RMSE N = 2.7cm and RMSE H = 5.5cm. A proper overall quality measure of the planar coordinates E and N – if at least 20 check points are available – is the Approximate Circular Error at 95% confidence level as defined in the *Manual of Photogrammetry*, Fifth Edition, ASPRS, pages 991-992 : $ACE(95\%) = 2.4477 \cdot 0.5 \cdot (RMSE E + RMSE N)$. Given the above RMSE, ACE(95%) becomes 9.2cm and the vertical accuracy at 95% confidence level ($1.96 \cdot RMSE H$) becomes 10.8cm. Given a maximum GSD of 4cm in this project, these results confirm the rule of thumb that planimetric and vertical accuracies are of the order of

two and three pixels respectively. In addition to the two overall quality measures outlined above, vector plots were drawn to enable detection of systematic errors which may indicate weaknesses in the adjustment. Figure 3 shows that the orientation of the errors in the left part differs from the right part, suggesting that the use of more GCPs would improve the result.

SURVEY QUALITY

The above method of accuracy assessment is based on comparing measured points with check points, and it is commonly used by field surveyors who traditionally aim at high point accuracy. However, such an assessment disregards the benefits of aggregating many points with lesser accuracy to represent lines or surfaces. In Figure 4, the red profile is based on connecting distinct points measured by a surveyor in the terrain; the distance between consecutive points is large. The green profile is generated by virtual surveying which enables points to be collected at small intervals, thus yielding a better representation of the terrain shape. The accuracy of the individual points of the green profile is less than those of the red profile, but because there are so many of them, the quality of representation of the actual terrain feature of interest, i.e. the profile, is better.

DESIGNING CONSTRUCTION WORKS

UAS surveys are usually limited to 'as built' or 'as is' mapping projects. To be useful for staking out property corners and other demarcation tasks, the payload capacities and

navigation accuracy of UAS needs improvement. This does not mean that UAS would always be unfit for designing construction works. Generally UAS is suitable for any project where data density prevails over accuracy. An example where UAS was successfully applied for design purposes was when capturing a motorway interchange in Belgium as part of a project to design a noise barrier. A Sirius drone from MAVinci was used to obtain aerial images with GSD 4cm and overlap 80% at a flying height of 140m. The images were georeferenced using 10 GCPs which were measured by RTK GNSS with an accuracy of 1cm, thus enabling the generation of a 3D model with 10cm accuracy in which the noise barriers could then be designed (Figure 5). Another successful design project was the acquisition of stereo imagery with GSD 1cm and 70% overlap covering a 250m trajectory of urban street for repair purposes using a VTOL (Aibot X6 from Aibotix). The images were

◀ *Figure 4, Two profiles: red was measured in the field, green by virtual surveying.*

▲ *Figure 5, Designing a noise barrier in a virtual landscape.*

Series on Experiences with UAS

This article is the fourth in a series of articles focusing on experiments carried out to test the aptness of Unmanned Aerial Systems (UAS) for a broad spectrum of potential applications. An Unmanned Aerial Vehicle (UAV) is the carrier of sensors and systems used for geodata acquisition. The platform together with the on-board sensors constitute an UAS. The applications may include land administration, map updating, landslide and dike monitoring, and biodiversity and heritage conservation. UAS technology is a low-cost alternative to classical manned aerial photogrammetry and is obviously growing mature. Feel free to contact us if you would like to contribute: Wim van Wegen, editorial manager, wim.van.wegen@geomares.nl or Mathias Lemmens, senior editor, m.j.p.m.lemmens@tudelft.nl.

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acquired at a flying height of 50m and with a distance of 5m between successive exposure positions (Figure 6). One surveyor could perform the planning and air survey in less than two hours. Using around 120 images, processing was completed overnight so that the entire project could be finalised within 24 hours. Figure 7 shows a detail of the features measured in the virtual model, a task which would require a field crew of three individuals.

BENEFITS

Not all surveying projects are suitable for virtual surveying, but for those which are the benefits include: cost savings, since feature extraction in the 3D model can be done much faster than in the real world; surveying is not hindered by logistics or weather conditions; and no revisits to the terrain are necessary, since the

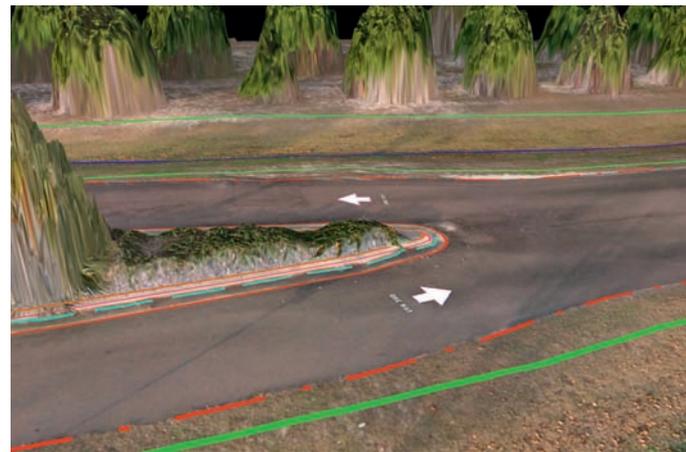
virtual world can be quickly uploaded in case of mistakes or omissions. It is also the safest way to acquire data under harsh conditions such as in mine pits, along unstable slopes or in road traffic. Furthermore, virtual surveying improves productivity, resulting in increased turnover.

CONCLUDING REMARKS

As with any new technique, UAS requires investments in equipment, software and time to climb the learning curve. However, the level of investment can be modest – the investment in software and training is less than 10% of an averagely priced UAS. Hence, apart from the initial purchase of the UAS, the financial burden is bearable. Surveyors will continue to measure point, line and area features and to apply their expertise – only now not merely in the real world but also in the virtual world. ◀



▲ Figure 6, Urban street: yellow lines indicate the position of the camera's projection centres.



▲ Figure 7, Road features extracted in a virtual model.

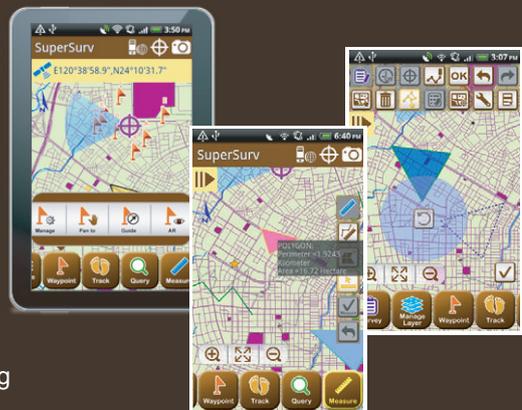


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INNOVATIVE PRO-POOR LAND TOOLS UNDER IMPLEMENTATION

Piloting the STD²M in Uganda

Series on LADM

This article is the first of a series on the Land Administration Domain Model (LADM) and its implementations. The upcoming issues of *GIM International* will cover worldwide developments related to LADM. For more information on this series, or if you would like to contribute, please contact the editorial manager: wim.van.wegen@geomares.nl

By 2030, 60% of the world's population, or about 5 billion people, will live in urban areas; 78% of them will be in less developed regions. UN-Habitat highlights that the urban slum population is expected to increase to 1.4 billion by 2020. Most people living in slums do not have registered land rights, are not covered by conventional cadastres, and are excluded from other 'benefits' of urbanisation. Informal settlements or slums are defined as lacking one or more of the following five conditions: security of tenure, access to water, access to sanitation, durable housing quality and sufficient living space.

Rather than focusing merely on issuing individual freehold titles, the Global Land Tool Network (GLTN) is promoting the concept of a continuum of land rights (Figure 1). Across this continuum, different

tenure systems may operate either by individual and/or group claims and may change over time. Conventional land-titling approaches have largely failed to deliver the expected results because the existing

technical solutions are expensive, inappropriate for the range of tenure found in developing countries, or unsustainable either financially or in terms of available capacity. Instead, a range of land tenure options is more appropriate. While the concept is incrementally and widely accepted in the global discourse, a new set of land administration and information management systems is necessary to implement and support it. GLTN partners are motivated to assist governments, land professionals and poor communities in both urban and rural areas to improve tenure



Danilo Antonio is a programme officer within the Global Land Tool Network (GLTN) unit of UN-Habitat. He is the task team leader of STD²M and also works on other pro-poor land tools, land projects and activities.

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Jack Makau is a country programme officer with Shack/Slum Dwellers International, and has been involved in many urban development projects over the last 12 years. He is also currently

assisting SDI work in several countries.

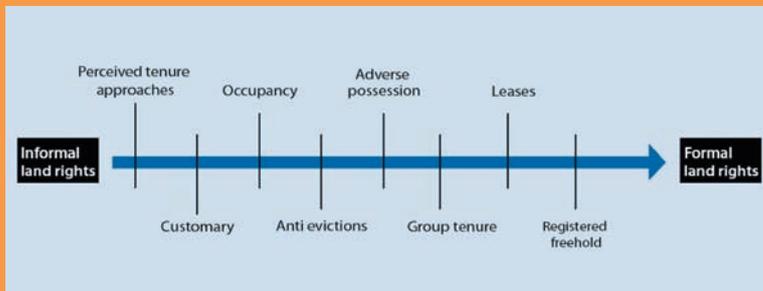
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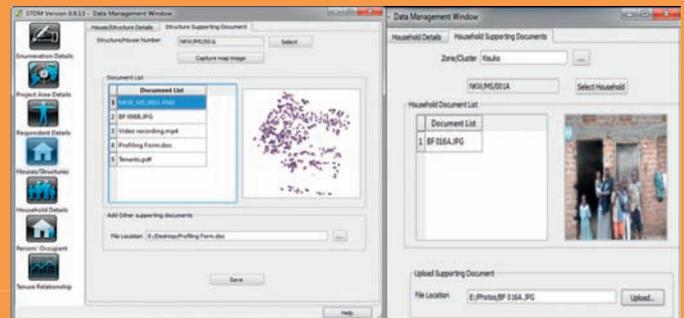
Samuel Mabala is the commissioner for urban development in the Ministry of Lands, Housing and Urban Development, Uganda. He is also the coordinator of the Secondary Cities

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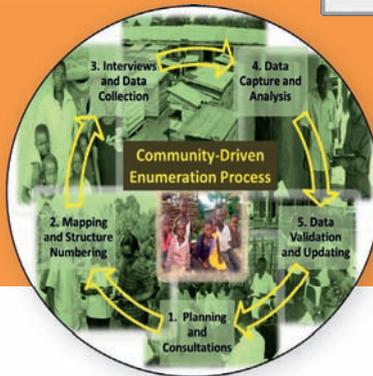


▲ Figure 1, The continuum of land rights.



▲ Figure 3, Supporting documents.

► Figure 2, The enumeration and mapping process.



security at scale and are committed to bridging the identified gaps. By now, stakeholders are aware of the emergence of a potential solution: the Social Tenure Domain Model (STDM). The STDM is a more flexible land information system that can handle various types of land rights and claims, particularly in informal settlements. It is based on a global standard (the Land Administration Domain Model). The STDM is a specialisation of the ISO 19152 Land Administration Domain Model, and this standardisation enables data integration.

PARTICIPATORY ENUMERATION

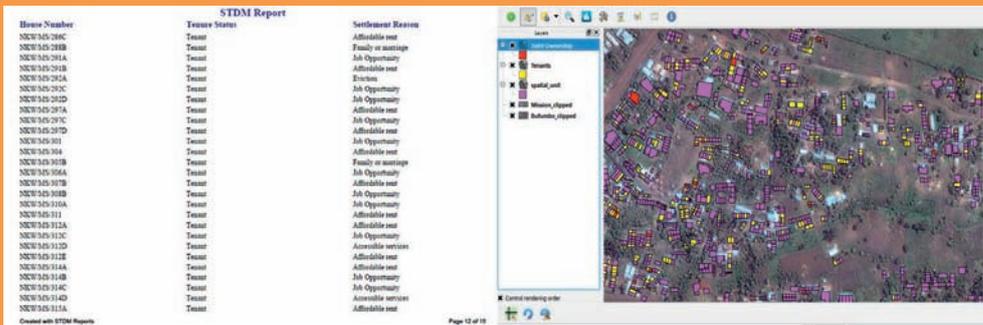
The aim of developing the STDM is to support and implement the concept behind the continuum/range of land rights. A first STDM prototype, developed by UN-Habitat, the International Federation of Surveyors (FIG) and the faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente, was launched during the FIG Congress in Sydney, Australia, in 2010. UN-Habitat continues to work on its enhancement and further development in three areas: adding

more functionality, improving the user-friendliness of the software, and reshaping the STDM to cater for the information needs and requirements of the informal settlements. Data acquisition is performed as participatory enumeration. This is an innovative approach whereby the people who are being enumerated are involved in the inception, design, management, implementation, analysis and use of the data. Participation can provide transparency and build trust: once accepted, local residents can easily co-operate and will provide the information required – resulting in improved data-gathering and better data. Participation means self-empowerment: residents initiate and retain control of the process, and actually own the process. Moreover, women have a critical role in participatory enumeration. The data about informal settlements is needed for a range of purposes: to enable residents to demand their rights as citizens, to improve land tenure, to plan for the provision of infrastructure and services, to redevelop/upgrade the slums, to guide housing improvement, land allocation

and adjudication, and to use in land administration and information systems.

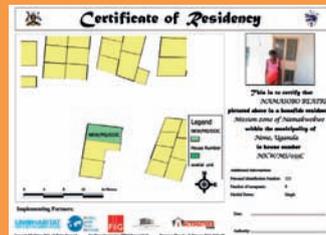
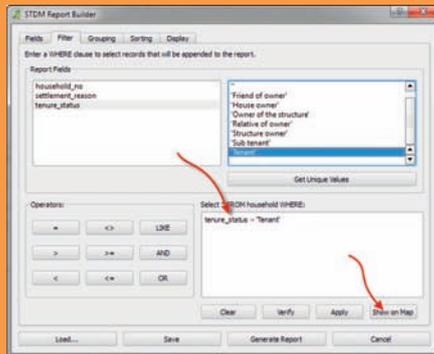
PILOT IN UGANDA

STDM software was tested in the municipality of Mbale in Uganda for wider learning and application. The long-term objectives are to address the land information requirements of women and men living in slum communities, to build their capacity for using and applying the land information systems based on free and open-source software packages, and to mainstream the thinking behind the continuum of land rights. This will form a basis for dialogue between local communities and cities in negotiations for improving tenure security, inclusive planning and enhancing access to basic services and infrastructure. A pilot was facilitated by Cities Alliance and FIG and supported by UN-Habitat, GLTN Secretariat, Slum Dwellers International, the Ministry of Land and Housing and Urban Development, Actogether (a leading urban NGO) and the Municipality of Mbale. The Mbale Slum Federation took the lead in policy-based and consultative



▲ Figure 5, Producing reports and maps.

▶ Figure 4, Generating reports.



▲ Figure 6, Generating certificates.

dialogues with local authorities on community mobilisation, sensitisation, capacity development, mapping, household interviews, enumeration, and data collection and analysis. At the core of the project implementation were the community leaders and members of the informal settlements. The field enumerators were actively engaged throughout, from the project preparation and consultation up to data analysis, validation and updating. The existing 'structures' were digitised from the available satellite imagery to produce initial maps. Using a printed map, assigned enumerators numbered all existing structures and houses in the slum settlements using a unique code. They also made use of handheld GPS to identify available community facilities such as water points, public toilets, dumping grounds, roads, community centres as well as newly constructed houses/structures, and updated the map accordingly. Enumeration teams conducted house-to-house interviews to fill in a questionnaire. In addition, they collected supporting information such as documents or photos with a unique code painted or written in the background for each structure. The slum federation leaders and enumerators were trained on how to use the STDM to enter and analyse the data and produce reports. As a quality assurance measure, community

members validated the gathered information. After the validation period, enumeration teams and slum federation leaders entered all the data into the STDM system, with the initial digital maps being updated in the process. Some slum federation leaders and members were trained to manage the system and to continue the updating process. The entire process is illustrated in Figure 2.

DATA GENERATION AND ANALYSIS

For the STDM pilot in Uganda, satellite imagery was used to produce a settlement map wherein structures, houses, roads, water points and suchlike were digitised. Data was entered into the STDM via MS Excel. Thanks to the STDM plug-in (part of Quantum GIS components), almost any type of document, scanned image and text, photo or video could be uploaded into the system (Figure 3). These supporting documents could link the parties' (individual, group or household) tenure status to a specific spatial unit such as a physical structure (as used in the pilot), land or other properties. Using a 'report builder' (Figure 4), various tenure relationships could be presented including overlaps. The report builder enabled automatic reports to be generated including a matrix of the information or a specific map showing the selected data/information (Figure 5). Since the STDM promotes

the continuum of land rights, the 'certificate composer' will be of significant benefit once the legal arrangements are in place and once the authorities have decided which tenure instrument to provide. For the pilot area, the communities and authorities have initiated discussions to produce certificates of residency (Figure 6). While these may not be instruments for tenure security, the community members find them useful since such certificates will open up more development opportunities for them and provide them with their first step on the tenure ladder.

RESULTS AND IMPACT

The STDM was tested and proven to be technically sound for addressing the information requirements of both informal settlers and government authorities alike. Community members are able to use and interact with the STDM system and can manage and update the information confidently. Data analysis has informed community plans to pursue priority projects such as roads, lighting, water and sanitation. Communities are now negotiating with local authorities on possible community development initiatives as informed by data collected using the STDM. The process provides an opportunity for the authorities and slum communities to initiate dialogues for inclusive planning, access to basic services and infrastructure, and potential tenure security improvement. Data generated, such as house numbers, will be used as the basis for a physical address system which will in turn enhance slum dwellers' access to other services. An international training course for trainers and an educational workshop on STDM use and application were held. The trainers will form part of the group that is expected to champion the use and application of STDM. A regional learning centre was established in Kampala, Uganda, for capacity development and future requirements of STDM use and application,

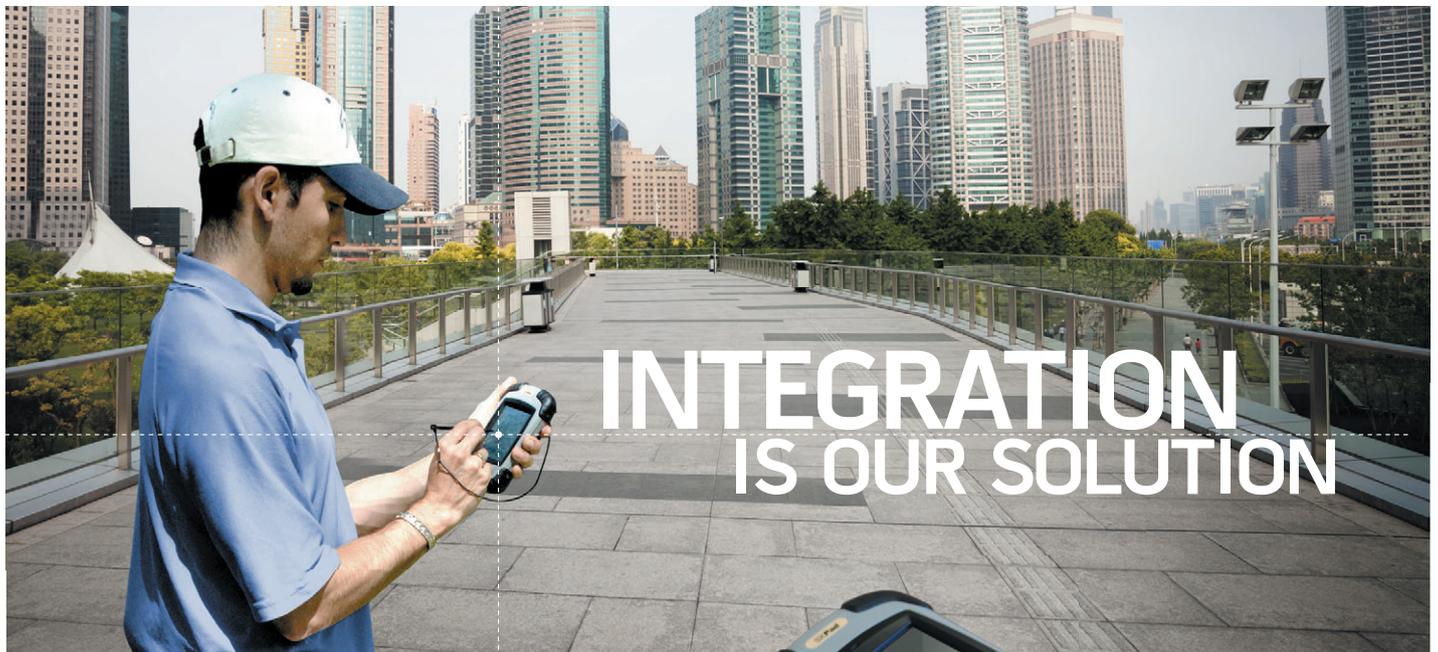
particularly in the region. With the successful implementation of the STDM pilot in Uganda, the demand for its application and implementation has steadily increased, extending to include potential use in other contexts such as natural resource management, land dispute resolution in post-crisis situations, national land administration and customary tenure. While these are all possibilities, the STDM development team felt that focus is needed to produce an STDM version which will be most useful for tenure security improvement for the poorest of the poor. With partners, a strategy is currently being developed for the way forward. Building on the experiences from the pilot, the STDM will be further improved at a technical level, and it is planned to scale up the capacity development initiatives on the use and application of the

STDM. With partners' support, it is envisioned that an STDM will be rolled out in some countries through participatory enumeration for the purposes of addressing the information requirements of

the urban poor, improving tenure security and upgrading settlements. An STDM training session will be provided during the FIG Working Week for Young Surveyors in Abuja, Nigeria, in May 2013. ◀

FURTHER READING

- Antonio D. (2011), Social Tenure Domain Model: Towards Addressing the Information Requirements of Informal Settlements. FIG Working Week 2011, Marrakesh, Morocco.
- Augustinus C. (2010), Social Tenure Domain Model: What Can it Mean for the Land Industry and for the Poor? FIG Congress, Sydney, Australia.
- Augustinus C., Lemmen C. and Oosterom P. V (2006), Social Tenure Domain Model – Requirements from the Perspective of Pro-poor Land Management. FIG Regional Conference, Ghana.
- Deininger K. and Enemark S. (2010), Land Governance and the Millennium Development Goals, In *Innovations in Land Rights, Recognition, Administration and Governance*, World Bank, GLTN, FIG and FAO.
- ISO/TC211 (2012), ISO 19152:2012 Geographic Information – The Land Administration Domain Model.
- Zevenbergen J. and Haile S. (2010), Institutional Aspects of Implementing Inclusive Land Information Systems like STDM, FIG Congress, Sydney, Australia.



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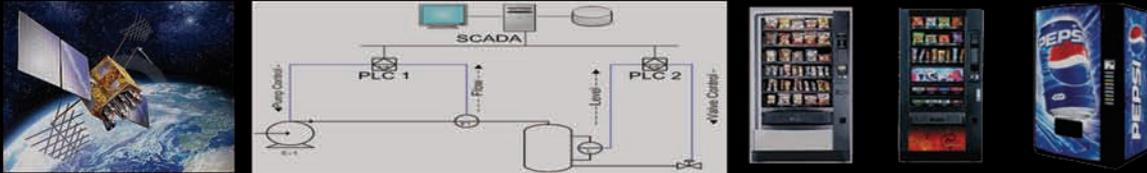
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NEW AUGMENTED REALITY STANDARD

A Milestone in Standardisation

Augmented Reality (AR) has many use cases; however, it is not as widely used in location-based service (LBS) applications as it could be. An open, standard, royalty-free specification for Augmented Reality content will help to expand the AR user base by separating data publishing from data visualisation software. The first AR markup format specification, ARML 2.0, has been drafted by members of the OGC as a candidate OGC standard. This article introduces use cases for ARML 2.0, as well as background information on the new format.

Much has been written about Augmented Reality – the visualisation of information about a person, place or object as a computer graphics overlay on an image of the physical world – and about its numerous potential applications in daily life, revolving around navigation, exploration and interaction.

NAVIGATION

AR offers an alternative to a map when a user is trying to find an unfamiliar destination. An AR-assisted service allows the user to see the physical world, in real time, while viewing labels on landmarks and arrows that provide helpful directions. The labels and arrows are superimposed and ‘georegistered’

with the street or other physical world features. Ideally, just as with good map-based navigation services, the user only sees information that is useful for immediate decision-making (Figure 1).

EXPLORATION

If the user does not have a specific destination in mind, an AR-assisted tour guide allows the user to explore an area with the help of overlaid annotations. Annotations can be visual and/or auditory, such as audio guides in a museum, and may even provide precisely the same content as a tourist brochure or guidebook.



Christine Perey, principal of PEREY Research & Consulting, Switzerland, leads a global community of experts who seek to reduce barriers to open and interoperable AR

content and experiences.

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Martin Lechner is the CTO of Wikitude, Austria, the developers of one of the leading AR browsers. He chairs the ARML 2.0 Standards Working Group within the Open Geospatial Consortium,

comprising more than 50 members.

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Blair MacIntyre is an associate professor of interactive computing at the Georgia Institute of Technology, USA, and directs the Augmented Environments Lab. He leads the AR Game Studio

and Argon AR Web Browser projects.

✉ blair@cc.gatech.edu

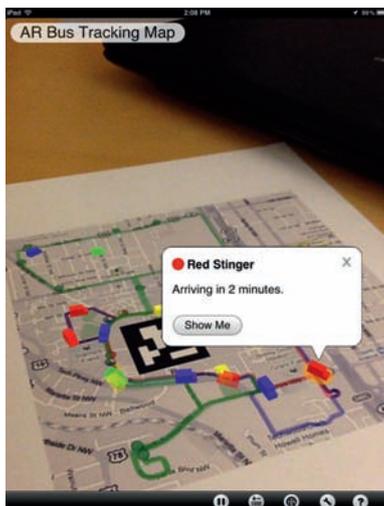
► Figure 1, AR in an automotive navigation service.



▼ Figure 2, AR-assisted campus tour.



► Figure 3, A printed map with real-time bus tracking.



Anywhere that the mobile device's location and orientation can be determined by the device, the real world 'lights up' with data. When a compass detects changes in the user's orientation, different information appears. The information presented is always contextual, as with any LBS application, but the ability to superimpose information on the real world associates the digital data with a person's experiences in more meaningful ways. Rather than being merely a collection of 'points of interest,' an AR-enhanced tour guide can provide rich, context-based background – images, sound, video or 3D models – aligned with only that which captures the tourist's attention at a specific point in time (Figure 2).

INTERACTION

Maps are another way of learning about one's surroundings from a different perspective. AR-enabled maps allow printed maps to be enhanced with time-sensitive LBS content when desired yet retain their traditional ease of use. For example, an AR viewer can be used with an AR-assisted map showing bus routes to display, in real time, whenever the information is required, the user's current location and expected arrival time of the buses at the user's stop (Figure 3).

AUGMENTED REALITY OBSTACLES

Despite these and many other potentially interesting use cases, Augmented Reality remains, to most people, a futuristic novelty. Data that is suitable for use in AR, such as geospatially referenced annotations, is currently constrained to publishing in proprietary software silos, like the databases of popular AR 'browsers' such as Wikitude, Layar and Junaio. Complex content that could be valuable to users in AR, such as the 3D building models used in Google's, Apple's and Nokia's map applications, is difficult and expensive to develop.

Additionally, there are too few users to justify the effort needed for publishers to make their data available in more than one proprietary AR data format. But what if the data could be prepared once,

in the authoring environment of a publisher's choice, and used on many platforms and in many applications? A standard markup protocol will accelerate the ability of service providers to make their data available for use by a larger potential audience with AR-assisted applications.

AR MARKUP LANGUAGE

An AR markup format is squarely in the crosshairs of the Open Geospatial Consortium and, in the autumn of 2011, members of the OGC took up the challenge. The ARML (Augmented Reality Markup Language) 2.0 Standards Working Group (SWG) was formed to address the need for an open standard which content publishers can use for specifying how their content will be shown in AR browsers and other AR applications.

ARML 2.0 TECHNICAL OVERVIEW

ARML 2.0 is an XML grammar, allowing a developer to describe virtual objects, their appearance and their behaviour in an AR scene. It is based on concepts of existing standards such as the OGC Geography Markup Language (GML) Encoding Standard, the OGC KML Standard and COLLADA (from the Khronos Group). ARML 2.0 currently focuses on mobile, visual AR but builds on top of a generic object model to support other types of AR in the future.

The objects that are observed and augmented in the AR scene are called Features. Features have one or more Anchors that locate them in the AR scene. An Anchor defines the spatial relation between the Feature and the digital object that represents the physical object in the augmented scene. Typical examples of Anchors include geospatial locations. The following types of Anchors are available in ARML 2.0:

1. (Geo)spatial Anchors describe the location of a Feature using fixed coordinates (e.g. WGS84 coordinates, etc.). Points, lines and polygons are allowed.
2. Trackables describe the location of a Feature using tracked targets (a QR code, marker, reference image, 3D model, etc.). As soon as the referenced Trackable is detected in the video stream delivered by the camera, the Trackable becomes the location of the Feature in the AR scene. The Tracker specification is open-ended, allowing different implementations of ARML2.0 to support different sorts of vision-based tracking.
3. RelativeTo Anchors describe locations relative to other Anchors or objects already located in the AR scene. This allows an entire scene to be constructed based solely on the location of one particular object.

VISUAL ASSETS

While Anchors describe the location, VisualAssets describe how the Feature appears in the AR scene. ARML 2.0 supports the following types of VisualAssets:

1. 2D VisualAssets, such as HTML content, images or plain text
2. 3D models

VisualAssets are projected onto the Anchor they are attached to. After being correctly placed in the scene, they can be modified by applying 3D transformations, such as rotation and scaling. Additionally, VisualAssets can be set to always face the user instead of being statically oriented, and custom scaling modes can be

applied to control the maximum and minimum size of the VisualAssets, based on the distance to the user. Similarly, VisualAssets can be set to visible or invisible based on certain criteria, such as the distance of the user to the VisualAsset, or whether a particular VisualAsset is currently selected by the user. ARML 2.0 does not prescribe specific 3D model formats, but instead aims to provide a way for different kinds of content to be located in the physical world.

Figure 4 illustrates an example of an ARML 2.0 use case. The hotel represents one of the Features in the augmented scene; the hotel's geolocation is the Anchor, and the grey box holding information about the hotel represents the VisualAsset in the augmented scene.

Finally, and similarly to the way in which HTML and ECMAScript (the standardised version of JavaScript) interact with each other, ARML 2.0 also includes ECMAScript bindings to allow developers to dynamically modify the properties of each object in the scene, or react to certain events, most notably user clicks and objects entering or exiting the current field of vision. By providing a complete set of ECMAScript bindings, arbitrary non-trivial AR applications can include ARML2.0 content without being limited in how it is presented or interacted with.

The ARML 2.0 specification will be implemented in the Wikitude World Browser and the Wikitude SDK, as well as in Georgia Tech's AR-enabled web browser, Argon. (Unlike the 'AR browsers', Argon v2.0 is an experimental web browser with AR capabilities, allowing more seamless integration of AR and web content. Argon 1 is available now for iOS; Argon 2.0 will be available on multiple platforms, and as an open source project, later this year.) Before any OGC candidate standard can be adopted by the OGC membership, it must be put to the



▲ Figure 4, A typical example of ARML 2.0.

test of implementation in at least two instances, and it is hoped that these systems will provide robust implementation examples.

INTEROPERABILITY

Once the ARML 2.0 has been implemented, interoperability testing will need to follow. First, there will need to be a common understanding of what interoperability in AR content and experiences truly means. Once agreement has been reached on a preliminary definition of interoperability, an approach to testing and content sets will be developed and distributed openly.

Around the same time that the ARML 2.0 will be implemented, many new smartphones sporting hardware acceleration for AR will be introduced onto the market. Suppliers will have the option of pre-loading an OGC standard-compliant AR viewing application on their new devices.

CONCLUSION

Many obstacles must be overcome for AR to become a ubiquitous and valuable addition to personalised mobile computing. A common, royalty-free AR data markup language for use by data publishers and software application developers is one of the necessary steps. Thanks to the co-operation of the market leaders in the OGC who are delivering ARML 2.0, this markup language will soon be an international standard. Once it is widely implemented in platforms and applications, it will offer users more choices for exploring and consuming geospatial data. ◀



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Doha Declares Its Intentions at the Second High Level Forum on Global Geospatial Information Management



◀ Participants at the Second High Level Forum on Global Geospatial Information Management in Doha, Qatar.

Wu Hongbo, United Nations Under-Secretary-General for Economic and Social Affairs.

EXCHANGE FORUM

The Forum was preceded by an Exchange Forum, attended by members of the private sector, research and development institutes and government representatives. In the Exchange Forum, the participants committed to continually exchange ideas and practices with the wider community to advance the objectives of the United Nations Initiative on Global Geospatial Information Management (UN-GGIM). Professor Orhan Altan,

As an outcome of the Second High Level Forum on Global Geospatial Information Management, the Doha Declaration affirms the importance of having a stable, credible and reliable national geospatial information infrastructure in each country built on internationally recognised standards, to integrate, manage and deliver geospatial information for timely, evidence-based and authoritative decision-making and policy formulation on location-based development issues, including disasters and humanitarian needs.

During the Second High Level Forum on Global Geospatial Information Management held in Doha, Qatar, from 4 to 6 February 2013, policymakers, ministers and other delegates

from 60 Member States along with representatives of industry professional societies gathered in the Qatar National Convention Centre to exchange and discuss further implementation of geospatial information in governments' decision and policy-making. By the end of the summit, the Doha Declaration also contained statements on their commitment to working together as an international community under the co-ordination of the United Nations to improve a sustained, operational, global geodetic reference frame and to support increased demand for positioning and monitoring applications with associated societal and economic benefits. Additionally, the Forum affirmed the importance of an agreed set of authoritative core

global geospatial reference datasets that are needed to support global sustainable development activities and to work jointly towards the preparation, improvement and maintenance of these core datasets.

The Forum in Qatar was opened on Monday 4 February by Sheikh Hamad Bin Jassim Jabor Al-Thani, Prime Minister and Minister of Foreign Affairs of Qatar, together with Sheikh Hamad Bin Jabor Bin Jassim Al Thani, President, Qatar Statistics Authority, Dr Vanessa Lawrence, co-chair of the UN Committee of Experts on Global Geospatial Information Management, professor William Cartwright, president of the Joint Board of Geospatial Information Societies, and

Geomares Publishing (publisher of *GIM International*) attended the Second High Level Forum on Global Geospatial Information Management in Doha, Qatar, on 4-6 February 2013. Regular reports in *GIM International* will keep the geomatics sector informed of UN-GGIM developments.



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► *Panel discussion during session 4:
Geospatial Information and
Sustainable Development.*

member of *GIM International's* Editorial Advisory Board, will provide a report on the Exchange Forum in next month's issue of *GIM International*.

TOPICS

The Second High Level Forum on GGIM consisted of the following five thematic sessions: 'Building a National Geospatial Information System: Driving Forces, Success Stories', 'Future Trends in Geospatial Information: Growing the Information Base, Promoting Greater Use', 'Developing an Effective Global Geodetic Reference Framework and Supporting Location-Based Services', 'Geospatial Information and Sustainable Development (Rio+20)' and 'Challenging in Developing Core Global Reference Datasets'. With presenters, a panel discussion and input from the floor, all topics were widely discussed and information was exchanged between the Member States, resulting in the aforementioned Declaration.

CASE STUDIES REQUESTED

The document entitled 'Future Trends in Geospatial Information' was shared with the delegates as an advanced final draft following discussions during the 2nd session of the United Nations Committee of Experts on Global Geospatial Information Management in New York, USA, 13-15 August



2012. The document is intended to serve as an important reference piece for informing the geospatial community. To improve the basis of the document, the UN-GGIM secretariat is requesting geospatial users, industry, national mapping and cadastral authorities and academic institutes to submit case studies which show the value of geoinformation. Co-chair Vanessa Lawrence emphasised that while UN-GGIM has already received a number of valuable case studies, many more are needed. These vendor and software-neutral case studies will be used to demonstrate the importance of geospatial information to all nations, and hence show the Member States the multitude of ways in which geoinformation can add value to decision-making and policymaking. This will therefore support UN-GGIM in its drive to help ensure that all nations are able to benefit from a reliable,

accurate and authoritative geospatial information base.

NEXT SESSIONS

At the invitation of the National Administration of Surveying, Mapping and Geoinformation (NASG) of China, UN-GGIM decided to co-organise the Chengdu Forum to be held in Chengdu, Sichuan Province, China, from 24 to 26 April 2013. The Chengdu Forum will be focused on development and applications in urban hazard mapping; it will discuss priority issues related to the development and provision of consistent geospatial information and modelling techniques to enable nations to better understand and implement natural hazard impact mapping and analysis in urban environments. The Chengdu Forum will be a technical forum. The third session of the United Nations Committee of Experts on Global Geospatial Information

Management is scheduled to be held in Cambridge, United Kingdom, from 24 to 26 July 2013. This meeting is coupled with the Cambridge Conference 2013 which will take place from 21 to 27 July.

Durk Haarsma

FURTHER READING

See <http://ggim.un.org/> for all documentation related to UN-GGIM summits.

To submit a case study, please contact Cecille Blake of the UN-GGIM Secretariat at blake1@un.org.

For requirements and templates for case studies, see www.gim-international.com.

MORE INFORMATION

<http://ggim.un.org/>



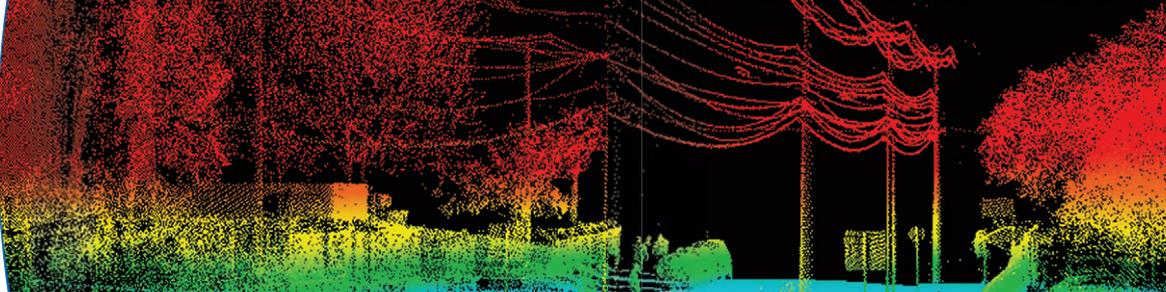
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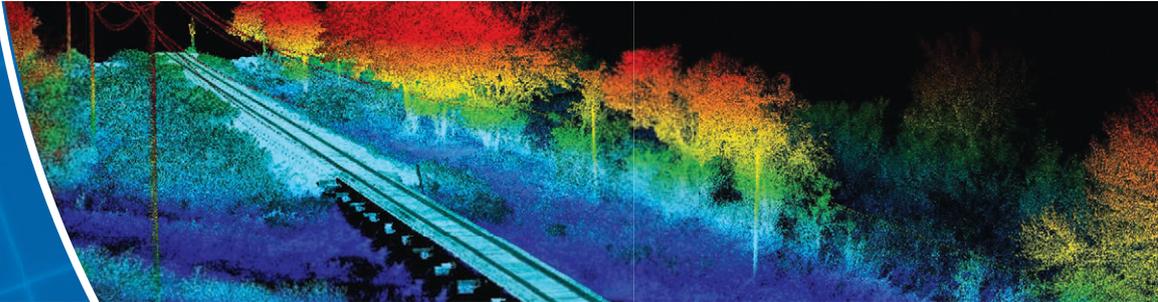
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AVISYSTEM/TAXUS SI

A Truly Photogrammetric UAV

The AviSystem UAV was made on the assumption that it was intended to be a photogrammetric system. Hence, when designing the AVI, it was created for long, stable, precise and efficient flying – photogrammetric flying.

The Polish company Taxus SI Ltd. embarked on the AviSystem project in 2009 with support from the European Regional Development Fund. Poland's best specialists in the field of unmanned aircraft construction were invited to join the project. Design of the entire system, of which the main element is the AVI drone, was completed within two years.

The AVI is an electrically powered sailplane with a span of 3.5m. The construction is made of carbon fibre which is lightweight, durable and resistant to damage as well as ensuring a high-quality surface finish. The airframe is very well integrated with the autopilot which precisely retraces flight routes and at the same time controls the photographic module. Two types of



▲ AVI right before take-off.

non-metric digital cameras are used: a DSLR Canon 550D and SIGMA DP2 compact cameras (one for RGB and the second is modified to capture near infrared), both with fixed focal length lenses. The current battery capacity allows a flight time of one hour and is adapted to the conditions of UAV missions in Poland (flying with visual sight). The battery can be enlarged if necessary.

Standard photogrammetric missions provide images for areas of several square kilometres (from one flight), maintaining a 5-15cm ground resolution from the altitude of 250-400 metres AGL. Several flights can be integrated to cover areas that

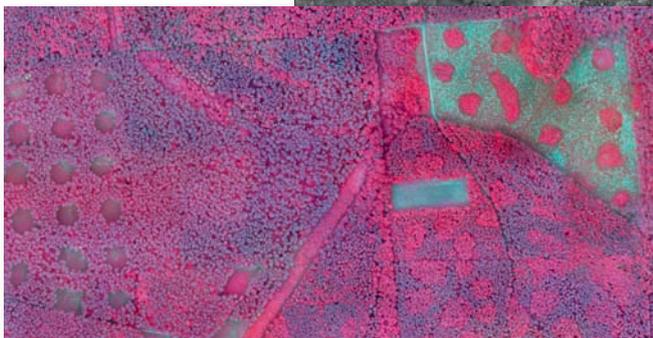
are dozens of square kilometres wide. The AviSystem team uses EnsoMOSAIC desktop software for image processing since it allows for full process control, although other software brands can also be used. During 2011 and 2012, AVI carried out hundreds of test flights and orders covering a total area of approximately 250 square kilometres. This article provides some interesting examples.

GLUCHOW – CIR IMAGERY

Gluchow forest is situated in central Poland and is surrounded by agriculture land and several villages. It belongs to the Warsaw University of Life Sciences – SGGW, the Faculty of Forestry. It was also one of the ▶

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.

► A small part (0.52 sq km) of one flight over Gluchow forest in RGB, the same part in Infrared channel (middle), and in Color Infrared (under).



test polygons for AviSystem. In 2010, flights were performed over a 1.6 sq km section of Gluchow forest. Images were acquired by two Sigma DP2 cameras which registered the RGB and NIR ranges. A 15cm ground resolution was achieved from the altitude of 350m AGL. Images were processed in the aerial triangulation and orthorectification processes into RGB and CIR orthophoto maps using EnsoMOSAIC software. The CIR material was used to evaluate the health of spruce stands: sick, weak or dead spruce trees are visible in the bluish-green colour, in contrast to the red or pink colour which indicates healthy individuals.

CZAJKA – INDUSTRIAL INFRASTRUCTURE
The Czajka sewage treatment plant

in Warsaw is in the final stages of construction. It is situated in the north-eastern part of Poland's capital city and occupies the area of 0.5 sq km. It is a modern facility which will provide a wastewater treatment for a large area of the city and improve the environment. Together with the Warsaw Geodesy Enterprise (WPG S.A.), it was decided to prepare the orthophoto map for documentation and inventory of the construction phase. In December 2012, AVI performed one flight at an altitude of 250m AGL. RGB images were taken with a Canon 550D camera with 28mm lens. Using EnsoMOSAIC, the orthophoto map was prepared with 5cm resolution. It was used to present a detailed infrastructure of the area around the Czajka plant.

ROAD CONSTRUCTION MONITORING

There has been considerable investment in Poland's road infrastructure in recent years, and photogrammetry is useful for many purposes in this industry. The test performed with the AVI photogrammetric UAV reveals that aerial images can serve to document the status and monitor the progress of work.

The A2 motorway connecting Warsaw and Poland's western border is one of the country's key projects. The AVI fitted with a Canon 550D camera performed a flight above the Wiskitki (near Zyrardow) junction at 250m twice: in September 2011 and August 2012. The area of the site was approx. 1.6 sq km and the resulting orthophoto achieved 5cm ground resolution. The second flight, conducted after the 2012 UEFA European Football Championship, perfectly illustrated the progress in the construction phase within the space of a year.

FOREST MONITORING AND BORDER VERIFICATION

In Poland, forestry management is based on 10-year forest management plans. Silviculture activities and natural disasters (hurricane, fire, flood, etc.) make it necessary to monitor the state of the forest and to update forestry maps and databases. The AVI was of particular benefit in a 2.5 sq km forest area where storm had randomly broken down fragments of pine stands. A quick analysis performed on the orthophoto map (15cm resolution) allowed the cause of pine weakening to be detected (unsuitable for the habitat conditions) and a species composition for renewal to be well chosen.

In another case, AviSystem was very useful in verifying the borders of silviculture and harvesting operations and for updating forest numerical maps. In July 2012, the AVI UAV carried out several one-hour flights over the Krasnystaw forest complex (in the south-east of Poland)



▲ *Ksiaz Wielki - an example of an orthophoto map of 12.25 sq km out of a total of 88.5 sq km of the S7 express road.*



▲ *A good impression of AVI's size.*

in order to provide up-to-date images for orthophoto map creation. At over 20 sq km, the area was notably wide. Images were taken with a Sigma DP2 camera from 250m altitude. The whole orthophoto map was integrated with layers of the forest numerical map and GPS measurements.

PERFORMANCE CHALLENGE TEST

The S7 express road connects Warsaw and Krakow. The southern part is scheduled for modernisation, which is currently in an early

This represented the ideal opportunity to test the performance capabilities of the AVI airframe. It was equipped with a Sigma DP2 camera and flight routes were prepared for the altitude of 350m AGL, maintaining ground resolution of 15cm for the images. Good weather conditions allowed several days of missions to be performed for consecutive segments of the S7. The AVI achieved an excellent result: in the period between 11 September and 20 October 2012, the UAV

between the images acquired from the UAV and those from manned aircraft shows that images captured by a UAV are of higher quality, producing clear, high-contrast and vivid colours. The flight altitude of the manned aircraft certainly had an impact, since the air photos were taken through a thick layer of autumnal air.

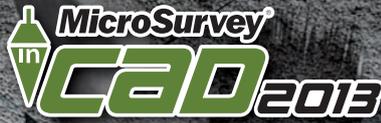
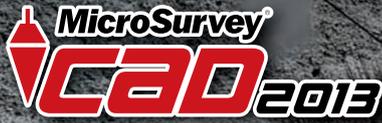
AviSystem has now been in active operation for two years, and it was exploited particularly intensively in 2012. The company has two working AVI units, although one is predominantly a reserve. A visual and technical assessment of the condition of the aircraft shows that the number (nearly 300) and intensity of missions (the AVI has had to fly in winds of over 15 m/s yet still provided images which produced good-quality ortho) has not had any great impact. At a similar level of exploitation, the AVI can withstand many more years of service. In summary, it can be concluded that the initial assumptions on which the AVI was based have been entirely confirmed during service.

In the future, AviSystem is destined for true photogrammetric missions in which quality of data matters, the performance (predisposed to relatively large areas) and repeatability of the mission are important, and durability of the structure is appreciated. ◀

A UAV captures high-quality images, producing clear, high-contrast and vivid colours

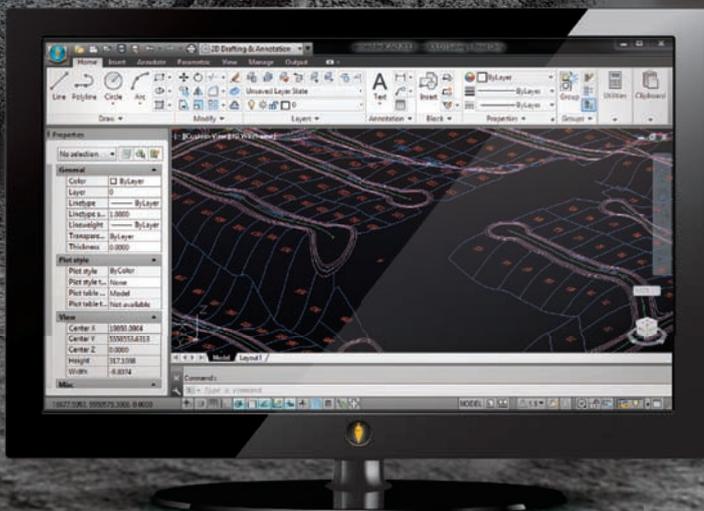
phase of design. In September 2012, the regional office of the General Directorate for National Roads and Motorways ordered the preparation of an orthophoto map and vectors of building silhouettes within a 1km buffer along variants of S7 route, which amounted to a total area of nearly 140 sq km. This task was undertaken using a manned aircraft equipped with a Hasselblad H3DII-39 camera. The orthophoto map was prepared using EnsoMOSAIC PRO software, as also used for the photogrammetric UAV-acquired data.

conducted no less than 83 successful flights, acquiring 31,340 images for an area of approx. 88.5 sq km. Mission operations were agreed with the FIS office and Krakow airport flight control (part of the area lies within the CTR). The test is being continued – within free resources, orthophoto maps are being prepared for the successive flight routes. It is worth emphasising that data quality (images and flight log data) and EnsoMOSAIC features allowed trouble-free image processing. The extra effort involved in the test aside, a comparison of quality



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World Bank Conference on Land and Poverty

The 2013 World Bank Conference on Land and Poverty, to be held in Washington DC, USA (8-11 April 2013), will bring together representatives from governments, the development community, civil society, academia and the private sector. The conference aims to foster dialogue and sharing of good practices relating to the diversity of reforms, approaches and experiences that are being implemented in the land sector around the world. FIG is one of the collaborating partners for this event and many colleagues from FIG will be contributing towards the success of this year's edition. The range of subjects on the agenda is broad, and includes presentations and discussions on some of the innovations initiated by FIG in its co-operation with partners such as the Global Tool Land Network (GLTN), UN Habitat, FAO and the World Bank itself. The theme of the event is 'Moving towards transparent land governance: evidence-based next steps'. The profession will demonstrate its consideration and contribution to that which is applicable, appropriate and affordable, i.e. which is fit for purpose.

On the continuum of land rights, for instance, it calls for recognising and protecting various prevailing possibilities with adequate provisions to navigate and transition through the options. Land rights can range from legitimate to legal, and from documented to non-documented. Rights can be recorded on paper or on a more sophisticated device, such as a tablet with advanced mobile computing technology and support. Similarly, the approach to securing land rights can range from using



World Bank, Washington DC, United States.

'barefoot' practitioners to highly qualified and competent experts. The continuum of data accuracy should be fit for the intended purpose and intended users, and can range from sub-centimetre accuracy to kilometres. The event in Washington is taking place just one month before the FIG Working Week in Abuja, Nigeria (6-10 May 2013), where further discussions and considerations will be the focus of attention.

DOHA DECLARATION

FIG remains optimistic with the issuance of the Doha Declaration on Advancing Global Geospatial Information Management at the recently concluded Second High Level Forum on the United Nations Global Geospatial Information Management in Doha, Qatar, in February 2013.

Among other things, participants resolved to:

- Commit to working together as an international community, under the co-ordination of the UN, to work with all stakeholders to improve a sustained operational global geodetic reference frame

and infrastructure, and to support the increasing demand for positioning and monitoring applications with associated societal and economic benefits

- Affirm the importance of having a stable, credible and reliable national geospatial information infrastructure in each country built on internationally recognised standards that will integrate, manage and deliver geospatial information for timely, evidenced-based and authoritative decision-making and policy formulation on location-based development issues, including disasters and humanitarian needs
- Affirm the importance of an agreed set of authoritative core global geospatial reference datasets that are needed to support global sustainable development activities and to work jointly towards the preparation, improvement and maintenance of these core reference datasets.

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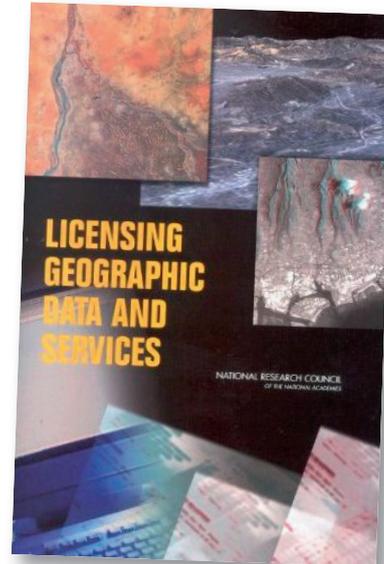
www.gsd.org

Legal Interoperability It Is!

Awareness is rising that legal interoperable spatial data is among the key factors for successfully utilising spatial data infrastructures. Legal interoperability was introduced in the *Licensing Geographic Data and Services* publication of the NRC's Committee on Licensing Geographic Data and Services back in 2004, and is now the key discussion topic of the GSDI working group on legal and socio-economic aspects. To increase awareness and capacity to this end, the GSDI working group on legal and socio-economic issues organised a workshop on the harmonisation of licences at the GSDI13 conference in Quebec in 2012. The group also published a chapter in the book *Geographic Data and the Law* by Katleen Janssen and Joep Crompvoets, in which many relevant legal topics are discussed by leading scholars.

In Europe, the European Commission recently provided grants to two projects aimed at increasing the legal interoperability of data. The first project is the European Location Framework (ELF), led by the Norwegian Kartens Statverk. This pilot project will foster the wider use of geoinformation and enable the creation of innovative value-added services. The purpose of this project is to deliver the ELF required to provide up-to-date, authoritative, interoperable, cross-border, reference geoinformation for use by the European public and private sectors. The work package 'Sustainable access and use' will create a policy for a sustainable legal interoperability consistent with European legislation (INSPIRE and PSI legislation) and policy.

The second project concerns the Legal Aspects of Public Sector



Licensing Geographic Data and Services.

Information 2.0 project, with the KU Leuven in charge. This project will identify the remaining legal barriers and obstacles to the access to and re-use of public sector information (PSI) on the European content market, and provide measures and tools to overcome or reduce these barriers and to stimulate the progress of the European market towards open data. The Licensing Framework work package will identify the essential elements for the development of public sector-body licensing policies that are interoperable, allowing the combination of datasets from multiple public-sector data suppliers in a cross-border information product or service. It will further develop a licensing framework that promotes the open availability of PSI for any use, while at the same time allowing sufficient flexibility to take into account the needs of particular public sector bodies or national legal frameworks.

Although the scope of these projects' objectives is Europe, the

legal interoperability issue does not stop at the European border. The heavy involvement of members of the GSDI working group on legal and socio-economic aspects in both projects should ensure that the experiences and results will be shared with the rest of the world, and likewise that developments taking place elsewhere in the world will be taken into account to bring the legal interoperability of geographic information one step further on a global scale.

Dr Bastiaan van Loenen is chair of the GSDI Legal and Socio-Economic Working Group of the GSDI Association. He is a faculty member and member of the OTB Research Institute for the Built Environment at the Delft University of Technology in The Netherlands.

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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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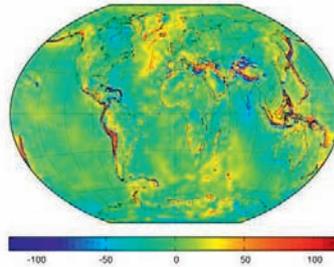
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Since the predecessor of the IAG, the 'Mitteleuropäische Gradmessung', was established back in 1862, IAG is celebrating its 150th anniversary in 2012. Celebrations will climax in September 2013 at the IAG Scientific Assembly in Potsdam, Germany. This location is particularly significant since the first ever meeting, in April 1862, was organised by General Baeyer, as representative of the Kingdom of Prussia, in Berlin. The participants were several geodesists from the Kingdom of Saxony and the Austrian-Hungarian Empire.

IAG Commission 2, 'Gravity Field'

The IAG is organised into Commissions, Services, the Global Geodetic Observing System (GGOS) and the Inter-Commission Committee on Theory, each of which has established a number of Working Groups and Study Groups. Details can be found in the Geodesists' Handbook [1]. The four Commissions, their goals and their activities will be highlighted in a series of forthcoming articles. The 'Terms of Reference' for Commission 2 acknowledge that the accurate determination of the gravity field and its temporal variations is one of the three fundamental pillars of modern geodesy (the other two being geometry and Earth rotation). This is essential for applications in positioning and navigation, metrology, geophysics, geodynamics, oceanography, hydrology, cryospheric sciences and other disciplines related to the Earth's climate and environment. IAG Commission 2 was established to promote, support and stimulate the advancement of knowledge, technology and international co-operation in the geodetic domain associated with the Earth's gravity field. It has close collaboration with most other IAG components through joint working groups and study groups that provide a cross-disciplinary stimulus for work in several topics of interest to the geodetic community.

Commission 2 has the scientific responsibility for and promotes the advancement of science, technology and international co-operation in the following topics: Terrestrial, marine and airborne gravimetry; Satellite gravity field observations; Gravity field modelling; Time-variable gravity field; Geoid



Gravity anomalies from the global model GOCO03s combined with terrestrial and satellite altimetry data up to degree and order 720 (image courtesy: Roland Pail, TU Munich).

determination; Satellite orbit modelling and determination; and Satellite altimetry for gravity field modelling. Commission 2 is grouped into a number of sub-commissions as below (with the chairpersons listed in brackets):

- SC2.1 Gravimetry and Gravity Networks (Leonid F. Vitushkin, Russia)
- SC2.2 Spatial and Temporal Gravity Field and Geoid Modelling (Yan Ming Wang, USA)
- SC2.3 Dedicated Satellite Gravity Missions (Roland Pail, Germany)
- SC2.4 Regional Geoid Determination (Hussein Abd-Elmotaal, Egypt), with six regional sub-commission groups: Europe, South America, North and Central America, Africa, Asia-Pacific, Antarctica
- SC2.5 Satellite Altimetry (Xiaoli Deng, Australia)
- SC2.6 Gravity and Mass Displacements (Shuanggen Jin, China).

The Commission 2 Steering Committee comprises president Urs Marti (Switzerland), vice president Srinivas Bettadpur (USA), Oliver

Baur (Austria), Rene Forsberg (Denmark), Maria Cristina Pacino (Argentina), Yoichi Fukuda (Japan), and the chairs of the six sub-commissions.

The main tasks of Commission 2 in the future will include:

- Analysis of GOCE data and the release of improved global gravity field models (satellite-only models, and in combination with terrestrial data and altimetry)
- Promoting GRACE follow-on missions for assuring the continued monitoring of global gravity and mass flux changes
- Defining and realising a new Gravimetric Reference System to replace the outdated IGSN71 and assuring the future of the comparison campaigns of absolute gravimeters
- Establishing a service for easy access to satellite altimetry data
- Assisting GGOS in the realisation of a World Height System
- Improving the knowledge of the interaction between gravity change and mass transport
- Assisting the regional sub-commissions in establishing contacts and acquiring data.

Commission 2 will co-ordinate a number of sessions at the upcoming IAG Scientific Assembly to be held in Potsdam, Germany, 1-6 September 2013, to celebrate the 150th anniversary of the IAG [2].

MORE INFORMATION

1. <http://bit.ly/XYhh8e>
2. www.iag2013.org/IAG_2013/Welcome.html
www.iag-aig.org

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Maps and Graphics for Blind and Partially Sighted People: Commission Update

The ICA Commission on Maps and Graphics for Blind and Partially Sighted People has been revitalised since its renewal at the 2011 ICA General Assembly, under the leadership of professor Alejandra Coll Escanilla (Universidad Tecnológica Metropolitana de Chile (UTEM), Santiago). The work of this Commission, notably in Latin America, highlights the importance within ICA of this sector of map producers and users.

A progress meeting, held at UTEM in August 2012, heard about a new book soon to be published: *Tactile Cartography and Disability*, by authors Teresa Barrientos and sociologist Victor Ramirez from UTEM's Center for Tactile Cartography (CECAT). The meeting also formed the IV International Meeting of the research project entitled 'Generation touch mapping and learning materials for the understanding of global warming and its relation to natural events', sponsored by PAIGH (Pan-American Institute of Geography and History) and attended by researchers from Argentina, Brazil, Chile and Peru.

Also in 2012, researchers and practitioners from the Commission developed a workshop for 37 blind and partially sighted children and their teachers at the 26th Children's Book Fair in Santiago de Chile. Later, the Commission conducted a training activity called 'Tactile Cartography, Geography: Pupils with special educational needs', attended by professionals in kinesiology, psychology, history, geography, special education and pedagogy in technology, representing many educational establishments. The participants discussed challenges of



Waldirene Ribeiro (Brazil), Commission Vice Chair, presents aluminium-based tactile maps.

disabilities and engaged in exercises and knowledge-sharing, helping to develop training programmes using the latest generation of maps which had been crafted in aluminium and then thermoformed. The Commission, through CECAT, also organised a workshop on 'Signs and Activities with Books with Textures' at the 17th Conference of Education, part of the 32nd International Book Fair in Santiago.

In October 2012, CECAT, the UTEM School of Design and the National Public Library System (SNBP) held a seminar with Philippe Claudet (France), academic educator of children with visual impairments and founder of the Les Doigts qui Révent association. He presented educational material developed by his association and facilitated an exchange of educational experiences and research concerning tactile book production, illustrated with tactile images, for children with visual impairments.

During 2012, CECAT received specialised equipment ('tíflotécnico') through co-operation between the Spanish Ministry of Education, the ONCE Foundation for Latin America, the Organization of Ibero-American

States for Education, Science and Culture (OEI), and the Chilean Ministry of Education. This consisted of Text Impact Printer Braille machines, with converters and software, contributing to the Education Resource Center for People with Visual Impairment, co-ordinated and managed by CECAT and members of the Commission: this will support the specialised production of Braille and large-print textbooks for all levels of education, and of resources for geographical research, mapping training, technology transfer and outreach.

For 2013, plans include a training workshop entitled 'Teaching Geography through Maps: Tactile teaching materials for teachers of pupils with SEN in Latin America' to be held in Central America and further afield. The Commission will also participate in a pre-conference Symposium in August 2013 in Dresden, Germany.

Alejandra Coll Escanilla,
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ISPRS HEADQUARTERS

see address of secretary general

ISPRS Test Project on Urban Classification and 3D Building Reconstruction



The two test sites: Vaihingen (Germany) on the left, and Toronto (Canada) on the right.

The automated extraction of urban objects from data acquired by airborne sensors has been an important topic of research in photogrammetry for at least two decades. One problem that has hampered progress is a lack of standard datasets for evaluating object extraction results, so that the outcomes of different approaches can usually not be compared experimentally. In order to overcome this problem, ISPRS Working Group III / 4 ('3D Scene Analysis') has provided a benchmark dataset that can be accessed via that Working Group's website. Currently, two urban datasets are available, each with different characteristics: Vaihingen /Enz (Germany) and Toronto (Canada). For each test site, high-resolution aerial imagery with orientation data and airborne laser-scanner data are available. Reference data were generated for the detection of buildings, roads, trees and cars, as well as for the

generation of detailed 3D models of building roofs. Researchers who wish their methods for object detection or building reconstruction to be evaluated can submit their results to ISPRS WG III/4, which will carry out the evaluation based on the reference data and provide feedback within a few working days. The evaluation results are also made available online on the website related to the test.

Some 20 research groups have submitted results since the test was established in 2011. A first report was presented at the 22nd ISPRS Congress in Melbourne, Australia. Thanks to the success of the test, WG III/3 decided to keep it going, and participants may submit their results for evaluation at any time. The Working Group is currently working on a third dataset that is to be released in the course of 2013. Furthermore, a themed issue of the *ISPRS Journal of Photogrammetry*

and *Remote Sensing* dedicated to urban object detection and 3D building reconstruction is to be published in 2014. The deadline for the submission of papers for potential inclusion in this themed issue is 31 May 2013.

MORE INFORMATION

www.isprs.org
[www2.isprs.org/commissions/
comm3/wg4/tests.html](http://www2.isprs.org/commissions/comm3/wg4/tests.html)
<http://bit.ly/WBJbfk>

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Future events

► APRIL

Geomatics Meeting

Rabat, Morocco
from **08-09 April**
For more information:
E: rsc2013@amjgistes.org

8th EARSeL Imaging Spectrometry Workshop

Nantes, France
from **08-10 April**
For more information:
W: <http://bit.ly/Tpa6TS>

World Bank Conference on Land and Poverty

Washington, DC, USA
from **08-11 April**
For more information:
W: <http://econ.worldbank.org/landconference2013>

AAG Annual Meeting

Los Angeles, CA, USA
from **09-13 April**
For more information:
E: meeting@aag.org
W: www.aag.org/annualmeeting

SPAR International 2013

Colorado Springs, CO, USA
from **15-18 April**
For more information:
E: lmurray@divcom.com
W: www.sparpointgroup.com/International/

International Forum "Integrated Geospatial Solutions-the future of Information Technologies"

Moscow, Russia

from **17-19 April**

For more information:
E: dmordovina@sovzond.ru
W: www.sovzondconference.ru/eng

JURSE 2013

São Paulo, Brazil
from **21-23 April**
For more information:
E: jurse2013@dpi.inpe.br
W: www.inpe.br/jurse2013

35th International Symposium on Remote Sensing of Environment

Beijing, China
from **22-26 April**
For more information:
E: isrse35@ceode.ac.cn
W: www.isrse35.org

Interexpo GEO-Siberia-2013

Novosibirsk, Russia
from **24-26 April**
For more information:
E: nenasheva@itcsib.ru
W: <http://geosiberia.ssga.ru>

8th International Symposium on Mobile Mapping Technology (MMT 2013)

Tainan, Taiwan
from **29 April-03 May**
For more information:
E: mmt2013@conf.ncku.edu.tw
W: <http://conf.ncku.edu.tw/mmt2013/>

► MAY

FIG FIG Working Week

Abuja, Nigeria
from **06-10 May**
For more information:
W: www.fig.net/fig2013

8th Annual International Symposium on Environment

Athens, Greece
from **13-16 May**
For more information:
E: atiner@atiner.gr
W: www.atiner.gr/environment.htm



ISPRS Hannover Workshop

Hannover, Germany
from **21-24 May**
For more information:
E: secretariat@ipi.uni-hannover.de
W: www.isprs.org

Oracle Spatial and Graph User Conference

Washington, DC, USA
On **22 May 2013**
For more information:
E: info@locationintelligence.net
W: www.locationintelligence.net/dc/#oracle

► JUNE

HxGN LIVE

Las Vegas, NV, USA
from **03-06 June**
For more information:
E: contactus@hexagonconference.com
W: <http://conference.hexagon.com/>

33rd EARSeL Symposium 2012

Matera, Italy
from **03-06 June**
For more information:
E: secretariat@earsel.org
W: www.earsel.org/symposia/2013-symposium-Matera/index.php

13th SGEM GeoConference and Expo

Albena, Bulgaria
from **16-22 June**
For more information:
E: sgem@sgem.org
W: www.sgem.org

MundoGEO#Connect LatinAmerica 2013

São Paulo, Brasil
from **18-20 June**
For more information:
E: imprensa@mundogeo.com

Calendar Notices

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

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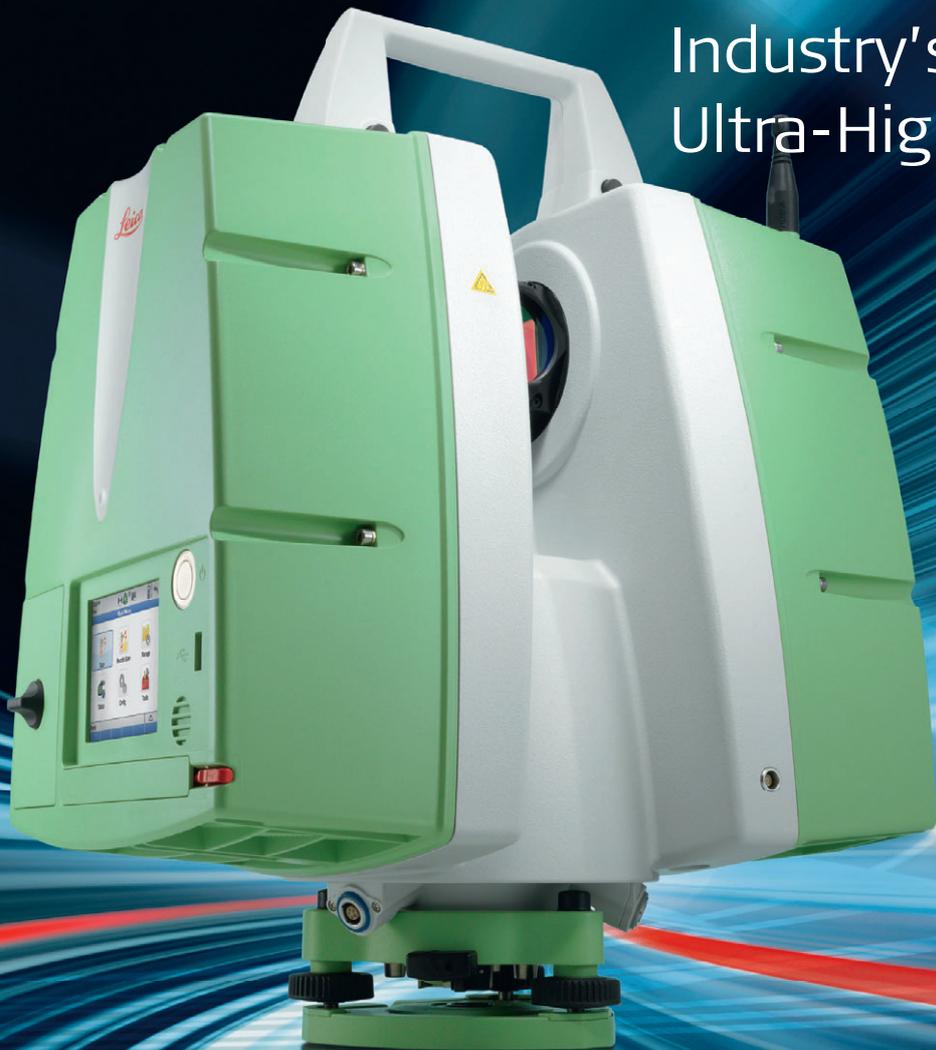
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