GIM INTERNATIONAL

THE GLOBAL MAGAZINE FOR GEOMATICS
WWW.GIM-INTERNATIONAL.COM

geomares PUBLISHING

ISSUE 12 • VOLUME 28 • DECEMBER 2014

EuroSDR Survey

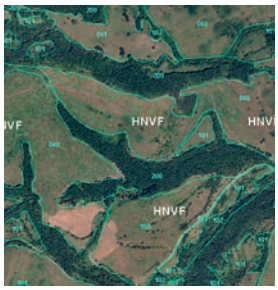
Oblique Airborne Photogrammetry: Users' and Vendors' Views

3D DATA SOURCING FOR LAND AND PROPERTY INFORMATION

DOROTA GREJNER-BRZEZINSKA GIM International Interview

GAINING INSIGHT INTO HIGH NATURE VALUE FARMLAND


NEW PRODUCTS RELEASED!
S650
S520
NTS-342R5A
R10
S760
SOUTH
Target your success
www.southinstrument.com www.southsurvey.com
mail@southsurvey.com export@southsurvey.com impexp@southsurvey.com gnss@southsurvey.com
No.2677



A digital surface model (DSM) of Munich, Germany, created from overlapping aerial imagery using the dense image matching (DIM) facilities of Photomod 6.0, a recently released photogrammetric software suite from Racurs, Russia.

Get your back-issues in the store

www.geomares.nl/store

RUIDE

GNSS POSITIONING SYSTEM

R90-X

- 220 channels dual frequency antenna.
- Compatible to GPS, GLONASS, GALILEO & BDS.
- RX/TX internal radio using TRIMTALK protocol.
- GSM/GPRS module integrated.

Where there's a need for
reliability.

TOTAL STATION

RTS-862R^5 Plus

- RDM5 technology delivers 500m non-prism range.
- 3.0mpx camera captures color images of the points at anytime.
- ATMOsense system detects and corrects PPM value automatically.
- Q-MEAS button on one side cover triggers a fast measure, generating zero deviation on horizontal axis.
- SD card, USB, RS232 interfaces.
- 3.5" super large color and touch screen.
- Bluetooth.

No 2683

RUIDE_

GIM INTERNATIONAL

PUBLISHING DIRECTOR Durk Haarsma
FINANCIAL DIRECTOR Meine van der Bijl
SENIOR EDITOR Dr Ir. Mathias Lemmens
CONTRIBUTING EDITORS Dr Ir. Christiaan Lemmen, Dr Rohan Bennett, Mark Pronk BSc, Martin Kodde MSc, Ir. Danbi J. Lee, Dr Ir. Marlies Stoter-de Gunst, Frédérique Coumans
EDITORIAL MANAGER Wim van Wegen
COPY-EDITOR Lynn Radford, Englishproof.nl
EDITORIAL BOARD Ir. Paul van Asperen, Dr Bharat Lohani
ACCOUNT MANAGER Sybout Wijma
MARKETING ASSISTANT Trea Fledderus
CIRCULATION MANAGER Adrian Holland
DESIGN Verheul Media Supporters BV, Alphen aan den Rijn www.vrhl.nl

REGIONAL CORRESPONDENTS
Ulrich Boes (Bulgaria), Prof. Dr Alper Çabuk (Turkey), Papa Oumar Dieye (Niger), Dr Olajide Kufoniyi (Nigeria), Dr Dmitry Kurtener (Russia), Dr Jonathan Li (Canada), Dr Carlos Lopez (Uruguay), Dr B. Babu Madhavan (Japan), Dr Wilber Ottichilo (Kenya), Dr Carl Reed (USA), Dr Aniruddha Roy (India), Prof. Dr Heinz Rüther (South Africa), Dr Tania Maria Sausen (Brazil)

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

PAID SUBSCRIPTIONS
GIM International is available monthly on a subscription basis. The annual subscription rate for *GIM International* is €140 within the European Union, and €200 for non-European countries. Subscription can commence at any time, by arrangement via our website or by contacting Abonnementenland, a Dutch subscription administration company. Subscriptions are automatically renewed upon expiry, unless Abonnementenland receives written notification of cancellation at least 60 days before expiry date. Prices and conditions may be subject to change. For multi-year subscription rates or information on current paid subscriptions, contact Abonnementenland, Postbus 20, 1910 AA Uitgeest, Netherlands
+31 (0)251-257926
(09.00-17.00 hrs, UTC +1)
paidsubscription@geomares.nl.

ADVERTISEMENTS
Information about advertising and deadlines are available in the Media Planner. For more information please contact our account manager: sybout.wijma@geomares.nl.

EDITORIAL CONTRIBUTIONS
All material submitted to Geomares Publishing and relating to *GIM International* will be treated as unconditionally assigned for publication under copyright subject to the editor's unrestricted right to edit and offer editorial comment. Geomares Publishing assumes no responsibility for unsolicited material or for the accuracy of information thus received. Geomares Publishing assumes, in addition, no obligation to return material if not explicitly requested. Contributions must be sent for the attention of the editorial manager: wim.van.wegen@geomares.nl.

Geomares Publishing
P.O. Box 112, 8530 AC Lemmer,
The Netherlands
T: +31 (0) 514-56 18 54
F: +31 (0) 514-56 38 98
gim-international@geomares.nl
www.gim-international.com

BPA WORLDWIDE BUSINESS

No material may be reproduced in whole or in part without written permission of Geomares Publishing.
Copyright © 2014, Geomares Publishing, The Netherlands
All rights reserved. ISSN 1566-9076

Humbling

Authoritative geospatial data is the basis of every informed decision, and the industry has reached a point where it can deliver unbelievable amounts of data every day. Eric Arvesen, vice-president of the Trimble's Geospatial Division, told the crowd at the biannual Trimble Dimensions 2014, which was held from 3-5 November at the Mirage in Las Vegas, that one of the challenges is to organise, authorise and open up data in such a way that decision-makers are able to use it in the right way. He presented the new cloud-based data management solution, InSphere, that will enable survey managers, project coordinators, technology directors, field technicians and utility inspectors to manage their daily work in one central place which is continuously accessible. The company's focus is on solutions for streamlining work processes in construction, transport & logistics and agriculture. In the years ahead, technology will enter into every part of professionals' daily work in all these sectors with the emergence of all-in-one solutions which connect field to office and acquisition to processing, analysis and monitoring. However Arvesen emphasised, and maybe even reassured the audience, at the grand opening that geospatial data starts with "boots on the ground" – knowledgeable professionals in the field setting up instruments such as total stations, laser scanners, UAVs and mobile mapping units – to acquire accurate data.

Photography: Arie Bruinsma

▲ *Durk Haarsma, publishing director*

A marvellous example of these "boots on the ground" was presented during the conference later that week. Lourdes Noriega Bardalez from the regional government of San Martin, which is in northern Peru, told some 20 attendees about a fascinating surveying and titling project to ensure land tenure for inhabitants. Native Indian communities have been living in the region, which is mountainous and characterised by rivers and rainforest, for centuries yet no data was available. The surveying project entailed talking to the indigenous people, asking them where they understood the boundaries to be and, when two neighbours agreed, incorporating that information to create a map. The surveyors started from scratch, working in an often hostile environment among people who communicated in five native languages plus a little Spanish, and many of whom had never seen modern instruments like the surveying equipment, but they received help from the friendly locals. The land titling that followed assured the locals of security, ownership and perhaps greater prosperity. Land titling in that relatively poor region also added many sol (the local currency of Peru) to the country's GDP. I was humbled by this presentation at the conference. The example illustrated the importance of surveying for a small farmer and his family in a forgotten corner of a Latin American country – and at the same time for his counterpart in Africa or Asia – who has no access to the type of modern-day economy which many of us take for granted. This is what surveying was about in the beginning, and what it should be about in the end. Please let us not forget that, among all our modern techniques, high-rise buildings, innovative solutions and masses and masses of data.

ComNav

T300
GNSS RECEIVER

Easy to use

Super light (less than 1kg with two batteries)

GPS L1/L2/L5, BeiDou B1/B2/B3, GLONASS L1/L2

Built in Tx&Rx

Ultra small

Hot swappable battery design

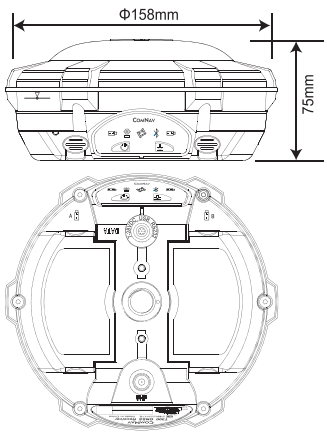
Compatible with other brands GNSS RTK

Many user-friendly conveniences built in

Low power consumption

Choose Right, Measure Right!

With decades' experience on the surveying GNSS receiver, the T300 is an ultra small and light product which combines lots of market proved advantages together. It could track all the working GNSS constellations. By using ComNav's unique QUAN™ algorithm technology, it can function in RTK mode with all the GNSS constellations or by using any single GNSS constellation such as GLONASS or BeiDou. The strong anti-interference ability of the receiver makes it possible to work in any environment. It frees surveyors to do the work in any place.



ComNav Technology Ltd.

www.comnavtech.com

No 2690

Towards a Spatially Enabled Society

Very recently an attempt was made in Hungary to demonstrate the capabilities and socioeconomic benefits of use of geographic information for decision-makers and politicians. With contractual support based on a Memorandum of Understanding provided by the National Council on Communication and Informatics, the Hungarian Association for Geo-information (HUNAGI) agreed to arrange a national forum on the topic of a spatially enabled society (SES). The aim was to raise awareness of the role and importance of location-based geospatial information and related services, and to demonstrate benefits offered by advanced applications.

An excellent opportunity was offered by Information for Society (Infotér), a Hungarian NGO which organised its fifth annual e-government-related national conference from 5-7 November 2014. The event attracted over a thousand important players from the national information and communication market, members of the Federation of Entrepreneurs in Informatics, and high-level representatives from government departments and agencies. Infotér and HUNAGI agreed that two sessions at the conference would be devoted to the subject of SES.

In the first session the challenges, issues, best practices and future trends in SES were introduced by Roger Longhorn, secretary-general of the GSDI Association. This was also the theme at the GSDI World Conference held in Quebec City, Canada, in 2012. Hungarian speakers from industry addressed data-policy issues regarding location-based acquisition of business information, and the director-general of the Hungarian institute FÖMI discussed special features, results and opportunities of Hungarian progress towards a SES.

Gabor Remetey-Fülöpp.

Government agencies and public service representatives approached the topic from the applications side. They highlighted the (r)evolution of the use of GI in time-critical applications such as disaster response and management, introducing micro-regional meteorological warnings using instruments available from mobile technologies and citizen involvement. The Budapest Transport Centre's GI project was also shown. Furthermore, this session saw the award ceremony of the HUNAGI Mobile Apps Challenge, with representatives from the four winners briefly presenting their apps to an appreciative audience. Roger Longhorn also made the first GSDI Mobile SDI App Award to eCamino, and this will become an annual prize from GSDI in future.

The second session of the afternoon concerned 'How can the government act?' in regard to issues ranging from INSPIRE Directive implementation to open data, public sector information access, use and reuse, and similar issues and challenges faced by government agencies, industry players and citizen stakeholders. The keynote speaker, Francesco Pignatelli from the European Commission's DG Joint Research Centre (JRC), introduced the synergy of GI and e-government actions reflecting on the EU Location Framework (EULF) initiative. Zsolt Sikolya of NHIT analysed the possible elements and relations of the Governmental Data Policy. Meanwhile the talk by the head of the Land Administration was devoted to INSPIRE implementation, mentioning related issues such as interagency coordination and supervisory tasks. The panel discussion that concluded the session investigated how government could offer further support, seeking experiences and opinions from Hungarian experts from the geoinformation industry, researchers and various government agencies, plus the EU. The audience learned much from an open debate on the range of issues and challenges involved and the progress being made.

The Infotér conference was very timely for these discussions, as the new cycle of the Hungarian government and the budget period in the European Union have both just started. This provides an opportunity for investors and decision-makers to better understand the societal, economic and political value of geoinformation and location-based data for all stakeholders: government, industry and citizens.

GIM INTERNATIONAL

EAB
The Editorial Advisory Board (EAB) of *GIM International* consists of professionals who, each in their discipline and with an independent view, assist the editorial board by making recommendations on potential authors and specific topics. The EAB is served on a non-committal basis for two years.

PROF ORHAN ALTAN
Istanbul Technical University, Turkey

PROF DEREN LI
Wuhan University, China

MR SANTIAGO BORRERO
Secretary-general of Pan American Institute of Geography and History (PAIGH), Mexico

PROF STIG ENEMARK
Honorary President, FIG, Denmark

DR ANDREW U FRANK
Head, Institute for Geoinformation, Vienna University of Technology, Austria

DR AYMAN HABIB, PENG
Professor and Head, Department of Geomatics Engineering, University of Calgary, Canada

DR GABOR REMETEY-FÜLÖPP
Secretary General, Hungarian Association for Geo-information (HUNAGI), Hungary

PROF PAUL VAN DER MOLEN
Twente University, The Netherlands

PROF DR IR MARTIEN MOLENAAR
Twente University, The Netherlands

MR JOSEPH BETIT
Senior Land Surveyor, Dewberry, USA

PROF SHUNJI MURAI
Institute Industrial Science, University of Tokyo, Japan

PROF DAVID RHIND
ret. Vice-Chancellor, The City University, UK

PROF DR HEINZ RÜTHER
Chairman Financial Commission ISPRS, University of Cape Town, Department of Geomatics, South Africa

MR FRANÇOIS SALGÉ
Secretary-general, CNIG (National Council for Geographic Information), France

PROF DR TONI SCHENK
Professor, The Ohio State University, Department of Civil and Environmental Engineering, USA

PROF JOHN C TRINDER
First Vice-President ISPRS, School of Surveying and SIS, The University of New South Wales, Australia

MR ROBIN MCLAREN
Director, Know Edge Ltd, United Kingdom

Chintergeo 2014 Held Successfully in Nanchang

Chintergeo, China's largest professional geomatics exposition, was held successfully from 25-27 October 2014 in the city of Nanchang. The event, which attracted over 20,000 visitors, focused on the latest surveying and mapping equipment and geographical information software. The event was organised by the Chinese Society for Surveying, Mapping and Geoinformation in order to provide a platform for international manufacturing enterprises and dealers and support them in developing new business and marketing activities.

▸ **http://bit.ly/1AaT47R**

Impression of the Chintergeo 2014 exhibition.

30,000km Lidar Survey of Overhead Power Lines

A multimillion-pound contract to produce the largest ever Lidar survey undertaken by an electricity distribution network operator in the UK has been awarded to ADAS and Bluesky International. The companies have been contracted to conduct an aerial 3D Lidar survey of the whole of UK Power Networks' high and extra-high voltage (HV & EHV) overhead power lines, which extend to over 30,000 kilometres.

▸ **http://bit.ly/1twfyKi**

Bluesky surveys UK Power Networks' pylons.

First TUSExpo Speakers Announced

TUSExpo has announced its first speakers scheduled to present during the first European Unmanned Systems trade show and conference, taking place from 4-6 February 2015 in the World Forum, The Hague, The Netherlands. The event is set to become a dedicated business platform bringing together European and global companies across the entire unmanned systems supply chain.

▸ **http://bit.ly/1twgaj1**

Position Partners Appointed as FARO Master Distributor

Position Partners, a 3D positioning solutions company, has been appointed as FARO's distributor across Australia and Papua New Guinea, with distribution rights to FARO's 3D documentation products in both countries. The distribution rights include the FARO Focus range of laser scanner products developed for precise measurement of large objects and environments for 3D documentation and modelling.

▸ http://bit.ly/1AaW1W1

Position Partners and FARO at the 3D User Conference in Sydney.

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

1. UAVs Revolutionise Land Administration - http://bit.ly/1tem2Lo
2. Sharing Experiences at The Commercial UAV Show - http://bit.ly/1tZkxpD
3. Berlin: Three-day Geomatics Capital of the World - http://bit.ly/1temcm4
4. Speeding up 3D Modelling for Highways Surveying - http://bit.ly/1temaKZ
5. RIEGL Launches UAS at Intergeo - http://bit.ly/11izqHe

senseFly UAV Technology Used to Map Hawaiian Lava Flow

On 22 October 2014, in a collaborative partnership with Hawaii County Civil Defense and the U.S. Geological Survey Hawaiian Volcano Observatory, specialists from the UH Hilo Spatial Data Analysis and Visualization (SDAV) laboratory used a senseFly swinglet CAM UAV, carrying an RGB camera payload, to collect high-resolution still images of the lava's active flow front. These shots were then merged into a full orthomosaic for use by Civil Defense emergency planners.

▸ http://bit.ly/1AaToUO

Mapping lava flow of the Kilauea volcano.

5 Questions to...

Ludvig Emgård

Ludvig Emgård, founder, Spotscale.

You are the founder of Spotscale, a young start-up specialised in 3D modelling. Can you tell us a little more about your company?

We are a tech start-up which is truly devoted to representing buildings and areas in realistic 3D, focusing on 3D reconstruction algorithms to solve known problems in computer vision. The company was founded two years ago. We create state-of-the-art technology and methods for the capture process and tools to deliver high-resolution experiences and usability for city planners and the real-estate sector. The 3D models that we produce usually cover small areas with an immense level of detail.

Which techniques do you use to collect the data for your 3D models?

We make use of mid-size multi-rotor UAVs equipped with cameras and other sensors to fly in well-defined patterns around a building. We have developed various capture solutions to enable us to handle different kinds of buildings. Each scene presents different problems so the capturing part must be done right to obtain the best data for input into our process. We capture thousands of high-res images while in the air and have developed advanced codes for selecting the right subsets to use in the reconstruction.

Which software do you use to generate the 3D models?

We combine open source software, our own algorithms and commercial components to deliver gigapixel renderings as a final result. In recent months we have focused on improving our in-house structure from motion and texturing algorithms, since we have realised that what is available is not always enough to deliver excellent results. People with reconstruction experience know that many building types and light/weather circumstances present challenges which lead to artefacts. We are devoted to solving the delivery problems by treating each building, feature and scene differently and to achieving the most efficient blend of automation and manual input.

What are the target groups for your 3D replicas, and what are the replicas used for?

To summarise, there are three major cases where users prefer realistic models: to visualise or measure changes, to simulate scenarios or to market a building to generate commercial interest. Therefore, real-estate developers, city planners and construction companies are among our customers. Other groups include luxury estate owners and serious gaming providers. Now, at the end of our first year of active sales, we are already working with over 30 customers to constantly improve the products.

Can you explain to GIM International readers why your company is more than just another one of the many recent UAV-related start-ups?

So far, most UAV-related start-ups are focusing on mapping terrain, forests or landscapes using fixed-wing UAVs, resulting in terrain models and orthophotos as end products. At Spotscale we are experts in the creation of high-quality models of buildings and complex urban scenes. We have already mapped over a hundred urban scenes and learned that it takes a combination of hardware, maths, processing knowledge and experience to do that successfully. What also makes us different is that we focus on making the vast amounts of image-based 3D data work smoothly on tablets, handsets and laptops.

C-Astral Launches New Range of UAS Solutions

C-Astral, a Slovenia-based performance surveying, remote sensing and tactical small UAS integrator, has unveiled new high-precision systems and new tactical UAS solutions. The Bramor C4Eye, designed for real-time or near-real-time video observation and surveillance, and the Bramor rTK, suited for surveying and remote sensing applications, are among the products that have been launched.

▸ http://bit.ly/1AaV2Fd

C-Astral Bramor rTK.

Promising 3D Portable Measuring Instrument Launched

At Intergeo 2014 e-Capture R&D, a technology-based company, introduced a new 3D-accurate measuring instrument embedded in a tablet. e-Capture intends to revolutionise the world of measuring with a new generation of portable, easy-to-use and highly accurate instruments, optimal for most archaeology and civil engineering-related jobs.

▸ http://bit.ly/1tZqgM3

e-Capture's EyesMap.

p3d Systems' ProScan.

Setting New Standards for Precise 3D Data Capturing Systems

German 3D solutions manufacturer p3d Systems has announced that the ProScan system and p3dSW now fully support the Leica ScanStation P20 and P15 ultra-high-speed scanners in the spectrum of kinematic laser scanning solutions. The full integration turns both of p3d Systems' solutions into more productive, precise 3D data capturing systems which can be utilised for a wide variety of applications and 3D data capture tasks.

▸ http://bit.ly/1tZpQoX

SuperGIS Server 3.2

Integrate and Share GIS Services over the Web

Why SuperGIS Server 3.2 ?

- Share GIS data over the Web
- Integrate various GIS services
- Manage huge data in geodatabases
- Customize applications with free APIs
- Extend to mobile applications
- Mash up with online map sources

What our partner says...

SuperGIS Server helps our clients from education, agriculture, public works, research institutes, etc. to easily build robust GIS websites and make better decisions in Kuwait. The following technical service is also strong to address evolving user requests. - Dr. Thamer Alrashidi, CEO, IIES, Kuwait

Worldwide distributors wanted. Contact us at staff@supergeotek.com www.supergeotek.com

Supergeo®

No 2693

©2014 Supergeo Technologies Inc. All rights reserved. Supergeo, the Supergeo logo, SuperGIS, SuperPad, SuperSurv, and www.supergeotek.com are trademarks of Supergeo Technologies Inc. Other companies and products mentioned herein are trademarks orregistered trademarks of their respective trademark owners. Android Robot is modified based on work created and shared by Google and Windows Mobile logo is modified based on work created and shared by Microsoft.

X8-M.

3D Robotics Launches New 3DR Mapping Platforms

3D Robotics, a North American UAV company, has announced the launch of the new 3DR mapping platforms consisting of the 3DR X8-M (multi-copter) and Aero-M (fixed-wing), with highly accurate resolution that allows users to zoom in from the sky 'down to the grape'. Each platform is bundled with both hardware and software solutions, including a high-resolution visible-spectrum camera, protective hard case, autopilot-controlled image acquisition and professional image processing software powered by Pix4D, 3DR's newest business partner.

▸ **http://bit.ly/1AaWDL2**

Leica Geosystems and Headwall Photonics Announce Partnership

Leica Geosystems and Headwall Photonics have established a partnership agreement whereby Leica Geosystems will resell and integrate Headwall's line of hyperspectral imaging sensors into its airborne product portfolio. Leica Geosystems, a leader in geospatial data acquisition and mapping products, has selected Headwall's hyperspectral imaging sensors to meet the growing demand for advanced hyperspectral sensors that acquire imagery data, which includes both spatial and spectral (chemical) information within the mapping area of interest.

▸ **http://bit.ly/1tZjy8X**

Land Stability Service Wins Copernicus Masters

The first Earth observation service for extensive and uninterrupted coverage of land stability monitoring and mapping with millimetre-precision has been named the winner of this year's Copernicus Masters competition. This year's overall winners, Dr Andrew Sowter and Paul Bhatia from the University of Nottingham, have developed a novel procedure called PUNNET.

▸ **http://bit.ly/1AaUgrV**

Brontopixels

Some years back I wrote in this column, "Today, Earth observation (EO) satellites are being constructed and launched at conveyor-belt speed." This avowal was confirmed at the 14th Int'l Scientific and Technical Conference, 'From Imagery to Map', held recently in Hainan, China (see my report on page 28). To date over 200 optical EO satellites are in orbit, run by governmental agencies or private firms in over 30 countries, including former USSR country Kazakhstan. The republic has a GDP of less than USD250 billion and is home to 17 million inhabitants. It is working hard to create a national space industry and, with the support of France's Airbus Defence and Space, has constructed a very-high-resolution (VHR) EO satellite which launched on 30 April 2014. The ground sample distance (GSD) of the panchromatic (pan) mode is 1m, and 4m for the four multi-spectral (MS) bands. The amount of pixels captured annually by all the orbiting sensors should no longer be counted in petapixels (10^{15}) or zettapixels (10^{21}) but rather in yottapixels (10^{24}), and this will soon become brontopixels (10^{27}). The data can easily be stored on mass solid state devices but all the computer power in the world is not enough to transfer the massive amount of pixels into information fit for use in a reasonable amount of time and at acceptable costs. One may even question whether it is wise to produce such high volumes if only a small portion will be used…perhaps enough is enough. The construction, launch and operation of an EO satellite takes a big chunk out of the sovereign budget and some people might argue that this is a waste of taxpayers' money – money that could be better spent on the repair of roads and dikes or on public health and social security. Others may counter that the effort is justifiable, as a space programme brings prestige to politicians and nations alike. Moreover, despite the optimism of many leaders when the Cold War ended 25 years ago, quarrels between nations continue and armed attacks remain a very real possibility. In today's world, competing camps play power games – the tension is tangible and the fear of raids has become a part of everyday life for millions. Russia and Asia are not only attempting to usurp the USA as the issuer of the world's reserve currency but are also challenging its space hegemony as they launch one EO satellite after the other. The power balance is gradually shifting, and many nations – large and small – are keen to ensure that no foreign blocks or bans will disrupt life within their territory. Many no longer want to rely on other nations' promises and prefer instead to follow their own path to the future. They know how quickly faith can evaporate and world leaders' power can crumble when they run out of taxpayers' money. When it comes to space technology, any emerging economy has the right to try to take a piece of the Earth's exosphere. In the meantime the USA continues to extend its fleet of spacecraft with optical sensors on board at conveyor-belt speed. On 13 August 2014, DigitalGlobe launched WorldView-3 into an orbit 617km above the ground. The GSD of the pan mode is 31cm and 1.24m for MS imagery. The average revisit time is around one day, and up to 680,000km^2 can be captured daily. Due to US regulations the GSD has to be resampled to 40cm prior to delivery. To date, 11 spacecraft collect optical imagery at a GSD better than 1m: WorldView 1 (46cm), 2 (46cm) and 3 (31cm); GeoEye 1 (46cm) and 2 (34cm); the Pleiades twins (50cm), Quickbird (65cm); Ikonos (82cm); and the SkySat twins (90cm). ◂

GIM INTERNATIONAL INTERVIEWS DOROTA GREJNER-BRZEZINSKA

Navigating **the Future of the Geospatial** and Geomatics Sectors

Dr Dorota Grejner-Brzezinska is the incoming president of the Institute of Navigation (ION). She also serves as president of the International Association of Geodesy (IAG) Commission 4, Positioning and Applications. *GIM International* held an in-depth conversation with Grejner-Brzezinska on the role of the ION, the latest developments and trends in GNSS survey solutions, and the future of GNSS.

The Institute of Navigation (ION) serves a worldwide community including those interested in air, space, marine, land navigation, and position determination. How has the Institute evolved?

The Institute of Navigation was founded in 1945 by a group of practising air navigators, originating from both military and civilian backgrounds. Much of the Institute's energy during the early years was devoted to building an effective organisation that would advance the art and science of navigation by coordinating the knowledge and achievements of practitioners, scientists and developers of navigation equipment. In the 1990s ION really began to flourish as it garnered support from everyone interested in position-determining systems, particularly after GPS had reached full operational capability. Advancements in navigation technology eliminated the need for specialist navigators for most applications; navigation became automated as humans and electromechanical devices were replaced by microcomputers, integrated circuits and sensors. Accuracy and coverage performance for all phases of navigation were rapidly enhanced as today's various GNSSs evolved. The manner in which ION adapted to, and in some cases played a key leadership role in, these changes has accounted for its success.

ION members include cartographers, professional navigators, photogrammetrists, geodesists and surveyors. What are the main membership benefits?

ION membership is an outstanding opportunity to stay connected and informed about what's happing in the field of positioning, navigation and timing (PNT). Membership of professional organisations are considered a 'best practice' for professional and personal development, and ION members gain access to the tools they need to advance in their field. Membership includes a subscription to the quarterly peer-reviewed journal *NAVIGATION* and the quarterly ION Newsletter, and access to the database of more than 13,000 technical papers published in *NAVIGATION* and Proceedings of the many ION meetings. In addition, members receive discounts on meeting registration fees and publication

purchases, they have the right to vote and to hold office, and they can participate in the Annual Awards programme. They can also become a Government Fellow. The Government Fellow programme is designed to offer ION members a unique educational experience while providing the government with technical experience and private-sector perspectives that we hope will foster effective public policy on the issues that affect our profession and society as a whole. There are two categories: Congressional Fellowship and Executive Fellowship. A Congressional Fellow serves as a science and technology staffer for a Member of Congress or a Congressional Committee, while an Executive Fellow serves as a science and technology advisor in an Executive Department.

The Institute is well-known for its annual awards programme, such as the Johannes Kepler Award and the Bradford W. Parkinson Award. What do you achieve with these awards, and how do they benefit the navigation industry?

By honouring people who are making a difference, our awards help to focus attention on the field of PNT and serve to foster innovation, excellence, commitment and advancement. This is a perfect role for ION, and our honourees all represent the finest in technical achievement and altruistic dedication to their profession.

ION also sponsors student awards for navigation excellence. Have these students produced any ground-breaking developments?

The vitality of an organisation is preserved by fostering the growth and development of the next generation of professionals and organisational leaders. Many of the leaders in the PNT marketplace and academia are former ION student-paper winners, and several of the ION's past presidents were introduced to the ION through a student programme.

What were the most eye-catching developments at the 2014 edition of ION GNSS+ in Tampa, USA?

One of the highlights of the ION GNSS+ 2014 meeting was the plenary session that, for the first time, this year included several 'ignite talks'. These were brief, high-energy and high-impact presentations focused on the new element on the technical programme – a panel session as part of each technical track. We had panels covering systems, policy, technical visions, commercial products and application developments, and the second indoor positioning panel even featured live demonstrations of the latest technology. These panel sessions really caught the audience's attention; they were very well attended and generated lively discussions. The commercial exhibition was also sparked with innovation. But fundamentally it is the international audience's technical acumen and willingness to share their knowledge that makes it such a unique event.

What new opportunities can surveyors expect from GNSS developments over the next few years?

Multiple constellations of GNSS expected to reach full operation in the next few years will bring new and enhanced capabilities to the surveying community: more signals and more satellites will provide better availability and redundancy, particularly in areas of a limited sky view. However, these will not necessarily always translate into better accuracy, since observation geometry has a strong influence on the final accuracy levels, even if redundant satellites are observed. Triple-frequency configuration will allow formation of additional wide-lane and first-order ionosphere-free linear combinations, as well as a second-order ionosphere-free linear combination that will have a positive impact on the speed and reliability of ambiguity resolution and coordinate accuracy. Availability of the new and modernised civilian signals will significantly improve the accuracy of the Standard Positioning Service (SPS). The US government is in the process of implementing three new signals designed for civilian use: L2C, L5 and L1C. The legacy civilian signal, L1 C/A, will continue broadcasting in the future for a total of four civilian GPS signals. The new civilian signals are phasing in incrementally as new GPS satellites are launched to replace the older ones. Note that most of the new signals will be of limited use until the new constellation reaches the level of 18 to 24 satellites. On 28 April 2014, the Air Force began broadcasting civil navigation messages on the L2C and L5 signals. Fully operational GNSS constellations will be able to provide metre-level (1-10m) positioning accuracy with better coverage and availability than GPS only. The accuracy of GNSS augmented by space-based and ground-based augmentation is at decimetre level (<1m) and carrier-phase-based multi-frequency techniques, including RTK and PPP, are at centimetre level (<10cm).

The rise of UAS in the geomatics sector seems to be unstoppable. How can the navigation industry contribute to this game-changing development?

The navigation industry has been a game-changer from the onset of the rise of UAS in the geospatial and geomatics sectors by developing portable, low-cost and reliable navigation sensors, such as GPS boards and MEMS IMUs, and GPS/IMU-integrated systems. No UAS can be used in national security, scientific or commercial applications without reliable navigation. The navigation industry has made significant R&D efforts to ensure the availability of accurate, continuous and global PNT to support the growing market of geospatial technology applications, including the UAS market. Even the best information wasn't 'geoinformation' until we attached coordinates and a time stamp to it!

People spend most of their time indoors, where GNSS signals are too weak to be picked up by receivers. How do you view the development of a GNSS-free positioning system for indoor locations?

In recent years, the so-called high-sensitivity GNSS receiver technology has entered the market. These receivers have some indoor reception inside glass or wooden structures, although the accuracy is lower than in clear-line-of-sight navigation. Personal navigation, designed for indoor and generally GNSS-challenged environments, has been of increasing interest among the navigation community for well over a decade. Miniaturised, portable sensors are available on the market, and integration algorithms designed for fusing information from conventional and unconventional sensors (e.g. passive and active imagers and step sensors) have progressed significantly, followed by the improved processing power of portable computers and wireless technology. RF-based systems, such as ultra-wide band (UWB), RFID or WLAN, or a land-based constellation of transceivers that acts as an independent navigation system, such as Australian Locata, are being used for indoor navigation together with MEMS IMUs (inertial measurement units) and image-based navigation. A number of research demonstrations as well as

commercial prototypes have been designed and implemented. Global space-based PNT combined with indoor navigation systems, plus the proliferation of wireless technologies, mobile computing devices and mobile internet, has fostered a new and growing interest in location-aware systems and services. It is the fastest-growing location-based commercial market and already generates over 47% of all location-based commercial applications. A typical smartphone houses a GPS chip, digital maps and a number of sensors that can provide navigation information, such as IMUs, Wi-Fi, proximity sensors, cameras, etc. Better exploitation of these sensors will make a smartphone the ultimate personal navigation device of the future.

Today, commercial network-based RTK (NRTK) is an essential GNSS infrastructure for centimetre-level positioning. Meanwhile, precise point positioning (PPP) is rapidly developing as an alternative to NRTK. How do you foresee that accurate positioning will be done in the near future?

I regard NRTK as the next evolutionary step of the differential GPS (DGPS) service which was enabled by the expanding ground-based infrastructure, availability of near-real-time IGS orbits and clocks, increased computing power and ubiquitous Wi-Fi communication, as well as a solid GPS/GNSS constellation that has been offering more than 24 satellites for many years. In PPP mode, the user combines the precise satellite orbits and clocks with dual-frequency GNSS data collected at their location and can calculate coordinates which are absolute rather than relative to a reference station. Dual-frequency data is needed to remove the first-order ionospheric effect. The coordinate accuracy is at centimetre level for static solution and closer to decimetre level for kinematic applications. Dense ground reference networks are available in many parts of the world – Europe, Canada, USA, Japan, etc. – and the availability of high-accuracy error corrections from these permanently tracking networks can, theoretically, be used to support single-frequency users in PPP mode. Static PPP is considered a rather settled approach. For example, Natural Resources Canada offers PPP-based, high-accuracy GPS data processing tools online. Many argue that PPP is the future of precise positioning. I believe that the key is the availability and accuracy of the network-based corrections that provide 'local' or 'regional' resolution of tropospheric and ionospheric corrections and, generally, can provide better accuracy than the global models. Availability of external high-accuracy iono corrections can support faster convergence, which is a primary problem of kinematic PPP. The actual user positioning can be accomplished either as NRTK or PPP, with the benefit of PPP of broadcasting smaller packets of data than NRTK.

What will be the main challenges for the GNSS industry in the coming years?

Firstly, a fiscal challenge – how much are governments willing to spend on GNSS, and will the monetary support be continuous, organised and sufficient? We have seen ups and downs, delays and uncertainties, and it seems to be an ongoing challenge despite the fact that GNSS is present in virtually every aspect of our lives. For example, the space segment must be updated and replenished at a faster pace than the ongoing GPS and GLONASS modernisation projects. Secondly, the challenge to manage and internationally co-ordinate GNSS in a far-reaching, equitable, transparent and comprehensive way – establishing co-operation via the International Committee on GNSS is an excellent move towards addressing this. Other challenges facing the GNSS industry, but also other industries, include: no back-up system, spectrum protection, interference and jamming, vulnerability to spectrum and cyber attacks, and location privacy. In addressing these challenges, the broader GNSS community must assume the role of a leading enabler, since this amazing, global tool it has created has now become available to many, who may abuse it. Therefore, the GNSS industry, legislators and regulatory agencies must become proactive in addressing these challenges. Otherwise, the GNSS sector and related industries may become reluctant to invest in a market whose sole backbone depends on government policies.
Of course, there are also technological challenges. For example, considering that UAVs are becoming mainstream geospatial data-collection platforms, GNSS and GNSS/IMU/imaging sensors must become not only lightweight but also affordable and more accurate than most of the portable devices currently available. A challenge related to this opportunity is the relatively slow pace of innovation; the industry must step up and close the gap quickly. Another point worth mentioning is the consequence of mergers and consolidations. These may limit competition, creating a market which is shared among a small number of manufacturers or sellers, which can in turn lead to an even slower pace of innovation.

With Europe, China and India actively developing GNSS systems, there are more positioning satellites available today than ever before. How do you see navigation benefiting from this increased availability?

The fastest-growing sector of GNSS applications is location-based services (LBS). Aside from the privacy challenge associated with LBS, it brings tremendous opportunities to many markets, with Asia leading the pack. Global GNSS market growth in terms of CAGR is expected to reach approximately 21% over the period 2012-2016, with the GNSS LBS-only revenues expected to reach over EUR80 billion by 2020. At present, the global base of GNSS devices is around 2 billion units, and by 2022 it is expected to grow almost fourfold to seven billion – that's almost one GNSS receiver for every person on the planet!

Self-driving cars is an upcoming application that not only needs reliable GNSS information, but must also ensure that the cars will 'see' their surroundings using a suite of radar and Lidar sensors. Among others, the University of Texas Radionavigation Laboratory has demonstrated centimetre-level positioning

accuracy is possible with a smartphone antenna. That's an enabler of high-accuracy and low-cost applications which have so far been served by high-end, costly GNSS equipment. So, the next step to expect is an app for high-accuracy global mapping via crowdsourcing. D.P. Shepard and T.E. Humphreys presented a very interesting vision on high-precision, globally referenced position and attitude via a fusion of visual SLAM, carrier-phase-based GPS and inertial measurements at IEEE/ION PLANS in 2014.

GNSS was originally developed for military purposes, and recent unrest such as in Ukraine, Gaza and Iraq has prominently highlighted its role as a military tool. Do you expect growing tension in international relations to impact on civilian use of GNSS?

The 2004 US space-based PNT policy recognises that the growth in civil and commercial applications continues. However, the positioning, navigation and timing information provided by GPS remains critical to US national security, and its applications are integrated into virtually every facet of US military operations. However, according to the space-based PNT guidelines, the US government is committed to continuous, worldwide provision of GPS civil services, and civil signal design information, free of charge. We can only speculate on whether the US or other governments will decide to impose any restrictions on accuracy or access. With the GPS modernisation programme aimed at separating military and civilian signals, it's fair to expect that no restrictions will be necessary. However, it has been demonstrated how relatively easy it is to spoof a civilian signal, and it seems prudent to focus on protecting vulnerable civilian applications that rely heavily on GNSS (e.g. timing, banking, tolling, emergency response, Earth observation for weather and climate purposes, natural hazards, land-use change, ecosystem health, marine affairs, etc.) from intentional jamming and cyber attacks. ◂

Dorota A. Grejner-Brzezinska

Dorota A. Grejner-Brzezinska gained a PhD in Geodetic Science in 1995 from The Ohio State University. She is a professor and chair of the Department of Civil, Environmental and Geodetic Engineering, and director of the Satellite Positioning and Inertial Navigation (SPIN) Laboratory at Ohio State University. Her research interests cover GPS/GNSS algorithms, GPS/inertial and other sensor integration for navigation in GPS-challenged environments, sensors and algorithms for indoor and personal navigation and mobile mapping. She has published over 300 peer-reviewed journal and proceedings papers, numerous technical reports and five book chapters on GPS and navigation. She is an ION Fellow, Fellow of the Royal Institute of Navigation, president of the International Association of Geodesy (IAG) Commission 4, Positioning and Applications, and IAG Fellow. Dorota is currently serving as ION executive vice-president and the incoming president.

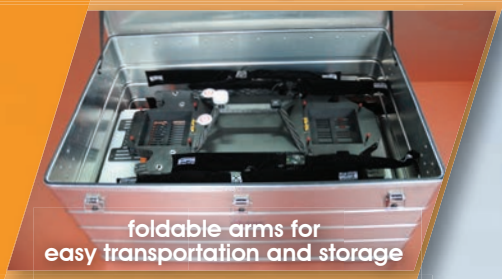
NEW RIEGL RiCOPTER

Ready to Fly Remotely Piloted Airborne Laser Scanning System

ULS

Learn more about the RiCOPTER

SPAR Europe / ELMF 2014
December 8-10, 2014
Amsterdam | The Netherlands
RIEGL booth #410



foldable arms for easy transportation and storage

easy to carry with the integrated carrying handle

RiCOPTER ready for take off

scan data

The NEW RiCOPTER: First fully integrated LiDAR system solution for professional UAS surveying missions

The RiCOPTER is a high-performance UAS equipped with RIEGL's VUX-1 survey-grade LiDAR sensor to offer a fully integrated turnkey solution.

The robust and reliable platform design integrates the *RIEGL* VUX-1 LiDAR sensor, IMU/GNSS unit with antenna, control unit, and up to 4 cameras. The turnkey system provides remarkable measuring characteristics: 230° Field of View, 350,000 meas./sec., range up to several hundred meters, and multiple target capability.

RiCOPTER is ideally suited for applications such as precision agriculture, topography in open-cast mining, terrain and canyon mapping, cultural heritage documentation, corridor mapping, and many more.

RiCOPTER marks the first complete UAS LiDAR solution from one manufacturer!

Stay connected with *RIEGL*

www.riegl.com

RIEGL®

No 2687

RIEGL LMS GmbH, Austria | *RIEGL USA Inc.* | *RIEGL Japan Ltd.* | *RIEGL China Ltd.*

OBLIQUE AIRBORNE PHOTOGRAMMETRY: USERS' AND VENDORS' VIEWS

EuroSDR **Survey**

Today, oblique airborne images are a powerful source of geodata, particularly for applications in urban areas. Although the cost of capturing is higher, object identification and creation of dense 3D point clouds is easier and more reliable compared to conventional vertical imagery. To better understand the current practice and possible user needs, the EuroSDR initiated a survey on the use and expectations of obliques. The questionnaire went online in spring 2014 and was targeted at both users and providers of hardware, software and services. Here, the authors summarise the key findings from the survey.

In recent years, aerial multi-camera systems which are able to deliver oblique and nadir imagery simultaneously have become standard. The interest in oblique imagery for mapping is primarily driven by the disclosure of the entire façade and, normally, the footprint of buildings. The use has evolved from simple visualisation or reconnaissance to cartographic mapping. The multiple applications of aerial obliques include extraction of dense point clouds for 3D city modelling, identification of structural damage to buildings, road updating, monitoring services, urban area classification and administration services.

EUROSDR SURVEY

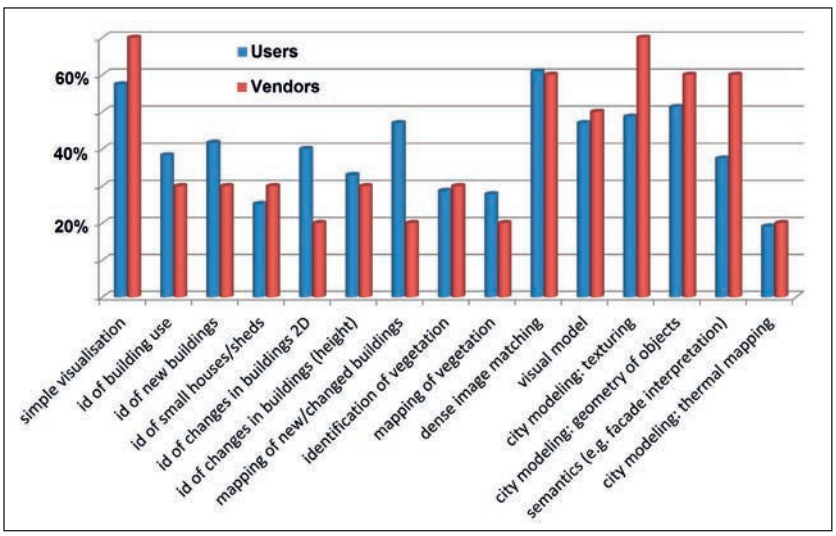
Eleven questions were directed towards users and seven questions to vendors/suppliers. As of October 2014, more than 130 participants had responded to the survey, including 11 vendors. The largest group of respondents comes from academia, followed by national mapping agencies (Table 1).

A key question addressing users was: "In your institution or company, which applications would you see for (or are you already serving with) high-resolution oblique airborne images?". Similarly, vendors were asked: "What do you anticipate is the major application of oblique airborne images?". Figure 1 shows the percentages of positive answers given to the question on the use of obliques (multiple choices are possible); users and vendors largely agree. The respondents from academia and NMAs see mapping of buildings as offering important potential. Dense image matching is also seen as significant, as facades are often visible and therefore buildings can be reconstructed in 3D. Figure 2, which shows a point cloud computed from Microsoft Osprey imagery of Graz (Austria) using the Micmac tool, demonstrates the current level of dense image matching. The denser and more complete 3D point clouds are, the greater the challenge is to transform them into structured and detailed building models. This is still an open and 'hot' research topic.

IMPROVEMENT OF TASKS

Which tasks improve with oblique airborne images? "Easier identification of objects," replied 71% (Figure 3). Indeed, recognition and identification of buildings and other elevated objects is easy in obliques. Just 40% say they expect an increase in automation, which seems quite pessimistic, whereas around 60% expect increasing reliability. Interesting comments include:

- "One can easily identify features such as trees and buildings while editing automatically generated DSM for producing DTM."
- "Since SAR images are also looking from a slant direction, obliques can be used as valuable complement to radar images."



▲ *Figure 1, Usage of oblique images: users' and vendors' views.*

Users	
Universities/Research Institutes	44.7%
National Mapping Agencies (NMA)	20.6%
Other Users	14.9%
Data or Information Providers	5.7%
Cadastres/Land Administration	3.5%
Municipalities	1.4%
Real Estate Companies	1.4%
Vendors	
Software	5.0%
Hardware	2.8%
Total	100%

▲ *Table 1, Classification of respondents.*

V60

GNSS RTK

Lighter and Faster
Compact design, higher performance
1GB internal storage + 8GB
SD card memory (Max.32GB)

HI-TARGET Surveying the world, Mapping the future.

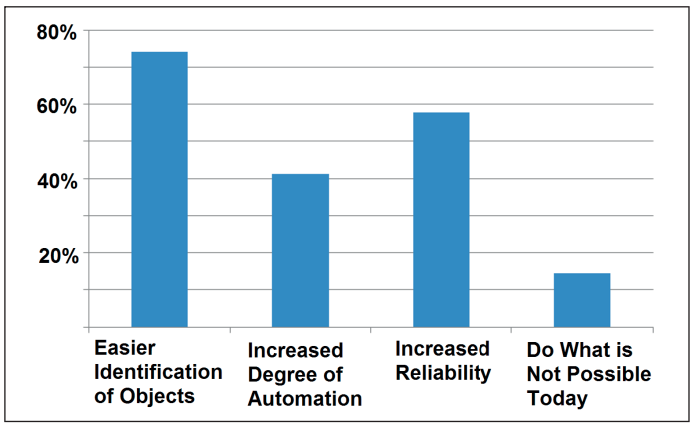
IP67

Add: Building 13, Tian'an technology zone, No.555,
North of panyu road, Panyu district, 511400, Guangzhou city, China
TEL: +86-020-22883930 FAX: +86-020-22883900

www.hi-target.com.cn
info@hi-target.com.cn

No 2631

▲ *Figure 2, Dense image matching point cloud of the city of Graz, Austria, derived from imagery captured by the Microsoft Osprey camera.*



▲ *Figure 3, What can obliques do better?*

The survey also focused on automation of the image processing workflow; 75% say that their current workflow is semi-automated, although 25% comment that they already have a fully automatic workflow. Overall, the comments show that orientation and dense matching seem to work fully automatically depending on software, size of block and other features. However, some say that these initial data processing steps do not provide the results expected. In contrast, automatic interpretation is a bottleneck. Users differentiate between simple tasks, such as identification of buildings which is regarded as being realistic to conduct automatically, and the complex and detailed modelling of buildings which still requires manual processing.

DISCUSSION

56% answer yes to the following interesting and thought-provoking question: "Looking at your applications and assuming that the nadir camera is at least a middle-format, metric camera, with PAN, RGB and IR camera cones: would a combination of this nadir camera and the oblique views replace large-format-camera nadir flights in the future?" – fodder for discussion thus. Those affirming that middle-format multi-view can replace large-format say that photorealistic 3D mapping is more important for urban areas than 2.5D representation. Others point out the increasing reliability of object identification. In contrast, some respondents state that obliques contain too much unnecessary data for traditional mapping, and the production of very-high-resolution true orthoimages still would require large-format cameras. This subject was also discussed by NMAs and academia during the EuroSDR Board of Delegates meeting in May 2014. One of them argued that flights conducted with a middle-format multi-camera would require more flight lines to cover the entire area from all directions and thus result in higher acquisition costs. However, this could be compensated for by the NMAs offering new products and services, such as property evaluation or inventory of building usage and other semantic 3D analyses. The regular and systematic capture of obliques in rural areas was not thought to be significant for the near future.

CONCLUDING REMARKS

Exploration of the potential of airborne obliques is an ongoing activity of EuroSDR. The questionnaire is still active and available at [1]. Another activity in this framework, conducted in cooperation with ISPRS, is a benchmark on multi-platform very-high-resolution photogrammetry [2] aimed at image orientation of a large block of oblique imagery and dense image matching. ◀

Series on Oblique Photogrammetry

This is the seventh article in the series on oblique photogrammetry. The articles published in the January, February and March 2014 issues covered properties of oblique airborne imagery, automated processing and automatic building detection, respectively. Oblique camera systems were covered in the April and May issues. The September edition presented a methodology for evaluating the performance of dense image matching algorithms applied to oblique images. This series is a joint initiative of EuroSDR Comm. 1, Delft University of Technology, University of Twente (ITC) and FBK Trento, Italy. Edited by Mathias Lemmens the series is intended to cover concepts, applications and camera systems and configurations available on the market. You are cordially invited to contribute or to convey comments or additions. To do so, please feel free to contact the editorial manager at wim.vanwegen@geomares.nl or the senior editor at m.j.p.m.lemmens@tudelft.nl.

MARKUS GERKE

Markus Gerke studied geodetic sciences at the Leibniz University of Hannover, Germany, where he also gained his PhD in 2006. He has been assistant professor at the Faculty ITC, University of Twente, The Netherlands, since 2007. He focuses on the automatic processing and interpretation of oblique airborne and UAS images. He is co-chair of the ISPRS Working Group III/4 and co-organiser of the ISPRS benchmark test on urban object detection and reconstruction.
✉ m.gerke@utwente.nl

FABIO REMONDINO

Fabio Remondino received his PhD in Photogrammetry from ETH Zurich in 2006. He then moved to FBK Trento, Italy, where he currently leads the 3D Optical Metrology (3DOM) research unit (http://3dom.fbk.eu). His research interests are automated data processing and sensor and data integration. He is serving as president of EuroSDR Commission I on Sensors, Primary Data Acquisition and Georeferencing and is president of ISPRS TC V on Close-Range Imaging, Analysis and Applications.
✉ remondino@fbk.eu

More information

1. www.surveymonkey.com/s/EuroSDR_oblique
2. www2.isprs.org/commissions/comm1/icwg15b/benchmark.html

K96-T The third generation of KOLIDA GNSS receiver

With an extreme ability to track satellite signals, and superior speed to analyze the data, K96-T is going to be the king of the GNSS jungle.

All-frequency Signal Capturing Technology

With upgraded all-frequency Antenna, K96-T well supports satellite signals from GPS+ GLONASS+COMPASS. After Galileo Positioning System completely comes to use in the future, K96-T need no modification in hardware, but only some upgrade in firmware to trace and analyze its signals.

World Class GNSS Motherboard

220 channels, most advanced processing technology. 3mm+0.5mm RMS precision for horizontal measurement (static), 8mm+1ppm RMS precision for horizontal measurement (RTK).

Flexible Working Mode

Built-in transceiving radio (emitting range 1-5km), compatible with all brands receiver; Seamless access to all brands CORS system; Workable under 2.5G/ 3G/ 3.5G mobile network.

Optimized Design

With optimized design for hardware as well as firmware, K96-T provides higher work efficiency. Enhanced industrial level of waterproof, dustproof and shockproof ability (IP67) guarantees it to survive 1m-deep water long time immersion, and 2.5m natural drops.

KOLIDA
KOLIDA INSTRUMENT

KOLIDA INSTRUMENT CO., LTD.

Add: 2/F, Surveying & Mapping Building (He Tian Building),NO.24-26, Ke Yun Road, Guangzhou 510665, China
Tel: +86-20-85542075 Fax: +86-20-85542136
E-mail: export@kolidainstrument.com http://www.kolidainstrument.com

No 2675

COMBINING COPERNICUS AND IN-SITU DATA FOR BETTER INVENTORY

Gaining Insight **into High Nature Value** Farmland

Although experts are making a considerable effort to provide a clear definition of high nature value farmland (HNVF), its complexity prevents the establishment of a straightforward approach to inventory and change-monitoring in such areas. The recently developed approach to generating detailed land cover information by integrating Copernicus Earth observation data with national in-situ datasets, such as the Land Parcel Identification System[1], enables a more rigorous description of HNVF areas, from their decomposition down to the land cover features they contain.

Nowadays, citizens in Europe are confronted with various terms and concepts used in European environmental policy, many of which are linked with agriculture. Expressions such as 'high nature value farmland', 'ecosystem services', 'areas with natural constraints', and the newly defined 'ecological focus areas' are key terms aimed at providing experts with modelling instruments for comprehensive characterisation of the agricultural landscape in Europe and enabling accurate and effective monitoring of land change and impact assessment in support of EU policies. Due to the interdependency and cross-connection of different policy areas, the applied indicators are rather composite and complex, which presents challenges in terms of their measurability and traceability.

1. The Land Parcel Identification System (LPIS) was designed as the main instrument for the implementation of the CAP first pillar – direct payments to the farmer, i.e. to identify and quantify the land eligible for payments. The system is now broadly used for different purposes, e.g. environmental. In the period 2007-2013, the 45 land parcel information sytems across the EU held more than 135 million detailed land parcels, annually declared by 8 million farmers in the EU.

LAND COVER AND LAND USE

Most of the definitions related to agro-environment can be considered a combination of land cover and land use concepts. Land cover is the biophysical substrate of the Earth's surface, while land use expresses the socioeconomic and functional aspect of a given territory. As land cover can be regarded as the easiest indicator of the human intervention on land and can be efficiently observed and qualified, it is the core element of all strategies and methods for inventory and monitoring-related agro-environmental parameters. There have been numerous projects and initiatives at EU level for the elaboration of monitoring approaches in that respect. Most of them have relied on the future extensive use of remote sensing data from the Copernicus programme. However, the combined use of in-situ information has remained rather limited and unexplored.

HIGH NATURE VALUE FARMLAND

The HNVF concept is designed to describe a specific type of agriculture land that holds certain environmentally valuable properties. High nature value farmland is an area in Europe where agriculture is usually the

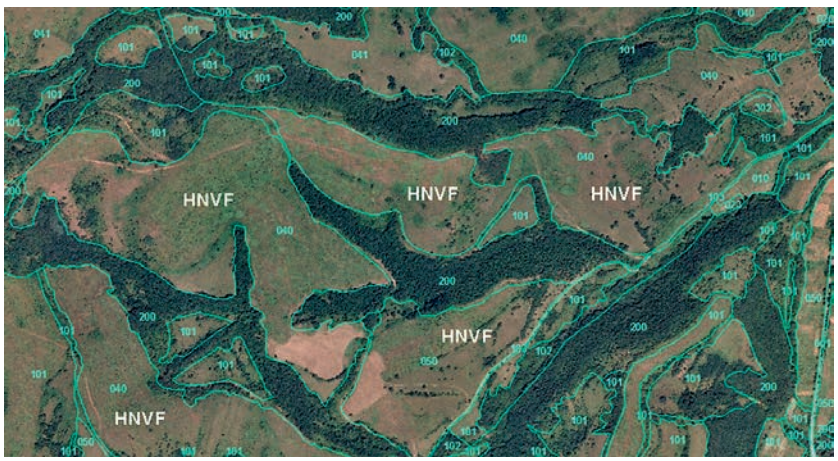
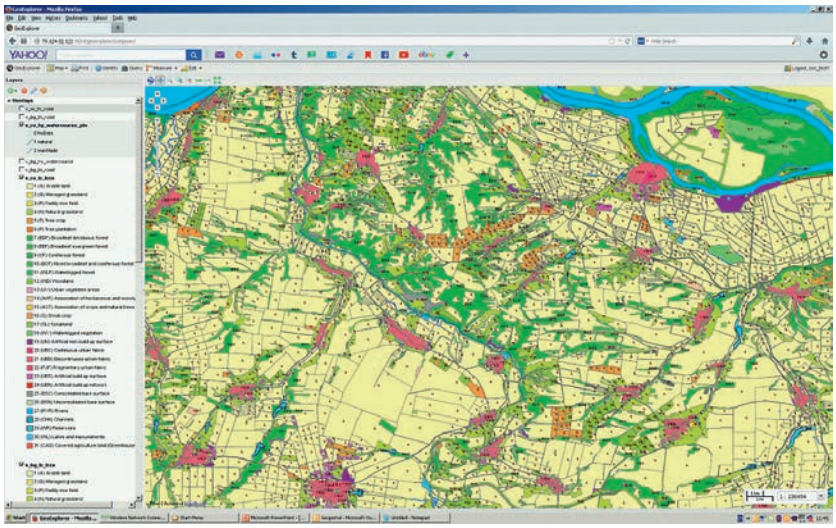


Figure 1, Extract of the LPIS over the semi-mountainous region in Bulgaria, showing the areas subject to HNVF (courtesy: ASDE 2014).



▲ *Figure 2, Extract of the reference land cover developed within the SPATIAL project, provided as a web service through the SmartCover portal (courtesy: ASDE 2014).*

dominant land use. Furthermore, the area supports, or is associated with, high species and habitat diversity or the presence of species of European conservation concern. Generally, HNVF can be recognised from its small-scale mosaic of low-intensity agriculture and natural and structural elements – such as field boundaries, hedgerows, stone walls, patches of woodland or scrubland and small rivers – or by its diverse, often semi-natural, land cover. Such land is subject to specific policy measures that support the farming of the lands while simultaneously ensuring that valuable environmental features and characteristics will be maintained.

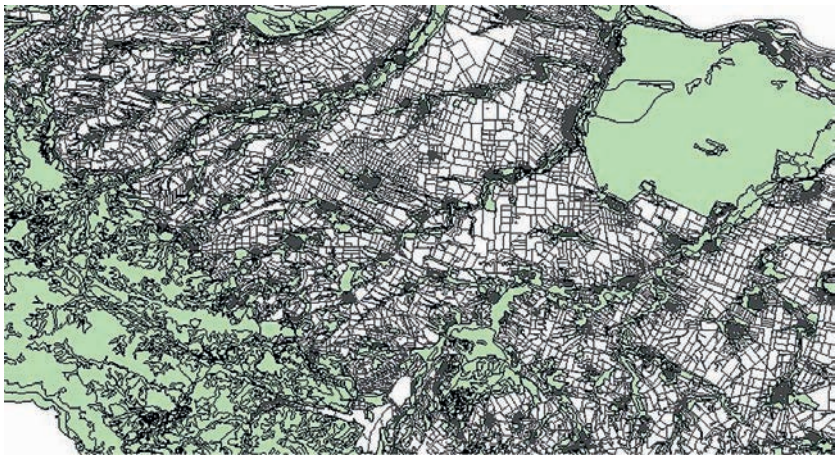
HNVF COMMITMENTS

Low-intensity farming that ensures and protects high biodiversity is central to the objectives of the EU Common Agriculture Policy (CAP). High nature value farming has to be identified and properly inventoried in order to be supported and maintained through various EU policy instruments, mainly the rural development programmes. As part of the monitoring mechanisms of these programmes, it is also essential to monitor the changes to areas covered by the high nature value farming concept and to the associated parameters. Bulgaria has defined the following types of HNVF:

1. Agricultural land with a significant presence of semi-natural vegetation
2. Agricultural land with mosaics of crops with low cultivation intensity, demarcated by belts of natural vegetation – field boundaries, patches of trees and bushes, small streams and ditches
3. Agricultural land (including intensively cultivated arable pastures) containing populations of rare animal or bird species with European significance.

INVENTORY AND MONITORING

The definition and delineation of the HNVF areas in Bulgaria basically follows the approach adopted by the European Environment Agency. Type 1 and Type 2 HNVF areas are identified on the basis of land cover data from the Corine Land Cover database, combined with Natura 2000[2] and agronomic and economic farm-level data, while Type 3 is identified mainly on the basis of species distribution data and habitat sites for specific creatures. The resulting detailed register of high nature value farmland is incorporated in the Bulgarian Land Parcel Identification System (LPIS), which is considered the single GIS of the Integrated Administration and Control System (IACS) set up by each EU Member State to channel and manage the direct EU aid to farmers (see Figure 1 and Footnote 1). Since the LPIS provides accurate geospatial information about the location and type of the potential agricultural land at national level, it is considered a key in-situ dataset, especially if used together with national orthophotos.



▲ *Figure 3, Mask of the HNVF areas (light green) recorded in the LPIS (courtesy: ASDE 2014).*

QUALITY

Recent research studies revealed some deficiencies in HNVF inventory and monitoring. The quality of the identification of high nature value farmland and the changes over the years depends largely on the availability of suitable input data. The existing datasets used to define HNVF, such as Corine Land Cover, are often too coarse with respect to spatial resolution and too ambiguous with respect to the land cover and land use information they contain. Since HNVF is region-specific and requires data with a high level of detail, pan-European monitoring of high nature value farmland solely based on Earth observation data is not feasible without supplementary in-situ information. However, as the identification of HNVF relies on harmonised land cover/land use information, the availability of a common EU-wide spatial dataset, such as the LPIS, is of utmost importance, especially when combined with proper Earth observation information.

LARGE-SCALE DATA INTEGRATION

The flagship cross-border cooperation project 'SPATIAL', funded by the European Regional Development Fund, can be regarded as the one of the first large-scale integrations of Copernicus Earth observation data with in-situ data. Its purpose was to establish common resources for territorial planning, analysis and strategy of the cross-border area shared by Bulgaria and Romania, covering more than 70,000 square kilometres and largely demarcated by the River Danube

2. Natura 2000 is the centrepiece of EU nature & biodiversity policy. It is an EU-wide network of nature protection areas established under the 1992 Habitats Directive.

itself. Within the scope of the project, the Agency for Sustainable Development and Eurointegration in Bulgaria was entrusted with setting up and developing a harmonised spatial land-related database and services synchronised with the existing information systems available at local and regional levels. A core element of the common geodatabase is the reference land cover layer. It represents a tessellation of the Earth's surface on uniquely defined georeferenced units of management, holding information on land cover and land use. The creation and subsequent updating of the reference land cover is based on:

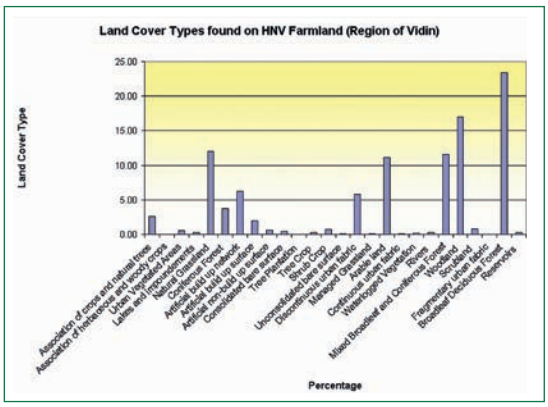
- Classification concepts of ISO 19144-2 (Land Cover Meta Language)
- Conceptual model and spatial information from the LPIS
- Copernicus CORE 01 and 03 satellite image datasets in combination with in-situ data (LPIS, aerial orthophotos)
- High-resolution layers from 'initial operations of the service' provided by the European Environment Agency
- Methodology elaborated in collaboration with the Monitoring Agricultural Resources Unit of the Joint Research Centre of the European Commission
- Further data support from the Digital Earth and Reference Data Unit of the Joint Research Centre (JRC), as part of the Danube Reference Data Service Infrastructure.

EFFICIENT MANAGEMENT OF FUNDS

The resulting two adjacent reference land cover datasets for the Bulgarian and Romanian parts of the cross-border area were fully interoperable in accordance with the INSPIRE principles, ensuring efficient cross-border analysis and reporting (see Figure 2). The classification coherence was guaranteed by the use of standardised semantic language. The resulting spatial database (minimum cartographic scale of 1:25,000) will be used for regular monitoring of changes and integrated risk and territory management, as well as the efficient management of EU funds. Due to its macro-regional dimension and transnational aspect, the deliverable of the project also contributed to the build-up of the Danube Reference Data Service Infrastructure, as part of JRC's scientific support to the Danube Strategy.

RELEVANCE TO HNVF

Since the reference land cover provides detailed and standardised information on the land cover features found on the Earth's surface, a cross-check with the HNVF data available in the LPIS (see Figure 3) can reveal the structure and pattern of the land cover found within the HNVF areas which were initially defined with the help of coarser and more generic datasets. This will provide valuable information about the true nature of each HNVF area and its correct definition. Figure 4 presents the results from a cross-check of the two datasets for one administrative district in Bulgaria. The diagram shows the abundance of different land cover types found in the HNVF areas expressed as percentage of the total HNVF in the given district. It is evident that the HNVF areas contain a huge diversity of land cover types, some of which, such as the artificial structures, are beyond the HNVF scope and hence are completely irrelevant. This indicates that a revision of the HNVF areas is needed based on more accurate and detailed information.



▲ *Figure 4, Abundance of the land cover types found in HNVF areas (courtesy: ASDE 2014).*

CONCLUDING REMARKS

A key prerequisite for proper identification and monitoring of HNVF is to make a clear distinction between land cover and land use concepts. This requires the use of standardised semantic models such as the Land Cover Meta Language. Although Copernicus Earth observation data can provide uniform information across country boundaries, national and regional specificities make it essential to integrate this with accurate and reliable in-situ data, such as LPIS and national orthophotos. The methodology developed within the SPATIAL project can be used as an example for developing an approach to harmonised HNVF mapping at pan-European level. ◀

FURTHER READING

- Elaboration of reference land cover dataset for the Romanian part of the cross-border area of the project – General Methodology. MIS-ETC-CODE171 PROJECT – Common Strategy for Sustainable Territorial Development of the Cross-border Area Romania-Bulgaria
- Devos, W. Milenov, P. (2013) Introducing the TEGON as the elementary physical land cover feature. Agro-Geoinformatics
- Hazeu, G.W.; Milenov, P.; Pedroli, G.B.M.; Samoungi, V.; Eupen, M. and Van Vassilev, V. (2014) High nature nalue farmland identification from satellite imagery, a comparison of two methodological approaches. *International Journal of Applied Earth Observation and Geoinformation*, 30
- ISO 19144-2:2012, Geographic information – Classification Systems – Part 2: Land Cover Meta Language (LCML)
- Tasdemir, K., Milenov, P., Tapsall, B. (2012) A hybrid method combining SOM-based clustering and object-based analysis for identifying land in good agricultural condition. *Computers and Electronics in Agriculture*, 83

PAVEL MILENOV

Pavel Milenov graduated in civil engineering in Sofia, Bulgaria. He has more than 15 years' experience in remote sensing and GIS, in particular land cover modelling and mapping. He was FAO TCCT consultant for the use of LCCS and has worked for 6 years at the Joint Research Centre of the European Commission in the field of the EU Common Agriculture Policy. He is project manager at the Remote Sensing Application Center (ReSAC) in Bulgaria.
✉ pavel.milenov@resac-bg.org

KRISTIAN MILENOV

Kristian Milenov has an MSc in Architecture and Territorial/Urban Planning. He is associated professor at the University of Architecture, Building and Geodesy in Sofia, Bulgaria, and is executive director of the Agency for Sustainable Development and Eurointegration (ASDE). He has broad experience in urban and regional planning, EIA, transfer of technologies, risk management, remote sensing and GIS. He is a member of GEO-HLWG, and deputy chairman of the IMWG on EO-GMES/Copernicus.
✉ k.milenov@stalkerkm.com

www.Trace.ME

Incorporating TraceME with your projects

The possibilities of KCS TraceME's M2M connectivity are virtually limitless. It's not a hollow marketing slogan! If you are planning a project which isn't described, chances are that it can be achieved too. Do not hesitate to contact us.

Quick return on investment
Saving on costs is perhaps the most common reason to invest in TraceME technology.

Tracking drones with GPS and GPRS
Flying with drones is quickly becoming a very popular hobby. Drones are equipped with all sorts of electronics, mostly cameras. Add GPS tracking functionality to this flying platform and you can always find the drone via the TraceME.

Personal GPS locater
In certain situations tracing people can be critical. Whether it is your kids, elderly relative, high-profile VIPS, pets. All can be located, on demand or afterwards with TraceME key fob. It is possible to have 2 way audio conversations.

KCS TraceME Micro is the most configurable and smallest tracing device available on the market today.

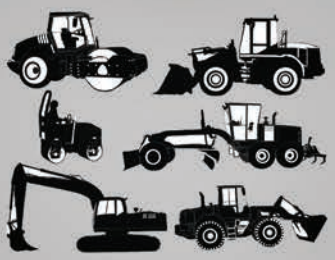
Animal management
Animals tagged with a RFID chip can be remotely monitored and managed. TraceME can be equipped with an RFID reader so it is essentially a checkpoint for keeping administration of which animal has already been fed, milked, shaved, etc.

Bird life tracking
A TraceME Micro is small enough to be a real-time bird tracking system. The on-board connectivity allows the position of the bird to be fully traced while the animal is entering a race or flying around in it's natural habitat.

Extreme Sports
There are a number of Extreme Sports that requires you to travel across some sort of terrain.

Backup power generator
For critical machines running (backup power generator) a black-out can be close to life. TraceME gives you remote solutions.

Security applications
It is the most obvious use of a TraceME module. Keep discretely track of your properties with on-site surveillance or on the go. It essentially becomes a 24/7 security guard on site. Set an alert in the case of alarm via SMS, GSM, GPRS, Wi-Fi, RFID, 3G, etc..



Real-time update of vending machines
TraceME equipped vending machine can give a real-time update of it is inventory and sales of that day.

Rented machinery
If you rent out machinery which needs high level of reliability or service, place a TraceME module inside.

Flexible payment solutions
If your company is a service provider for office facilities, you can deploy the TraceME for flexible payment solutions. Imagine connecting the TraceME to a copying or coffee machine.

TraceME is the affordable alternative to SCADA solutions. To measure is to know.

Advertising displays Control advertising displays from your desktop or mobile phone.

Keeping track of your personal and business mileage for taxation reasons
Do you have to keep track of when you drive a company car for personal use? TraceME can help.

Reading out car statics with ODB-II
A ODB-II plug is fitted with a TraceME inside for an easy connection and reading out car statistics.

Social Media Connectivity
Sometimes you want to share your location via Twitter and Facebook. TraceME supports this.

Speed camera detection TraceME as a warning system preventing fines for speeding.

www.Trace.ME

All trademarks mentioned herein belong to their respective owners.

KCS BV, Kuipershaven 22, 3311 AL Dordrecht, The Netherlands

No 2674

A GEOMETRIC AND SEMANTIC PERSPECTIVE

3D Data Sourcing for Land and Property Information

Population growth has prompted land administrators to re-evaluate the current land development cycle, incorporating the third dimension to enable a more complete and effective property registration system. Managing the growth of existing communities and optimising the design of future cities is critical in both developing countries and modern societies. A key aspect of this is the effective management and maintenance of land and property information.

The significant developments in 3D data acquisition techniques, visualisation, image processing algorithms and computer power, as well as trends such as volunteered geographic information and BIM, have facilitated the creation of 3D models of buildings and cities around the globe. As illustrated in Figure 1, the culmination of legal entities together with the physical components of cities in a 3D environment will enable a more complete and effective land and property information registration system. In turn, that will ultimately support governing bodies' decision-making processes and help them to better manage economic development and build sustainable communities.

EXISTING SITUATION

Land and property information, which includes geometric, visual and legal data for each property unit, has traditionally been two-dimensional (2D) based on 2D land parcels. Current 2D survey plans are no longer able to represent the complex realities of inter-related titles and land uses, and 3D architectural drawings do not deliver legal authority in land and property registration. Most land and property registration processes are in 2D, with little or no 3D visualisation or analysis capabilities. The z coordinate describing the height dimension of each building is captured in current systems but illustrated only in 2D using complicated survey plans. The 2D and 3D information collected generally comes from the architects and from the field using traditional survey equipment to facilitate the optimal derivation of accurate distance measurements for surveying tasks and developing subdivision plans.

3D DATA SOURCING

Data sourcing for 3D land and property information registration needs to deliver intelligent information that is not only visually explicatory but is also extended to include architectural and survey information and ownership data as well as rich semantic and geometric information that changes over time. It is suggested that the requirements for data sourcing be classified into the following 5 dimensions (see Figure 2):

(1) Geometric: the geometry and shape of a land parcel and building including accurate survey information, indoor floor plans, dimensions, bearings, distances and height as well as the spatial position of the objects and coordinates
(2) Semantic: the physical attributes of the land and building, including facade data, roof data, materials and surrounding environment
(3) Legal: information relating to ownership, rights, restrictions and responsibilities, boundary data, easements and body corporate
(4) Land use: the information relating to the meaning of land and property including a description of what it is and what it is used for
(5) Temporal: a description of how the land and property changes over time during its life cycle.

GEOMETRIC AND SEMANTIC COMPONENTS

Data sourcing for information acquisition relating to the geometric and semantic dimensions of a land and property registration system is fundamentally 3D modelling for geometric object reconstruction. 3D modelling can be classified into range-based modelling via active sensors, including terrestrial laser scanning, Lidar and mobile mapping, or image-based modelling via passive sensors (using imagery), specifically architectural plans, terrestrial photogrammetry, high-resolution satellite imagery, aerial imagery and more recently unmanned aerial vehicles (UAVs).

RANGE-BASED MODELLING

During the last decade laser scanning, both airborne and terrestrial, has been one of the most significant advancements in acquiring 3D data. Also referred to as Lidar, it has emerged as a standard technology for 3D data acquisition and can be classified as:

(i) Terrestrial laser scanning (TLS), where the scanner is ground-based on fixed camera stations
(ii) Airborne laser scanning (ALS), where the scanner is mounted on an aircraft
(iii) Mobile laser scanning (MLS): a more recent development where the scanner is mounted on a moving vehicle on the ground.

TLS is now widely applied in field surveying and also for recording and modelling buildings for 3D urban models. ALS, which is costly and data-intensive, is used to obtain surface models and roof information for the reconstruction of buildings. More recently, MLS campaigns have been conducted, providing data on urban environments in much greater detail. MLS has been used to acquire a massive collection of detailed data for 3D city modelling and building facade construction, and to capture vegetation and road features for inventories. However, due to cost and the large amount of data captured, it is suggested that MLS should be used for larger-scale applications and integrated with other data acquisition techniques for a more complete model.

Semantic				
Indoor	**Roof**	**Facade**		
+ Yes – costly	– No, not visible	+ Yes, with detail – costly	Terrestrial laser scanning	Range-based
– No, not possible	+ Yes – costly	+ Yes – limited	Lidar/Aerial laser scanning	Range-based
+ Yes – requires field work	– No	+ Yes	Mobile laser scanning	Range-based
+ Yes – requires field work	– No, not visible	+ Yes, with detailed texture	Terrestrial photogrammetry	Image-based
– No, not possible	+ Yes – costly	+ Yes – limited	Aerial photogrammetry	Image-based
– No, not possible	+ Yes	– No	High-res satellite imagery	Image-based
– No, not possible	+ Yes	– No	Unmanned aerial vehicle (UAV)	Image-based
– No, not possible	– complex to interpret	– complex to interpret	Cadastral plan	Image-based
+ Yes – costly – requires field work	+ Yes, with detail – costly	+ Yes, with detailed texture – costly	Lidar & photogrammetry	An integrated approach
– No, not possible	+ Yes	+ Yes – costly	Lidar & high-res satellite	An integrated approach
– No, not possible	+ Yes – costly	+ Yes – costly	Lidar & aerial photogrammetry	An integrated approach
+ Yes – requires field work	– No, notvisible	+ Yes, with detail – costly	Terrestrial laser scanning & Terrestrial photogrammetry	An integrated approach
+ Yes, from plans	– No, not visible	+ Yes, with detail	Mobile laser scanning & cadastral plans	An integrated approach
+ Yes, from plans	+ Yes	– No	High-res satellite & cadastral	An integrated approach
+ Yes – costly	+ Yes, with detail	+ Yes, with detail – costly	Mobile laser scanning/TLS & UAV	An integrated approach
+ Yes, from plans	+ Yes, with detail	+ Yes, with detail	UAV & cadastral plans	An integrated approach

▲ *Table 1, Evaluation of sourcing semantic requirements.*

IMAGE-BASED MODELLING

Advancements in digital photogrammetry have also meant that image-matching algorithms can be used to produce 3D models capable of competing with laser scanning with respect to accuracy. Image-based modelling is defined as a complete process that starts with image acquisition and ends with an interactive 3D virtual model. Advantages of imaging methods are the level of detail, economic aspects, portability, handling in spatially limited environments and short data collection time. The disadvantages remain in the post-processing when the texture of the object is poor.

Nowadays, due to the increase in resolution for aerial cameras as well as the introduction of low-cost UAVs, airborne data is transforming the traditional methods and presenting an opportunity for new methods of 3D data acquisition. High-resolution satellite images (down to 0.25m) may lead to research that demonstrates the use of satellite imagery for more-detailed and higher-accuracy modelling for building and surface reconstruction based on low-cost, multiple-view terrain.
For ground coverage of large areas with better image resolution and greater accuracy, aerial photogrammetry generally provides good radiometric quality and high redundancy due to large image overlap. While aerial photogrammetry can provide texture information, the imagery cannot provide high-level detail. Therefore, with the exception of roof data, detailed information about a building has traditionally been captured most effectively from the ground. Roof data should be acquired from orthorectified images, which have traditionally been obtained from aerial imagery or high-

IDA JAZAYERI

Dr Ida Jazayeri is a research fellow at the Centre for Spatial Data Infrastructures and Land Administration in the Department of Infrastructure Engineering at the University of Melbourne, Australia. Dr Jazayeri teaches advanced imaging, and her area of research interest involves 3D data sourcing methods for automated building reconstruction and image analysis.
✉ jazayeri@unimelb.edu.au

ABBAS RAJABIFARD

Professor Abbas Rajabifard is head of the Department of Infrastructure Engineering and director of the Centre for SDIs and Land Administration, both at the University of Melbourne. He is immediate past-president and an Executive Board member of GSDI. He has spent his career researching, developing, applying and teaching spatial information management and strategies, particularly for SDIs and land administration, to deliver benefits to both governments and wider society. Through his academic and professional activities, he promotes the surveying and spatial science professions, driven in his belief that these professions play an integral role in delivering the vision of a sustainable future.
✉ abbas.r@unimelb.edu.au

MOHSEN KALANTARI

Dr Mohsen Kalantari is a lecturer in geomatics and associate director at the Centre for Spatial Data Infrastructures and Land Administration (CSDILA) at the University of Melbourne. His research involves crowdsourcing and 3D indoor mapping and modelling in land administration.
✉ mohsen.kalantari@unimelb.edu.au

resolution satellite imagery. In complex building structures, however, the resolution obtained from ortho images decreases. Hence it is suggested that this may be better captured using new methodologies such as UAVs. UAV-based mapping provides the required accuracy with respect to cadastral laws and policies and is competitive to other measurement technologies in terms of economic aspects.

UAVS

A number of recent studies have reported on the use of UAVs in cadastral applications for the generation of elevation models and 3D objects. The feasibility of using a UAV to gather cadastral information has been tested in Switzerland. In this study, aerial images were taken over a calculated flight plan and the camera was tilted to navigate around complex building structures, acquiring images from the facades of the buildings. The achieved accuracy was about 2cm horizontally and 5cm vertically, which is below the required 3.5cm horizontal and 7cm vertical accuracy required in the Swiss cadastral system.

One of the major advantages of UAVs compared to manned systems is that UAVs can fly in otherwise inaccessible locations, such as areas affected by natural disasters (earthquakes, volcanoes, flood plains) and areas with difficult terrain such as mountains and deserts. Another major benefit of UAVs is the cost factor, as UAVs are less expensive and have lower operating costs than manned aircrafts. As a result UAVs have been tested in remote areas, where many homes have been built without the luxury of property surveys to accurately define boundaries.

AN INTEGRATED APPROACH

Over the past 10 years a number of systems have integrated Lidar, CCD cameras and GPS/INS for the derivation of highly detailed 3D spatial data. Additionally, several methods have been developed to combine data for building modelling, e.g. Lidar and optical imagery, Lidar and high-resolution satellite imagery, Lidar and aerial imagery.
Multiple data fusion, i.e. data from a number of sources such as panchromatic images, terrain models, laser scanning data or cadastral maps, often enhances the reliability of the data acquisition process, and in most cases a combination of laser scanning and image-based modelling maybe the best solution.

Geometric						
Analysis	Indoor mapping	Spatial location	Boundary location	Building dimensions	(for acronyms see Table 1)	
+ Yes	+ Yes, possible – costly	– Relative	– No	+ Yes, with high accuracy – costly – facades only in dense areas	TLS	Range-based
+ Yes	– No	+ Yes, via on-board GNSS – costly	+ Yes – costly	+ Yes, with accuracy – costly	Lidar/ALS	Range-based
+ Yes	– No	+ Yes, via car GNSS	– No	– building facades only	MLS	Range-based
+ Yes	+ Yes, possible	– Relative	– No	+ Yes – less accurate high-rise>100m	TP	Image-based
+ Yes	– No	+ Yes, via on-board GNSS – costly	+ Yes, – costly	+ Yes, with high accuracy – costly	AP	Image-based
+ Yes	– No	– requires control points	+ Yes	– Only building shape	High-res sat	Image-based
+ Yes	– No	+ Yes, via on-board GNSS	+ Yes	+ Yes, with high accuracy – subject to environ. cond.	UAV	Image-based
– No	– too complex	– Relative	+ Yes – Difficult interpret	+ Yes – Difficult to interpret	Cadastral plan	Image-based
+ Yes	+ Yes, possible – costly	+ Yes – costly	+ Yes – costly	+ Yes, with high accuracy – costly	Lidar & P	An integrated approach
+ Yes	– No	+ Yes, via on-board GNSS – costly	+ Yes – costly	+ Yes, with high accuracy – costly	Lidar & high-res sat	An integrated approach
+ Yes	– No	+ Yes, via on-board GNSS – costly	+ Yes – costly	+ Yes, with high accuracy – costly	Lidar & aerial	An integrated approach
+ Yes	+ Yes, possible – costly	– Relative, requires control points	– No	+ Yes, with high accuracy – costly and limited to facades only in dense areas	TLS & TP	An integrated approach
+ Yes	– No	+ Yes, via car GNSS	+ Yes	+ Yes, from plans – costly	MLS & cadastral	An integrated approach
+ Yes	– No	– Relative	+ Yes	+ Yes, from plans	High-res & cadastral	An integrated approach
+ Yes	+ Yes, possible – costly	+ Yes, via car and on-board GNSS	+ Yes	+ Yes, with high accuracy – costly	MLS/TLS & UAV	An integrated approach
+ Yes	+ Yes, possible	+ Yes, via on-board GNSS	+ Yes	+ Yes, with high accuracy	UAV & cadastral	An integrated approach

▲ *Table 2, Evaluation of sourcing geometric requirements.*

By combining laser scanning data with digital imagery, it is now possible to create photorealistic and highly accurate 3D models of buildings and of the terrain. Fully automated generation of dense 3D point clouds which can be converted to wireframe and texture are becoming more readily available and boast high-accuracy results.

OVERVIEW OF TECHNOLOGIES

A summary of these technologies and their capabilities to capture the required data for the geometric and semantic components of a 3D land and property information system are illustrated in Table 1 and Table 2. The evaluation shows that, of all the available technologies, UAVs may provide a new approach to sourcing the geometric and semantic dimensions based on their low cost and effectiveness in gathering the required information.

CONCLUDING REMARKS

Following an overview of the current practice in land and property information management, a set of data sourcing requirements is suggested. Focusing on two of these requirements (the geometric and semantic dimensions), both image-based and range-based methods for data acquisition have been investigated which can be applied to help governing bodies in developing countries to manage their growing communities. ◀

FURTHER READING

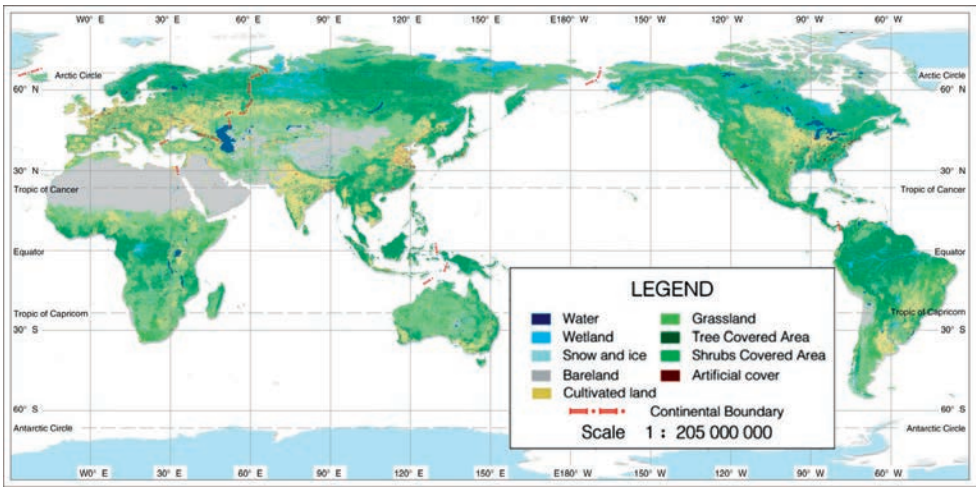
- Manyoky, M., Theiler, P., Steudler, D., and Eisenbeiss, H., 2011, Unmanned Aerial Vehicle in Cadastral Applications, I*nternational Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Vol. XXXVIII-1/C22, UAV-g 2011, Conference on Unmanned Aerial Vehicle in Geomatics, Zurich, Switzerland
- Remondino, Fabio and El-Hakim, Sabry, 2006, Image-Based 3D Modelling: A Review, *The Photogrammetric Record* 21(115): 269–291
- Van Oosterom, P, Fendel, E.M., Stoter, J., Streilein, A.(Eds.), 2011, Proceedings from the 2nd International Workshop on 3D Cadastres, Delft, The Netherlands

14TH INTERNATIONAL SCIENTIFIC AND TECHNICAL CONFERENCE 'FROM IMAGERY TO MAP: DIGITAL PHOTOGRAMMETRIC TECHNOLOGIES'

Geomatics Developments in Asia

The International Scientific and Technical Conference 'From imagery to map: digital photogrammetric technologies' was held for the 14th time from 20-23 October 2014 in Hainan, China. The conference was opened by Victor Adrov, managing director and co-founder of Racurs, Moscow, along with SmartSpatio from Beijing, China, as organiser of the event. One of the features of this event is the shift of venue every year; 2014 was its first time in Asia, and China was chosen because of its rising influence on the geomatics market.

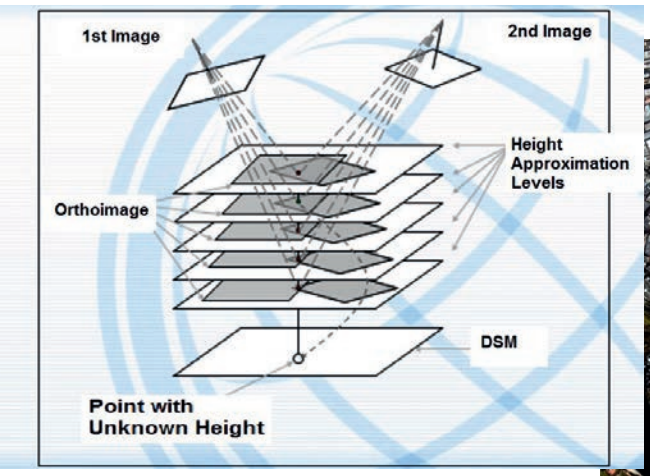
Prof Chen Jun, National Geomatics Center of China, not only addressed the audience during the opening as ISPRS president but also presented a unique product and multi-million-dollar project developed by his home country: the world's first 30m global land cover dataset. The GlobeLand30 marks 10 land cover types, entails the entire planet (Figure 1) and has been created from 10,270 Landsat scenes recorded in 2000 and 9,907 Landsat scenes and 2,640 Chinese HJ scenes captured in 2010. The dataset, which has an overall accuracy of 83.50%, was donated to the UN on 22 September 2014. It is accessible free of charge for users all over the world through web services [1]. After the opening address, Gottfried Konecny from Leibniz University Hannover, Germany, discussed the current status of global geospatial information and database issues for urban mapping. Armin Grün from ETH Zurich, Switzerland, focused on 3D modelling from UAS images, mobile mapping and terrestrial laser scanner (TLS) point clouds, discussing among other things the project to create a 3D model the 150m-high Shukhov Tower in Moscow, Russia (built between 1919 and 1922) from 100 million TLS points – a subject which has also been covered by Mikhail Anikushkin and Andrey Leonov in *GIM International* (July 2014). Mathias Lemmens from Delft University of Technology, The Netherlands, spoke on features of massive point clouds and functionalities of processing software and mentioned his current preparation work on a book about the acquisition, processing and management of point clouds which is scheduled to be published by Whittles Publishing, UK, in early 2016.



▲ *Figure 1, 30m global land cover dataset; 9 classes are shown in the legend, the 10th class is Tundra.*

AERIAL CAMERAS AND SOFTWARE

Yuri Raizman from VisionMap, Israel, reviewed the A3, a camera system covered extensively in *GIM International* (June 2014) as part of the series on oblique photogrammetry. Beijing Geo-Vision, founded in 1989, presented its SWDC-4 aerial camera – pixel size 6µm, image size 16K x 12K pixels and a 8-/12-bit radiometric resolution. The focal length is either 50mm or 80mm, resulting in an along-track field of view (FoV) of 74° or 49° degrees respectively and an across-track FoV of 91° or 59°. The SWDC-5 is an oblique camera system constructed as a Maltese cross, i.e. one camera is looking nadir and four are spaced at 90° intervals around the nadir-looking camera and tilted 45° to capture obliques. The firm also supplies the JX-4G, a semi-automatic DPW with two hand wheels and one foot wheel. Alexander Chekurin, commercial director and co-founder of Racurs, discussed the accuracy and contents of SPOT 6 & 7 imagery. The images are suited for creating/updating 1:25,000 topo maps. Most objects can be recognised in mono imagery, although mapping of steep banks and road edges requires



▲ *Figure 2, Photomod: iterative deformation method (IDM).*

▼ *Figure 3, Image of Dubai captured by China's VHR satellite ZY-3.*

stereo views while power lines and the like need extra data – as does the detailing of building use, types of road surfaces, load strength of bridges, etc. Andrey Sechin, scientific director and co-founder of Racurs, presented the upcoming release of Photomod 6.0 with two novel features: 64-bit computing and dense image matching (DIM). A 64-bit system optimally explores the random access memory (RAM) as it places virtually no restrictions on the RAM size, while 32-bit systems are limited to 4GB of RAM. As photogrammetric processing involves massive volumes of input and output data, 64-bit systems bring huge gains: fast rectification and mosaicking in the production of orthoimagery, optimised distributed processing, fast DIM computation and simultaneous processing of a large number of satellite images, to name but a few. An earlier version of DIM was based on cross-correlation, which generates smooth edges causing a Cappadocian tuff look of buildings. Furthermore, it does not cope well with occluded areas and thus is primarily suited for the production of orthoimagery and contour lines. The performance of the DIM included in version 6.0, called the iterative deformation method (IDM), imports both aerial and push-broom imagery (Figure 2). It relies heavily on the number of overlaps used to generate a height point – at least four overlaps are recommended.

ASIAN SPACE IMAGERY

The second day of the event was mainly devoted to Earth observation (EO) from space. JSCRussian Space Systems, Moscow, presented the features of a planned constellation of three satellites, called Resurs-P, the first of which was launched on 25 June 2013. The optical imagery aims at map updating, environmental monitoring and exploration of resources. The satellite orbits at a height of 475km with an inclination of 97.28° while the revisit time is 3 days. The ground sample distance (GSD) of the PAN mode of the Geoton-L1 sensor is 1m and 3-4m for the multispectral (MS) mode, capturing blue, green, red, red edge (0.72-0.80µm) and NIR (0.81-0.88µm). In-track stereo images can be taken with a swath width of 38km and an along-track length of 115km. The hyperspectral sensor has a swath width of 30km, a GSD of 25-30m and captures 130 bands in the spectral range of 0.4-1.1µm, with each band having a spectral width of 5-10nm. The medium-resolution sensor can provide images with a GSD of either 12m or 59m in PAN mode and 24m or 118m in MS mode. As usual, EO imagery products with an increasing level of processing are offered from images with radiometric and geometric correction only to georeferenced and pan-sharpened standard. China is developing a constellation of 4 VHR satellites called ZY-3. The first one was launched in January 2012. Orbiting at a height of 506km and with a revisit cycle of 5 days, the spacecraft has on board a nadir-looking scanner (GSD 2.1m) and two further scanners (GSD 3.6m), one looking forward and the other backward, both under an angle of 22°. The imagery is suited for stereo mapping at scale 1:50,000 and DEM creation and updating (see Figure 3). On 30 April 2014 Kazakhstan launched a very-high-resolution (VHR) EO satellite, the KazEOSat-1 which was built by Airbus Defence and Space, France. Designed for a lifespan of over 7 years and placed in a 750km orbit, it captures 220,000km² daily and can revisit any area in Kazakhstan within three days. The GSD of the PAN mode is 1m and the push-broom scanner can be pointed off-nadir. On 20 June 2014 it was joined by a medium-resolution EO satellite, the KazEOSat-2, built by Surrey Satellite Technology (SSTL), UK. With a swath width of 77km it will capture MS images with a GSD of 6.5m for agricultural and resource monitoring, disaster management and land use mapping. In addition to speakers from Russia, China and Kazakhstan, representatives of DigitalGlobe and Airbus Defence and Space presented overviews of their space images and derived products.

Producing image data from orbiting platforms is one thing, but successfully taking them to market is a different matter altogether. China, Russia and Kazakhstan repeatedly underlined their keenness to collaborate with firms and agencies in other countries. Alan Kazkenov from Kazakhstan Gharysh Sapary declared: "Kazakhstan is ready to enter into the world space community with its services to provide remote sensing data which can be used by other countries. We are open for dynamic dialogue and mutually beneficial cooperation in the field of ERS data application." ◀

More information
1. http://globallandcover.com
www.racurs.ru

MAVINCI

SIRIUS Surveying UASs

MAVinci specialises in the development of unmanned aerial system (UAS) technology, designed specifically for automated mapping of construction sites, pipelines, disaster areas, mines and quarries. Based in St. Leon-Rot, Germany, MAVinci has a leading position on the civil UAS market, driven by innovation and the company's dedication to producing high-quality aerial surveying solutions.

As one of the first civil surveying UAS manufacturers, MAVinci was founded in January 2009 in Darmstadt as a privately held company by the four shareholders Cornelius Claussen, Johanna Claussen, Marco Möller and Michael Niesen. MAVinci's main business is unmanned aerial system (UAS) technology, designed specifically for automated mapping of construction sites, pipelines, disaster areas, mines and quarries. The SIRIUS UAS was developed to market maturity within the company's first two years. In addition, MAVinci successfully completed a development and service project for the national aeronautics and space research centre (DLR) in the same period.

INNOVATIVE FEATURES

By 2012 MAVinci's distribution network covered five continents of the world and was further expanded in 2013 by a distribution agreement reached with Topcon Europe. The company moved into its new headquarters based in St. Leon-Rot in January 2014. "MAVinci's company history is characterised by the introduction of new and innovative key features into the UAV market," says Cornelius Claussen, one of the MAVinci shareholders and CEOs. "Besides the introduction of flight planning-related features, in 2013 we presented the first surveying UAS with a real-time kinematic (RTK) GPS receiver on the surveying market."

THE SIRIUS UAS IS A USEFUL TOOL IN MINING, CONSTRUCTION AND AGRICULTURE

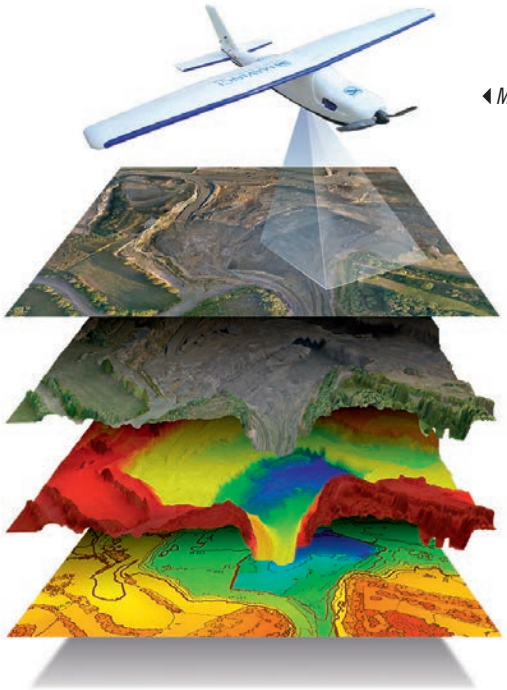
▲ *MAVinci SIRIUS pro in flight.*

SIRIUS

The MAVinci SIRIUS pro is a fully integrated orthophoto UAS which delivers orthophotos and three-dimensional elevation models with an absolute accuracy of down to 1.6cm without using ground control points (GCPs). The ground sampling distance (GSD) of the single images ranges from 1.5 to 20cm. Combining MAVinci's precision-timing technology with Topcon's subcentimetre-grade L1/L2 GPS/GLONASS RTK receivers, this robust system helps to realise projects faster and more effectively. The product range further comprises the SIRIUS basic and classic; both models offer survey-grade accuracy when using GCPs, and the SIRIUS basic is upgradable to SIRIUS pro via the internet.

SURVEYING AND DOCUMENTATION

The SIRIUS UASs are mainly used for aerial surveying applications or documentation purposes. They have proven to be useful tools for tasks such as volume measurements in open mines, documentation of construction



MAVinci SIRIUS pro.

Operation in a mining site.

site progress or to deliver 3D models as the basis for construction project planning. Meanwhile in agriculture, for example, they can be used to document crop damage for insurance purposes.

EFFICIENT OPERATION

MAVinci's main target markets are the surveying, mining and construction sectors, with clients ranging from global construction and mining enterprises to surveying service providers. "We want to help our users to save time. Therefore operating our UAS is highly efficient. Its straightforward architecture minimises ground time between the flights. Every detail has been optimised for practical handling," says Marco Möller, another of MAVinci's shareholders and CEOs. The MAVinci autopilot has been developed in-house. The company's thorough insight into the technology enables it to integrate newly emerging technologies into its products, which contributes to MAVinci's innovative role in the field of surveying and mapping UASs.

GLOBAL DISTRIBUTION NETWORK

MAVinci has an extensive worldwide distribution network and is continually expanding its business around the globe. Distributors support customers in their local languages and professionally represent MAVinci in other countries. The recent extension of the distribution agreement with Topcon earlier this year has further increased the availability of the company's products on a global scale [1].

MAVinci SIRIUS pro in Australia.

FUTURE GOALS

Michael Niesen, another of the four MAVinci shareholders and CEOs, adds: "We promote our products and services supported by true facts that have been proven in real-life situations. Our customers trust in our integrity, because we are honest and take responsibility for what we say and do." Looking to the future, the company intends to continue to rise to the challenges presented by its customers, viewing them as opportunities to demonstrate the true capabilities of MAVinci's UAS technology. Hence, the company is committed to delivering high-quality products and service to customers by developing new features in response to their varied needs. The goals for the years ahead are continued company growth, expansion of the product distribution network and introduction of new market innovations.

More information
1. http://bit.ly/1onBoAv
www.mavinci.de

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.

Man the Unmanned

with centimeter- to decimeter-level accuracy.

THE ASHTECH MB-ONE — A NEXT GENERATION COMPACT, POWERFUL GNSS OEM RECEIVER MODULE

Impressive GNSS and RTK technology paired with Ethernet support in a miniature, power-saving design achieves centimeter- to decimeter-level accuracy for unmanned applications and more.

MB-ONE RECEIVER: FOR HIGH-PERFORMANCE, CENTIMETER-LEVEL POSITIONING IN A MINIATURE, POWER-SAVING DESIGN

- Precise Heading + Pitch/Roll
- Precise Point Positioning using L-Band services
- 240 Channel Dual Core Engine with Ashtech Z-Blade Technology
- L1-only RTK and L1/L2 RTK with Precise Platform Positioning (P^3) including Heading

The MB-ONE's extremely compact, dual-core design enables low power consumption and high performance. Count on accurate GNSS-based heading and attitude for static and dynamic applications. Man the unmanned and more with the full range of Ashtech's GNSS receivers from Integrated Technologies, a division of Trimble.

ashtech™

Trimble GNSS OEM

InTech.trimble.com

© Copyright 2014 Ashtech. All rights reserved. The Ashtech logo and Z-Blade are trademarks of Ashtech. All other trademarks are the property of their respective owners. TPC099 (11/14)

No 2669

Let's Solve the Problem in Our Generation!

The Third High Level Forum on Global Geospatial Information Management (GGIM), held from 22-24 October 2014 in Beijing, PR China, was hosted by the Chinese government through the National Administration of Surveying, Mapping and Geoinformation (NASG) with the theme 'Sustainable Development with Geospatial Information'. The Forum was organised based on the mandate from the United Nations Economic and Social Council (ECOSOC) to convene global forums to promote comprehensive dialogue on global geospatial information management with all relevant governments, non-governmental organisations (such as FIG) and the private sector.

▲ *The third High Level Forum on Global Geospatial Information Management (GGIM) was held in Beijing.*

The Forum was attended by 261 delegates from 44 countries, nine United Nations representatives and 27 representatives from international organisations and the private sector. FIG was represented by vice-president Pengfei Cheng and president CheeHai Teo. A total of five sessions were programmed: 'Geospatial information for the post-2015 development agenda'; 'Sustainable cities and human settlements'; 'Climate change and disaster mitigation'; 'Science, technology, and innovation to measure and monitor progress'; and 'Working together across borders and regions'.

The second session, on 'Sustainable cities and human settlements', was moderated by the FIG president. One of the keynotes in this session was on 'Sustainable Land Administration and Management'. This keynote, presented by Dr Clarissa Augustinus (UN-Habitat/GLTN), highlighted rapid population growth, urbanisation (and slums) and food insecurity. Cities are dysfunctional because of improper planning and manipulation with legal tools. The private sector is capturing urban space – plot by plot, partial plan by partial plan; there are many illegal subdivisions and parcel boundary 're-definitions' (for example, roads becoming increasingly narrow). Any value of growth is captured exclusively by the private sector. Conventional land administration (LA) systems including the geospatial information framework are not delivering at scale. There is no security of tenure for the citizens in the majority of cities, and there is no information for city management. Areas with no LA are susceptible to illegal crops, rebel movements and Ebola. Most urban lands are outside the land register and conventional LA is not affordable. In her keynote, Dr Augustinus said that 'business as usual' is not possible in combination with sustainability of our planet. There is an urgent need to build affordable and sustainable systems to identify the way land is occupied and used. For coverage, currency and affordability, a fit-for-purpose approach to land administration can be adopted. This is flexible and pragmatic; it is not imposed through rigid regulations, demands for spatial accuracy and systems that are unsustainable for less-developed countries. Fit-for-purpose land administration can lead to incremental improvements over time, and is a game-changer. She mentioned the Social Tenure Domain Model as one of the new tools related to a new way of thinking to get currency and coverage. The land issue and especially land administration lies in the critical path of sustainability of our planet. Dr Augustinus concluded her keynote with the words: "Let's solve this problem in our generation!"

The Beijing Declaration published by GGIM after the event in China includes explicit reference to fit-for-purpose land administration: "Affirm the importance of good land administration and management to address the challenges for the Post-2015 Development Agenda, specifically supporting the development of fit-for-purpose land administration and geospatial information approaches in developing countries."

This is an important recognition of FIG's contribution to the global agenda and very relevant for the profession. ◀

More information
www.fig.net
www.fig.net/news/news_2014/unggim_3hlf_oct_2014.htm
www.fig.net/pub/figpub/pub60/figpub60.htm

FIG

FÉDERATION INTERNATIONALE GÉOMÈTRES

INTERNATIONAL FEDERATION OF SURVEYORS

INTERNATIONALE VEREINIGUNG DER VERMESSUNGSINGENIEURE

PRESIDENT
CheeHai Teo, Malaysia

VICE-PRESIDENTS
Bruno Razza, Italy
Pengfei Chang, China
Chryssy A. Potsiou, Greece
Rudolf Staiger, Germany

REPRESENTATIVE OF THE ADVISORY COMMITTEE OF COMMISSION OFFICERS
Yerach Doytsher, Israel

COMMISSION CHAIRS
COMMISSION 1: PROFESSIONAL STANDARDS & PRACTICE
Leonie Newnham, Australia

COMMISSION 2: PROFESSIONAL EDUCATION
Steven Frank, USA

COMMISSION 3: SPATIAL INFORMATION MANAGEMENT
Yerach Doytsher, Israel

COMMISSION 4: HYDROGRAPHY
Michael Sutherland, Canada/ Trinidad and Tobago

COMMISSION 5: POSITIONING & MEASUREMENT
Mikael Lilje, Sweden

COMMISSION 6: ENGINEERING SURVEYS
Gethin W. Roberts, United Kingdom

COMMISSION 7: CADASTRE & LAND MANAGEMENT
Daniel Roberge, Canada

COMMISSION 8: SPATIAL PLANNING & DEVELOPMENT
Wafula Nabutola, Kenya

COMMISSION 9: VALUATION AND MANAGEMENT OF REAL ESTATE
Frances Plimmer, United Kingdom

COMMISSION 10: CONSTRUCTION ECONOMICS AND MANAGEMENT
Robert Šinkner, Czech Republic
FIG OFFICE
Louise Friis-Hansen, manager

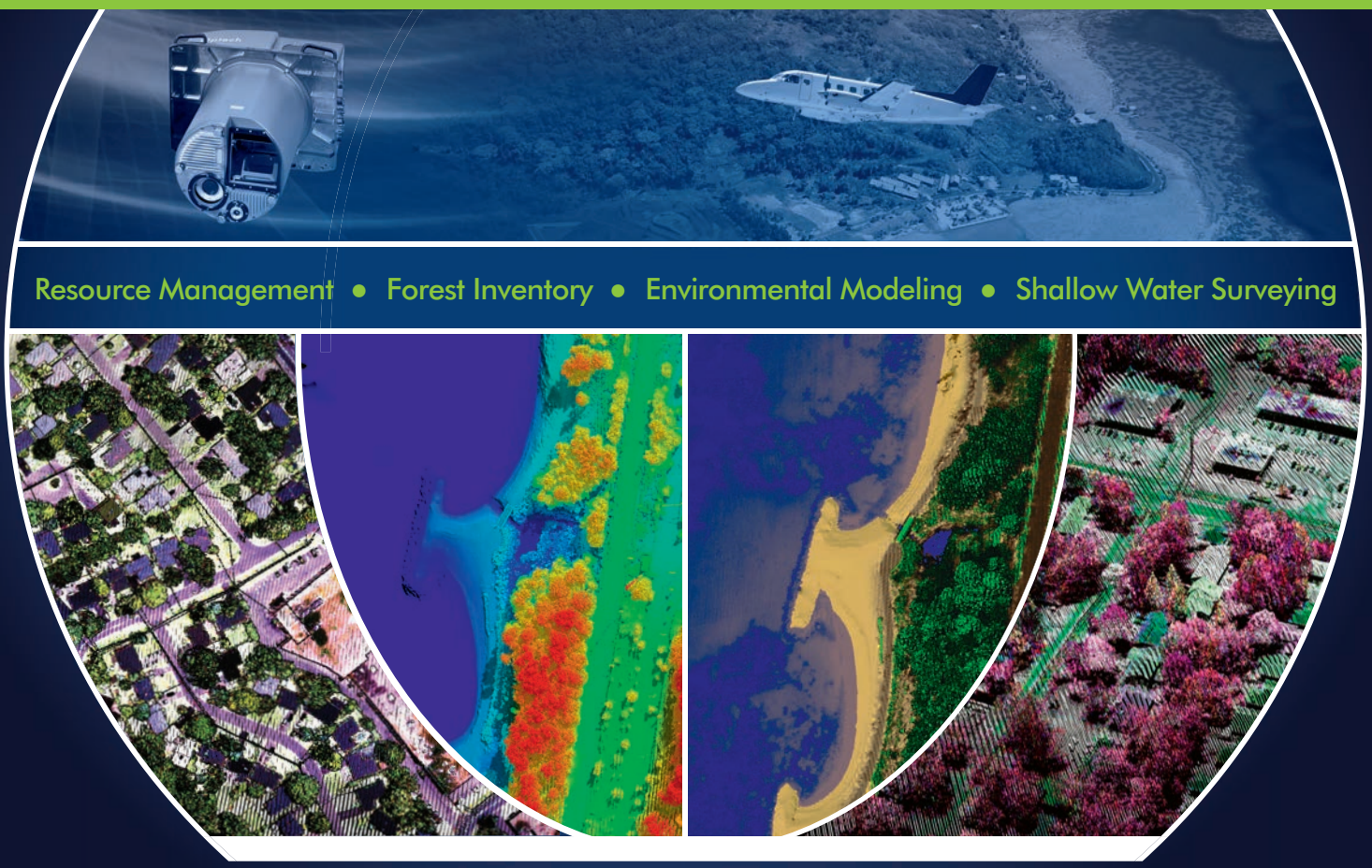
International Federation of Surveyors, FIG, Kalvebod Brygge 31-33
DK-1780 Copenhagen V, Denmark
Tel + 45 3886 1081
Fax + 45 3886 0252
Email: fig@fig.net
Website: www.fig.net

Optech

Optech ALTM Titan

Imagine the possibilities...

with a ***multi-spectral*** lidar system!



Resource Management • Forest Inventory • Environmental Modeling • Shallow Water Surveying

ALTM Titan

A new era in fused sensor performance and feature identification!

- Three active imaging channels, each with unique wavelengths
- Spectral sensitivity for vegetation/non-vegetation analysis and improved land cover classification accuracy
- Seamless simultaneous bathymetric and topographic surveying, with exceptional data precision and fidelity
- Day or night collections, with a combined ground sampling frequency of ~1MHz

Please join us at: SPAR EUROPE & ELMF • December 8-10, 2014 • Amsterdam, The Netherlands • Booth #313

www.optech.com

No. 2685

GSDI – The Way Forward to 2020

On 9 October 2014, the GSDI Association Board adopted a new GSDI Strategy and Strategic Plan 2015-2020, focusing on activities in five areas:

- SDI capacity building
- raising awareness of SDI challenges for implementers, users and beneficiaries of SDIs
- sponsoring research into SDI issues
- dropping the IGS 'brand' to create an all-inclusive membership association
- streamlining the infrastructure and administration of the Association.

CAPACITY BUILDING

The Association's current capacity-building work focuses on the following:

- The GSDI Small Grants Program, which sponsors workshops, seminars and projects mainly in developing nations, with support from URISA's GISCorps
- The GSDI SDI Cookbook and various publications, which provide guidelines for implementing SDIs
- Targeted training activities, such as the two-week GIS training offered free of charge to selected GSDI members in Taipei each year
- Information on webinars related to SDIs, from both member and non-member resources
- Reports and studies related to SDI, in the GI Knowledge Network spatial documents depot
- The Community Registry, which includes details of more than 700 industry professionals and organisations, to offer wide networking opportunities.

RAISING AWARENESS

The Association publishes the monthly GSDI SDI Regional Newsletter, with global coverage of SDI-related news, and the GSDI Global Newsletter covering member activities. It maintains an extensive online calendar of events, and news items are posted almost daily to the GSDI website. GSDI officers and members also regularly participate in conferences and meetings around the globe.

Roger Longhorn is GSDI secretary-general and editor of the monthly GSDI Global Newsletter.

SDI RESEARCH

GSDI World Conferences are drivers for professionals globally to focus on research relating to SDI. Since 1996, 14 conferences have been held and GSDI 15 is scheduled for the first quarter of 2016. All conference proceedings are available online as open access documents. In 2015, the Association will introduce 'SDI White Papers', the first of which will be an analytical comparison of SDI best practices from regions around the globe. The final report will be available to members, the wider community, and the UN-GGIM initiative, as partial fulfilment of the Association's responsibilities under its special consultative status with the UN.

GSDI AS AN ALL-INCLUSIVE ORGANISATION

The Association's Bylaws initially provided for membership for organisations only. In 2009, the Association opened membership to individuals, creating the International Geospatial Society (IGS) as a separate 'brand' within the Association. In order to reduce confusion among current members, sponsors and the geocommunity, from 2015 GSDI will drop 'IGS' as a separate name, while reaffirming to all individual members that they are, and always have been, Association members and will continue to enjoy the membership rights and privileges. The Association will also be seeking members from outside the usual geocommunity.

STREAMLINING THE INFRASTRUCTURE

From 2015, the GSDI Board will be reduced to enable it to react more quickly in providing guidance to GSDI's officers. Committees will be replaced by projects, with targeted deliverables and named project leaders, to deliver tangible benefits to members and the geocommunity. The goal is to permit more resources to be used in producing meaningful member benefits, more easily and more efficiently. ◂

More information
www.gsdi.org
www.giknet.org
www.urisa.org/about-us/urisa-s-giscorps

GSDI Global Spatial Data Infrastructure Association

PRESIDENT & EXECUTIVE DIRECTOR
David Coleman, Canada

PAST PRESIDENT
Abbas Rajabifard, Australia

PRESIDENT ELECT
David Lovell, Belgium & UK

SECRETARY GENERAL
Harlan Onsrud, USA

SECRETARY
Alan Stevens, USA

TREASURER
Eddie Pickle, USA

BUSINESS MANAGER
Marilyn Gallant, USA

OPERATIONS & COMMUNICATIONS
Roger Longhorn, Belgium & UK

RECRUITMENT MANAGER
Bruce Westcott, USA

NEWS EDITOR
Kate Lance, USA

GSDI STANDING COMMITTEES

1) LEGAL AND SOCIOECONOMIC
Chair: Dr ir Bastiaan van Loenen, Delft University of Technology, The Netherlands
Chair: Dr ir Joep Crompvoets, KU Leuven Public Governance Institute, Belgium

2) TECHNICAL
Chair: Eric van Praag, Venezuela

3) OUTREACH AND MEMBERSHIP
Chair: Denise McKenzie, UK
4) SOCIETAL IMPACTS
Chair: Carmelle Terborgh, USA

International Geospatial Society

President: Sives Govender, South Africa
President-elect: Dav Raj Paudyal, Australia

GSDI OFFICE
GSDI Association

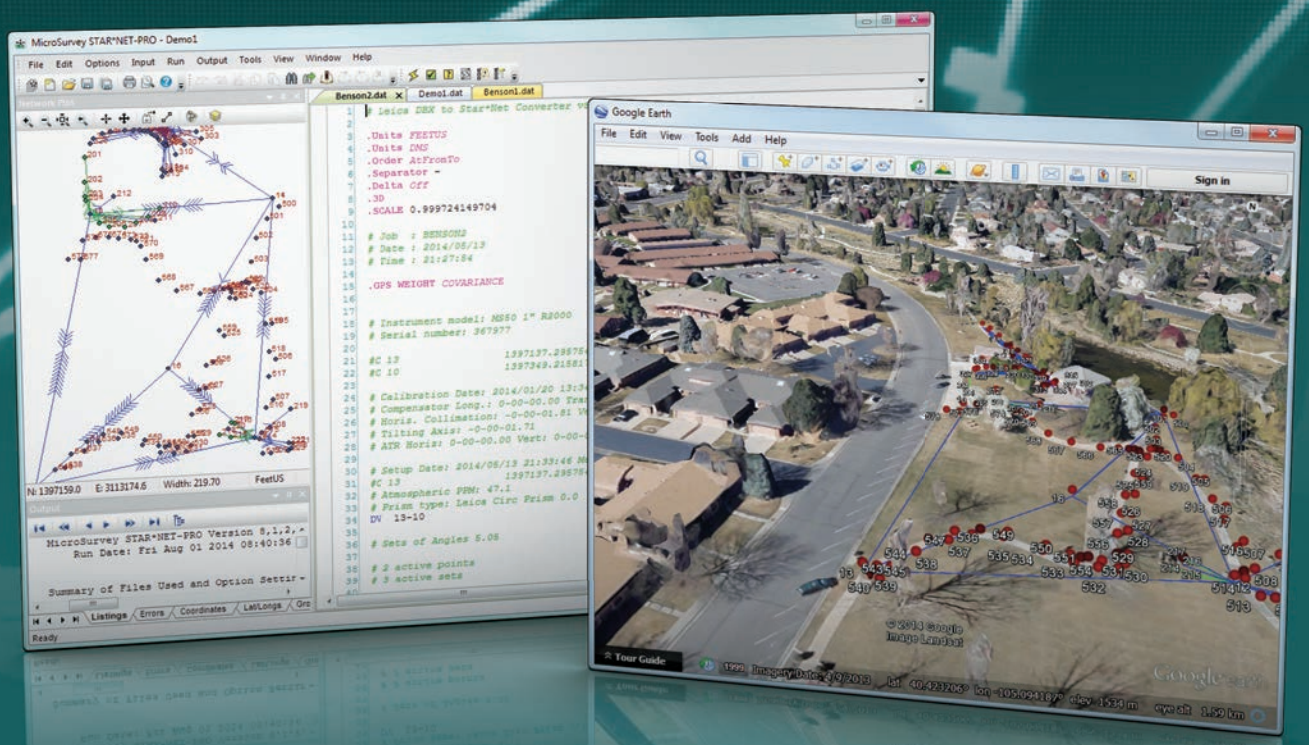
Attention: Marilyn Gallant, Business Manager

946 Great Plain Avenue, PMB-194 Needham, MA 02492-3030, USA

www.gsdi.org

STAR*NET 8.1 TIP #6:

VIEW YOUR SURVEY NETWORK IN GOOGLE EARTH™



Viewing your survey network in Google Earth is just one of many new features in STAR*NET 8.1.

New in 8.1: Visually identify regions with lower redundancy without analysis, correct distances without tedious calculations, and immediately confirm whether your traverses fall within the maximum allowable tolerances—all with STAR*NET 8.1.

Download a free demo from our website: www.microsurvey.com

MicroSurvey® STAR*NET 8

FREE DEMO

PART OF HEXAGON

® MicroSurvey is registered in the U.S. Patent and Trademark Office by MicroSurvey Software Inc. MicroSurvey is part of **Hexagon**.

Google Earth is a registered trademark of Google Inc.

MicroSurvey®

No 2662

26th IUGG General Assembly 2015 Taking Place in Prague

The IUGG General Assembly is held every four years, bringing together the eight associations of the International Union of Geodesy and Geophysics (IUGG) for a range of inter-disciplinary, cross-disciplinary and association-specific symposia. The next IUGG General Assembly, which will be held in Prague, Czech Republic, from 22 June to 2 July 2015, is based around the theme 'Earth and Environmental Sciences for Future Generations'.

The eight IUGG associations are: the International Association of Cryospheric Sciences (IACS), International Association of Geodesy (IAG), International Association of Geomagnetism and Aeronomy (IAGA), International Association of Hydrological Sciences (IAHS), International Association of Meteorology and Atmospheric Sciences (IAMAS), International Association for the Physical Sciences of the Ocean (IAPSO), International Association of Seismology and Physics of the Earth's Interior (IASPEI), and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

The joint symposia supported by IAG are:

- Joint Inversion and Mutually Constrained Inversion of Geophysical Observations
- Results from SWARM, Ground Based Data and Earlier Satellite Missions
- Data on the Edge: Preservation and Utilisation of Historical Data in the Geosciences
- Dynamics of the Cryosphere from Geometric and Gravimetric Observations
- Modelling the Atmosphere and Ionosphere by Space Measurements
- Variations of the Hydrosphere from Satellite Gravity Missions
- Extreme Hydrological Events
- Earth Systems Dynamics, Predictability and Probabilistic Forecasting
- Data Assimilation in Geophysical Sciences
- Sea Level Change and Variability: Past, Present and Future
- Satellite Oceanography and Climatology
- Geophysical Imaging of Natural Resources
- Deformation of the Lithosphere: Integrating Seismology and Geodesy through Modelling

The list above underlines that modern geodesy is very much an Earth observation science, contributing to our understanding of the dynamic Earth. However geodesy is also the foundation for national mapping, land and environmental management, and supports the geospatial industries. In addition to the above multi-disciplinary symposium topics, IAG will also organise a series of symposia that reflect current geodetic technology and applications topics:

1. Reference Frames
2. Static Gravity Field Models and Observations
3. Variations of the Gravity Field
4. Earth Rotation and Geodynamics
5. GNSS++: Emerging Technologies and Applications
6. Unified Height System
7. Geohazards Monitoring
8. Sea-Level Observation and Modelling

The 26th IUGG General Assembly 2015 will be held in Prague, the capital city of the Czech Republic. Prague has played an important part in the history of both the nation and of Europe, and it ranks among the most impressive historical cities in the world. It features a unique collection of historical monuments, including Prague Castle. Since 1992, the historical core of the city has been listed in the UNESCO World Cultural and Natural Heritage Register as an area with a unique and lively blend of Roman, Gothic, Renaissance, Baroque, Art Nouveau and Cubist architecture. The venue for the 26th IUGG General Assembly 2015 is the Prague Congress Centre, a purpose-built venue with easy accessibility to many hotels in the near vicinity. With the underground station located a mere 2-minute walk from the venue, the very heart of the city can be reached within minutes.

The logo of the 26th IUGG General Assembly.

The Call for Abstracts has been released, and the deadline for abstract submissions is 31 January 2015. For full details on abstracts, symposia, registration and other conference information, please consult the IUGG2015 website. Looking forward to seeing you in Prague!

Prague will host the 26th General Assembly of the IUGG, the umbrella organisation of eight semi-autonomous associations covering various physical, chemical, mathematical and environmental disciplines. IAG is one of the eight IUGG associations.

More information
www.iag-aig.org
www.iugg2015prague.com
www.iugg.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.

IAG EXECUTIVE COMMITTEE 2011 - 2015

President:
Chris Rizos,
c.rizos@unsw.edu.au

Vice-President:
Harald Schuh, harald.schuh@gfz-potsdam.de

Secretary General:
Hermann Drewes,
iag@dgfi.badw.de

Immediate Past President:
Michael Sideris,
sideris@ucalgary.ca

President of Commission 1 Reference Frames:
Tonie van Dam,
tonie.vandam@uni.lu

President of Commission 2 Gravity Field:
Urs Marti,
urs.marti@swisstopo.ch

President of Commission 3 Rotation & Geodynamics:
Richard Gross,
richard.gross@jpl.nasa.gov

President of Commission 4 Positioning & Applications:
Dorota Brzezinska,
dbrzezinska@osu.edu

Chair of Global Geodetic Observing Systems (GGOS):
Hansjörg Kutterer,
hansjoerg.kutterer@bkg.bund.de

President of Communication & Outreach Branch (COB):
József Ádam,
jadam@sci.fgt.bme.hu

Representatives of the Services:
Riccardo Barzaghi, riccardo.barzaghi@polimi.it
Tom Herring, tah@mit.edu
Ruth Neilan,
ruth.e.neilan@jpl.nasa.gov

Members at large:
Claudio Brunini,
claudiobrunini@yahoo.com
Richard Wonnacott,
rwonnacott@gmail.com

President of the ICC on Theory:
Nico Sneeuw, sneeuw@gis.uni-stuttgart.de

Assistant Secretary:
Helmut Hornik,
hornik@dgfi.badw.de

TI Asahi Co., Ltd.
International Sales Department
4-3-4 Ueno Iwatsuki-Ku, Saitama-Shi
Saitama, 339-0073 Japan
Tel.: +81-48-793-0118
Fax. +81-48-793-0128
E-mail: International@tiasahi.com

www.pentaxsurveying.com/en/

Be Prepared and…Consider the Mapping

The Commission on Cartography in Early Warning and Crisis Management is an active group within ICA. It grew out of a Working Group established in 2005 to address specific concerns about the mapping response to disasters in tropical areas. Its work was well received and renewed in 2007, under the hard-working leadership of then ICA past-president Milan Konecny. It was awarded Commission status in 2011; its remit has extended globally and to address more issues, including conceptual and methodological aspects, human involvement (crisis impact on rescued people and children; end-user approach to map utilisation), participation in global initiatives, and technological developments (including field sensors).

The Commission was active at GeoSiberia, held earlier this year in Novosibirsk.

The Commission has promoted and participated in many meetings around the world in recent months. The Commission chair delivered a keynote on 'Ubiquitous Mapping for Early Warning and Crisis Management' at the event called Researching Spatial and Social Aspects of Disaster Management, which was organised by the Hungarian CASCADOSS Association in May 2013 in Budapest. In the following month, the Commission chair addressed a geoinformatics conference in Kaifeng, China, which was attended by Chinese and other renowned GIS experts, on the topic of 'Early Warning and Disaster Management', noting the impact of VGI and cartography on the role of contemporary GIS in disaster management.

In August 2013, the Commission was invited to a Special Seminar in Kuala Lumpur, Malaysia. Discussions led by Hasan Jamil (deputy surveyor general) were wide and addressed the needs of special groups (e.g. children, the elderly) during emergency situations. Visits were made by Commission members to the Malaysian Center for Geospatial Data Infrastructure – where discussions included updates on the use of INSPIRE and GMES in Europe, and the role of cartography – and the Ministry of Natural Resources and Environment in the country's new national administrative capital, Putrajaya.

The 2013 ICC in Dresden was a further opportunity to disseminate the work of Commission members with a number of papers presented at dedicated, well-attended, sessions. Also in Germany, the November 2013 Cartographic Colloquium of the German Cartographic Society in Berlin heard Dr Christophe Lienert (vice-chair of the Commission) deliver a paper on 'Methods and Applications in the Real-time Mapping' which included crisis management.

Furthermore, a couple of workshops were held by the Commission, one in Wuhan (December 2013) and the other, as part of InterExpo GeoSiberia 2014, in Novosibirsk (April 2014). The former attracted a number of leading Chinese experts in disaster management whilst the latter, organised by the Commission, the Siberian State Academy of Geodesy (SSGA) and International Society of Digital Earth (ISDE) in cooperation with sister societies, was titled 'Early Warning and Crises Management in the Big Data Era'. Papers addressed topics ranging from specific flooding case studies to the handling of big data in the geoinformation environment. Local participation from students and professionals was encouraged in both workshops and attendance levels were gratifyingly high. Having also contributed in 2013 to the UN-sponsored publication titled *The Value of Geoinformation for Disaster and Risk Management (VALID)*, it is clear that the Commission is conducting high-profile work. ◀

More information
www.icaci.org

ICA ACI

EXECUTIVE MEMBERS
PRESIDENT
Georg Gartner, TU Wien, Austria

SECRETARY-GENERAL & TREASURER
Laszlo Zentai, Eotvos University, Hungary

VICE-PRESIDENTS
Derek Clarke, Surveys and Mapping, South Africa
Menno-Jan Kraak, ITC, The Netherlands
Sukendra Martha, Bakosurtanal, Indonesia
Paulo Menezes, Federal University of Rio de Janeiro, Brazil,
Anne Ruas, IFSTTAR, France
Tim Trainor, Census Bureau, USA
Liu Yaolin, Wuhan University, China

PAST-PRESIDENT
William Cartwright, RMIT University, Australia

EDITOR ICA NEWS
Igor Drecki, University of Auckland, New Zealand

COMMISSION CHAIRS
Cognitive Visualisation sara.fabrikant@geo.uzh.ch
Map Design kfield@esri.com
Art & Cartography scaquard@gmail.com
History of Cartography elri@worldonline.co.za
Map Projections mlapaine@geof.hr
Theoretical Cartography qydu@whu.edu.cn
Data Quality chenxy@ecit.cn
Atlases peter.jordan@oeaw.ac.at
Mapping from Remote Sensor Imagery xyang@fsu.edu
Geospatial Analysis and Modeling bin.jiang@hig.se
Geovisualisation gennady.andrienko@iais.fraunhofer.de
Maps and the Internet rcammack@mail.unomaha.edu
Ubiquitous Cartography arikawa@csis.u-tokyo.ac.jp
Digital Technologies in Cartographic Heritage livier@topo.auth.gr
Open Source Geospatial Technologies suchith.anand@nottingham.ac.uk
Generalisation and Multiple Representation dirk.burghardt@tu-dresden.de
Planetary Cartography hhargitai@gmail.com
Mountain Cartography karel.kriz@univie.ac.at
Neocartography s.l.chilton@mdx.ac.uk
Maps and Graphics for Blind and Partially Sighted People acoll@utem.cl
Maps and Society chris.perkins@manchester.ac.uk
Use and User Issues elzakker@itc.nl
Cartography and Children jesus@map.elte.hu
Education and Training dave.fairbairn@newcastle.ac.uk
GI for Sustainability vstikunov@yandex.ru
Map Production and Geobusiness philippe.demaeyer@ugent.be
Cartography in Early Warning and Crises Management undatra@yahoo.com
Geoinformation Infrastructures and Standards acooper@csir.co.za

GIM CORRESPONDENT
David Fairbairn, Newcastle University, UK

X91+ GNSS - The industry's performance and reliability standard

- ***TRACKING EVERY SIGNAL AND EVERY SATELLITE***
  Advanced 220-channel GNSS technology for state-of-the-art RTK accuracy and reliability
- ***FLEXIBLE AND SCALABLE***
  Internal UHF and Cellular data modems; bundled with Carlson SurvCE or CHC Landstar field software
- ***EFFICIENT***
  Small, lightweight and rugged design for the most demanding field work
- ***SUPPORT***
  Worldwide network of local service centers and dealers

www.chcnav.com

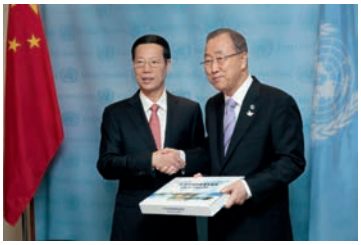
No 2657

GlobeLand30: A Milestone in Earth Observation and Open Access Geospatial Information

During a ceremony on 22 September 2014, UN secretary-general Mr Ban Ki-moon praised China's donation of the world's first 30-metre-resolution global land cover (GLC) dataset, GlobeLand30, to the United Nations. He said: "The world needs solid, science-based information for making wise decisions for sustainable development. This donation is very timely and precious. Tomorrow, global leaders will gather at the United Nations to participate in the Climate Change Summit and to confirm their commitments to action. These detailed datasets will help us to better understand, monitor and manage changes in land cover and land use all over our planet. I commend you for this laudable example of information sharing." [1]

Over the past four years Professor Chen Jun, ISPRS president and chief scientist at the National Geomatics Center of China, and his team have processed over 20,000 Landsat and Chinese HJ-1 images to cover the Earth's entire land surface (approx. 150 million square kilometres) and to derive ten land cover types at global scale for two years: 2000 and 2010. A number of factors, including the availability of good-quality imagery covering the whole Earth and the complex spectral and textual characterisation of global landscapes make 30m-resolution GLC mapping extremely technically challenging as well as demanding in terms of human and financial resources, which explains why so far only global datasets with limited classes at 30m resolution have been reported. The production of GlobeLand30 2000 and 2010 by Professor Chen Jun and his team within a four-year period is a milestone achievement in the history of obtaining global geospatial information from satellite imagery, and can also serve as a successful example of big-data mining.

In comparison with the existing GLC datasets ranging from 300m to 1,000m resolution, GlobeLand30 provides more-detailed land-cover patterns and their changes induced by human activities between 2000 and 2010. Preliminary results from an initial validation of the global water layer of the GlobeLand30 conducted by KTH Royal Institute of Technology (Sweden) and the International Institute for Applied Systems Analysis (IIASA) in Northern Europe show that accuracy of GlobeLand 30 (total disagreement less than 5%) was much higher than other existing GLC products. The full datasets of GlobeLand30 are now freely available on the website [2]. The open access of this important scientific dataset will significantly promote scientific data-sharing and decision-making in the field of Earth observation and geospatial information sciences within the international community.



UN secretary-general, Mr Ban Ki-moon, officially received the GlobeLand30 from Mr Zhang Gaoli, vice premier of China, on 22 September 2014.

Recognising the importance of GLC information, ISPRS decided during its 2012 Congress in Melbourne to establish an Inter-Commission Working Group on Global Land Cover Mapping and Services involving three of its eight technical commissions (TC II, IV and VIII) to coordinate international efforts on identifying scientific, technological and application challenges related to GLC mapping, validation and web services of GLC data. I would like to take this opportunity to call for your participation in the continued validation and refinement of GlobeLand30 and other GLC products and collaborative information services. I would also like to congratulate Professor Chen Jun and his team on this remarkable achievement.

Yifang Ban, chair of ISPRS ICWG II/IV/VIII on Global Land Cover Mapping and Services and professor of geoinformatics, KTH, Stockholm, Sweden.

Fig. 2, OpenLandService: the web platform for GlobeLand30.

More information

1. http://unstats.un.org/unsd/GlobeLand30.htm
2. www.globallandcover.com/GLC30Download/index.aspx

www.isprs.org

ISPRS COUNCIL 2012 – 2016

CHEN JUN
PRESIDENT
National Geomatics Centre of China
28 Lianhuachixi Road Haidian District,
Beijing 100830, PR CHINA
Email: chenjun@nsdi.gov.cn

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

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

MARGUERITE MADDEN
2ND VICE PRESIDENT
Center for Geospatial Research (CGR)
Department of Geography
The University of Georgia
Athens, Georgia 30602-2305, USA
Email: mmadden@uga.edu

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

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

ISPRS HEADQUARTERS
see address of secretary general

DECEMBER

EUROPEAN LIDAR MAPPING FORUM
Amsterdam, The Netherlands
from 08-10 December
For more information:
E: info@SPARPointGroup.com
W: www.lidarmap.org/europe

SPAR EUROPE 3D MEASUREMENT & IMAGING CONFERENCE
Amsterdam, The Netherlands
from 08-10 December
For more information:
E: lcorkhill@divcom.com
W: www.sparpointgroup.com/europe/

2015

JANUARY

INTERNATIONAL WORKSHOP ON SPATIAL DATA, MAP QUALITY
Valleta, Malta
from 20-21 January
For more information:
E: carol.agius@mepa.org.mt

FEBRUARY

TUSEXPO 2015
The Hague, The Netherlands
from 04-06 February
For more information:
E: a.hagenstein@tusexpo.com
W: www.tusexpo.com

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

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

APRIL

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

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

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

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.

New Products Coming.....

Total Station

GNSS

GIS

Gyroscope

Levels

- A50 New Generation GNSS Receiver
- RTS812M Motor Total Station
- RTS340 Total Station
- DT402-Z Auto-collimating Digital Theodolite
- EL03 High Precision Digital Level
- .....for more, welcome to visit FOIF website

SUZHOU FOIF CO.,LTD. WWW.FOIF.COM

No 2672

AN IMAGE SO POWERFUL, IT LEAVES NO ROOM FOR UNANSWERED QUESTIONS.

Nobody likes site revisits to gather missed information. Get the information you and decision makers need with the Trimble® V10 Imaging Rover–the first time. Now you can capture 360-degree digital panoramic images for efficient visual documentation and measurement of the surrounding environment. Combined with a Trimble positioning sensor, the Trimble V10 gathers geo-referenced images from a fixed point, so you don't have to venture into hazardous areas, jump fences or break environmental regulations to get the measurements you need. In the office, review the field data, check the conditions of the pipes, and extract additional positional and attribute information using Trimble Business Center office software. The Trimble V10 provides highly accurate images that help everyone back in the office make informed decisions–as if they were on the site themselves.

Discover the power of images collected with the Trimble V10 at www.trimble.com/V10

Trimble V10
Imaging Rover

- Capture rich, accurate visual data that's inaccessible to other sensors
- Avoid site revisits: locate and measure features in the office that weren't targeted in the field
- Document and communicate site conditions to decision makers not on site
- Integrate with Trimble R-Series receivers for a highly accurate data set
- Produce comprehensive geospatial deliverables in Trimble Business Center

© 2014, Trimble Navigation Limited. All rights reserved. Trimble and the Globe & Triangle logo is a trademark of Trimble Navigation Limited, registered in the United States and in other countries. All other trademarks are the property of their respective owners. (GEO-046) 10/14

Trimble®

No 2686