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Germany's Progress towards a Multi-dimensional Cadastre

3D Data for Environmentally and Energetically Relevant Topics

CHRYSSY POTSIOU GIM International Interview

PRO-POOR LAND TOOLS Effectiveness within Peri-urban Areas

3D RECONSTRUCTION OF THE POLLERA CAVE, ITALY


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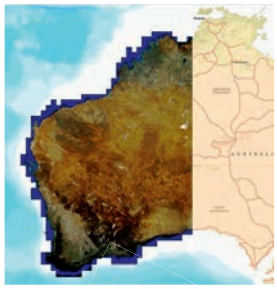

On the front cover of this month's *GIM International*: This image represents the Kreishaus Recklinghausen, the administrative building of the government of Recklinghausen, Germany. The level of detail of this building equates to the specification for LoD3 of the CityGML standard. The model includes a digital terrain model (DTM) with break lines. From page 18 onwards you will find an article about Germany's progress towards a multi-dimensional cadastre.

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BPA WORLDWIDE BUSINESS

Not Just Technical

"The global progress that has been achieved in the last five to ten years in geospatial information provision and management is greater than what was achieved in the whole history of cadastral development before then," says the newly installed president of the International Federation of Surveyors (FIG), Chryssy Potsiou. I had the privilege to interview her during a kick-off event she organised on 24 January 2015 in her home city of Athens, Greece. You will find the interview on page 14 of this issue of *GIM International*. In Athens, Chryssy Potsiou set the stage for her term in the coming four years. The theme was 'Ensuring the Rapid Response to Change, Ensuring the Surveyor of Tomorrow', which precisely mirrors the new president's message: the profession needs to be ready and think ahead to predict future changes. This all sounds quite obvious, but – as long as most of us lack a crystal ball on our desks – it will certainly prove a challenge in the next few years. Even those who pretend to have forecasting abilities are often proven wrong, when technical developments catch up with them. One of the few things we know for sure is that our world is changing faster than ever before. Hordes of people are flocking from rural areas to cities; those cities are mostly located in vulnerable coastal areas and lack the infrastructure to host all the newcomers. The result: immense informal settlements on the outskirts of these metropolises. When people have neither the means nor the ability to move, they stay where they were born or raised but remain prone to land grabbing and evictions. While those developments are mainly taking place in the developing world, the challenges for urban and rural areas alike are no less complicated in the so-called 'developed world': environmental hazards in heavily built-up areas and population decrease in many remote areas, to name but a few. In all these cases, geomatics provides applications for securing rights, offering solutions or delivering underlying data for decision-making. And geomatics is becoming more important thanks to new techniques such as UAVs, ever-faster processing software, crowdsourcing and more. App-like, all-in-one smart solutions which simplify the process from sensor to information, and the increasing interconnectivity of total stations, GNSS and mobile devices are two of the most promising developments of our time, states Potsiou. But, as she told me, we are not just technical people. The technology is very important, but policies and responsible thinking ensure that the technology is deployed as effectively as possible. It is therefore right that people in positions like Chryssy Potsiou are putting dots on the horizon and sketching a future for the profession, just as her predecessor Teo CheeHai did. Maybe the path is not perfectly clear to everybody, but at least the destination is: a place for the surveyor in the middle of our changing environment, putting technology to work for the betterment of humankind.

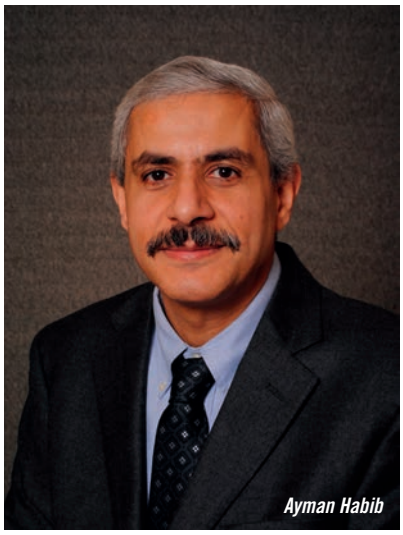
Photography: Arie Bruinsma

▲ *Durk Haarsma, publishing director*

Image-based Versus Lidar-based 3D Mapping: Is the Controversy Resolved?

3D mapping has evolved from an activity that is of interest to government mapping agencies into a product that is being sought after by a wide range of users for diverse applications. Photogrammetric mapping was traditionally the main source for satisfying 3D mapping needs, until Lidar technology recently emerged as a possible contender. With the introduction of Lidar systems, many people said that it was a pre-cursor to the demise of photogrammetry. However, with the emergence of dense matching techniques and digital photogrammetric sensors that are capable of capturing images with large overlap and side lap, we are now once again faced with views that these technological developments will have a significant impact on reducing the popularity of Lidar mapping. This controversy brings to mind similar sentiments after the introduction of the direct georeferencing technology, for providing the position and orientation of imaging platforms will eliminate the need for photogrammetric triangulation since we already have the georeferencing parameters for every image in the block.

This column is in no way claiming to resolve this controversy. It is merely highlighting that there are several factors we should consider when looking at these technologies. For example, we should be looking at the following aspects (listed in no particular order):


Ayman Habib

1. The ability of the sensor to work day or night and under different environmental conditions
2. The necessary prerequisites for a sensor to provide the 3D coordinates of features along the object space surface
3. The number of sensor observations that are required to provide the 3D coordinates along the object space surface
4. The ability of the sensor to provide observations pertaining to features beneath the visible surface
5. The ability of the sensor to provide 3D coordinates for surfaces with different textures
6. The complexity of the system calibration process and the constraints it imposes on the calibration test field
7. The ability of the sensor to facilitate a self-calibration procedure to mitigate the impact of problems in the system calibration process
8. The ability to have a built-in quality control procedure to evaluate the reconstruction outcome
9. The degree to which the system is relying on having accurate direct georeferencing information
10. The variety of the products that could be derived from the collected data by a given sensor
11. The ability of the sensor and associated processing algorithms to perform indoor and outdoor mapping
12. The complexity of the processing workflow for a given sensor technology to produce the desired output
13. The amount of data that needs to be collected and the constraints this would impose on the data acquisition process
14. The ability of having scalable sensors and a processing workflow that could be adapted to different data acquisition platforms with different payload and power requirements.

In summary, this column has aimed to list some of the factors that need to be considered when weighing up the pros and cons of different data acquisition technologies. It is important to make sure that we are not swayed by a preferential view that focuses only on the advantages of a given technology.

Bentley Systems Acquires Acute3D

Bentley Systems has acquired France-based Acute3D, the provider of Smart3DCapture software for reality modelling. Through reality modelling, observations of existing conditions are processed into representations for contextual alignment within design modelling and construction modelling environments. Rapid technology advancements in scanning and photography – and especially the burgeoning application of UAVs for these purposes – are making the capture of such observations broadly and continuously affordable in sustaining infrastructure.

▸ http://bit.ly/1DwY324

Smart3DCapture.

Merrick and Juniper Unmanned Announce Partnership

Merrick & Company's Geospatial Solutions (GSS) team has entered into a business partnership with Juniper Unmanned, a full-service provider of UAS solutions. The purpose of this new business relationship is to provide professional services and products to organisations that value growth chances in the rapidly emerging global UAS marketplace.

▸ http://bit.ly/1DwY4Tz

5 Questions to...

Kees de Zeeuw

The January 2015 issue of *GIM International* included a feature on an 'emerging new era in land administration'. We asked Kees de Zeeuw, director of Kadaster International, for his thoughts.

1. What is your opinion of the 'emerging new era in land administration'?

In my view, this era is not emerging – we are already acting in it. Within the profession it is widely understood that we have to deliver a global land administration now. The population is growing and the pressure on land and natural resources is increasing all the time. There are limits; land is scarce. There are too many land-related conflicts and disputes resulting in unequal access to land. Governments need a proper land information system to govern. It is more important to include all parcels and other spatial units of a country than to have highly accurate coordinates of each of those parcels. The real accuracy is in the quality of the described relationships between right-holders, the rights and the spatial units where those rights apply. Let's start by establishing rough land administration covering all the territories worldwide, including low-income areas. The land administration can be fine-tuned at a later stage.

2. What needs to be done?

The land administration challenge is that we cannot work for centuries to establish a well-functioning system. As Clarissa Augustinus recently said: let's solve the problem in our generation!

We have the technologies and approaches available – based on well-referenced imagery. We have very good companies and communities providing tools. These can be used for collecting evidence from the field as in Rwanda, Lesotho, Colombia and other countries. Results from the field can always be combined in a GIS with results of so-called 'automatic feature extraction', as explained in the feature in January. That means that objects, such as parcel boundaries, can be automatically determined from a digital image. This method could be used for the administration of large areas, saving a lot of time. Boundaries as indentified in the field can be simply drawn on an image, and be linked to the digital map. In this way, field work can be simple – by pen on an image – and the georeferenced data is of acceptable quality.

3. How should this be organised?

The different professional worlds are increasingly co-operating, as can be seen in the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). The worlds of mapping, land administration, remote sensing and statistics are meeting and working towards a global geospatial infrastructure. We can see similar approaches at both continental and country level. Recently, during an event in India, I joined a discussion on user-centric or citizen-centric approaches. Some colleagues see the new era as user-centric – without a role for the national land administration and mapping agencies – in which everything will be done by the people themselves with support from services 'in the cloud'. I disagree with that; national mapping agencies and land administration agencies are citizen-centric. Their services are available for all citizens, including the poor, and not only for people who are able to pay for the services of businesses – because that cannot be a sound foundation for a society. So users and citizens are not the same.

4. What is lacking?

Capacity is needed. Robin McLaren stated several times that FIG is representing only 350,000 professionals worldwide. Much more is needed – at 'grassroots level', such as in Rwanda where villagers received a crash course in measurement techniques so that they could collect data. Coordination and organisation of the land administration requires professional approaches. The primary key to success is cooperation between the public and private sector. Based on a rough calculation of the costs, between USD50 billion and USD100 billion are needed to create the data. That might sound like a large amount of money, but on a global scale this is not much at all.

5. What is your contribution?

At Kadaster International we have the ambition to become active and make inclusive land administration happen, on a worldwide scale, and within our lifetime. We know it can be done. But of course we cannot do it alone; we are a small player. Therefore, we challenge our colleagues and professional friends to share this ambition. We will continue to share our knowledge and use our network to bring stakeholders together wherever possible.

Geo-matching.com Adds CAD Software Category

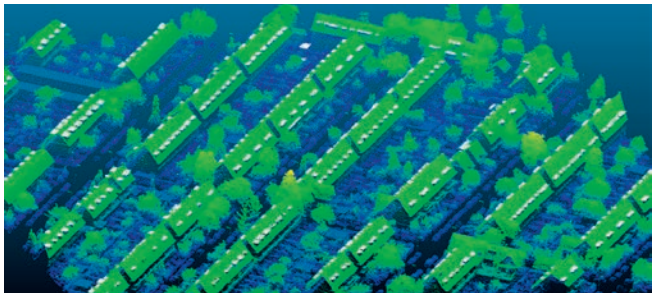
Geo-matching.com has recently added CAD Software to its broad spectrum of product categories. Pythagoras and Orthograph Architect are the first suppliers in this category. In addition to general specifications, detailed information is given about storage, interoperability and data analysis.

▸ http://bit.ly/1DwYdXn

Rotterdam Analyses City Lidar Data Using New Technique

From demolished offices and new dormer windows to recently planted trees: municipalities continuously keep an eye on changes in the city in order to optimally organise space. The Municipality of Rotterdam, The Netherlands, recently analysed 'Big 3D Data' from airborne Lidar data (elevation dataset) of Rotterdam very quickly using a new technique by the Dutch high-tech start-up GeoSignum.

▸ http://bit.ly/1DwYt80



Rotterdam's airborne Lidar data is analysed using Geosignum Pointer software.

Aeromao Launches UAV for Mapping Applications

Aeromao, a Canada-based manufacturer of fixed wing UAVs, recently released the Aeromapper 300, a UAV especially developed for mapping applications. The Aeromapper 300 is equipped with more than 25 different sensors, offering a wide range of applications for the professional geomatics user. All the sensors are available with swappable mount and automatic trigger. The autopilot triggers the sensor based on distance with respect to the overlaps and flight altitude. Relevant fields can be selected and entered during creation of the mission.

▸ http://bit.ly/1DwYiKx

The Aeromapper 300 UAV.

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

1. Promising 3D Portable Measuring Instrument Launched - http://bit.ly/1tZqgM3
2. Help! What Should We Do With All These 3D Points? - http://bit.ly/1BnvrDT
3. SPOT 7 Satellite Commercially Launched - http://bit.ly/1Az3UQW
4. 5 Questions to... Clarissa Augustinus - http://bit.ly/1wj5V6P
5. Collaboration on Obstacle Avoidance Technology for UASs - http://bit.ly/158ctIn

The famous Dew Drop Inn.

New Orleans Heritage Preserved with Pointfuse 3D Models

Laser scanner modelling software from Arithmetica is helping to preserve some of New Orleans' oldest and most historically important buildings. Using the Pointfuse point cloud processing software, heritage preservation project Scan-Nola is creating detailed 3D computer models directly from laser-scanned data. The resulting models provide digital preservation for often derelict or deteriorating structures that can be used for conservation and restoration works, as well as garnering interest and support from the local community.

http://bit.ly/1DwYvgL

15-metre Satellite Imagery Mosaic Released of Arctic Ocean

In response to the rapidly increasing demand for high-quality geodata of the Arctic Ocean, Earthstar Geographics (San Diego, USA) has compiled a detailed satellite imagery mosaic of the entire region and released it in map projections optimised for visualising the northern polar areas. TerraColor satellite imagery, long used by organisations and web mapping portals worldwide, provides an accurate, high-value mapping component for scientific research, navigation, logistics and natural resource exploration.

http://bit.ly/1DwYRnH

Satellite imagery of the Arctic.

GeoMax Releases New GNSS Receiver

GeoMax has introduced the Zenith25 Pro, which it says is built to last and designed with the future of GNSS in mind. The GNSS receiver supports GPS, GLONASS, Galileo, BeiDou and SBAS systems, providing superior position availability, especially in challenging measurement conditions.

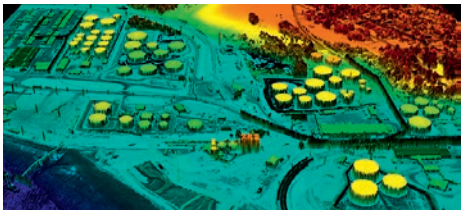
http://bit.ly/1DwYLwf

Zenith25 Pro.

DAT/EM Releases New Version of Photogrammetric Suite

DAT/EM Systems International has launched the 7.1 edition of DAT/EM software products including Summit Evolution, Landscape, Capture, MapEditor, Ortho+Mosaic, Airfield3D and Contour Creator. The advancements in the 7.1 DAT/EM Photogrammetric Suite represent the latest evolution in technology and are based on customer input and growth within the geospatial industry.

▸ **http://bit.ly/1DwZ6zO**



DAT/EM Landscape 3D point cloud software.

Pix4D and Aeryon Labs Create 3D Model of Christ the Redeemer Statue

Pix4D, together with Aeryon Labs and PUC University of Rio de Janeiro, have spearheaded the first accurate 3D reconstruction of the iconic Christ the Redeemer statue in Rio de Janeiro, Brazil. Using the Aeryon UAV for data acquisition and Pix4Dmapper image processing software for 3D reconstruction, the project team overcame challenging weather and geographic positioning in order to acquire the high-resolution images needed for the model. Read the full story in the next UAS edition of *GIM International*.

▸ **http://bit.ly/1F2rEiq**

Christ the Redeemer statue point cloud.

Thinking in End Products

Contractors have to deliver what their clients request, and it is common for those requests to be specified in written agreements. If the end product is a point cloud of planar coordinates with heights, the client will specify which criteria that end product has to meet. Since the creation of high-density digital elevation models (DEMs) has been a highly valued capability of airborne Lidar since its inception in the early 90s, the specifications of Lidar point clouds have evolved to centre on planar coordinates and their heights. Hence, after delivery, the client will validate whether the accuracy of the heights in terms of standard deviation is better than 5cm and the systematic error of the entire data is less than 5cm. The client will also check the point density and the homogeneity of the coverage. Furthermore, the written agreement may contain clauses about the ground filtering of the dataset. In other words, the heights have to refer to the bare ground, i.e. buildings, vegetation, cars, animals and suchlike have to be removed either manually or automatically. Another likely clause is that the acquired and filtered dataset must be resampled to an equidistant grid with a grid spacing of 50cm. Such an approach considers other data collected during the survey as 'chaff' to be separated from the 'wheat'.

The specifications on the deliverables will be based on the users' needs. But how should the users be defined when the client is a governmental agency who maintains one or more foundation geodatasets that cover the entire nation? To identify valued features, the agency will amass a focus group of (potential) users, including water boards, flood managers, inspectors of river dikes and coastal protectors. They will come together, discuss and agree on a set of features based on their common, present interests and budget constraints. What happens when user needs change over time? This can easily occur when previously unconsidered professionals discover the capabilities of the new technology for supporting their tasks. For example, environmental scientists may recognise that signal strength of the Lidar returns is a valuable asset for the solutions they are seeking, yet the original focus group may have treated signal strength as trash and tossed it into the vacuum of the digital inferno.

Indeed, professionals and laymen alike are used to thinking in terms of end products, and this is not a recent development as history demonstrates. After the founding of the Dutch Cadastre in 1810, surveyors were not obliged to hand in their original field sketches – the cadastral officers only attached value to the end products: the maps and the plot sizes. After their completion and computation, the sketches were discarded as worthless scraps of paper. Gradually it was realised that the field sketches contained invaluable information for staking out property boundaries and hence for settling quarrels between neighbours, so since 1878 the sketches have been carefully archived. This illustrates that data initially considered otiose can become of great value as a result of progressive insight. One often wishes that all the raw data could have been stored rather than just the end products, especially when one wants to trace changes over time for reconstruction or monitoring purposes. Surveyors using Lidar sensors would be doing such future users a great favour if they would save the original, raw data. Today, storage capacity is no longer an issue since an abundance of terabytes can be saved on desktop devices. The challenge nowadays is data management as rapid retrieval of data that cuts through space, time and attributes is crucial – and data should not end up as the proverbial 'needle in a haystack'. ◂

GIM INTERNATIONAL INTERVIEWS INCOMING FIG PRESIDENT CHRYSSY POTSIOU

The Surveying Profession Needs to **Think Ahead**

During a kick-off event in late January in Athens, Greece, Chryssy Potsiou took on the presidency of the International Federation of Surveyors (FIG) after having been elected at the four-yearly congress in Kuala Lumpur, Malaysia, last summer. Potsiou is the first woman to lead FIG. She has been active in FIG for many years and sees it as one of the main tasks of the federation to change the minds of governments in order to secure property rights for the millions of people currently lacking them.

Congratulations on the presidency! Can you tell our readers a little more about yourself?
Thank you! I studied surveying engineering at the School of Rural and Surveying Engineering at the National Technical University of Athens (NTUA). I graduated in 1982 and I finished my PhD in 1995. I started my research activity in photogrammetry and regularly participated in ISPRS conferences. Then gradually, over the years, I moved into the fields of cadastre, land management, property valuation, urban planning and formalisation of informal settlements. After graduation I worked at NTUA in various positions and in the private sector, eventually becoming an associate professor at NTUA.

How did you become active in FIG?
I started participating in FIG conferences after graduation and regularly presented my scientific work. Actually, I was one of the very few young surveyors within FIG at that time. Firstly, I was a correspondent member to Commission 7 of FIG. After several years of that I became a national delegate from the Technical Chamber of Greece (TCG) to FIG Commission 3 in 1999. Through my involvement in FIG my professional interests gradually changed from purely technical aspects to the management of land. I steadily gained more responsibilities in Commission 3 and went on to become chair of Commission 3 in 2007 and FIG vice-president in 2011, before becoming elected president just last summer.

▲ *FIG past president CheeHai Teo (2011-14) hands over the FIG chain of office to the new president Chryssy Potsiou.*

Why do you think FIG is important for the profession?
FIG supports international cooperation among its members for the progress of surveying in all its fields and applications, rather than only in focused, specialised technical disciplines, and in various regions all over the world as well. In addition, FIG has a close cooperation with global organisations like the UN agencies and The World Bank. That cooperation means that members have a better understanding of the value of our profession in terms of its contribution to society, the environment and the economy. FIG members understand the current global trends and the

world's needs in the context of improving their skills and methods in order to better serve the public and to maintain the sustainability of the profession.

You mentioned the cooperation with The World Bank and the United Nations. Do you have other partners in mind?
Improving cooperation at national level with our member associations, academic members, corporate members and affiliates such as the national mapping agencies and also with governments will help us to make a real difference in people's lives. Strengthening our relationships with our corporate members and the business sector, both outside and inside FIG, is also among our priorities, as well as improving our cooperation with sister organisations and regional associations.

What will be the main focus during your presidency of FIG?
Our main focus will be on providing an enhanced response to the changes we experience constantly in our lives, while ensuring a prosperous future for the profession in all regions.

You're the first woman to head up FIG. Is that important to you? And to others?
I was fortunate to be born in a country that provides free and equal access to education for both genders. This also applies to employment opportunities in Greece. Therefore, I do not consider my situation unique or unusual. I hope to see all people, all women, from all regions, have access to education and professional opportunities in general. We know there is still much to be done in this field and I will do my best to contribute to the global effort for the human rights of women, against discrimination and to equal access to housing, land and property rights. As far as other people are concerned, so far I can only say that this position is important to my Greek colleagues; at TCG and HARSE we have a common strategy to promote the current international trends and the best practices in the management of land in Greece for the benefit of the local society, the national economy and the environment, and in parallel to ensure the future of the profession here.

How do you view the 'new era for land administration'?
It looks very promising. The provision of reliable and current spatial information about land and property, and the rights to own and use property, as well as the value of these rights has gained global recognition amongst governments and international organisations regarding people's prosperity and well-being. Therefore land administration has become a top issue on the global agenda.

Do you foresee complete cadastral systems for the developing world in the near future?
The global progress that has been achieved in the last five to ten years in geospatial information provision and management is greater than what was achieved in the whole history of cadastral development before then. This progress is increasing at an enormous rate. We have moved from e-services to mobile services which, when applied to land administration, will very soon facilitate the establishment of cadastral systems in the regions most in need. In my opinion what may slow the procedure down is a lack of government determination to recognise property rights quickly and affordably, and that process is vital to the success of the cadastre.

What would be the most compelling reasons for governments to speed up?
Governments need to understand that housing is directly linked to economic development. We know from Hernando de Soto and his research that housing, regulated ownership rights and a functioning market are a way to build wealth. We try to prove to politicians through metrics and real numbers that recognising citizens' property rights improves the national economy very quickly, and the more they delay in doing so, the greater annual GDP loss they create. That is a reason governments should acknowledge and act upon.

What are you doing to convince them?
We are promoting the impact of our work in the implementation of the global sustainable development agenda. That is why we are here, that is what FIG is devoted to! Our vision is not just to do our job well, not even to do what we do better and more efficiently, but actually to create a better world around us. It's a lifestyle. If you participate in FIG and if you are active for a long period, you actually contribute to change. Every active individual FIG member contributes to change. From my own limited experience, I can say that I've seen things changing gradually. That is very exciting and rewarding. I hope I can influence that even more in my position from now on, especially through my activity in the formalisation of informal settlements, security of tenure, registration of property rights and provision of affordable housing.

How can urbanisation be estimated and how should the associated problems be tackled?
There is a constant flow of people from rural areas into urban areas as people search for ▸

Chryssy Potsiou

Chryssy Potsiou is president of the International Federation of Surveyors (FIG). Before that she was vice president and member of the Council of FIG. She has held several other positions within FIG. Potsiou is an associate professor at the School of Rural & Surveying Engineering, National Technical University of Athens (NTUA). During her academic studies she received scholarships from NTUA and TCG, and awards from the private sector. She graduated in 1982. Since 1992, she has been employed at NTUA. In parallel, she has worked as a consultant on several research programmes and projects. She has more than 30 years' experience in education, training and international capacity building. She was a member of the board of directors of the Hellenic Mapping and Cadastre Organisation and of KTIMATOLOGIO SA, the agency responsible for the implementation and operation of the Hellenic Cadastre. She is an elected member of the board of the Hellenic Association of Rural and Surveying Engineers (HARSE). She has spent 12 years as an active bureau member of the UNECE Working Party on Land Administration. In her professional career, she has written several publications and more than 140 scientific papers.

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better jobs, better opportunities and better futures. This will not change; urbanisation is inevitable. What the world must do is manage urbanisation. It will require massive development of infrastructure supported by all disciplines of surveying, including data collection and measurement, positioning and navigation, land administration, valuation, planning, construction management, coastal zone management and marine cadastre and so on, to support municipal governments in their growth. Geospatial information has changed the administrative concept. We are moving from a model of historic data to a platform of real-time information for the provision of services to facilitate mobility, energy saving, environmental protection and disaster management. Never in the past have natural disasters had such an impact as now because of the accumulation of populations in higher densities. As a result, most of our future professional activities will be in urban areas.

Do you feel there is enough interest in the problems in rural areas, with evictions and land grabbing, versus urbanisation?

Rural areas are also going through reform. However, in order to achieve better results in any reform, it is important to recognise existing tenure rights, access to land and sufficient compensation to enable displaced people to restart their lives and businesses somewhere else. Otherwise the continuing massive influx of poor and displaced people to the cities will be accompanied by a growth of peri-urban areas of informal development, creating even more social unrest and economic exclusion. Urbanisation is inevitable, but people living in slums does not have to be inevitable.

Which geomatics techniques do you regard as holding the most promise?

The rise of UAVs with cameras and laser scanners accompanied by advanced software to provide them with some autonomy and intelligence is one of the most promising developments we have seen. Their capacity to enable high-resolution orthophotos and 2D site map production at multiple zoom levels; beautiful 3D scenes and maps that can be navigated online; 2D and 3D measurements as well as change detection over time and automatic feature extraction, can enable authoritative and accurate information to be used by any modern land administration system. Developments in point cloud processing are also moving fast; UAVs are used for a broad spectrum of applications both in rural and urban areas and soon even within the built environment. In general, the current trends in software modernisation, making 'app-like', all-in-one smart solutions to simplify the process from sensor to information, and the interconnectivity of total stations, GNSS and mobile devices are two of the most promising developments of our times.

And what about crowdsourcing?

Geospatial information has changed the perception of how governments seek growth; reliable cadastres have a direct impact on lending practices and national economies. Governments are seeking innovative ways to encourage universal parcel recording as quickly as possible. Citizens also understand that innovation facilitates good decision-making for all people in the public and private sectors alike. The question is, how much can governments afford to provide? There is a need for increased capacity building in assessing the value of data derived through crowdsourcing. Authoritative data can be provided and assured by government agencies but also by crowdsourcing with the engagement of surveyors.

You attracted a lot of young people to today's kick-off event here in Athens. Is that important to you?

One of my objectives with organising this event in Greece, especially now that the country is in a difficult situation, is to offer some inspiration to young surveyors and to show them that they actually have a lot of opportunities and that they can change things. As an academic, I strongly believe that young surveyors all over the world have a promising future and a great role in facilitating change, providing innovative tools and reliable solutions, and implementing reforms in the management of land and the built environment. Young Greek surveyors in particular have a promising future in which they can contribute to Greece's economic and social recovery.

What would make you most proud at the end of your presidential term?

The successful implementation of any part of the new FIG Work Plan towards achieving the global sustainable development agenda goals, and enabling a real difference in people's lives, would make me proud.

What message would you like to convey to the readers of GIM International now, at the start of your presidency?

It is urgent that the surveying profession thinks ahead, predicts future changes, foresees the requirements of the next generation of citizens and provides structure for the way forward. It is our role to provide solution functionality, reliably and affordably for a complex and rapidly changing world that cannot wait. Management of natural disasters cannot wait, the need to support global sustainable development cannot wait, management of economic disasters cannot wait. We need to respond fast. ◂

I STRONGLY BELIEVE THAT YOUNG SURVEYORS ALL OVER THE WORLD HAVE A PROMISING FUTURE

3D DATA FOR ENVIRONMENTALLY AND ENERGETICALLY RELEVANT TOPICS

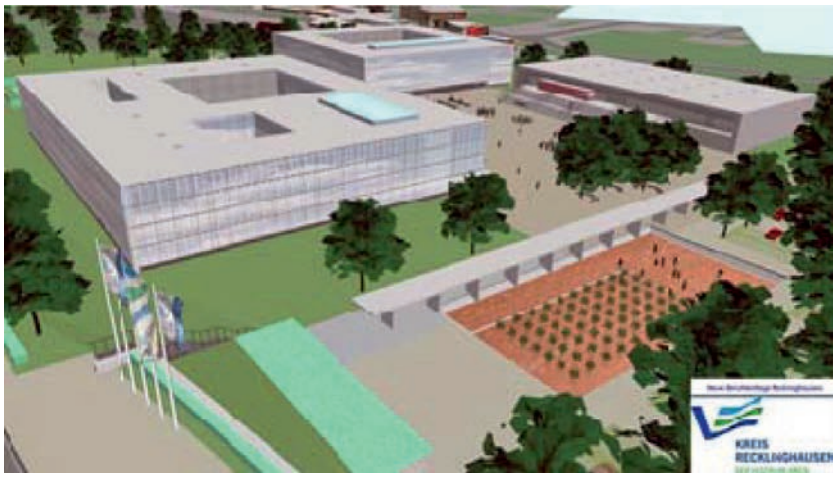
Germany's Progress towards a **Multi-dimensional Cadastre**

Nowadays, the worlds of economics, science and public administration have a specific demand for official three-dimensional spatial information (3D geodata) as a basis for multiple applications. The Surveying and Mapping Administration in Germany has accepted this demand as a challenge to develop and realise sustainable concepts for 3D geodata, focusing on fast and financially interesting solutions.

In recent years, the national mapping and cadastre information systems have become increasingly focused on demands for multidimensional applications, e.g. environmental protection, planning, energy supply and disaster management. The basic request of coverage and actuality has been defined for the third dimension. In 2009, the Surveying Authorities of the States of the Federal Republic of Germany (AdV) arrived at the following decision: "The collection, data modelling and quality management of buildings for geotopographical surveying and for the cadastre are main tasks of the official German cadastre. This also includes the third dimension." The fourth dimension (time) is already an integral component of the new German cadastral information system.

NEED FOR 3D BUILDING INFORMATION

In Germany the government targets for climate and environmental protection are currently producing extensive changes in the energy sector, the so-called 'energy turnaround'. This includes cessation of the use of nuclear energy by 2020, reduction of greenhouse gases and other objectives. As a result, planning processes especially have to take into account the use of photovoltaic technology, geothermal energy, wind energy and the energetic isolation of buildings. From a process perspective, data must be available to provide actual information of the environment and all energetically relevant topics in combination with up-to-date 3D building information. Very often this leads to a data-collection or at least to a data-processing task. Based on the required information, the analysis and evaluation will give a sustainable picture of the energy balance, including possible savings from the use of renewable energy and energetic isolation of buildings.



▲ *Figure 1, Planned school in the county of Recklinghausen.*

URBAN PLANNING

3D geometry and semantics, particularly of buildings, are also useful in the field of noise protection in terms of simulating and mapping noise expansion. A European Directive obliges the member states of the European Union to determine and to document noise pollution in cities every five years, and to check the progress of noise reduction. The use of cadastral information for urban planning has always been essential, even in the 2D world, especially to consider the property distribution. Nowadays 3D information is a basic demand of the urban planning sector (see the example in Figure 1). Demographic effects and other restrictions could be visualised in planning alternatives.

▲ *Figure 2, Noise map of the city of Düsseldorf.*

▲ *Figure 3, Photovoltaic map of the city of Düsseldorf.*

3D BUILDINGS IN CADASTRE

While 3D building information in the resolution of Level of Detail 1 (LoD 1) is sufficient for applications like noise mapping (see Figure 2), many other applications such as the aforementioned photovoltaic map (see Figure 3) need a higher resolution of at least LoD 2. As a consequence, so-called 'city models' were built in many German cities with the basic goal of supporting, or even allowing visualisation of, special application scenarios. On the downside, these models did not have the designated quality or permanent updating mechanisms. Often they used the cadastre as a data source only (exact location/2D building information) and never became part of the cadastre.

Several investigations have proved that minimal additional information is needed to build a 3D spatial dataset using the existing 2D spatial cadastral data and to keep the information up to date. That information is: the number of floors, ridge direction and the building height. Most of that information already exists from the planning process; additional data is collected during the cadastral survey. With this data-collection approach during the survey, a future 3D cadastre could be implemented sustainably.

TOPOGRAPHIC APPROACH

In Germany, the 3D cadastre is a 'topographic approach' to extend the current (building) content of the cadastre which is part of the new information system covering topography, geodetic references and cadastre in an integrated manner. With this so-called AAA® model of modern technologies, software has emerged that is suitable for XML descriptions and can now be linked to CityGML. While city models are often based on visualisation, the AAA® 3D spatial data focuses on semantic analysis. After the implementation of AAA® 3D spatial data, city models might be developed automatically as cadastral applications. More detailed building information (LoD 3 and 4) will not be included in the cadastre since this is regarded as a private-sector task.

AAA® STANDARD

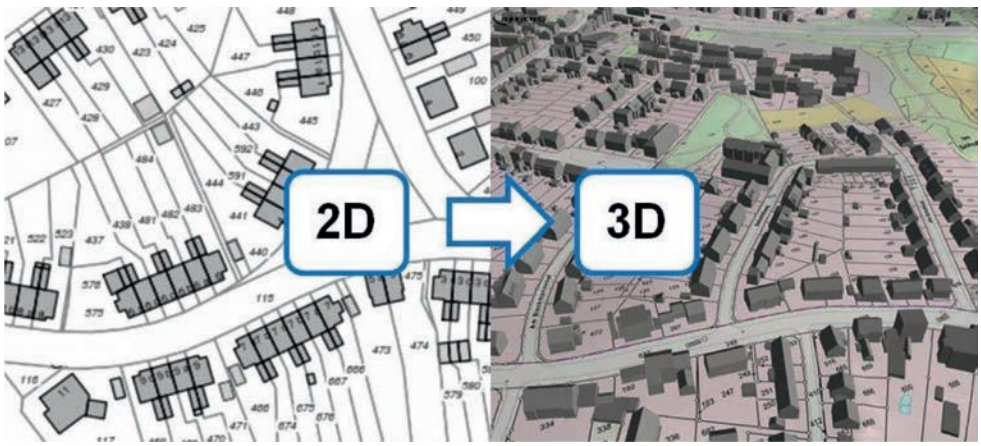
According to size (number of citizens), Recklinghausen is the biggest county district in Germany and therefore comparable to a city like Cologne. In 2011 approximately 1,600 cadastral surveys took place with respect to buildings. For Recklinghausen, as in general for the German cadastre with over 50 million buildings, it is therefore of fundamental interest to store actual 3D building information in line with the AAA® standard and consistent to 2D and 3D cadastral object information (in general: 2D property building layer identical to 3D building footprint) – the so-called 'vertical integration concept'.

VERTICAL INTEGRATION CONCEPT

This vertical integration concept takes into account the source of the data and the production process. The 'legal' 2D property building layer as major cadastral information is merged with the third dimension from laser scanning as a topographic source. The result is a 'legal' 3D building model (see Figure 4). It defines AdV's '3D building model' product. As a consequence, the demand – especially of the economy – for official (administrative) 3D building information could be fulfilled. In addition this data contributes to the existing national and international spatial data infrastructure (SDI), for example through simple export to the defined INSPIRE topics. In contrast to CityGML, which is designed only as an external interchange format and for the easy use of 3D data, the AAA® concept defines a standard for application schemas, feature catalogues and exchange interfaces. However, the AAA® data model in current use (version 6) is unable to store and provide the required 3D information. Therefore the expanded version 7.0 of AAA® will be implemented in Germany in the coming years.

THE FOURTH DIMENSION

Traditionally in the German cadastre, every change of a parcel (e.g. subdivision) is documented by surveying sketches and textual documentations. The development ▶



▲ *Figure 4, Vertical integration.*

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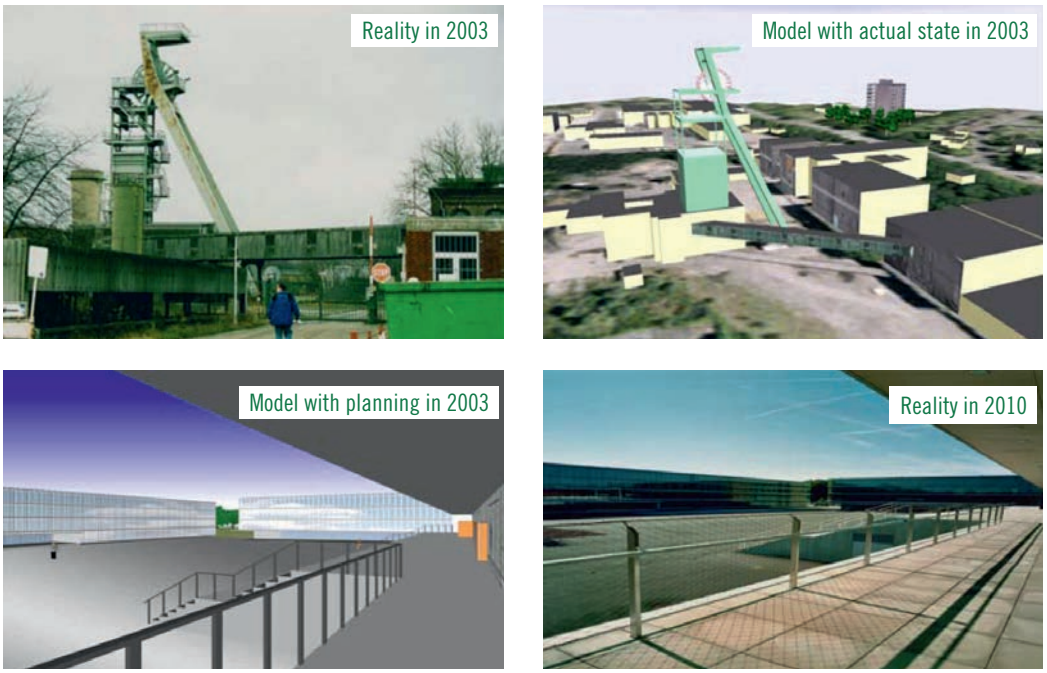

Figure 5, Management of historical data.

of the cadastral map is continuously monitored, and every change over time can be restored in case of cadastral disputes, although usually using non-digital, paper documents. Therefore, modern possibilities for inquiries were also part of the technical requirements for the AAA® standard. Besides this more internal cadastral usage, there were many further requirements for time-related cadastral information, such as:

- monitoring the development of cities and villages over time
- statistic of changes of land use and land cover
- planning purposes
- historical archiving
- monitoring cultural heritage.

HISTORICAL INFORMATION

For each object, the AAA® data model requires a unique identifier together with a designated time stamp for its creation and deletion. If an object has to be deleted during an updating process, however, the object will not be physically removed from the database. In this case, only the life cycle of the thematic relevance has ended, but not the existence of the object as such. A 'deleted' object is then regarded as historical information which can be easily distinguished from the actual information. Sometimes there are changes to an object which do not require it to be deleted (e.g. only a name change of the person/owner). In that case all the different versions of the object can be stored. Within the AAA® data model, this approach is called 'versioning concept'. Since every object carries life-cycle information, the storage of historical objects and versions of objects is not limited to a specific object type (see Figure 5).

Within the AAA® data model this approach is used for providing historical information as well as for the incremental updating of information systems used as secondary sources.

MULTIPLE APPLICATIONS

The worlds of economics, science and administration have an increasing demand for official multidimensional spatial information (4D geodata) as a basis for multiple applications. The Surveying and Mapping Administration in Germany has accepted this demand as a challenge to develop and realise sustainable concepts for 4D geodata, focusing on fast and financially interesting solutions. In this context, national and international standards, infrastructures and activities had to be considered. The German AAA® cadastre standard takes into account the international standardisation of ISO and OGC to include 4D geodata as an economic solution for guidance and continuation.

FURTHER READING

Gruber, U., Riecken, J., Seifert, M.: Germany on the way to 3D cadastre, ZfV 4/2014, p 223-228, 2014

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HIGH-PRECISION LASER SCANNING FOR CAVE TOURISM

3D Reconstruction of the Pollera Cave, Italy

The Pollera cave is situated in the region of Liguria, Italy, and is the subject of a strategy aimed at improving and promoting tourism in the area. In this project, 3D laser scans of some of the more easily accessible cave rooms were needed to create multimedia products such as movies, images and scenes for 3D virtual tours, and to generate geocartographic products for tourist excursions. To achieve this, the cave was scanned using a Z+F IMAGER 5010 high-precision laser scanner. Surveying and data processing proved to be particularly difficult and costly due to the underground environment, but by using free and open-sourced software a fully textured 3D model was successfully generated.

▲ *Figure 1, Z+F IMAGER 5010 laser scanner inside the Pollera cave.*

In normal conditions, the Z+F IMAGER 5010 laser scanner (Figure 1) can obtain millimetre accuracy on every single point and is generally useful for architectural applications. Instead of planning a topographic survey (that would have led to considerable logistical difficulties), the locations and number of survey positions were strategically chosen using a cave map and the experience of the speleologists. Despite careful planning of the scanning positions, in some places it was almost impossible to establish a proper position. In total, eleven scans in high-resolution and high-quality mode were needed in order to detect the entire cave surface.

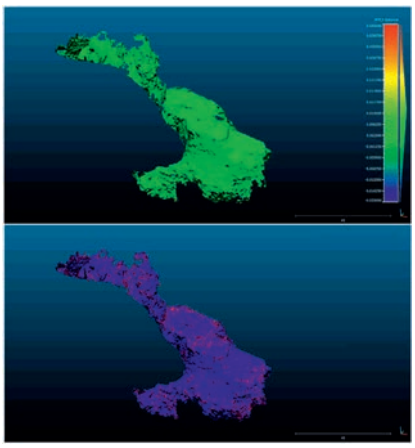
3D LASER SCANNING

Because individual scans would eventually be combined into a single 3D model, and since natural reference points were not obvious in the cave environment, physical reference targets (special support trestles) were placed in order to aid in point cloud registration. Due to the peculiar and complex formation of the cave, only a small number of targets were placed in easily accessible locations so that they could be visible from multiple scans.

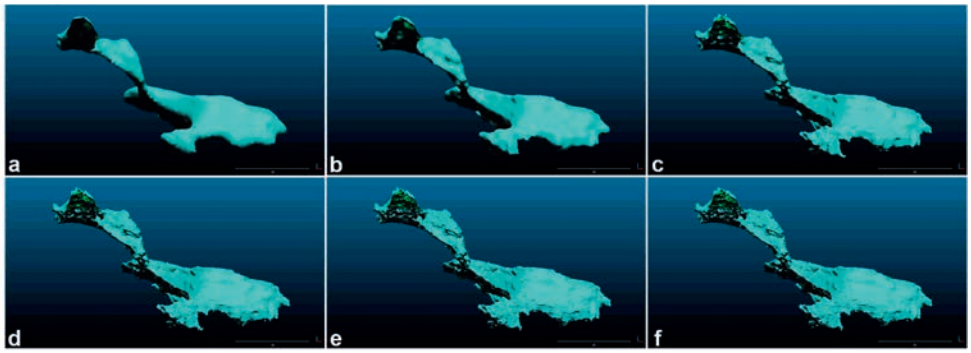
POINT CLOUD REGISTRATION

The point clouds from the eleven scans were registered with Z+F LaserControl, the software of the instrument. When scene geometry is simple (like in cities), it is easy to match two scans. However, in the case of more complex geometry such as in the cave, more obvious and distinguishable ▶

▸ *Figure 3, Top: M3C2 signed distances between the MeshLab mesh and the CloudCompare mesh vertexes clouds.*

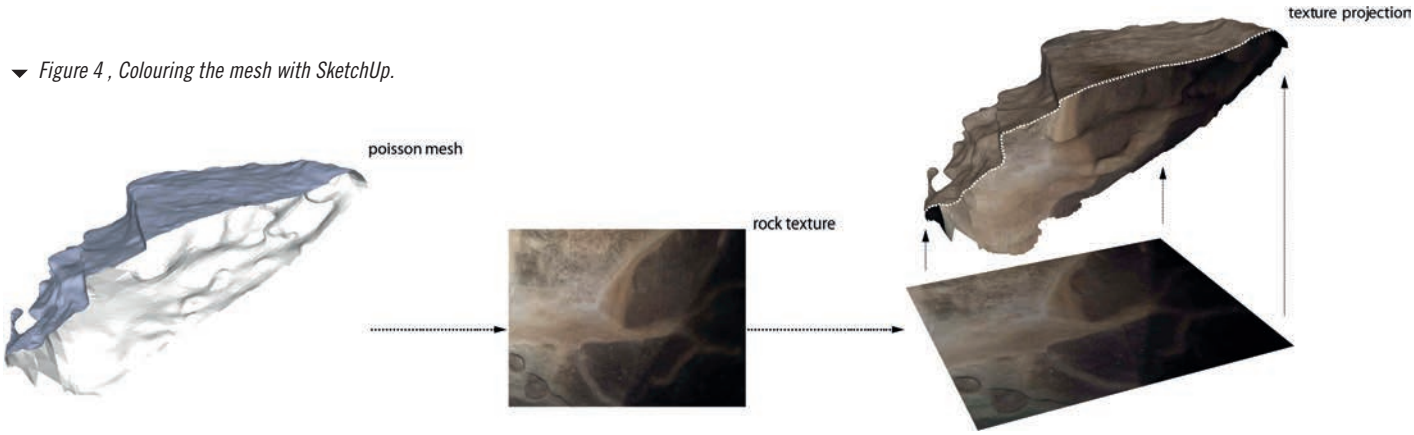


▲ *Figure 3, Bottom: Significant changes between the clouds (blue: no significant change = smaller than local Level of Confidence 95%; red: significant change).*



▲ *Figure 2, From a to f: various reconstructed meshes as octree depth parameter changes between 6 (a) and 11 (f).*

▼ *Figure 4 , Colouring the mesh with SketchUp.*



tie points need to be chosen as a first approach to matching point clouds. Unfortunately, in this case, some of the reference targets were not easily identifiable or visible from multiple scans, and most of them were placed at the same height due to practical constraints. To mitigate the effects of this, specific natural cave features (such as little rocks or other distinct cave characteristics) were carefully identified as additional targets. The registration was carried out with a mean error of 6cm for the whole project.

MESH CREATION

A 3D mesh was generated using the registered point cloud. In this project, the results of two different types of open source software, MeshLab and Cloud Compare, were compared. Both types of software are designed to process and manage point clouds and meshes, but MeshLab is oriented towards working with meshes whereas CloudCompare is more suitable for working with point clouds. Although there are many algorithms to generate a mesh from a point cloud, it was decided to use the Poisson algorithm because it was present in both types of software. Using the registered point cloud, a mesh was created using MeshLab. To validate this mesh and to see whether the algorithms worked in the same way, a second mesh was created with CloudCompare using the same point cloud. This also helped to verify whether it was possible to optimise the whole procedure using only one type of software.

To generate the mesh in CloudCompare, the most important parameters to be set were octree depth and samples per node. The octree depth is the maximum depth of the tree used for surface reconstruction; higher numbers mean higher precision in reconstruction but also higher processing times (Figure 2). 'Samples per node' specifies the minimum number of sample points that should fall within an octree node. Small values can be used for noise-free samples, but for noisier samples larger values may be needed to provide a smoother reconstruction. In this case, since a subsample of points was taken, it was assumed that the sample was noise-free.

COMPARING MESHES

The MeshLab mesh was compared against the CloudCompare mesh in the CloudCompare environment (Figure 3). CloudCompare uses the vertexes of the two different meshes and two tools to measure difference. First, the M3C2 plug-in computes the signed distances between the reference cloud (MeshLab mesh vertexes) and the vertices of the CloudCompare mesh. The main parameters for distance can be derived using the 'param guess' to set the values of normal scale (to orient a cylinder, inside which equivalent points in the compared cloud will be searched for), the projection scale (the diameter of the cylinder) and the max. depth (the cylinder height) parameters. The whole MeshLab vertexes cloud was used as core points, to compute the distances in the entire cloud. In this case it was decided to compute two different distances: one with default normals (using the normal scale parameters) and the other using vertically oriented normals, in pseudo 2D areas of the cave. The calculated distances have a centimetre order of magnitude.

The C2M tool searches the nearest triangle in the reference mesh for each point of the compared cloud. Meshes provide information using the normals, so cloud-mesh distances have a sign (+ or -) stored as scalar field in the compared cloud; they can also be split along the 3 main axes (X, Y and Z), generating three scalar fields, one for each axis. To obtain a comparison between different meshes that is easier to interpret, portions of the 3D model and 2D cross sections were extracted. 3D portions were generated with the segment tool simultaneously cutting the two point clouds on the ceiling (above the plateau), the plateau (internally), the entrance and the slide. Real distances were calculated with M3C2, using normal default and vertical normal, and with the C2M tool.

CAVE IMAGE PROJECTION

Google SketchUp was used to drape cave surface images as texture to the mesh, thus enhancing the visualisation (Figure 4). This process should be done for every area of surface that needs to be covered, meaning that more photo coverage will result in better visualisations. It is best to take narrow overlapping shots of the cave surface (ceiling, ground and walls). Each surface of the cave should be photographed in separate batches and the image should be taken with the lens perpendicular to the surface to minimise distortions.

CONCLUSION

What emerged from this experience is that MeshLab seems less intuitive but provides a larger range of filters, useful plug-ins and processing tools than CloudCompare, which is a faster and easier environment to manipulate even huge point clouds. The use of four different types of software (Z+F LaserControl, MeshLab, CloudCompare and SketchUp) was an ideal solution to carry out post-processing, from the registration to the creation of a textured 3D model. A suggested solution for the future consists of making a scan at the highest resolution to be used just for the registration phase. Then, to achieve reasonable processing times in mesh reconstruction, it could be useful to resample the point cloud, keeping only one or two out of ten data points. ◂

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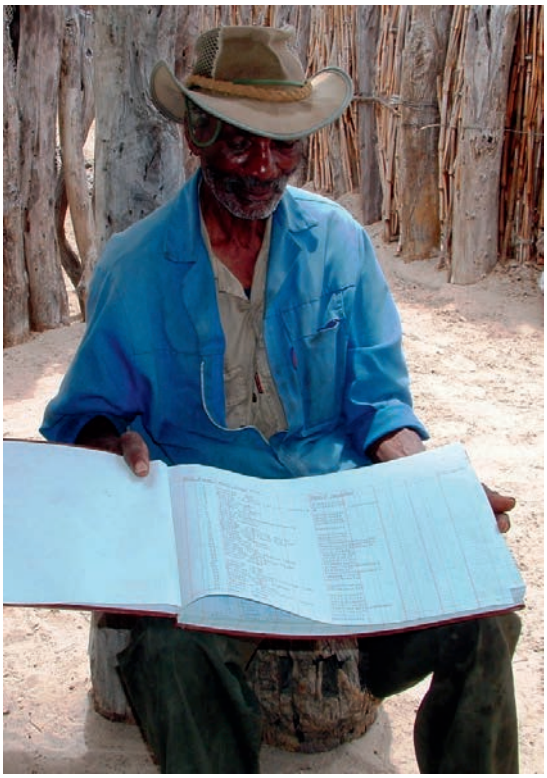
EFFECTIVENESS WITHIN PERI-URBAN AREAS IN NAMIBIA, ZAMBIA AND BOTSWANA

Pro-poor Land Tools

Conventional land administration systems tend to favour the wealthy and the elite at the expense of poor land holders. The implementation of pro-poor land tools aims to eradicate this inequality. Do these tools succeed? The author has investigated the impact and the effectiveness of pro-poor land tools in peri-urban areas in Namibia, Zambia and Botswana, and reports his findings here.

According to the Global Land Tool Network (GLTN), a land tool is "a practical way to solve a problem in land administration and management (LA&M) and is a way to put principles, policies and legislation into effect". Although this sounds rather vague, the intent is that the tools focus on the needs of the poor since their interests have been neglected in the past because conventional land administration tools favour the elite. To conduct the study, three peri-urban areas in Africa were selected where multiple tenure systems are co-existent and pro-poor tools have been implemented. Further selection criteria were that the areas are still developing and not fully built-up. The settlements include Oshakati, a small city in northern Namibia; Chazanga, in the northern part of Lusaka, the capital of Zambia; and Tlokweng and Mogoditshane, around Gaborone, the capital of Botswana (Figure 1).



▲ *Traditional headman with land register on his knee in Oshakati.*

TENURE SECURITY

Most peri-urban areas in Sub-Saharan Africa lack tenure security, mainly because of the coexistence of multiple tenure systems, particularly statutory, customary and informal systems. Lack of tenure security is the scourge of informal settlements, which often emerge in peri-urban areas. The government may evict informal settlers, who in general will have no legal papers to underpin their land claim. Lack of tenure security forms a barrier to controlled development of peri-urban areas since dwellers, who fear eviction, are unlikely to invest their savings in housing. In addition, local authorities will be reluctant to improve services. Therefore, increase of tenure security is key to reducing poverty. Legal security avoids holders being excluded from eviction or relocation without compensation and supports sustainable use and transfer of land to others. However, tenure security is not only a legal matter since owners may distrust the legal framework and the authorities, and thus will remain reluctant to spend their savings.

1.	Certified full ownership
2.	Certified long-term leasehold
3.	Short-term leasehold, either certified or uncertified
4.	Permission to occupy by a long-term or renewable permit
5.	Permission to occupy by a temporary permit
6.	Occupancy of part of a plot which has been subdivided without a permit
7.	Occupancy with temporary protection/ no protection against forced eviction

▲ *Table 1, Example of a continuum of land rights with – from top to bottom – decreasing tenure security.*

Key instruments are those tools which directly affect land tenure; these are derived from the legal framework and consist of an area component and an individual component. Area tools are aimed at managing multiple tenure systems and concern the organisation of land management and the stakeholders involved. Individual tools concern the allocation and registration of individuals' land rights.

CONTINUUM

People may hold a diversity of land rights within a jurisdiction, so the first step was to identify the continuum of land rights in the study areas. Some rights provide a higher level of tenure security than others. Hence, plot holders may improve security by climbing the ladder of rights and pro-poor land tools should ease and encourage the climb (Table 1 and Figure 2).

OSHAKATI

Oshakati employs a recently developed, innovative land tool: the Flexible Land Tenure System (FLTS). It provides affordable, more secure and simple rights and enables the land holder to climb the continuum ladder easily. Prior to FLTS the majority of informal land holders were given a right to occupy. An area tenure tool applied is the move of land from traditional authority to the jurisdiction of the Oshakati Town Council through the proclamation of town land. An individual tenure tool implemented is the savings scheme which supports the poor gaining access to land with the help of NGOs. Such an NGO is The Shack Dweller Federation of

▲ *House marked for demolition on 13 May 2001 in Gaborone, the capital of Botswana.*

Namibia which has negotiated a large plot with Oshakati Town Council. This plot has been subdivided with technical assistance from the Namibia Housing Acting Group and allocated to the members of the savings scheme. Despite the implementation of these tools, some land holders are still settled illegally.

CHAZANGA

Chazanga is an unplanned settlement which is rapidly urbanising and is claimed by both the Lusaka City Council and the traditional authority. This creates uncertainty but also opportunities, which is an explanation for the lively informal land market in Chazanga. The Council prepared for formalisation through the Housing Act, which declares part of Chazanga an 'improvement area' – which is an area tool – for which informal plot holders will be issued occupancy licences – which are individual tools. The licences are valid for 30 years and renewable. In the past, the Land Act has been applied to convert individual customary land rights to statutory leasehold, but such conversions are legally impossible on council land. The land transfers are overseen, as far as possible, by the Ward Development Committee (WDC), consisting of volunteers managed by the area councillor. The WDC is instrumental in providing the information needed for formalisation.

GABORONE

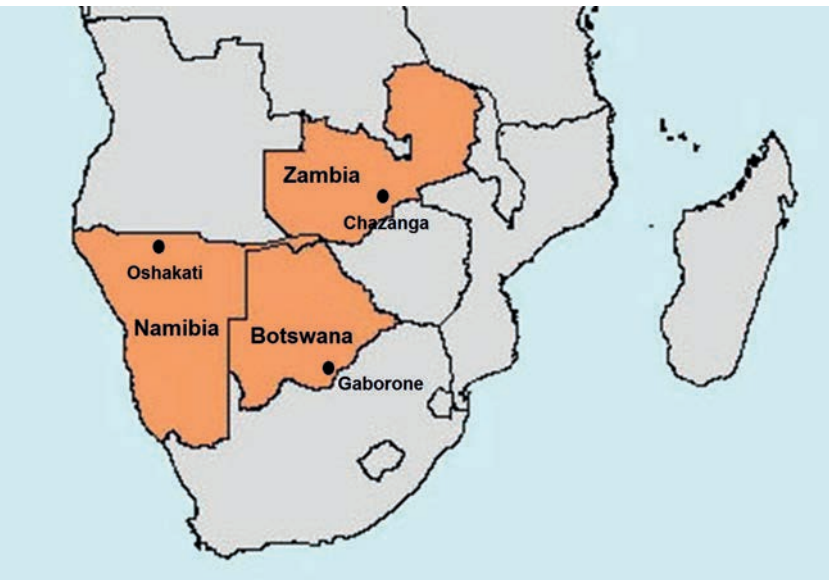
Since Gaborone is almost completely built up, incoming settlers move to the neighbouring villages of Tlokweng and Mogoditshane. The Tribal Land Act retains customary tenure and land rights as it formalised customary tenure as an area tool in the villages excluding Gaborone. The Act further defines the Land Board as the land management authority. The Act, enacted in 1970, also provides for issuing certificates of customary land grants as an individual tool. The majority of land holders have certificates but much land in Mogoditshane has been accessed informally because of high demand and long waiting lists. These land holders are monitored by the Land Boards; some have been evicted and their dwellings demolished. Several Presidential Amnesties have been proclaimed during the last 20 years, offering formalisation upon the payment of a fine. In 2011 an amnesty was aimed at formalising all land claims within one year. The Tribal Land Act retains customary tenure and land rights.

FINDINGS

Considering all cases together, the increase of legal tenure security for individual tools is limited (recognised occupancy, occupancy licence and savings scheme), which is also reflected in the continuum of land rights, due to the limited powers of the land holders and the temporality of the rights compared to leasehold and freehold. The Tribal Land Act is an exception, because the customary land grant is perpetual, while other pro-poor land rights are issued for 20 or 30 years. ▶

	Area Tool	Individual Tool	Authorities
Oshakati	Proclamation of town land	Flexible Land Tenure; savings scheme	Oshakati Town Council
Chazanga	Improvement area (Housing Act)	Occupancy licences	Lusaka City Council; traditional authority
Peri-urban Gaborone	Tribal Land Act	Certificates of customary land grants	Land Board

▲ *Table 2, Area tools, individual tools and authorities in the three study areas.*



▲ *Figure 1, Southern part of Africa indicating the case-study locations.*

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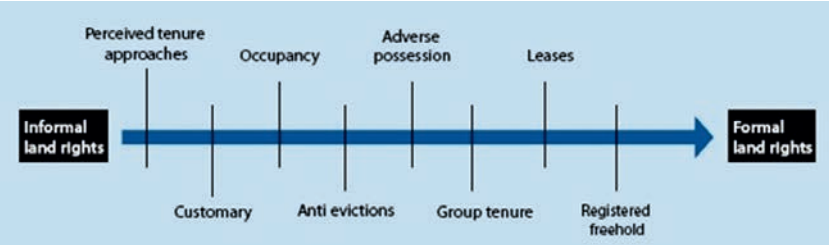

▲ *Figure 2, Continuum of land rights.*

Perceived security, which was studied through interviews, tends to improve after the application of the tools, although it evolves over time. Some land holders feared that their land would be taken away or that their plots would be adjusted to comply with planned layouts. Added to this, external events such as the announced relocation of settlements due to flooding dangers in Oshakati negatively affected the perception of tenure security. In contrast, some respondents overestimated their tenure security. For example, land holders in Chazanga bought land supported with sales documents which they mistakenly perceived as being legal.

CONCLUDING REMARKS

Namibia offers a full range of land rights within urban areas which enable informal settlers to climb the continuum ladder. Zambia, in contrast, offers a formalised occupancy right which cannot be upgraded. Pro-poor land tools improve tenure security fairly and contribute to the inclusion of the poor in formal administrations and the economy. Implementation is confronted with two challenges: (1) land is scarce and the elite and well-to-be also have an interest in urban/peri-urban land so that they can misuse the pro-poor tools for their own interests; and (2) a lack of financial resources and human capital. Both challenges should be addressed through cooperation between the government and local communities, and this in turn is also a pro-poor land tool. ◀

FURTHER READING

Asperen, P.C.M. van (2014), Evaluation of innovative land tools in Sub-Saharan Africa: Three cases from a peri-urban context, PhD thesis, Delft University of Technology, The Netherlands.

PAUL VAN ASPEREN

Paul van Asperen received his PhD in 2014 from Delft University of Technology, The Netherlands. He is a guest researcher at Delft University and works as a senior consultant at the Dutch Ministry of Infrastructure and Environment.
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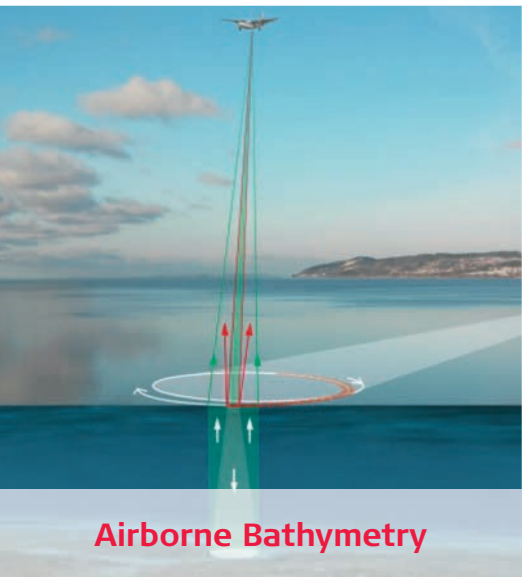

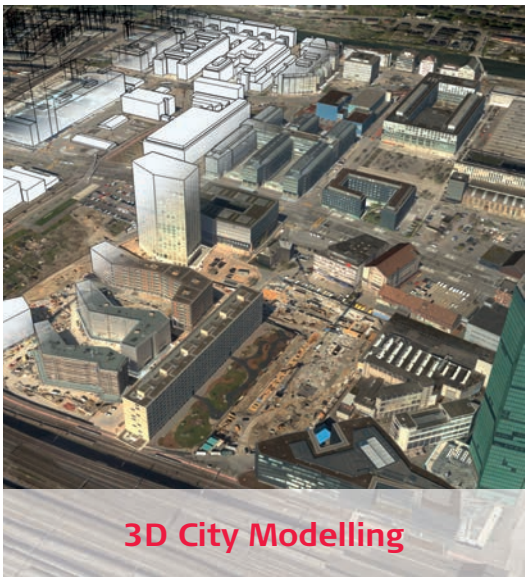

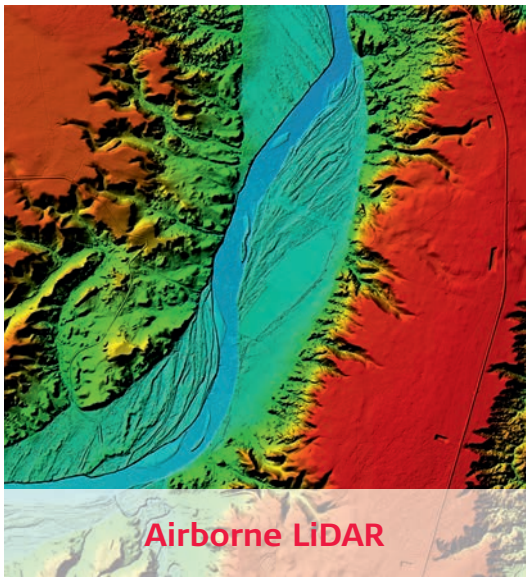

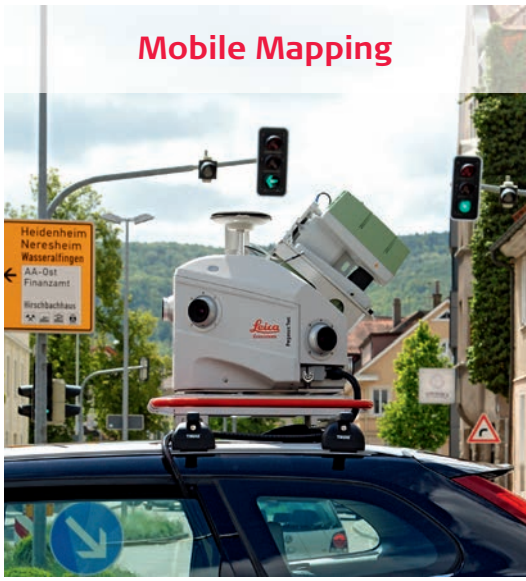

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No 2752

SOLUTIONS FOR RAPID ACCESS TO IMAGERY AND OTHER GEODATA

Data Management Services

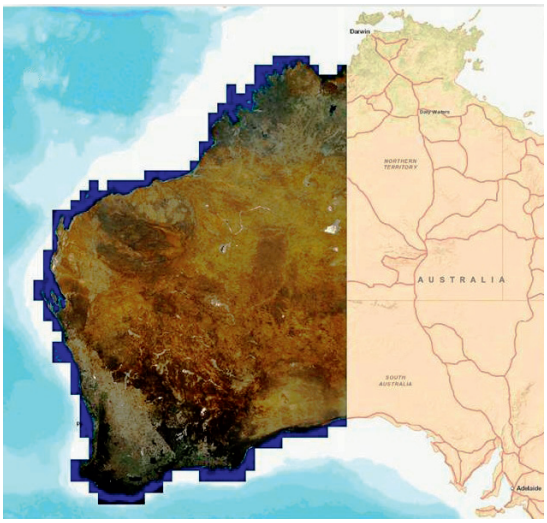
Easy access to repositories of space-borne imagery and other geodata is becoming increasingly important now that sensors are able to produce petabytes of data in the blink of an eye. The value of imagery to customers relies not only on its quality, but also on the ability to provide easy access to, and management and analysis of, the resulting geodata. Here, the author presents the geodata management services developed by the Geo-Intelligence programme line of Airbus Defence and Space and its strategic partners to serve the diverse needs of a broad spectrum of users.

The twin Pléiades satellites are each able to collect up to 1 million km² worth of imagery daily, and SPOT 6 and SPOT 7 can each acquire up to 3 million km² per day. The TerraSAR-X and TanDEM-X radar satellites also have a high acquisition capacity. To make handling this massive amount of satellite imagery less cumbersome and to reduce access costs, the data management services offered along with the image products are crucial. Such services are often best provided as secure, hosted/cloud-based portals which allow authorised users access to their data anytime, anywhere, and which ease dissemination to others. These services can also be installed on-premises, behind the organisation's own firewall. The following are four examples of how organisations are using Airbus Defence and Space solutions to manage their geodata.

THIS PORTAL ENABLES EFFICIENT DISSEMINATION OF IMAGERY TO DUTCH CITIZENS FREE OF CHARGE AND ITS USAGE TO BE TRACKED

DATADOORS

Airbus Defence and Space's own online sales portal, GeoStore, provides access to the company's imagery archive and satellite tasking capabilities. The platform technology behind this portal is the DataDoors software. Organisations can use custom-branded DataDoors portals to manage and disseminate all of their proprietary and third-party data. An example of this is the Netherlands Space Office's (NSO) Dutch Satellite Data Portal, which opened on 21 March 2012 within the framework of the European Copernicus (formerly the Global Monitoring for Environment and Security (GMES)) programme launched by the European Space Agency (ESA). In 2015, a series of satellite missions – Sentinels – will be operational for delivering satellite data free of charge for applications including precision farming, subsidence monitoring, water management and forest monitoring. This innovative Earth observation programme will revolutionise the way businesses, institutions and government agencies will use satellite data in the future. In the run-up to this, NSO – along with Airbus Defence and Space – is currently providing Dutch citizens with imagery collected daily over the entire country of The Netherlands. The images are captured by the FORMOSAT-2, Deimos-1/UK DMC-2 and SPOT 6 satellites. This portal, which was awarded the Geospatial World Innovation Award for Technology Innovation in Big Data in 2014, enables the NSO to efficiently disseminate imagery to Dutch citizens free of charge and to track who is using it. Providing single-point access to this large amount of imagery gives Dutch organisations a competitive advantage in geobusiness.



▲ *Figure 1, Western Australia covered by SPOTMaps seamless mosaics.*

IMAGERY STREAMING

Government agencies in Western Australia have a need to easily share geodata for environmental mapping, cadastre, infrastructure, engineering, agricultural and emergency services purposes. The Western Australian Land Information Authority ▶

▲ *Figure 2, Web browser-based mapping portal used by the UK police departments.*

▲ *Figure 3, Suspect vessel discovered through I4D.*

(Landgate) is responsible for coordinating the supply of data while minimising duplication of resources by collecting geodata just once and distributing it across the government. To address this need, Landgate developed a platform called the State Land Information Capture Program (SLICP) for which a high-quality foundation dataset was required. With complete, seamless coverage of Western Australia's 2.6 million square kilometres of land mass, the 2.5-metre-resolution SPOTMaps mosaics (see Figure 1) fulfil Landgate's need for a high-quality foundation dataset, and delivering the mosaics through a streaming service supports sharing across the State government. Users can now quickly access SPOTMaps via their GIS software or web browser, which eases integration into workflows.

OLYMPIC PORTAL

To ensure safety and security during the 2012 London Olympics Games, the UK police departments needed a way to view and share maps, real-time camera data and other data in a secure and uniform manner. The existing desktop GIS systems, loaded with different types of maps and data that were not linked to one another, did not meet the requirements. Therefore, Airbus Defence and Space helped to develop a single spatial data infrastructure based on interconnected platforms (Figure 2). The result is a web browser-based mapping portal using another of the company's core products, GetGeo, which enables analysis of links between people, objects, locations and events. A coherent set of geodata was created from Ordnance Survey's complete range of mapping data, including aerial photos. Added to these were datasets especially created for the Games such as an audit of all street furniture around Olympic sites and the Olympic route network. The single-point access portal supported authorised police officers in sharing information transparently and in a harmonised manner. The collaborative environment allowed sharing of data on traffic accidents, riots, fires and more in real time. The system also allowed post-event analysis.

INTELLIGENCE AGENCIES

To perform their numerous operations, intelligence agencies have to merge and manage maps, imagery, videos, track & trace, communications, open-source information, field intelligence and much more. To access, visualise, search, merge and analyse such data from worldwide scale to 3D urban level, the French Ministry of Defence developed a virtual globe, which Airbus Defence and Space named I4D to serve a wider audience of intelligence agencies. In order to fit all agency sizes and organisational set-ups, the storage volume of data is scalable while extensions can be made. Like many of the company's data management services, to ensure interoperability I4D supports all OGC standards as well as all major raster, vector and multimedia formats. Meanwhile, to make data and information querying and

▲ *Figure 4, Access to Pléiades and SPOT data through ArcGIS Online.*

filtering easier, I4D contains an embedded timeline tool which supports the retrieval of data covering different areas and captured at different times. Figure 3 depicts a combination of data sources to identify a suspect vessel.

STRATEGIC PARTNERSHIPS

With newly developed premium content services available through the ArcGIS Marketplace, ArcGIS users can easily access Airbus Defence and Space satellite imagery and monitoring services. One of the most popular services is an app that can be used to order newly tasked Pléiades and SPOT data and to archive it simply by clicking a point on a map (Figure 4). The imagery is automatically produced and delivered as an Image Service through the user's ArcGIS Online account. A newly developed plug-in enables users to search the 1.5m SPOT 6 and SPOT 7 and 50cm Pléiades data archives within the ENVI environment and gather the information they need to quickly place an order. ◀

JESSI DICK

Jessi Dick has been with Airbus Defence and Space for nine years, having first directed the marketing activities for the North American office before moving into the global role of senior marketing manager for the company's cloud and overall data management services as well as online and software partnerships.

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No 2669

BY **WIM VAN WEGEN**, EDITORIAL MANAGER, GIM INTERNATIONAL

OLDENBURGER 3D-TAGE 2015

A **Status Update** from the **3D World**

On 4 and 5 February 2015, the 14th edition of the Oldenburger 3D-Tage ('Oldenburger 3D Days') was held at the Jade University of Applied Sciences in Oldenburg, Germany. Optical 3D measurement techniques such as photogrammetry and laser scanning are the major themes of this annual event. Just as in the previous two years, *GIM International* editorial manager Wim van Wegen headed to the city in the northwest of Germany to experience the newest developments and trends in 3D measuring.

▲ *President of the Jade University of Applied Sciences, Dr Schreiber, the Minister for Research of Lower Saxony, Ms Gabriele Heinen-Kljajić, and Prof Dr Thomas Luhmann.*

▲ *The Aibot X6 UAV attracted a lot of attention.*

This year's edition consisted of more than 50 technical presentations and once again was a great platform for the exchange of information on the latest developments, research results and wide range of applications for 3D measurement solutions. As at previous editions, the presentation sessions were complemented by a small trade show where companies such as Leica Geosystems, RIEGL and Zoller+Fröhlich showcased their technology and FARO demonstrated its brand-new Freestyle3D handheld scanner.

Some of the sessions attracted a particularly high level of interest, and there was standing room only at the sessions on airborne laser scanning (on the first day) and on mobile systems and applications (on the second day), for instance. One of the presentations, held by Thomas Gaisecker from RIEGL, informed the audience on the applications of the RiCOPTER, the company's self-developed UAS. Moderator of the session, Heinz-Jürgen Przybilla of the Bochum University of Applied Sciences, asked Gaisecker if such a heavy system (the RiCOPTER has a maximum payload of 16kg, Ed.) would really be allowed to fly above a city to capture imagery for 3D models. Gaisecker responded that the weight is not the problem, but rather the complexity of the regulations and that must be solved first, he said firmly.

UAVS

There was a high proportion of UAV-related issues at this edition of the Oldenbuger 3D-Tage. To underline the relevance, a discussion was organised on metric cameras for UAV applications, which proved to be an extremely interesting feature of the event. Everyone more or less agreed on one thing: legislation and policies are way behind the technology – which is quite a problem considering that the UAV market accounts for an annual revenue of USD11.6 billion.

The session focused on the question whether the geomatics sector needs a metric camera for UAVs, which triggered a very lively and thought-provoking discussion. Hans-Gerd Maas, professor of photogrammetry and remote sensing at Dresden University of Technology, noted that he regards the camera systems of Phase One as metric cameras, so there actually already is a good camera system available. The discussion was divided into two elements: the hardware and the ▶

▲ *A view of the exhibition floor.*

▲ *Lutz Bannehr gave a presentation about the application of a gyrocopter for environmental monitoring.*

software. Some of the participants pointed out that the solution could be on the software side. There is obviously a demand for high-performance, fully fledged software which delivers top-quality output.

Price versus quality was another key element of the discussion. What are users prepared to pay for a tiny bit more quality? Thomas Luhmann, head of the Institute for Applied Photogrammetry and Geoinformatics (IAPG) at the Jade University of Applied Sciences, stated that it would probably cost over EUR1 million to develop a metric camera for UAVs. At the end of the session, not everyone agreed that there is a need for such a camera since there were also a significant number of advocates for better software solutions.

CHALLENGES

The second day of the Oldenburger 3D-Tage was full of many more interesting presentations, which were once again held in parallel sessions. Subjects covered included the application and calibration of terrestrial laser scanners, and the calibration of cameras. Cornelius König from Scalypso gave a presentation on the effective utilisation of 3D laser scan data and also showed the audience a demonstration on the possibilities of Scalypso, which is a solution to overcome the challenge of visualising terabytes of data in a very user-friendly way. In the afternoon, Matthias Naumann told the audience about a project in the German town of Greifswald, on the Baltic Sea. He and his team had carried out a challenging survey of the cathedral there using both UAS photogrammetry and TLS.

Once again, a visit to the 2015 edition of the Oldenburger 3D-Tage was worthwhile. The event is an excellent opportunity to gain an update on everything that is going on in the world of 3D measuring. A real *Geheimtipp*, as they say in German! ◀

PROF DR THOMAS LUHMANN, DIRECTOR, ON THE OLDENBURGER 3D-TAGE:

"As every year, the Oldenburger 3D-Tage provided an interdisciplinary forum where experts from different fields, system suppliers, service companies and universities came together for fruitful discussions. The mixture of application-oriented research and market-oriented interests was again a source of new contacts and ideas since the field of optical 3D metrology is rapidly developing. The feedback from participants was extremely positive and we expect that most of them will visit us again next year, when we will be celebrating the 15th anniversary of this event."

The first three photos were taken by Piet Meyer, Jade University of Applied Sciences.

MORE INFORMATION

http://www.jade-hs.de/3dtage

SENSEFLY

Mapping More, More Accurately

senseFly is a developer and producer of autonomous, ultra-light aerial imaging UAVs (also called 'drones') for professional applications. Based in the French-speaking region of Switzerland, the company provides professionals around the world with safe, easy-to-use aerial imaging tools that help them collect the geospatial data they need to make better decisions.

senseFly was originally founded in 2009 by a small team of researchers working in the field of small, bio-inspired, autonomous flying robots at the Swiss Federal Institute of Technology in Lausanne (EPFL) in Switzerland.

Having achieved several innovations in fields such as vision-based navigation in cluttered environments and 3D flocking behaviours, senseFly's founders entered into a tech-transfer agreement with EPFL which allowed them to bring important software and hardware components into the new company. senseFly then launched its first commercial drone system, the swinglet CAM, in 2010. Fully autonomous from take-off to landing, this UAV allowed users with zero piloting skills to map areas of up to six square kilometres. "Our philosophy at senseFly was, and remains, to develop systems that are much lighter than our competitors, while still capable of achieving equivalent or even better results. This reason for our quest to keep kinetic energy low is to increase passive safety and our products' ease of deployment. At just 500g, the swinglet CAM instantly became the lightest mapping drone on the market," explains senseFly CEO and co-founder, Jean-Christophe Zufferey.

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.

▲ *Launching the eBee on its autonomous mapping flight.*

FULL SOLUTION

Realising that the UAV is only one part of a complete mapping solution, senseFly also partnered with Pix4D. This software start-up, originating from EPFL, produces a senseFly-specific version of its post-flight photogrammetry software, which is now supplied – alongside senseFly's own eMotion flight planning program – with every senseFly system.

Today senseFly employs over 80 staff, most of whom are based in Switzerland but the company also has employees in the USA, France and China. The organisation comprises R&D, production, technical support, marketing and sales departments, plus administration, HR and finance teams. The largest senseFly department, R&D, covers all aspects of drone development, from hardware through to software. senseFly is managed by an executive team of five, four of whom are senseFly co-founders. "We really focus on keeping a start-up spirit and we have a very flat structure," Zufferey says. "This allows our team members to work in a company where everyone is responsible for what they do, and where they are able to communicate directly with colleagues and customers."

GLOBAL REACH

senseFly works with a network of approximately 40 value-added distributors serving 60 countries. Furthermore, it retains a key accounts team and direct sales staff in Cheseaux-Lausanne to serve customers in those countries that are not currently served by distributors.

senseFly currently produces more than 100 units per month, of which the most popular product globally is its eBee mapping

drone. Launched in early 2013, this 700g solution features a range of camera options to suit different applications, including RGB, NIR, red-edge, multispectral and thermal sensors. The UAV can cover an area of up to 12km² (4.6mi²) per flight and, at lower flight altitudes, can achieve a ground sampling distance of 1.5cm/pixel.

DRONE WORKFLOW

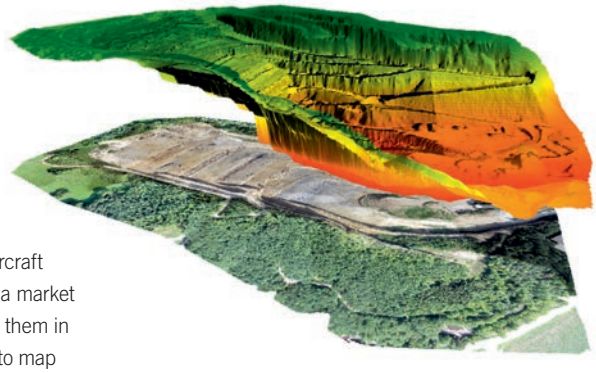
A senseFly drone's workflow begins with the user loading a base map and defining the region they want to map. They then launch the UAV by hand and it flies and collects high-resolution aerial images automatically, before landing at a pre-defined point. Postflight Terra 3D software, powered by Pix4D, is then used to process and 'stitch' these images together to create 2D orthophotos, 3D point clouds and digital surface models.

senseFly has also recently launched the eBee RTK, a survey-grade version of the eBee that is capable of producing orthomosaics and 3D models with absolute accuracy of down to 3cm without the need for ground control points. Meanwhile, senseFly is also developing its next aerial imaging platform, called the eXom. Due to launch in 2015, this system is targeted squarely at industrial inspection and close mapping applications. It will be the company's first rotary system, in the form of a quadcopter (four-propeller) UAV capable of capturing HD video, still images and thermal data simultaneously.

FILLING A GAP

senseFly drones are used by professionals around the world in fields as diverse as land surveying, geographic information systems (GIS), mining, agriculture, humanitarian aid and environmental management. These professionals include land surveyors, GIS and geodesy professionals, precision farmers and agronomy service providers, NGOs, mining companies, and research institutes and universities. "What we're finding, and what we see professionals increasingly realising, is that drone technology can effectively fill a gap: between traditional surveying instruments, which produce high-accuracy outputs but are costly to buy and time-consuming to use, and existing aerial data services such as manned aircraft and satellite imagery, which can cover large areas but at lower resolutions than drones and only when there is no cloud cover," explains Zufferey. "That's not to say, however, that UAVs are necessarily a threat to such providers, since UAVs give manned aircraft companies a way in which to address a market that was never economically viable for them in the past – namely customers wishing to map smaller areas of just a few square kilometres with high geospatial accuracy."

▲ *senseFly UAVs are used in several fields, including mining.*



▶ *Example outputs from a senseFly quarry survey.*

RELEVANT REGULATION

senseFly's team believes that the benefits offered by commercial drones will ensure this technology plays an important role in the future growth of economies around the world. However, key to this adoption is effective and considered regulation. "Regulations create the framework within which professionals can legally use drones. These laws currently vary widely from country to country. However, most specify line-of-sight operation and not flying near airports or over crowds, plus many aviation authorities also stipulate a maximum flight altitude – often around 120-150 metres or 400-500 feet," Zufferey explains.

senseFly's team believes that UAV regulations which take into account the differences between the different drone platforms available – their weights, materials, flight speeds and resulting kinetic energy – are the best approach, since relatively heavy systems such as those weighing above 2kg pose a greater threat to people and property than lighter systems with lower impact energy. This focus on weight and safety is the case in Canada, for example, where Transport Canada recently updated the country's UAV regulations to make it simpler for professionals to use systems that weigh under 2kg. Several other senseFly markets, such as France, Poland, Spain and Australia, also currently have this same first weight threshold.

In the USA, as a Parrot company, senseFly is a member of the Small UAV Coalition. This group advocates for law and policy changes to permit the operation of small UAVs with varying degrees of autonomy for commercial, consumer, recreational and philanthropic purposes. As an interim measure, however, while the United States' aviation authority is currently working on creating nationwide commercial drone regulations, senseFly has also recently petitioned the Federal Aviation Administration (FAA) for exemption to fly its eBee for surveying and agricultural purposes, based on existing rules for flying model aircraft over private land. If approved, this would allow companies in these areas to operate a senseFly eBee immediately, without requiring them to each obtain their own '333 Exemption' from the FAA (which is currently the case and which several eBee operators have already received). ◀

More information
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SPECTRA PRECISION

No 2741

FIG Kick-off Event 2015-2018

The new FIG Working Plan 2015-2018 will be presented during the FIG Working Week in Sofia, Bulgaria, from 17-21 May 2015. 'Ensuring the Rapid Response to Change, Ensuring the Surveyor of Tomorrow' is the theme for the current FIG Council 2015-2018. This theme was launched during the FIG Kick-off Event and Seminar held in January 2015 in Athens, Greece. In her home city, the new FIG president Prof Chryssy Potsiou presented FIG's vision: a modern and sustainable surveying profession in support to society, the environment and the economy – providing innovative, reliable and best-practice solutions to our rapidly changing and complex world.

FIG is well respected as a proactive non-governmental organisation (NGO) by the UN family. There was general agreement that the Federation is ready to bring a positive response to the Post-2015 Development Agenda. A key element of FIG's support is the development of innovative, citizen-centric approaches and solutions for the of 70% people-to-land relationships that are undocumented. The 'fit-for-purpose land administration' approach of The World Bank/FIG was mentioned by almost all speakers as a realistic approach in achieving this aim, and key representatives from global organisations expressed their support. This approach can be very well aligned with the agendas, guidelines and proposals from global organisations such as UN-FAO, UN-Habitat, UN-GGIM and the World Bank. The pressure from G8 to solve land issues was an important item of discussion during the seminar. For the first time in history, a global land administration solution is needed more than ever and can be realistically be achieved. Technologies are available, foundation data is available (imagery, remote sensing), geodetic infrastructure is increasingly available – but capacity needs to be built. The importance of open Standards to underpin these solutions was addressed several times during the seminar, including by the leading GIS provider, Esri.

The kick-off event also celebrated the change in FIG's leadership. Departing president Teo CheeHai received warm words of thanks for his leadership, energy and achievements. Accomplishments under his presidency include: the position of the Joint Board of Geospatial Information Societies was further strengthened; the fit-for-purpose land administration approach was developed and published; the so-called 'Continuum of Continuums Approach' was also developed, including a continuum of approaches, technology and accuracy to provide a flexible contribution of the profession to the global agenda; the Land Administration Domain Model was published as an international ISO standard; and the FIG publication called Spatially Enabled Society established a foundation for the profession in the information society. At the end of his presidency, the FIG Congress in Kuala Lumpur in 2014, opened by the prime minister of Malaysia, was a truly global and successful event.

▲ *FIG Council at the kick-off event. President Chryssy Potsiou with vice-presidents Rudolf Staiger (left), Diane Dumashie and Pengfei Cheng. Bruno Razza was not present.*

Special thanks go to the sponsors of the event. Gold: Attica Bank and Eurobank; Silver: Marathon Daa Systems; and Bronze: Gaia SA, Geosystems Hellas, and the Association of Geoinformatics and Cadastre Companies. ◀

More information
1. http://bit.ly/1J7o6Sx
www.fig.net

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No 2744

SDI Capacity Building at GSDI

GSDI is focusing strongly on capacity building initiatives in 2015, especially for Individual Members in developing nations. The Capacity Building Project involves several components.

SDI WEBINARS

Webinars are being developed focused on SDI challenges and best practices, including non-technical topics such as data and information policy, organisational and legal issues. These will offer insights into research on managing Big Data and Open (Government) Data, especially when open data is combined with proprietary data in delivering new information services.

GI KNOWLEDGE NETWORK

The GSDI GI Knowledge Network (GIKnet) is expanding as we move to a new website and server architecture in 2015. GIKnet comprises two main components: the Community Registries (for individuals, companies, agencies and academic/research/NGOs) and the Spatial Documents Depot. Anyone interested in SDI is welcome to join GIKnet, which today has over 2,400 individuals registered in the system and details of 167 government agencies, 30 companies and 28 NGOs and academic departments. In 2015, we will also be expanding the documents held in the open document Spatial Documents Depot archive.

WORLD CONFERENCES

Among the most valued initiatives in capacity building are the GSDI World Conferences, of which 14 have been held since 1996, each attended by many hundreds of participants. GSDI 15 will be held in Taipei in 2016. Networking is key to the conferences, which feature numerous workshops. All presentations, peer-reviewed papers and publications from the conferences are freely available to all under Creative Commons licences. The conferences continue to provide a driver for research into the numerous issues impacting SDI implementation globally, including information policy, legal and organisational issues, standards and technical challenges.

ON-SITE TRAINING

GSDI is expanding its on-site training activities, including major workshops at key international conferences and meetings of the geocommunity. The following workshops are planned for 2015:

- CoastGIS 2015: 21 April 2015 – Cape Town, South Africa – *Marine/Coastal SDI Best Practice*
- INSPIRE-GWF 2015: (post-conference workshop) 30 May 2015 – Lisbon, Portugal – *SDI Big Data and Open Data Challenges and Successes*
- Digital Earth 2015: 5-9 October 2015 – Halifax, Nova Scotia, Canada – *SDI's Role in Supporting Digital Earth Concepts and Issues*
- ISPRS WG IV/4 and FIG Commission 2 International Workshop: 25-27 November 2015 – *Strengthening Education for Land Professionals and Opportunities for SDI Development*

Further on-site training opportunities are continually being sought via our global members and will be announced on the GSDI website and via our extensive mailing lists (regional and global).

Each year since 2012, a major commitment to on-site training has been support from Taipei in funding GSDI members to attend the two-week ICLPST (International Center for Land Policy Studies and Training) training seminar on geographical information systems and land management in Taipei. The support comprised all-expenses paid awards for three GSDI members in 2012, 2013 and 2014, and in 2015 that has been increased to five members. This year's awards go to:

▲ *Participants of the two-week ICLPST training seminar.*

- Mr Anish Joshi (Nepal)
- Ms Aster DenekewYilma (Ethiopia)
- Mr Olutoyin Justus Oloniteru (Nigeria)
- Mr Andres Felipe Ramirez (Colombia)
- Mr KaziSaiful Islam (Bangladesh)

We once again thank Mr Jeremy Shen, vice-chair, Capacity Building, of the GSDI Societal Impacts Committee for making these awards and this training programme available to GSDI members over the past four years.

SMALL GRANTS PROGRAM

GSDI has been running the Small Grants Program annually since 2003, during which time over 100 projects have received funding from GSDI and/or volunteer support from the Small Grants partners URISA's GISCorps, in more than 30 developing countries. The 2014 grants were highlighted in the January 2015 edition of *GIM International*. ◀

Learn more here:

- GSDI GIKnet: http://www.giknet.org
- GSDI World Conferences archive: http://www.gsdi.org/gsdiConferences
- CoastGIS 2015 – http://www.coastgis2015.co.za/program/
- INSPIRE-GWF 2015: http://www.geospatialworldforum.org/
- Digital Earth 2015 - http://digitalearth2015.ca/

More information

www.gsdi.org

International DORIS Service Workshop 2014

The International DORIS Service (IDS) is a service of the International Association of Geodesy (IAG) that supports geodetic and geophysical research activities through data and derived products of the Doppler Orbitography and Radio positioning Integrated by Satellite (DORIS) system for satellite orbit determination and precise ground positioning. Every two years, the IDS organises a workshop to provide a forum for reviewing the progress in the DORIS technique, presenting recent scientific developments and achievements, and preparing for future activities.

The most recent IDS workshop was held in Konstanz, Germany, from 27-28 October 2014 in conjunction with the Ocean Surface Topography Science Team (OSTST) meeting and a SARAL/Altika workshop [1].The participants included representatives of the six IDS Analysis Centres and of the IDS Combination Centre, people involved in the DORIS system management, and scientific groups interested in the DORIS data/products. The organisers were pleased to welcome some new users and potential partners with promising results and perspectives.

One session was devoted to the data analysis performed for the IDS contribution to the next realisation of the International Terrestrial Reference Frame (ITRF). All Analysis Centres had analysed the entire period of archived DORIS data for 1993-2013. The Combination Centre had submitted the DORIS contribution to the new ITRF to the International Earth and Reference Systems Service (IERS). It was also shown that the new DGXX instruments (on the Jason-2, Cryosat-2, HY-2A and Saral satellites) as well as the improvements to the data analysis and modelling have led to a significant gain in the quality of the DORIS solution compared to that which was available for the past realisation, ITRF 2008.

▲ *Participants at the IDS Workshop.*

Among the topics addressed in other sessions were:

- Two satellites equipped with a DORIS receiver will be launched in 2015: Jason-3 and Sentinel-3a.
- The first ground antennas benefiting from a new approach to consolidated manufacturing to ensure accurate radio frequency characterisation are being deployed.
- Radio frequency compatibility tests of DORIS-VLBI were performed at NASA's Goddard Geophysical and Astronomical Observatory.
- The future version of the DORIS navigator (DIODE) on board Jason-3 and the subsequent satellite missions will be able to provide pole coordinates estimations within two hours, making this contribution potentially interesting for publication in the IERS Bulletin A.
- It was demonstrated that including DORIS data in GNSS-derived vertical total electron content (VTEC) models has a positive impact, and this suggests some new and promising applications.

PDF versions of both presentations and posters are available for download from the IDS website at [2].

Following the workshop, the IDS Governing Board held a meeting and provided the opportunity to confirm the results of the IDS autumn 2014 elections. The seat of Frank Lemoine (NASA/GSFC) who had served as analysis coordinator since 2005 will be occupied for 2015-2018 by the duo Hugues Capdeville (CLS) and Jean-Michel Lemoine (CNES) who will share the responsibility and work of this position. Marek Ziebart (UCL) was also elected by the IDS Associates. He has succeeded John Ries (UTexas/CSR) as a member-at-large for the next four-year term as of 1 January 2015. The IDS welcomed the new members and paid tribute to Frank and John for their valuable contributions to the IDS. ◀

More information

1. www.ostst-altimetry-2014.com
2. http://bit.ly/1E6LtVM

http://ids-doris.org

The mission of the Association is the advancement of geodesy.

IAG implements its mission by:

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

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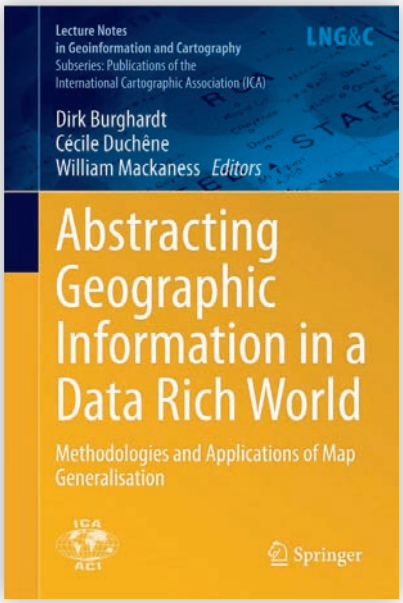
No 2734

Generalising and Summarising a Detailed Record of Achievement

It is four years since the work of the ICA Commission on Generalisation and Multiple Representations was last highlighted in this column. The fundamental importance of generalisation as an integral aspect of any map representation or database modelling has not changed; the transformations involved in cartography must involve the consideration of generalisation at all stages, and this is a topic which has significant resonance with the cartographic community at all times.

The major Commission achievement in 2014 was the publication in October of a new book, *Abstracting Geographic Information in a Data Rich World*. The result of two years of collaborative effort, and edited by Dirk Burghardt, Cecile Duchene and William Mackaness (current and past chairs of the Commission), this volume focuses on the essential theories, methodological advances and algorithms for automated mapping. It includes chapters on generalisation process modelling, integration and generalisation of volunteered geographic information (VGI), the ontological modelling that underpins data integration, and ideas of thematic, highly customised mapping (for example, delivering maps via mobile devices). The book, with its many case studies, illustrates the maturity of this research field, reflected in the increasing incorporation of automated mapping in the commercial systems used by national mapping agencies. It also illustrates the relevance of this research in the context of 'big data' and the increasing importance of user-generated geographical content.



▲ Published in October 2014: *Abstracting Geographic Information in a Data Rich World.*

The enthusiastic preface by Anne Ruas, ICA vice-president, outlines the role of notable personalities, of vendors competing to code and instigate algorithms, of national mapping agencies driven to adopting solutions to the multiple representation of their large, digitised datasets, and of research laboratories (some physically part of those NMAs). But it also notes the important role of ICA, the backward glance at history and cartographic principles, and most importantly the driving force represented by the Commission itself. The maturity and the impact of the previous publications, the joint activity with other ICA Commissions, with EuroSDR and ISPRS groups, with NMAs and with vendors, and the regular workshops have all been managed in an effective way by the active group of cartographers with an interest in this basic cartographic requirement.

Hardly pausing for breath, the Commission continues to look forward from this publication. Its 17th Workshop was held in Vienna, Austria, in September 2014, addressing new challenges in handling VGI and addressing the relatively neglected topic of raster generalisation. The presentations and outcomes of that meeting can be found at the record of previous events on the Commission website [1], whilst the 'state of the art' is illustrated in a small number of selected case studies [2]. All cartographers should be aware of the elemental nature of generalisation and of the way in which the Commission has successfully tackled many of the basic problems involved. It will next meet at its 18th Workshop in Brazil, prior to the ICC in Rio de Janeiro (August 2015), and will also play its part in that main conference. ◀

More information

1. http://generalisation.icaci.org/index.php/prevevents
2. http://generalisation.icaci.org/index.php/results

www.icaci.org

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No 2675

The Scientific Meetings of ISPRS

▲ *Prof Deren Li (Wuhan) and Prof Jianya Gong (TCP VI – organiser of the Symposium in Wuhan) with the congress director at the ice-breaker of the TC IV Symposium in Suzhou.*

▲ *From left to right: Vinay Dadhwal, president of Technical Commission VIII, Christian Heipke, Lena Halounová and Dr P.G. Diwakar, deputy director of National Remote Sensing Centre in India, at the TC VIII Symposium in Hyderabad in December 2014.*

ISPRS is a worldwide organisation which has a four-year functioning period, a two-layer structure system and a three-level meeting system. Scientific specialisations are managed by eight Technical Commissions (TCs). Each Technical Commission submits detailed scientific tasks to a lower ISPRS layer resulting in 60 Working Groups (WGs).

The three levels of meetings are Congresses, Symposia and Workshops. Congresses are organised every four years whereby the General Assembly elects the new venue, Council members and Technical Commission Presidents (TCPs), who determine the second level of meetings – the Symposia. The ISPRS Symposium is held in even years. All WGs organise at least one workshop in the Congress period. A new type of meeting, called Geospatial Week, is a joint meeting of several WGs. The next Geospatial Week will take place in France [1] in September 2015. TCPs from the USA (TC I), Canada (TC II), Switzerland (TC III), China (TC IV), Italy (TC V), China (TC VI), Turkey (TC VII) and India (TC VIII) were elected at the previous ISPRS Congress in 2012. The ISPRS Symposia venues extend from Denver (TC I) to Suzhou (TC IV) [2].

All Symposia have proved successful thanks to the participation of the organising and neighbouring countries, achieving substantial numbers of attendees and often more than 150. All Symposia have presented important developments in the ISPRS sciences and attracted high interest from young scientists within those branches.

However, the large number of ISPRS Symposia and other international meetings poses some difficulties for organisers due to significant competition in attracting participants and sponsors. In response to this complex situation, the ISPRS Council has started a procedure of restructuring the ISPRS TCs and this matter was discussed during the Symposia. If the Society gives its approval, the election during the 2016 Congress in Prague [3] will reflect the restructuring initiatives. ◀

More information

1. www.isprs-geospatialweek2015.org
2. www2.isprs.org/commissions.html
3. www.isprs2016-prague.com

www.isprs.org

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see address of secretary general

MARCH

AUVSI'S UNMANNED SYSTEMS EUROPE
Brussels, Belgium
from 03-04 March
For more information:
W: www.auvsi.org/UnmannedSystemsEurope/Home/

GEOSPATIAL ADVANCEMENT CANADA 2015
Ottawa, Canada
from 03-05 March
For more information:
E: neilthompson@wcgroup.ca
W: www.geospatialcanada.com

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY 2015
Washington, DC, USA
from 23-27 March
For more information:
W: www.worldbank.org/en/events/2014/08/06/landconference2015

JOINT URBAN REMOTE SENSING EVENT
Lausanne, Switzerland
from 30 March-01 April
For more information:
E: contact@jurse2015.org
W: http://jurse2015.org/

APRIL

GEO-TUNIS 2015
Hammamet, Tunisia
from 01-05 April
For more information:
E: atigeo_num@yahoo.fr
W: www.geotunis.org

III INTERNATIONAL FORUM 'INTEGRATED GEOSPATIAL SOLUTIONS – THE FUTURE OF INFORMATION TECHNOLOGIES'
Moscow, Russia
from 15-17 April
For more information:
W: http://sovzondconference.ru/2015

THE WORLD CADASTRE SUMMIT, CONGRESS AND EXHIBITION
Istanbul, Turkey
from 20-25 April
For more information:
E: tahsin@itu.edu.tr
W: http://wcadastre.org

INTEREXPO GEO-SIBERIA-2015
Novosibirsk, Russia
from 20-22 April
For more information:
E: argina.novitskaya@gmail.com
W: www.expo-geo.ru

AAG ANNUAL MEETING 2015
Chicago, IL, USA
from 21-25 April
For more information:
E: meeting@aag.org
W: www.aag.org/annualmeeting

SKYTECH 2015
London, UK
On 24 April
For more information:
W: www.skytechevent.com

GISTAM 2015
Barcelona, Spain
from 28-30 April
For more information:
E: gistam.secretariat@insticc.org
W: www.gistam.org/

MAY

ASPRS 2015 ANNUAL CONFERENCE
Tampa, FL, USA
from 04-08 May
For more information:
W: www.asprs.org/asprs-conferences.html

MUNDOGEO#CONNECT LATIN AMERICA
Sao Paulo, Brazil
from 05-07 May
For more information:
E: connect@mundogeo.com
W: http://mundogeoconnect.com/2015/en

RIEGL LIDAR 2015
Hong Kong and Guangzhou, China
from 05-08 May
For more information:
E: riegllidar2015@riegl.com.
W: www.riegllidar.com

ISRSE 2015
Berlin, Germany
from 11-15 May
For more information:
E: isrse36@dlr.de
W: www.isrse36.org

FIG WORKING WEEK 2015
Sofia, Bulgaria
from 17-21 May
For more information:
E: fig@fig.net
W: www.fig.net/fig2015

GEO BUSINESS 2015
London, UK
from 27-28 May
For more information:
E: dsmith@divcom.co.uk
W: http://geobusinessshow.com/conference/

JUNE

HXGN LIVE
Las Vegas, NV, USA
from 01-04 June
For more information:
E: contactus@hxgnlive.com
W: http://hxgnlive.com/las.htm

28TH INTERNATIONAL GEODETIC STUDENT MEETING (IGSM)
Espoo, Finland
from 01-06 June
For more information:
E: felix@igsm.fi
W: www.igsm.fi

INTERNATIONAL CONFERENCE ON UNMANNED AIRCRAFT SYSTEMS
Denver, CO, USA
from 09-12 June
For more information:
W: www.uasconferences.com

OPTECH IMAGING & LIDAR SOLUTIONS CONFERENCE
Toronto, CA, Canada
from 09-12 June
For more information:
E: inquiries@optech.com
W: www.optech.com

JULY

ESRI INTERNATIONAL USER CONFERENCE
San Diego, CA, USA
from 20-24 July
For more information:
E: uc@esri.com
W: www.esri.com/events/user-conference

AUGUST

27TH INTERNATIONAL CARTOGRAPHIC CONFERENCE
Rio de Janeiro, Brazil
from 23-28 August
For more information:
E: christina@congrex.com.br
W: www.icc2015.org

UAV-G CONFERENCE 2015
Toronto, CA, Canada
from 30 August-02 September
For more information:
W: www.uav-g-2015.ca

SEPTEMBER

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

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

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

OCTOBER

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

CALENDAR NOTICES

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

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

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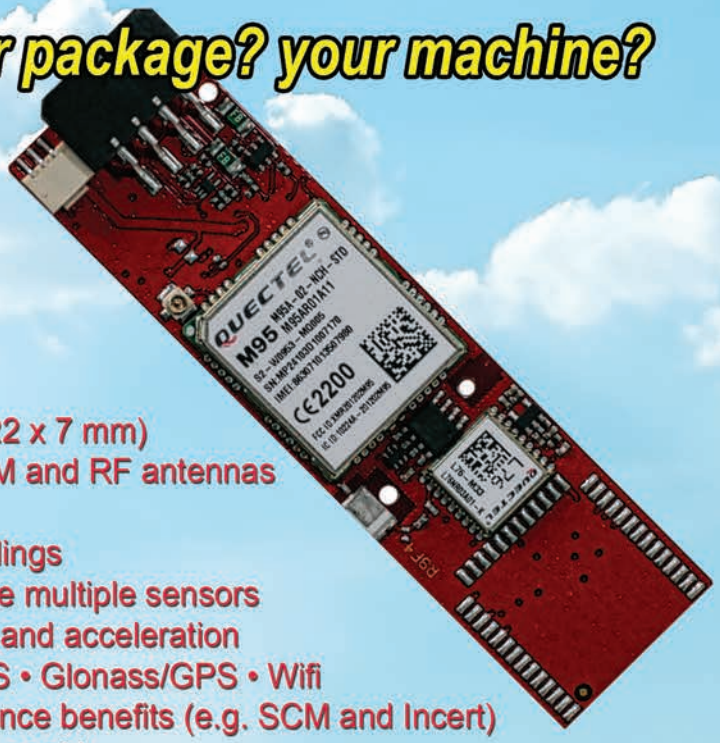

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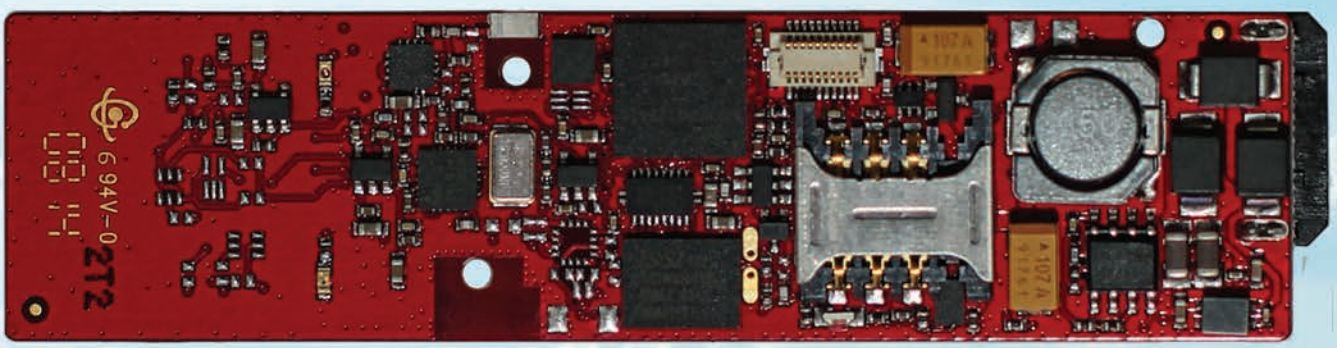
- Complies with additional standards for insurance benefits (e.g. SCM and Incert)
- Complies with automotive safety standard (E-mark)



We would like to invite you to have a look around our website and get inspired by the possibilities of what KCS TraceME products can bring to your project. Whether you need a solution for personal tracking, trace and control vehicles, object protection or more advanced M2M solutions, KCS TraceME can deliver it.

GPS/GPRS enabled GPS Tracker with advanced I/O. This will allow you to remotely track & trace and/or control a huge diversity of objects, machines and/or vehicles. KCS TraceME is absolutely the most versatile and adaptive Track-n-Trace solution in the market today. Our clients use the TraceME hardware for the most diverse tasks. It is truly an all-round performer and exceeds anything in the market currently available.

- KCS TraceME is available in different form factors (Key fob, OEM., Aluminum & custom made casing);
- GPRS, UMTS, SMS, GSM, Wi-FI, RFID, E-mail;
- Fully configurable administration tool;
- Event driven, can run custom code, remotely configurable;
- Connect M2M to any device;
- G-shock detection, temperatures, tilt, motion, iButtons, mobile phones, camera's;
- See the rest of the site for the full options!

Please contact us if you want to discuss your ideas!

OEM & Distributor requests are welcome!

www.Trace.ME

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