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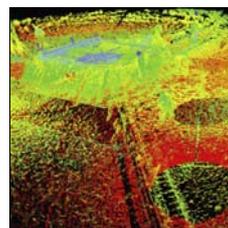
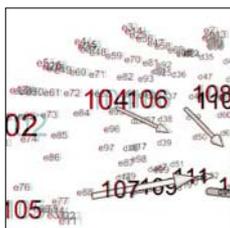
UAVs – useable survey tools: pros and cons

Software for free? 123D Catch: just how accurate is it?

Digidoc 2012: when the digital narrative was born

Merging seabed sonar with laser scanning

Combining land and offshore laser scanning with imagery

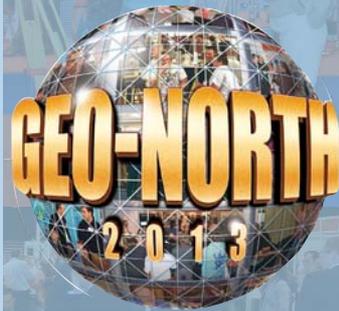


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COVER STORY

Our cover image shows Blom's coverage over Bristol; BlomOBLIQUE at 5cm with a 3D point cloud generated from their MetroHD vertical imagery. Turn to page 14 for the full story.

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Would you like to receive the electronic version of GW?

Many RICS members overseas receive an electronic version of GW. To receive the printed edition too overseas members must opt in. If you haven't already advised us please go to:

<http://www.pvpubs.com/OverseasRICS>

and register your requirements. Meanwhile, UK and Irish readers as well as subscribers can also receive the electronic version, which is sent at least a week ahead of the printed copy, by emailing a request to barbara@pvpubs.demon.co.uk

- **NOTE:** the electronic version can now be downloaded as a PDF and printed.

Next issue

The next issue of GW will be that for March / April 2013.

Copy dates are: Editorial: **11 February** Advertising: **15 February 2013**

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Here's the plan for the year

Welcome to the first issue of *Geomatics World* for 2013 and a very Happy New Year to all *GW* readers.

Without the Olympics, Diamond Jubilee and other sporting triumphs to look forward to, the year may appear a little bleak. We shall see.

For this issue we have been able to put together an stimulating series of articles around the theme of airborne data capture technologies: the processing, deliverables and applications. A sub theme is unmanned aerial vehicles, for which both platforms, sensors and applications are growing rapidly. There are also reports on events in Wuhan (China), Melbourne (Australia) and Edinburgh (Scotland); a truly international issue.

This year we are endeavouring to follow a more focused approach for the editorial programme. By publishing in advance themes for upcoming issues we hope to encourage greater input from readers. If you can contribute a case study, a longer article or just have relevant news please email editor@pvpubs.demon.co.uk Here are the themes and dates to note:

March/April - copy date 11 February
3D data capture for BIM, heritage and measured surveys

May/June - copy date 15 April
Keeping an eye on it: monitoring applications

July/August - copy date 10 June
Hydrographic trends - Offshore geodata: latest developments in 3D data capture and positioning systems.

September/October - copy date 12 August
Keeping in touch: developments in communication technologies for survey instrumentation plus case studies and application reports.

November/December - copy date 7 October
Close-range laser scanning: the possible, the economic and the realistic.

We will of course continue to remain as agile as possible with technology developments during the year, responding whenever possible with appropriate editorial coverage as well as news although the pressure on editorial space remains high so do go to our new website, www.location-source.com which will be the place of choice for geospatial news.

In addition to the BIM theme in the next issue we have an extremely topical paper on international boundaries in the South China Sea. This is a part of the world which has long been a flashpoint as two major powers with

'history' square up to each other over the ownership of a string of tiny islands. But China and Japan are not the only ones with claims on the Spratly Islands; Vietnam, Taiwan, Malaysia and the Philippines are also keen to assert their 'rights'. Let's hope it remains just a war of words.

Finally, a reminder on perennial topics. Firstly, we do not have teams of reporters ready to travel at a moments notice to the far corners of the world, despite such a belief amongst some companies and organisations. Generally speaking we don't have the time to go searching for news although we do monitor daily the BBC and other online news sources. We are not investigative journalists. Nevertheless, our technical editor Richard Groom can be quite inquisitive and persistent in rooting out a story. The work done by surveyors for last summer's Olympics is a case in point and we hope at last to be able to bring you the story on how Britain's mapmakers and surveyors provided highly accurate and detailed geospatial data for the project.

Lastly, please remember that unless you are a paying subscriber to *GW* we are not the custodians of the mailing list. If you're a member of RICS please contact them directly about changes of address and membership requirements. A first contact is **James Kavanagh**, Director of the Land Group of which *Geomatics* is a part, at RICS: jkavanagh@rics.org

Stephen Booth, Editor

TEN YEARS AGO: GW January/February 2002

NavSat 2002 in Nice provided a detailed report on the benefits the Galileo project would bring. Predictions were that the system would be up and working by 2008. ...

Also in the issue, **Jim Smith** was updating readers on plans to demarcate the Struve Arc, a chain of survey triangulations stretching from Hammerfest in Norway to the Black Sea, through ten countries and now a UNESCO world heritage monument. Struve's aim was to measure the circumference of the Earth as accurately as possible.

In the news, **John Brock** had just met the cricketing legend Sir **Don Bradman**; **Ed Danson**, whose book *Drawing the Line* had just been published, reported from the Surveyors Rendezvous, which gathers in the US each year to celebrate that famous survey, the Mason-Dixon line; and the RICS had just announced the ill-fated annual conference in The Netherlands.

A more focused approach to editorial this year is designed to attract more input from readers, but *GW* will remain agile and responsive to developments.

The editor welcomes your comments and editorial contributions by e-mail: editor@pvpubs.demon.co.uk or by post:
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Pléiades 1B delivers its first image



The Pléiades 1B satellite was launched on 1st December 2012 and delivered its first image six days later. Phased 180° apart in the same orbit, Pléiades 1A and Pléiades 1B form a constellation that now affords a daily revisit capability for acquisition of 50cm resolution imagery. This is vital for quick operational response but also means more effective change detection. For example, it is now possible to activate daily tasking to track progress of civil engineering works, monitor an industrial facility or keep an eye on mining operations.

The dual-satellite constellation brings a twofold increase in global acquisition capacity, ideal for mapping large areas. It also doubles the chances of acquiring cloud-free imagery.

Nature for sale?

The first RICS evening lecture of the season had a 'land' theme which also placed it at the margins of geomatics interest. In a talk entitled "Challenges for international professional practice: from market value to natural value", **Charles Cowap** presented the results of research he has carried out for the RICS on an emerging area of government policy.

To do this research justice (Ecosystem Services (ESS) their valuation and trading) it is well worth reading the report on the RICS website. Cowap's talk illustrated the concept by taking the story of peat – decomposed sphagnum moss which is produced naturally. One season's decayed vegetation results in a millimetre of moss. It is well known that peat can be used as a fuel or on the garden and there is a market for these products, but it also absorbs carbon dioxide (or releases it if maltreated) and retains water with value for water supply and flood alleviation, for which there is currently no value and no market. His example focused on Exmoor where the local water

company is considering building a reservoir in an area of peat bog. At the same time, the National Trust is taking active measures to restore damaged peat bogs so that they once again produce peat, absorb CO2 and serve their water supply and flood defence functions.

The question is: How do you value these ecosystem services and trade in them? Cowap suggested that RICS valuation practices are geared towards the market but that this experience in valuation should place RICS members in a good position to develop this new area of work. The subject includes carbon trading. Indeed Cowap could imagine house builders which have to be building carbon neutral housing by 2016, buying (say) the carbon capture value of peat bogs to offset the carbon production of new housing. In the panel discussion that followed, it was suggested that house builders would simply use carbon trading to avoid having to build more expensive, sustainable housing. Maybe so, but ESS would encourage carbon sequestration where it can be carried out most efficiently, by

comparing the value of the different options available. So, in order to value, you have firstly to measure and that could be where geomatics has a role.

Topcon takes lead sponsor role

Started in 2009 by land surveyor **Alison Watson** and architect **Dan Gibson**, Class of your own (COYO) has been successfully working towards establishing itself as an industry recognised source of educational material for students age 11-19. From the summer of 2012, Topcon has been supporting COYO in preparation for the new school year as their exclusive positioning partner, and will be working alongside COYO's other industry sponsors, Autodesk and Mott MacDonald to help deliver "best in Class" teaching experiences.

The Design, Engineer, Construct! project-based curriculum is the result of four years of research and development by COYO. "The whole idea started when we met lots of young people as we surveyed schools across the country for the UK Building Schools for the Future programme," said Alison Watson from COYO.

"We soon discovered that they knew very little about surveying and positioning... and decided to do something about it. We believed that if we could encourage teachers to recognise the part they had to play in changing the perception of the built environment through an exciting education programme, we might help bridge the skills gap that is frighteningly real." Visit: www.classofyourown.com

Allseas for Veripos

Offshore pipeline installation and subsea construction company, Allseas, has awarded Veripos a further three-year contract for continuing provision of specialist GNSS positioning services for its fleet of vessels. The vessels will be provided with Veripos's full range of proprietary high-precision GNSS positioning services typically realising continuous metre-level accuracies, including its latest Apex2 service utilising Precise Point Positioning (PPP) methods

using both GPS and Glonass satellite constellations.

Supporting the Olympics

The second in this season's RICS evening lecture series took place in December. **Neil Ackroyd**, Ordnance Survey Director of Data Collection and Management, spoke to a large audience of land surveyors about OS involvement with supplying spatial data to the security services before the Olympics. Whether it was really necessary to map every lamp-post and stopcock within miles of each venue is perhaps debatable, but this was the requirement and the OS took up the challenge with gusto by employing eight staff at any one time on the project. This resulted in the collection of 157,000 additional features in 82 new feature classes. They also flew 1,398 line km of aerial photography to provide a time series of images of the site during construction. **James Bulley**, Director of Venues and Infrastructure from LOCOG followed with a more general description of the challenges he faced in bringing the games together.

What did they see as the main successes of this vast mapping exercise? Unprecedented collaboration across government agencies and the development of a common map symbology, although it was unclear whether this would be a 'games legacy'.

Blom to map French coast

Blom's Italian-French subsidiary has signed a contract with the Finistère Department and the Provence-Alpes-Côtes d'Azur Region to map and monitor stretches of the Atlantic and Mediterranean coastline in France. The project aims to produce a seamless digital terrain model using bathymetric and topographic laser scanners to collect accurate land and seabed terrain data simultaneously.

The contract is part of the Litto3D project, a programme run jointly for the French navy and IGN (the national mapping agency) and will cover more than 5,500 km of coastline. Uses of

• there's lots more geospatial news, updated daily at our new site: www.location-source.com

the data will include flood risk reduction, erosion and ecological studies, pollution, safety at sea or natural disasters, and for regional development.

GPS fix in space

An experimental GPS receiver built by Surrey Satellite Technology Ltd (SSTL) has successfully achieved a GPS position fix at 23,300 km altitude, the first position fix above the GPS constellation on a civilian satellite. The experimental GPS receiver onboard GIOVE-A has been inactive for six years while the satellite has been used for transmitting prototype Galileo signals. The SGR-GEO receiver is collecting data that could help SSTL to develop a receiver to navigate spacecraft in geostationary orbit or even in deep space.

GPS is routinely used on Low Earth Orbit (LEO) satellites to provide the orbital position and offer a source of time to the satellite. Spacecraft in orbits higher than the 20,000 km of the GPS constellation, however, can only receive a few of the signals that "spill over" from the far side of the Earth, meaning that the signals are much weaker and a position fix cannot always be secured.

Newcastle's professional awareness

More than 100 GIS and surveying & mapping students were joined by 16 organisations from across geomatics for Newcastle University's annual professional awareness event on 11 October. The annual evening showcases the wide range of geomatics careers, applications and technology, and 2012 was the biggest in the event's seven year history.

"This event is a key part of the professional education that our students and industrial partners need and expect. It is also a major part of the process of students finding jobs and placement work. That so many organisations are coming to meet our students and talk to them about our industry and their future careers is incredible in the current economic climate and we're very grateful to all who have given their time," said organiser Tom Bramald.

RICS, Leica Geosystems, Amec,

BP, ESRI, Shell, Costain, Skanska, eBIM, CICES, Fugro, ProMap, Loy Surveys, Schlumberger, Scopus Engineering, and Trimble / KOREC were all in attendance.

BRIEFS

1Spatial has been awarded a single source contract by Ordnance Survey Great Britain (OSGB), under which it will supply software support and consultancy services to OSGB's Geospatial Data Management System (GDMS).

Leica Geosystems Viva GS08plus, the lightest, wireless, high-precision GNSS system on the market, won the Wichmann Innovations Award for "Most Innovative Product" at Intergeo 2012. The prestigious award was evaluated against ten other products and applications and judged by a five-member jury.

KOREC has become a patron partner of CRASH, the construction and property industry's charity for homeless people. The charity encourages patron companies to get directly involved, matching their expertise to the needs of a particular homelessness project so vital renovations and developments of emergency night shelters, day centres and hostels can be carried out to a high standard. As a result safe, sustainable and welcoming places are created where vulnerable people can seek help.

Leica Geosystems has posted three educational videos on youtube, which provide an easy-to-understand introduction to the basics of 3D laser scanning. Topics include how the technology works, applications & benefits, field and office aspects, and what options users have for taking advantage of this increasingly popular technology.

Next year's Cambridge Conference – 'Bringing Geographic Authority to Information' will be held between 21-24 July 2013 at Churchill College Cambridge and hosted by the Ordnance

Britain from Above goes live



Blackpool, from the south-west, July 1932 (© English Heritage/RCAHMS/RCAHMW)

More than 16,000 images from one of the earliest and most significant collections of aerial photography of the UK have been made freely accessible online for the first time. Britain from Above presents the Aerofilms unique collection of aerial photographs from 1919-1953.

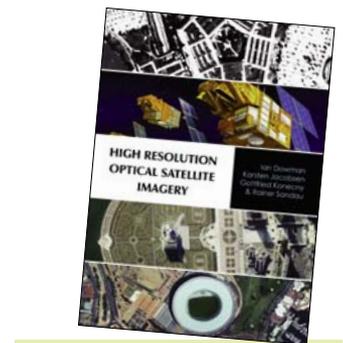
Launched by English Heritage and the Royal Commissions on the Ancient and Historical Monuments of Scotland and Wales, it features some of the oldest and most valuable images of Aerofilms' collection, a unique and important archive of over 1 million aerial photographs taken between 1919 and 2006. Many shots were taken in the early days of aviation by ex-First World War pilots, from extremely low altitudes, a technique which was very dangerous. It shows just how far their pilots were willing to go for a great photograph.

The photographs featuring on the website date from 1919 to 1953, and have gone through a painstaking process of conservation and cataloguing. Due to their age and fragility, many of the earliest plate glass negatives were close to being lost forever.

Survey. The conference is invitation-only and will this year be coupled with the third session of the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM3).

RapidEye's archive of remote sensing data is now available to the scientific user community of ESA member states (including Canada), the European Commission Member States, as well as Africa and China (as part of the Dragon programme) through ESA's Earthnet Online Portal. Visit: <http://earth.esa.int>

Topcon, in cooperation with the Vatican and Pope Benedict XVI, is developing a global agriculture initiative – Person and Technological Innovation. The programme is designed to introduce young people in



Apologies to readers for publishing the wrong photo of the cover of *High Resolution Optical Satellite Imagery*, reviewed in the last issue. Above is the correct image. Copies are available from our website at www.pvpubs.com

developing countries to technologies and applications of precise positioning in the global agriculture markets. Initial training will be conducted at Topcon training facilities in Italy.

The Leica Geosystems 3D Disto won the Performance and Innovation Award at the recent EquipBaie trade fair in Paris. The 3D Disto is able to measure, scan or project to any location in a room independent from the room's geometry or around a building in three dimensions while visualising and documenting the results immediately on a display. The jury, comprising journalists and experts from the building sector, selected ten winners from 72 new products and innovations presented in the Equipbaie and Metalexpo 2012 Innovations area.

ASTRAEA (Autonomous Systems Technology Related Airborne Evaluation and Assessment) is a programme aimed at enabling the routine operation of unmanned aircraft systems in civil airspace. The surveying industry already uses micro UAVs for small area surveys (see Andrew Blogg's article on page 20) but ASTRAEA is more

interested in the future for larger unmanned aircraft and has been promoting several technologies, such as 'sense and avoid' to automatically detect and take steps to avoid other aircraft. This year's ASTRAEA conference was held in London on 20th and 21st November and attracted nearly 200 delegates over the two days. For more information visit: www.astraea.aero.

Red Eléctrica de España, S.A. (REE), the sole transmission and electricity system operator in Spain, has chosen Blom to assist with its plans to improve powerline engineering and maintenance operations. REE's transmission grid is composed of more than 40,100 kilometres of powerlines. Blom is to provide detailed topography and powerline vegetation clearance analysis, which REE will then use for maintenance planning. In addition, Blom will provide the

Events Calendar 2013

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Defence Geospatial Intelligence (DGI) 2013

21-23 January, QEII Conference Centre, Westminster, London, UK.
Contact: www.dgjeurope.com

International LiDAR Mapping Forum 2013

11-13 February 2013, Denver, Colorado, USA.
Contact: www.lidarmap.org/ILMF.aspx

GEO-North

7 March 2013, Reebok Stadium, Bolton, UK.
Contact: Sharon Robson
sharon@pvpubs.demon.co.uk or www.pvpubs.com/events.php

Wavelength Conference 2013 – By RSPSoc

11-13 March 2013, Glasgow, UK.
Contact: www.rspsoc-wavelength.org.uk/wavelength2013

SPAR International 2013

15-18 April 2013, Colorado Springs, Colorado, USA.
Contact: www.sparpointgroup.com/international/

GEO-South

1-2 May 2013, Holiday Inn, Elstree, UK.
Contact: Sharon Robson
sharon@pvpubs.demon.co.uk or www.pvpubs.com/events.php

information needed for REE to build new, and upgrade existing powerlines. All the projects are based on laser scanning and delivery of high resolution data.

Leica Geosystems has signed a formal agreement with Sigma Seven Ltd, to provide asset collection and management. By combining Sigma Seven's GeoField software on Leica's Zeno CS25 GNSS tablet computer, high accuracy satellite position data can be collected with attribute data in one rugged system.

Trimble and AVEVA have announced that they are collaborating to provide integration between Trimble's 3D laser scanning solutions and AVEVA's software, including the LFM software suite, for the plant, power and marine industries.

US survey technology company Terramatrix is using 3D Laser Mapping's StreetMapper, to survey more than 7,000 bridges in California. Consulting to the California Department of Transportation, Terramatrix is collecting survey grade measurements using vehicle-mounted lasers. The company claims to achieve relative positional accuracies of better than 0.02' (6mm) in the raw data.

Digital Surveys has purchased the first Leica ScanStation P20 to be sold in the UK. Ben Bennett, Digital Surveys' chief technology officer, explains: "We decided to purchase the ScanStation P20 because it offered us a full integrated package that no other supplier could provide. We are heavily involved in engineering based scanning projects that require higher precision; with the ScanStation P20 we can obtain clean data, much quicker and with less noise. The scanner itself is durable and rugged to be able to withstand the demands of large industrial and offshore projects."

Altus Positioning Systems dealer for its GNSS surveying products in France, Belgium, and Northwest Africa is Apex-Nav, based in Orvault in the Loire-Atlantique Region. They will sell and service Altus products, including the new APS-3L and APS-U, introduced at Intergeo 2012. The APS-3L is the first GNSS surveying instrument to offer embedded L-band TERRASTAR-D precise point positioning (PPP) differential capability as well as high-precision RTK. The APS-U will also feature in the Apex-Nav portfolio with its appeal to the offshore community for L-band, heading ability as well as land-based machine control applications.

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In December, **Chris Preston** took over as the chair of the Geomatics Global Professional Group Board. In his first column for GW he introduces himself and looks ahead.

“The board is particularly keen to promote the Professional Experience Route (PER) to membership. . .”

Chris Preston welcomes your comments and thoughts so please email on the following address geochair.rics@gmail.com

Musings from the new Chair

As I write my first column for you, I wish to thank **Stuart Edwards** for his sterling efforts in leading the Professional group board over the last two years or so and I look forward to continuing Stuart's work in a number of areas.

My surveying career has spanned more than 35 years, I was chartered in 1985 and became a fellow in 1998, with fellowship of CICES in 2002. I have worked mainly within the railway industry, in the fields of asset information, engineering and topographic survey. I have worked for a private practice, a nationalised industry, my own consultancy business and a not-for-profit company. Projects have included the National Gauging Project, West Coast Route Modernisation, Edinburgh / Glasgow improvement project, Thameslink and currently HS2, as well as numerous other projects mainly in the UK. I had overseas experience in the early part of my career in the Ivory Coast and CERN in Geneva. Numerous roles within the RICS have included: NVQ Assessor in Spatial Data Management, APC Doctor, Fellowship assessor and serving on the Geomatics Professional Board since 2005. I was a member of the CIC working group that wrote the Level 3 and 4 NVQs for Spatial Data Management.

While chairing the board, I will seek to understand better the views of the membership at large and I will always be pleased to hear how the RICS could better serve its members' interests. As I am a member of CICES as well as RICS, I am keen to foster cross-industry links with CICES and The Survey Association. Our industry in the UK is too small to have a fragmented approach and we all need to work together to present a unified image to other professionals and clients.

The RICS has a strategic aim of gaining recognition for high standards and professionalism and we hope to build on this by working with our international board members to promote the use of consistent RICS survey specifications to assist within the World Bank and UN funded projects. This leads on to the need to continue the work of updating the 1/500 surveying specification document with the help of the Mapping & Positioning panel. This work has stalled recently due to debate about the digital formats to be included. However, this part of the specification will always be a “moving feast” as nothing stands still for long and we need to revisit this and perhaps be pragmatic enough to understand that a more general approach is needed and to let the Client and the Surveyor find the appropriate solution.

This issue is no more apparent than when we consider BIM. Although many will say “this is nothing new to me, I have been doing some form of this for years”, this is an opportunity of being in at the start, in the creation of the “Model” upon which everything else in the life cycle of the building/infrastructure is based. We must not get hung up on “there is only ‘one way’ to do this” and appreciate that there are opportunities to be involved in data management throughout the life of projects and long after, during the maintenance of the building/infrastructure too.

The routes to membership has generated much discussion at the board and the review of the APC in particular. I am sure I will be returning to this in the future so enough for now. The board is particularly keen to promote the Professional Experience Route (PER) to membership; they see this as an ideal route for the more experienced geo-professionals, which takes into account their years of experience and accrued knowledge that may not always be supported by academic qualifications in a cognate field. So if you know friends and colleagues who you feel could use this route please encourage them to enquire about pursuing this route to membership. Further review of the AssocRICS qualification is also needed to ensure candidates see it as relevant in providing an attainable bridge to MRICS.

CPD can be undertaken in many ways. I am keen to see greater use of modern technological for communication with the diverse global surveying communities, while recognising that availability of broadband may be limited for some.

In the last few months there has been a refresh of the RICS website and I encourage you all to take a look. Included in the update is the ability for you to provide a more comprehensive personal profile and to choose how you wish the RICS to keep you informed of the news in your specialisms. The means of recording your CPD has also been improved and the recording of it should now be much easier.

The December board meeting provided plenty more thought-provoking areas for action, not least of which is how our members engage more effectively with the Regional boards in the UK and internationally. These boards clearly have limited resources and getting them to assist where the GPGB see a need for action must be on our agenda.

Of course your thoughts and ideas are welcomed so please contact me on geochair.rics@gmail.com and I look forward to meeting many of you during my time as chair.



Looking on the bright side. . .

By Malcolm Draper

Business and surveying may be going down the pan but, Hey! . . . there's plenty of fun to be had out there.

Well, a Happy New Year to all; let's hope it's at least as good as 2012 was. Hang on a minute, I hear some of you saying, last year was pretty grim. Well, let's just take a leaf out of dear old **Eric Idle's** songbook and 'Always look on the Brightside of Life'. Last year we had the fantastic Jubilee of the Queen's 60-year reign (or was it rain?) under classic British weather. I was lucky enough to be invited to friends who have a riverside apartment so we watched and cheered from more comfortable surroundings than the Royal party enjoyed on their barge in the driving rain. Then came the brilliant and inspirational Olympics and to top it all a Brit won the *Tour de France* (that's worth repeating, A BRIT WON THE TOUR DE FRANCE!). And to round the year off, England won the Test against the Indians and we beat the All Blacks! Bad year? I rest my case.

Professor Roberts and the Ice Age

The autumn season of lectures at the Royal Geographical Society ended on a real high. I sadly missed our president Michael Palin's final lecture, being unlucky in the ballot for tickets and also unable to take up a late offer from a winner unable to attend (lucky Editor!). The final lecture just before Christmas I did see. Professor **Alice Roberts** talked about Survivors of the Ice Age, although to be fair there was a lot she talked about that did not survive, from sabre-toothed cats, giant wolves and bears and our own cousins, the Neanderthals. The debate remains out on exactly what happened to the Neanderthals. Some say we eliminated them, others believe, like me, that their genes remain amongst us. Indeed, I could suggest a few

candidates but that guardian of good taste, our editor, won't let me go there.

Many of you will have seen Prof Roberts fantastic BBC TV programmes, *The Incredible Human Journey*, *Origins of Us*, and *Prehistoric Autopsy*. She is a vivacious and bubbly speaker for one so young and heavily pregnant. She held the audience's attention for over an hour, speaking without notes from centre stage in front of a series of overheads and without an "er. . ." or a ". . .um. . .". I was totally bowled over by her. If you haven't seen her or read

one of her books, check her out at www.alice-roberts.co.uk

Lots to look forward to

The new year promises much although we may have to look elsewhere than surveying to keep us busy. Two upcoming exhibitions at the British Museum sound interesting. The first is entitled "Ice Age Art" and speaks for itself. The second is "Bubbles and Bankruptcy – financial crises in Britain since 1700". Apparently it covers everything from the South Sea Bubble of 1720 to the financial crash of 2008. We will investigate for readers and report in next issue's column.

I have read my fellow columnist Brocky's (aka **John Brock**) many meetings and dinings with celebs, sportsmen and even a minor royal during the past year with a mixture of envy and at times surprise (how many stars are there in Australian Rugby League?). Well, I am proud to say that I have met really topnotch royalty, and Aussie royalty to boot (literally!). The photo opposite shows me with Michael Lynagh, former captain of the Australian Rugby Union team and at the time of his retirement in 1995, world record holder for the number of points scored in international matches. True royalty for us rigger boys.

Another one gone

I was saddened to learn that former Story's surveyor **Peter Taylor** had died. The news came from former Story's partner **Derek Browning** (also of Longdin & Browning fame). **Nick Day** has kindly filled in a few more details of Peter whom he and I both worked with.

"I knew Peter quite well and worked under him for about six months down at Story's Bristol office, which he went to run, as well as spells in the London and Mitcham offices. Nice guy, quiet but firm as an office manager and a senior partner. Good technical person I seem to remember. I think he spent quite a bit of time working in Africa before coming back to UK. As with many of that era, he was quiet and kept his non-work life private. I remember talking to him in the Mitcham office before I left for the USA, that I thought the company was getting too overly staffed administratively; also that they were putting far too much emphasis on government work (PSA/DOE), and that they needed to branch out into other areas in case government contracts dried up. I dropped by to see Peter a year or two later on a trip back from the USA. Looking at a much

My kind of royalty.



depleted Mitcham office, Peter said, "You were right on both counts."

The dangers of blogging

Setting up a website that allows people to comment can be risky. The *verge.com*, a site that "covers the intersection of technology, science, art, and culture" recently ran an interesting story about a small robotic boat launched from California over a year ago that had just made it across the Pacific to Australia. The tiny vessel had to cope with shark attacks and storms but also collected useful oceanographic data. However, the *Verge's* comment section made rather more interesting reading. After the predictable "cool" and "far out dude" comments from pre-puberty nerds, a post suggested all container ships could become robotic, thus deterring piracy as there would be no crew to ransom. In no time at all a whole bundle of people had pitched in with posts advocating automatic machine guns, nukes and goodness knows what just in case the pirates did try it on. In the course of three or four posts the site degenerated into one of those US style gun-toters versus the lefty liberals debates. Amazing.

YouTube is really a fantastic place for fellow nostalgia wallowers. I was enjoying a recording of Dion singing Runaround Sue when my gaze strayed to the comments below from the "tubie followers": "My mum's name is Sue. I don't know my daddy." That comment was rather reminiscent of *Only Fools and Horses* when Del Boy commented that Trigger's birth certificate had on it against Father, "Some soldiers".

Should I really join Facebook?

(a grumpy old git has written to us. . .)

When I bought my Blackberry, I thought about the 30-year business I ran with 1800 employees, all without a cellphone that plays music, takes videos, pictures and communicates with Facebook and Twitter. I signed up under duress for the latter, so my 7 kids, their spouses, 13 grand kids and 2 great grand kids could communicate with me in the modern way. I figured I could handle something as simple as Twitter with only 140 characters of space.

That was before one of my grandkids hooked me up for Tweeter, Tweetree, Twhirl, Twitterfon, Tweetie and Twittererific Tweetdeck, Twitpix and something that sends every message to my cellphone and every other program within the texting world. My phone was beeping every three minutes with the details of everything except the bowel movements of the entire next generation. I am not ready to live like this.

The kids bought me a GPS for my last birthday because they say I get lost every now and then going to the shops or library. The GPS looked pretty smart on my dashboard, but the lady inside that gadget was the most annoying,

Choosing your words carefully



This one has come from one of my chums in the Middle East. Apparently a new fuel tanker was delivered to an oil company. The boss asked one of his expat workers to write the words "No Smoking" in Arabic and "Diesel Fuel" in Arabic on the side of the tanker. The above is what he got.

rudest person I had run into in a long time. Every 10 minutes, she would sarcastically say, "Re-calc-u-lating." You would think that she could be nicer. It was like she could barely tolerate me. She would let go with a deep sigh and then tell me to make a U-turn at the next light. Then if I made a right turn instead. Well, it was not a good relationship. . . When I get really lost now, I call my wife and tell her the name of the cross streets and while she is starting to develop the same tone as 'Gypsy', the GPS lady, at least she loves me.

To be perfectly frank, I am still trying to learn how to use the cordless phones in our house. We have had them for four years, but I still haven't figured out how I can lose three phones all at once and have to run around digging under chair cushions and checking bathrooms and the dirty laundry baskets when the phone rings.

The world is just getting too complex for me. They even mess me up every time I go to the grocery store. You would think they could settle on something themselves but this sudden "Paper or Plastic?" every time I check out just knocks me for a loop. I bought some of those cloth reusable bags to avoid looking confused, but I never remember to take them with me. Now I toss it back to them. When they ask me, "Paper or Plastic?" I just say, "Doesn't matter to me. I am bi-sacksual." I was recently asked if I tweet. I answered, No, but I do fart a lot."

CALLING ALL JASBEANS!

Did you work for JA Story & Partners? Then mark the **30th April** this year. **Gary Jackson** and I are organising another reunion of Jasbeans, those surveyors who worked for what was once one of the few survey companies in Britain. The venue will be the Elstree Holiday Inn and there may be rooms available at the special rate of £89 inc breakfast. Drop an email to confirm your interest to: gary.jackson@3sixtymeasurement.co.uk

Got a tale to tell?

Please send letters for publication by e-mail to the Editor: editor@pvpubs.demon.co.uk or contact Undercurrents, in strictest confidence if you wish (we promise to change names, places, etc to protect the guilty!), via e-mail: rentamal@aol.com

Laser scanning and sonar combined: the Talisman Auk North Spool Piece Metrology Project

by Greg Hammond, Star Net Geomatics

In the last issue of *GW* we reported on Leica's HDS awards event at Blenheim Palace. Star Net Geomatics won the 2012 Innovation Award for an ingenious use of laser scanning and multibeam sonar on a project in the North Sea. **Greg Hammond** explains.

“Star Net had surveyed the existing subsea manifold when it was in the fabrication yard, many years earlier...”

In December 2011, Star Net Geomatics was engaged by Talisman Energy to undertake a subsea survey to determine the precise dimensional relationship between flanges on two existing pipe manifolds on the sea floor. The survey was needed to enable a spool piece to be fabricated to fit between the two manifolds.

A sea / land partnership

The practice of laser scanning is becoming increasingly common within the offshore industry with operators such as BP and Talisman Energy adopting them as standard, but precise sonar scanning is new. In partnership with BlueView Technologies and Seatronics, Star Net pioneered a unique solution using a combination of high-resolution terrestrial data acquired from an HDS6100 laser scanner, together with high frequency multi-beam sonar data acquired by a Blue View BV5000 system.

Over the previous 12 months Star Net had been engaged with Technip UK, through a series of dry dock trials, in developing and improving the accuracy of the BlueView sonar system to provide a viable solution for spool piece metrology. For each trial, the project utilised high resolution terrestrial laser scanning technology to generate a precise point cloud against which the sonar data was compared. This then drove improvements to the system for the next trial in the series. New processing techniques, coupled with improved hardware and targeting systems were developed to achieve tolerances of less than 100mm and better than 1° inclination over a 30m baseline.

This approach of utilising purely high

resolution BlueView sonar data to derive spool piece metrology results was successfully implemented on four subsequent surveys. The results were verified by comparison with data generated from traditional Long Baseline Line (LBL) acoustic metrology techniques, using transponders on the sea floor for control.

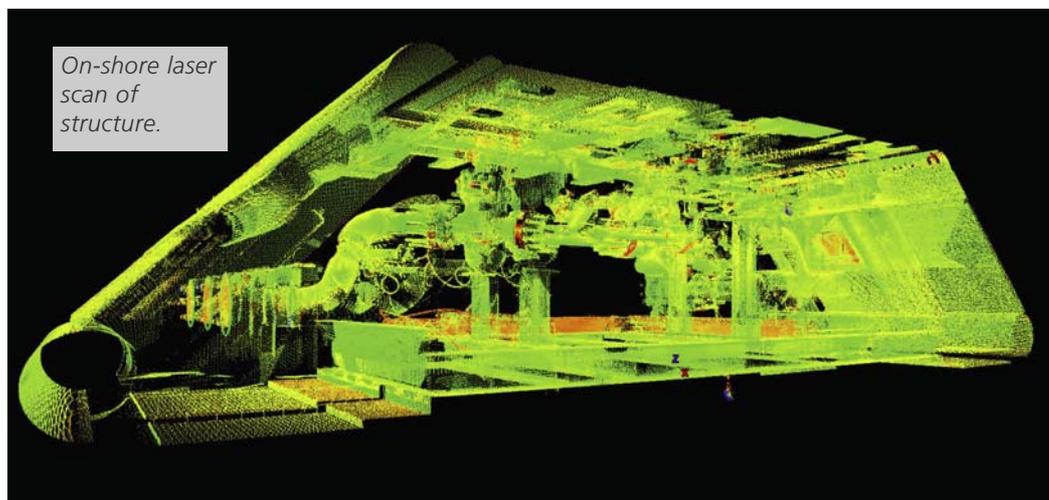
Laser Scanning enhancement

One of the subsequent projects was the task for Talisman Energy that won the Leica 2012 HDS Innovation Award. In this case, a previous laser-scan survey by Star Net provided an opportunity to enhance the sonar data thus improving accuracies and establishing a better overall workflow. For dimensional control purposes, Star Net had laser-scanned the existing subsea manifold when it was in the fabrication yard many years earlier. The use of this dataset allowed them to simulate metrology results on the subsea structure and for the installation contractor to retrospectively design acoustic metrology aid brackets which were to be added to the existing structure. The second manifold structure was subsequently also laser-scanned to provide a similar dataset, complete with acoustic metrology aids.

Due to the complex nature of the project, the traditional LBL acoustic solution contained inherent risks, thus an independent verification was required using BlueView technology. The access panel to the flange face of the existing structure was not to be removed as part of the operations, so the flanges could not be scanned directly. It was therefore decided to import the highly detailed and accurate terrestrial data into the BlueView sonar point cloud to provide a composite dataset with exact positions of the points of interest. The sonar data would provide a roadmap for both position and inclination which the terrestrial data would then utilise. The final metrology computation would then be derived from the merged dataset.

Static multibeam datasets

The deployment and operation of the BlueView sonar was planned and executed in a similar fashion to that of a terrestrial laser scanner. The sensor was deployed from the

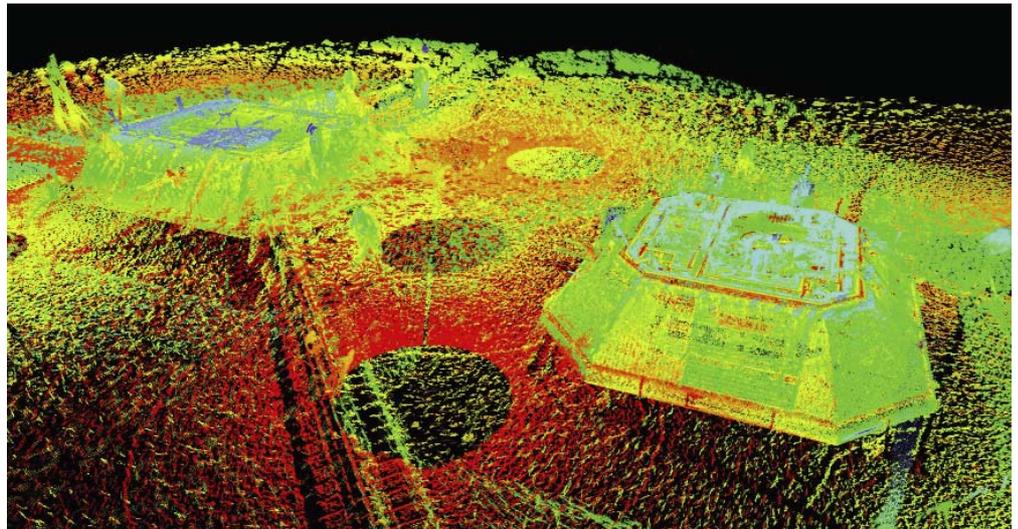


vessel on a mechanical winch through a moon pool to observe a total of sixteen setups in an eight and a half hour programme. An ROV observed the touchdown on the seabed and intervened as required. The resultant, individual, XYZ files were uploaded into Leica Cyclone and registered together. The terrestrial laser data was introduced as part of the same registration file, utilising main structural members for cloud-to-cloud registration of the multiple datasets.

... and it fitted!

The introduction of the terrestrial laser-scan data to enhance the overall solution was a ground-breaking approach, piggybacked onto a unique subsea survey solution. The project was the culmination of months of planning and proved to be very successful, with a horizontal error difference of only 14mm between the laser scanned and the acoustic result. Most importantly though, the pool fitted first time.

The use of this survey approach has been adopted by numerous oil companies following this project and provides another tool for



Above: Merged seabed sonar and laser scan data (see two manifold covers).

operators facing difficult situations where surveying using Long Baseline Line (LBL) techniques cannot provide the required results.

As **Pieter Jansen**, senior survey representative, consulting to Talisman Energy UK Ltd. says: "No doubt contractors will look at this solution with interest, as it provides a very precise and efficient method for obtaining metrology data in challenging operational conditions."



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Too Many Points?

– a comparison of airborne methods for point cloud production – Part 1

By D. Schnurr FRICS, M. Grant and H. Grierson, Blom UK

Point clouds can be produced using LiDAR or by applying image matching techniques to stereo photography. In the first part of this article the authors look at photogrammetry, whilst the second part will focus on LiDAR.

Immortalised in the film *Amadeus*, it was Mozart who when challenged that his music had “...too many notes ...” countered “...there are just as many notes, as are required, neither more nor less...” Over recent years the term ‘point cloud’ has become ubiquitous throughout the geospatial industry. But what is a point cloud and how do the processes behind its creation affect its characteristics? Can there simply be too many points and have we lost the sight of quality over quantity?

The two main established protagonists of point cloud creation from an airborne platform, LiDAR and photogrammetry, are based upon distinctly different technologies, utilising dissimilar approaches to point cloud creation. These two approaches produce point clouds with significant characteristic differences; in terms of accuracy, feature resolution and information content. These differences are important considerations when deciding which process is best suited for the end product, whether for use in further derived product creation, such as topographic mapping, or direct consumption by the end customer.

From manual plotting to pixel matching

Before the advent of digital imagery, the only way photogrammetrically to produce a dense cloud of points, as a DSM (digital surface model), was to laboriously plot each of the points by hand in the stereo model. But the introduction of digital imagery and pixel matching techniques meant that this previously time-consuming task could be reliably automated.

Early examples of digital photogrammetric work stations, such as Leica’s Helava DPW770 system used epipolar rectified images and image pyramids to identify the location of fixed, user-definable grids of points and to match pixels at

each location. The XYZ coordinates of each matched pixel were calculated to form the DSM post for that location. A limited number of strategies were available to the stereo operator, the most suitable being chosen to match the terrain being covered. Algorithms were used to smooth the automatically generated DSMs, removing blunders in the matching and to a limited degree, removing artefacts such as trees and buildings to produce a “bare earth” digital terrain model (DTM). The resulting DTM would then have been inspected in stereo by the photogrammetric operator, and any remaining errors were hand edited until the DTM “sat” on the ground.

These early automated methods of producing DTMs were designed to support the generation of digital orthophotography and as such, were tailored towards producing less dense ground models that required minimal editing by the photogrammetrist to enable accurate, distortion-free orthophotography to be generated. Early algorithms matched pixels at specific locations, and started with the principle that the local terrain was relatively flat and smooth.

Catching up with LiDAR

As airborne laser data started to become more widely available, offering far denser point clouds, photogrammetric software vendors have sought to catch up and offer photogrammetrically derived point clouds that match more closely those obtainable from LiDAR. This was quite challenging for an automated photogrammetric process to achieve.

Firstly, although pixels were matched only at specific locations within the stereo models, thousands, if not hundreds of thousands of points were matched. To equal the density of points being produced by LiDAR, hundreds of millions of points would need to be matched. And it was no longer viable to start with the principle that the local terrain was flat. New algorithms had to allow for huge variations in height across the area they were matching, particularly in urban terrains.

Matching areas and edges

The answer to these problems was “area matching” where instead of matching single, discreet pixels in two images, an area is located in one image and a corresponding area is moved within the second image until a match is found. Using this method, all of the

“To equal the density of points being produced by LiDAR, hundreds of millions of points would need to be matched.”

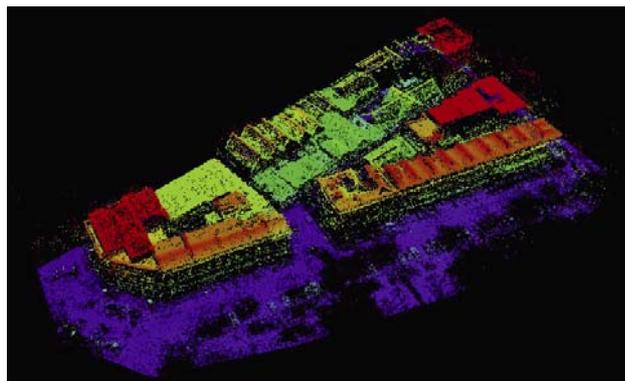


Figure 1:
Photogrammetric point cloud from part of Bristol.

pixels in the image are correlated; so called 'single pixel correlation'. This would have been impossible without the capabilities of modern computers.

Another difficulty to be overcome when trying to match such a vast number of pixels is simply that certain features "look" different in one image compared to a second image. Take for example, a sloping roof which may appear quite light in colour in one image, but very much darker in a second image. Or where buildings fall near the edge of one image but the centre of another, the side of the building will be visible in only one of the pair of images.

We as humans, have no problem in understanding that this is a roof or a building, but it is not so easy to "teach" a computer programme to identify these examples. To overcome this, so called "edge-matching" algorithms were developed to successfully match pixels along the edges of features.

The 'state-of-the-art'

The latest automatic terrain extraction software, such as BAE SOCET SET/GXP's NGATE (Next-Generation Automatic Terrain Extraction), Vexcel's UltraMap and inpho's Match-T DSM use combinations of area and edge matching to derive dense LiDAR-like point clouds from stereo imagery.

Further enhancements allow for the matching of pixels from several stereo models where they overlap. This is particularly useful if the imagery is planned with a higher than standard (60% forward, 30% lateral) overlap as it increases the possibilities to match pixels at the base of high buildings. This is especially the case in urban canyons where the ground surface between high buildings can now be accurately modelled; a typical specification for higher overlap would be an 80% forward and a 60% side overlap.

To exploit these new techniques fully, it is useful to work with imagery that has a GSD (ground sample distance) of 10cm or better. The best results can be achieved with 4 or 5cm GSD imagery where DTM grids with a point spacing of 20 or 25cm are output. This does not exceed the 'normally recommended' three times the pixel size criterion; including outputs from a single pixel correlation solution, as this helps remove the 'noise' in the point cloud solution.

Putting it to the test

In May of 2011, at Blom UK we were able to produce our first airborne point cloud DSMs using the photogrammetric techniques discussed above for our BlomMETRO product line. We used 4cm GSD imagery of the centre of Bristol taken with a Vexcel Xp digital camera. This was flown with a standard 60% forward and 30% side overlap. Two DTM extraction solutions were used: BAE SOCET SET/GXP's NGATE and Integraph's ERDAS LPS's eATE DSM;



Figure 2: LiDAR point cloud of part of Cardiff.

one of these results is shown in Figure 1. We found that both performed to a similar standard, but when comparing the output to our BlomMETRO LiDAR solutions, the building edges in some areas are still noticeably 'softer'. This can be seen when looking at our 'sharper' LiDAR point cloud in Figure 2.

In summary, automatic point cloud extraction from photogrammetric data has improved immeasurably over a very short period of time and advances continue to be made. Flying with increased overlaps, typically 80-90% forward and 60% side overlaps opens up the possibility for true multi-photo matching. Software such as Vexcel's UltraMap 3.0 which integrates digital image capture and processing with the photogrammetric workflow to fully exploit these advances, ensures that the gap between LiDAR DSM and photogrammetrically derived products should continue to narrow.

• Next month as we discuss LiDAR we further illustrate how this gap is narrowing. Importantly, we also detail some of the key differences, review the benefits and limitations of each type of point cloud and discuss some of the applications.

About the authors

Dan Schnurr studied under Prof Ashkenazi at Nottingham and has over 20 years experience in survey and mapping worldwide. With Blom since 2003, he has lead GPS, LiDAR and imagery innovation for geospatial market applications.

Martin Grant started as a photogrammetrist with Hunting Surveys in 1975. He then worked for a number of years with Survey International before joining Blom (Simmons Survey) as photogrammetry manager in 1994.

Hamish Grierson joined Blom in 1996 after graduating from Newcastle University. Since 2001 he has been responsible for all LiDAR production, whether from airborne, mobile or terrestrial LiDAR sensors.

“To exploit these new techniques fully, it is useful to work with imagery that has a GSD (ground sample distance) of 10cm or better.”



Laser scanning Ireland's Cliffs of Moher

By Mark Hudson and Mark Reid

Combining terrestrial and offshore laser scanning with colour digital imagery was the only way to record Ireland's world heritage site, report **Mark Hudson**, a director of Coastway Ltd and **Mark Reid**, technical director of MDL.

The Cliffs of Moher is one of Ireland's top visitor attractions and a designated UNESCO Geo Park. O'Brien's Tower stands proudly on a headland of the majestic cliffs. From the cliffs you can see the Aran Islands, Galway Bay, as well as The Twelve Pins, the Maum Turk Mountains in Connemara and Loop Head to the South. The Cliffs of Moher take their name from a ruined promontory fort "Mohtar" which was demolished during the Napoleonic wars to make room for a signal tower.

The Cliffs of Moher is home to one of the major colonies of cliff nesting seabirds in Ireland. The area was designated as a Special Protection Area (SPA) for Birds under the EU Birds Directive in 1986

Coastway were approached in April 2012 to assist in contributing towards an Environmental Impact Statement for the future development of a specific area on the Cliffs of Moher and its immediate hinterland. It is eventually planned to make the Cliffs of Moher a future UNESCO World Heritage programme site. There are currently only two in Ireland, Bru na Boinne and Skellig Michael.

Scope of Work

The Cliffs of Moher, located on the western seaboard of County Clare Ireland, are 214m high at the highest point and range for 8 kilometres over the Atlantic Ocean. The brief was to laser scan, prepare a 3D model and high definition video from the resultant point cloud data of a 2 km section of the cliffs. As the cliff

face is only accessible and visible by boat the biggest challenge for this project was how to laser scan from a moving platform and how to achieve sufficient resolution, coverage, and accuracy from a place of safety.

Data acquisition

After considering the various options, Coastway approached Measurement Devices Ltd (MDL) a manufacturer and provider of ruggedized laser scanning equipment. MDL proposed a solution using their Dynascan 3D mobile mapping system that can be mounted on both vehicles and vessels and used to capture 3D LiDAR data of topography. The small size and compact nature of the Dynascan system meant that it could be quickly mobilised during a limited weather window and easily mounted on a vessel of opportunity. A Dynascan M500 mapping system with a laser accuracy of $\pm 50\text{mm}$ and a range of up to 500m was utilised for the project.

The unit and secondary GPS antenna were mounted on a boom at the front of a fishing boat allowing a sufficient field of view for the 360° Scanning Laser Module (SLM) to survey the cliff. In addition to the SLM, the Dynascan contains a high grade Inertial Measurement Unit (IMU) consisting of gyroscopes and accelerometers that works to compensate for the motion, pitch and roll of the boat.

Accurate 3D positioning was achieved using built in RTK differential GNSS systems, which employ GNSS carrier phase differential techniques to provide real-time, centimetre-level, three-dimensional positioning. RTK correction signals were derived from a local RTK base station set up over a known survey control point on the cliff top. The computed correction signals were then transmitted to the mobile GNSS receivers on the Dynascan over a UHF radio link. The raw data was also logged to be used for post processing in case of RTK shadow near the cliff and as a quality assurance measure.

Qinsy acquisition software was used to provide real-time on the fly data processing and visualisation of the acquired data, allowing for coverage and quality to be verified during the survey. In addition to the laser point cloud, photography was captured using a standard digital SLR camera.

Approximately 2 km of the cliff face was surveyed over seven passes in different directions

Below: MDL's Dynascan 3D laser mapping system aboard the vessel.



to ensure full coverage of the varied contours of the cliff face and bays. The actual survey data took less than hour to acquire. On completion of the vessel survey the system was transferred onto a vehicle and used to capture the topography on the top of the cliff. The data was collected on the same grid allowing for seamless integration between the two data sets. The entire equipment mobilisation, data acquisition on the vessel and vehicle, demobilisation, and data download was completed successfully within a single day.

Data Post processing

The geo-referenced point cloud was handed over to Coastway for post processing. The initial data was imported into Leica Cyclone point cloud processing software. The data was reviewed and cleaned, producing a point cloud ready for mesh creation. The final dataset was exported to a XYZ text file and imported into 3D modelling software package.

Within some of the bays there was a shallow reef meaning that the boat could not get close enough to scan parts of the cliff face, which led to some gaps with the laser data. Coastway therefore used the photos acquired and the Autodesk 123D software to create a 3D model to fill in the gaps. The combined cloud was remeshed to create a seamless model of the cliff face. The high resolution image was used to 'bake' the imagery onto the final mesh model.

Finally the 3D model was rendered with the imagery acquired and a fly-through animation produced using 3D visualisation software.

About MDL and Coastway

Measurement Devices Ltd (MDL) is a pioneer in the design and manufacture of high speed laser measurement systems for use in extreme environments. Established in 1983, MDL has been providing innovative products and services for more than 25 years. MDL's product portfolio includes mobile LiDAR systems, terrestrial scanners and underground cavity & void scanners. For more visit: www.mdl.co.uk

Coastway is a chartered geospatial engineering company providing cost-effective survey solutions to the construction industry and

Right: a section of the Cliffs of Moher as the survey vessel approaches.

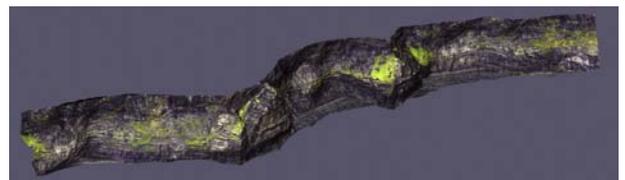
Below: a screen shot from the fly-through animation.



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Above: 3D seamless mesh model



Above: model with colour photography 'baked' on to the 3D mesh model



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Hinkley Point C: Mapping using UAV Aerial Photography

Rodolphe Jobard describes how EDF Energy is using imagery from a UAV to monitor the site for Britain's newest nuclear power station.

Hinkley Point C, in Somerset, will be Britain's first new nuclear power station in twenty years and is set to provide enough low carbon electricity to power five million homes. Preparatory works, such as the removal of vegetation and installation of fencing, are currently underway across the 150 hectares of the construction site.

Weekly mapping

Above the site a discreet bird-like object relentlessly follows a predetermined flight pattern. Under the watch of Rodolphe Jobard, a member of the EDF Energy Construction Team and a qualified Pilot, EDF Energy has embraced UAV photogrammetric mapping using an UAV to map the site. The 2D and 3D maps generated by the aircraft are updated weekly, and have been found to have a variety of uses. Introducing such an innovation in the nuclear industry required a robust safety case and approval from the Civil Aviation Authority (CAA).

To conduct UAV mapping a model aircraft fitted with a digital camera is flown on autopilot over the land being surveyed. Generally the overlap between photos exceeds 60%. The images are retrieved after the flight along with some flight data. A desk computer ortho rectifies the images, finds thousands of common points and stitches them together automatically. Keying coordinates of some ground targets increases the horizontal accuracy to 2 pixels (10cm) and vertical accuracy to 4 to 5 pixels (25 cm). Hinkley has some permanent marks dotted across the site,

which can be used as reference points. If no marks exist, a plank of wood with a simple red cross painted on it can be just as effective.

Provided they are point cloud compatible, the outputs can be read by a GIS programme and then used to measure distances and even volumes. As an added bonus, UAV mapping generates stunning aerial shots of the land being surveyed.

System details

Any aspiring UAV operator has first to decide whether to use a helicopter or an aeroplane. For Hinkley Point the decision was easy. Given the distance to be flown, with the flight pattern, approaching 100 km, the endurance of an aeroplane is required.

The Gatewing X100 was identified as the preferred system following a thorough bidding process which took into account a number of criteria. Tolerance to wind was an important factor given weather conditions on the Somerset coast. Like most of the land surveying UAVs on the market, the X100 system consists of a ground station, a tablet PC used both to plan and supervise the flight, and a distinctive aeroplane with a compact camera. A catapult completes the system, enabling automatic take offs. When airborne, the plane flies by itself following a pre-programmed pattern for 45 minutes at 80 km/h. It gives the impression that it is following an invisible wire. Thanks to a telemetry downlink, the pilot monitors the data from the onboard sensors (altitude, airspeed, voltage etc). Regulation requires such systems are flown within visual line of sight, so it is strongly recommended that the pilot is supported by an additional observer.

Mission planning

It is necessary to keep an eye on the Met Office forecast. Calm and sunny days can be few and far between, but so far, there has never been a week without at least one good weather window. The system did once get caught in a shower but the flight was unaffected. Having the system stored on site is an advantage, because it can be hand carried to its take off location, a field located in the centre of the site, with relative ease. From there, it can reach the entire area of interest whilst staying within the distance limit imposed by the CAA in segregated areas: a maximum of 750m from the pilot and no more than 500ft high, although the system is technically capable of much more.

In good weather the system can cover 1.2 sq

Right: preparing the Gatewing X100 for launch.

Below: launch is via a ramp.



km per flight at an altitude of 500ft. It provides an image resolution of 5.7 cm per pixel. At 100m, the minimum altitude possible, the pixel size is 3.7 cm, but of course the covered area is then reduced. Two flights are necessary to cover the full Hinkley Point C site. The data from the two flights is processed together so the end product is a single orthomosaic.

Processing

The processing of the images is largely automatic. A quick image can be processed in a couple of hours and produces a 20cm orthomosaic. Full processing requires a computer with a large amount memory - at least 48 Gb of RAM is recommended - and needs to be done overnight.

During its travel, the camera encounters various exposure conditions as cloud cover changes, for example. Some editing of the images is therefore often required. It is also possible to edit the edges of buildings and remove artefacts as required. Hiding some confidential or restricted areas is also possible. For the maps to be easy to transfer and use, the raw files can be compressed into different sizes and formats.

New applications

For the Hinkley Point C project the system is primarily used as a surveying tool. The

Engineering Team started to use the orthomosaics, first to provide a background for existing drawings, and then for creating plans for elements that are not directly involved in safety procedures for the plant. New uses for the data then emerged.

Engineers have used the technology to help monitor water levels; facilities managers have used the images to help relocate equipment and security staff have used UAV information to help with plans for possible events. New applications are being found all the time.

All users have appreciated the flexibility and the constant evolution of the data. Additionally, remote measurement means less exposure to risk for staff on the ground. The 3D maps offer fantastic realism, thanks to millions of reference points with texture added using high definition images.

Compared with photogrammetry by full size aircrafts, UAV mapping can be done more frequently, at reduced cost and minimal emission of CO2. Given its multiple advantages, UAV mapping stands to play an important role in surveying, complementing traditional ground surveys and photogrammetric imagery taken by full size aircraft.

“New applications are being found all the time.”

• Rodolphe Jobard is Aerial Intelligence Team Leader for EDF Energy. Email: Rodolphe.jobard@edf-energy.com

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Unmanned Aerial Vehicles: useable survey tools?

By Andrew Blogg, *Digital Mapping and Survey*

UAVs were developed for the military where they acquired the name, 'drones'. But recently the commercial sector has embraced the technology and experienced substantial growth particularly using micro UAS. UAV pilot **Andrew Blogg** explains the advantages and limitations.

UAVs were developed for the military where they acquired the name, 'drones'. But recently the commercial sector has embraced the technology and experienced substantial growth particularly using micro UAS. Andrew Blogg, an experienced operator, explains the advantages and limitations.

There are many terms for unmanned systems but the definition is essentially the same: UAVs are capable of operating without an internal pilot; are tethered by a radio control link; and can be pre-programmed for both flight and payload operations prior to launch. They are most commonly referred to as Unmanned Aerial Vehicles (UAV) or Unmanned Aerial Systems (UAS).

This article focuses on the low weight, cost efficient end of the market, specifically 'Micro'

UAS with a take-off weight less than 5kg, a flying height that should be less than 250m and flight duration of less than one hour.

Leaps forward in technology in the last decade have paved the way for commercial enterprises to develop sophisticated UAVs, predominantly to take aerial photography for use in mapping and for creating digital elevation models (DEMs). They are relatively easy to operate thanks to their on-board autopilots, intuitive flight planning and control software. They are safe, owing to their small payload and overall weight and many countries around the world are beginning to take notice of the commercial prospects for UAVs through regulation and legislation.

Choose the right platform

UAVs come in many guises, from helicopters, quad, hex and opti-copters to fixed wing plane-like systems. They all serve different purposes so, before spending your hard-earned cash on the latest opti-this or lightweight that, you must be clear about the purpose of its job.

Skill level, flight times, area, range, payload, wind speed, take-off and landing area, safety, vertical or oblique, video or photos are all factors to be carefully considered before making a decision. By way of a quick comparison, rotary types can generally offer better quality photos as they are capable of carrying higher payloads and therefore better quality cameras. Fixed wing UAVs, whilst offering lower payloads and lower camera quality, are capable of covering much greater areas and distances. So, for low level inspections or oblique photos, a copter is probably the choice. If larger scale ortho-rectified aerial photography is required, then a fixed-wing UAV might be more suitable. There are still many more factors to consider, but the choice should be made simpler if you understand your purpose.

Can UAVs compete?

Can a small UAV weighing less than 2kg using a consumer-grade camera and low-cost GNSS deliver results worthy of being used at

"... you must be clear about the purpose of its job."



Used under the right conditions UAVs can capture high-resolution imagery suitable for photogrammetric analysis and extraction of height data.

a professional level? Traditional aerial mapping using a piloted aircraft will utilise expensive mounted and stabilised camera systems with equally expensive integrated Inertial Navigation Systems (INS). None of this is yet feasible at the micro UAV level. Micro UAVs are also much more sensitive to weather conditions. With little to stabilise the camera in windy conditions the pitch, roll and yaw can be greatly affected way beyond the level considered acceptable for photogrammetry. A consumer grade camera is also more susceptible to blurring during windy or low light conditions.

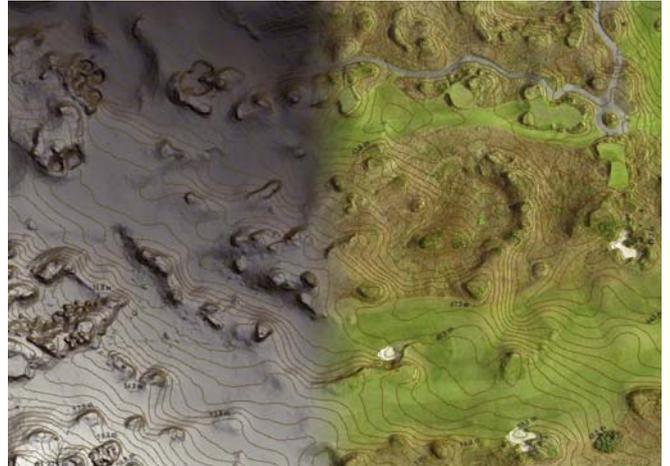
To compensate for the irregularity in the photos, most manufacturers of UAVs build in lots of overlap of photos, up to 60% laterally and 80% longitudinally. The obvious effect of this is greatly increased flight times to cover relatively small areas. While calibrating a camera for traditional photogrammetry is a must, it doesn't offer much in the world of consumer grade cameras. With their variable focal lengths and small moving parts, internal orientation values are too varied. Many UAVs now have built-in low cost GNSS, accelerometers and gyroscopes recording information, such as the photo centre coordinates, pitch, roll and yaw every time a photo is taken. Although the photo orientation information is not sufficiently accurate to control the photography it does help during the post-processing stages of mosaicing the images together.

Modern UAVs achieve much in compensating for the factors listed above, and do indeed deliver excellent results. UAV post-processing software company Pix4D say 5cm to 15cm accuracy can be achieved in relative terms. But, how can we deliver this kind of accuracy in both relative and absolute terms? From our experience, surveyed ground control points are a must in order to increase the accuracy. If we look at the on-board GNSS of many UAVs, they are capable of accuracies of no greater than 3m or so, which limits their inherent absolute accuracy. For volumetric work where height data is of the utmost importance, ground control points are crucial in getting the best possible absolute accuracies, making a simple survey much more time consuming.

The new Photogrammetry

The recent development of UAV technology has offered the geomatics industry a new commercial survey tool. But technology has really prospered in its ability to create full ortho-mosaic photos and DEMs without the need and skills of traditional photogrammetry. Software by companies such as EnsoMOSAIC or AgiSoft now have the ability to turn hundreds of images captured from a UAV into a 3D mapping product. In fact, some services are offered, by the likes of Pix4D, which entirely automate

An orthophoto
"fade" image.

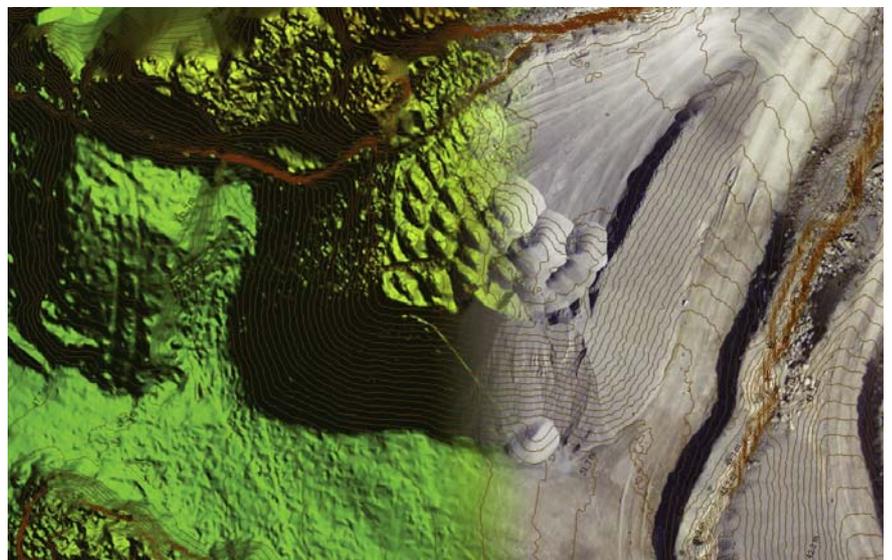


the process in a matter of hours. What this type of software really offers is a shift from traditional photogrammetry to a model that requires consumer level equipment.

A ground-based survey of a quarry could take several days but, depending on what accuracy you require, a 3D model of a quarry can be observed in a day using a UAV. Flight height, camera quality and capability of the UAV will affect the accuracies you might be able to achieve from this type of processing.

Using the Swinglet CAM UAV and 1cm GNSS, Digital Mapping and Surveys have conducted many tests to gain a good understanding of the accuracies achievable. We almost exclusively use GNSS ground control points in order to increase the absolute accuracy and obtain the best possible data. Points every few hundred metres are required to hold the accuracies to an acceptable level. Using locally installed software as opposed to an upload service gives us the flexibility to interrogate and check the data thoroughly. The result is an ortho-mosaic and DEM with an accuracy of around 5cm in x, y and z if flown below 80m

“...UAVs will certainly become more and more prevalent in the geomatics industry.”



A high resolution image captured by a UAV from which a contoured digital elevation model has been extracted.



About the author

Following an MSc in GIS and Remote Sensing Andrew Blogg has worked as a GIS consultant for several large companies including ADAS, Capita Symonds and KOREC. During his time at KOREC he introduced Sensefly's Swinglet CAM UAV to the UK market. Since then Andrew has started his own company using UAVs to provide an aerial data service in the UK.

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with a 14 megapixel camera. The accuracy falls off with higher flying heights and with fewer ground control points.

Locally installed software and processing hundreds of images has a downside – computer resources. Such methods are very memory and processor hungry so a computer to handle this will cost several thousand pounds, or be prepared to wait several days for a project to process.

Regulations

UAVs do offer a relatively low cost, practical way of obtaining high-resolution 3D data and ortho-mosaiced photos. But before heading out to fly over central London to capture some great images, beware of the Civil Aviation Authority (CAA) regulations in place for UAVs. In January 2010 the CAA introduced new regulations that require operators of UAVs for commercial purposes and those equipped for data acquisition to obtain permission from the CAA before commencing a flight within a congested area or in proximity to people or property. In order to fly in the UK, the operator (pilot) must pass a theory and flight test, specifically for light UAVs. A full list of the rules and regulations can be found in CAA publication CAP 393, section 166. Briefly, the main regulations for consideration are a height

limit of 400ft (which affects the resolutions that UAVs can obtain), not to fly over or within congested areas and to fly no more than 500m from the operator or within line of sight.

The future

It is now possible to capture high-resolution aerial data much more readily and at a fraction of a cost of other methods currently available. Using a UAV, we have demonstrated accuracies very close to topographical survey standards. In fact, for many applications the use of UAVs has replaced the standard topographical survey method, particularly in quarries where an accuracy of 5cm is sufficient for calculating stocks. We mustn't dismiss the amount of input that is still required to generate the best quality data and safety standards. Human operators are required for take-off, landing and processing, and to be aware of the safety regulations that need to be in place to prevent accidents. Airspace is not a free for all, and regulations prevent us from surveying in many locations, putting many people off. But as the UAV industry continues to develop at pace, accuracies and capabilities will increase and UAVs will certainly become more and more prevalent in the geomatics industry.

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Digital Documentation 2012: The year that digital narrative was born

By Dr Caradoc Peters, Truro College, University of Plymouth

The applications for 3D data capture are growing rapidly. From film animation inspired by a Dutch Master, hominid palaeontology, using BIM on an iconic building, to how children navigate libraries. These were just some of the applications Dr **Caradoc Peters** discovered.

The Digital Documentation Conference (Digidoc) for 2012 was held on the 22nd and 23rd of October in the Surgeon's Hall in Edinburgh, just off the historic Royal Mile. The Surgeon's Hall is a Category A listed building holding the medical collections of the Royal College of Surgeons of Edinburgh as well its archives and library. One of the College's nineteenth century presidents was **Joseph Bell** who taught Sir **Arthur Conan Doyle** medicine at the nearby university. It was his meticulous attention to detail that is supposed to have inspired Conan Doyle's Sherlock Holmes novels.

It was therefore an inspirational choice of venue for the launch of CyArk's new strategy to record the narratives that help make digital reconstructions come live. CyArk is already well-known for its High Definition Survey orientated digital records of many of the world's most famous monuments. **Ben Kacyra**, the director of CyArk, explained to me that the speakers at the conference reflected the new interest in engaging the public with storytelling. Ben had also turned up to support the appointment of **Doug Pritchard** of the Glasgow School of Art as the Director of Operations of the newly formed CyArk Europe.

Doug Pritchard was an obvious choice for the job, given his collaboration with Historic Scotland (the body charged with curating Scotland's national monuments) to establish the Centre for Digital Documentation and Visualisation (CDDV). The CDDV has produced a cutting-edge programme of digital documentation. Called the Scottish Ten, it

comprises of five renowned Scottish heritage sites like New Lanark and St Kilda and five key international sites, including Mount Rushmore (USA), Rani ki Vav or The Queen's Stepwell (India) and the East Qing Tombs (China). These can be viewed on the Scottish Ten website: <http://www.scottishten.org>

Advances in animation and application on Heritage

Gordon Cameron of Pixar Animation Studios and **Gael Seydoux** of UbiSoft dazzled the conference with the latest developments in animation and their role in creating characters and stories that can enthrall and captivate. Gordon explained that endless detail is not what makes for good storytelling: it is important to concentrate only on what advances the story. Starting with simple Google SketchUp roughouts from initial hand drawings, the animations progress through various stages to Finite Element Analysis (FEA) carried out on the tetrahedral meshes. The FEA allowed animators to devise 'biphasic springs' - one phase that dealt with muscles and the other with skin. The problem with old style animation is that it assumes a rigid structure as if the body was composed solely of bone.

Gordon showed how the concept of 'source to visualisation' in film is similar to the goals of digital heritage. One starts with source stories and works through to visualising the essential spirit of the story in film, just as in heritage one starts off with the acquisition and documentation of historical evidence and creates interpretative narratives that capture the spirit of the ideas and not necessarily every detail.

Gael Seydoux of UbiSoft drew inspiration from the paintings of the Flemish painter, Pieter Bruegel the Elder (1525-1569) whose paintings are populated by multiple characters that generate a sense of activity through how they relate to their environment and occupy space. It is the characters that allow the viewer to engage and imagine historic environments. Gael pointed out that an architectural space, however accurately represented, is not enough to permit the production of film that is true to the spirit of a story. For example, narrow streets can make filming highly challenging because the movements of the characters can not fit within the camera view. In such a case, the walls of the buildings on either side of the street have to be moved back far enough to capture the action. The public 'want to taste



Above: Ben Kacyra of CyArk (left) introduces his new director of operations in Europe, Doug Pritchard.



Above right: Gael Seydoux (UbiSoft) drawing inspiration from the busy populated scenes of Bruegel's paintings.



Above: Gordon Cameron (Pixar) visualising the film Brave 'from source'.



Left: Louise Leakey demonstrating the 123D Catch models of hominin skulls from the Turkana Basin Institute, Kenya.

Right: Paul Bryan presenting more of Stonehenge's secrets revealed by laser scans.



Adam P. Spring's article in *GeoInformatics 7, Vol. 15: pp 32- 34*), can be even cheaper through 123D Make if slices are selected through the object. These slices are printed off on paper, cut out and pasted onto cardboard and finally cut out of these. The cardboard slices are then stuck together to create a 3D model of the original, accurate enough for educational use in schools and universities anywhere in the world. What makes this even more accessible is that Louise has made these models freely available through her website: <http://africanfossils.org>

The stones that just keep giving

Paul Bryan, the Geospatial Imaging Manager of English Heritage, relayed the latest findings from laser scans of Stonehenge, the prehistoric temple in the heart of Wessex. A whole host of axes and daggers inscribed in the stones, many more than ever imagined as well as some later graffiti were all brought to light. Later that night, sipping a few whiskies at the ceilidh in the Jacobean Rooms in Edinburgh Castle, Paul confided "Stonehenge has not given up all its secrets: I am sure there is still more to discover!" As Paul and many of us are aware, the increasing power of digital technology never ceases to amaze.

Highlights of the second day

Doug Pritchard and **David Mitchell**, director of conservation at Historic Scotland, gave presentations on the work of the CDDV, showing how remote digital access could alleviate problems of access and the conservation issues associated with footfall. **Robert Leese**, the chair of the Sydney Opera House Trust Building Committee, was also on hand as the opera house was announced as the next international project of the Scottish Ten. Robert was particularly keen on the way in which building information modelling (BIM) could prove an excellent asset identifier, since original plans often present an idealised view rather than the reality of 'as built' assets. The accurate 3D models then help in designing exhibitions for example, where artwork can be arranged in advance of the actual erection of the exhibition.

Posters and displays:

The trend for narrative extended to the posters and displays. **Alice Watterson** of the Glasgow School of Art and Kieron Baxter of the University of Dundee have been working with acoustic archaeologist **Aaron Watson** to investigate Skara Brae, a Neolithic village in the Orkney Islands to the north of Scotland. Skara Brae is noted for its rounded stone houses nestled in sand dunes complete with interior furnishings such as stone beds, a central hearth or fireplace and cupboards. Kieron used a kite to achieve aerial photographic views of the village, and explored the way in which factors such as time of day or angle of view could

the lives of others' as Gael put it. He stressed that 'it is the desire to know and to imagine: both about the desire to live the lives of others and an engagement with the story'.

Engaging in the narrative

In some ways, despite its low cost and simplicity, another contribution had the potential to reach people that even the top movies and games cannot reach. **Louise Leakey**, the director of the Public Education and Outreach of the Turkana Basin Institute in Kenya, and a member of the famous palaeontological Leakey family, has been experimenting with technologies that could be used in institutions all over the world whatever their budgets. Using freeware photogrammetry, in this case 123D Catch, objects like hominin fossils can be modelled and then turned into hard copy using a rapid prototyping freeware package, in this case 123D Make. Rapid prototyping, whilst much cheaper than manufactured products (see

"Using freeware photogrammetry... objects like hominin fossils can be modelled and then turned into hard copy..."

Left: The model of House 7 showing the scandata created from the Scottish Ten laser scan and photogrammetry data, together with 3DS Max and Vray for the reconstructed elements and atmospherics. (Image, Alice Watterson).



The model of House 7 based on the Scottish Ten laser scan and photogrammetry data, together with 3DS Max and Vray for the reconstructed elements and atmospherics. (Image, Alice Watterson).



affect narrative. Alice combined a range of digital sources including laser scans from the Scottish Ten and photogrammetry as well as film, paintings and drawings to produce a richer, more creative, subjective, and experimental experience than the usual disembodied digital representations. The work was funded by Historic Scotland.

Although children are mostly associated with education and storytelling, they are often left as passive bystanders. **Jane Mycock** and **Steve Buchanan** of the University of Strathclyde are designing digital libraries for children between the ages of seven and eleven. Apparently children under the age of twelve have real difficulties navigating traditional library catalogues and respond better to 3D spaces which use tangible and unidirectional routes to information retrieval.

Another display, showed how people can create their own experiences within the Open Virtual Worlds project. In Open Virtual Worlds, **Alan Miller** of the University of St Andrews developed a virtual version of St Andrews cathedral which uses the freeware viewer Phoenix Firestorm and permits members of the public to create their own avatar and explore the site having downloaded the software. Those familiar with Second Life will recognise the environment and tools available in this viewer. That is because Second Life's viewer is

open source. The link to the virtual cathedral is <http://openvirtualworlds.org/cathedral/>.

Leica's ScanStation P20 and Viva TS15

Leica Geosystems demonstrated some of their latest equipment in the lunch break. The P20 is a laser scanner that goes further than the now expected improvements in capture (a million points per second). The P20 allows the user to suspend it via a bracket in order to scan from above, whilst an inbuilt WiFi system permits remote control. The new Viva TS15 total station has introduced improvements in the use of total stations. It produces images that can be annotated in order to help the operators keep a photographic record of where points were taken from and why they were taken.

Digidoc 2012 marked a sea change, in that high quality, high definition imagery was a given. What was more impressive is what one can now do with digital images. How to engage the public and the researcher alike requires new approaches and different kinds of software. The setting up of a European branch of CyArk is a further sign that digital cultural heritage has come of age, and the fact that participants came from as far away as Australia and South Korea (one even from the now famous district of Seoul, Gangnam!) shows how international the digital cultural heritage industry has become.

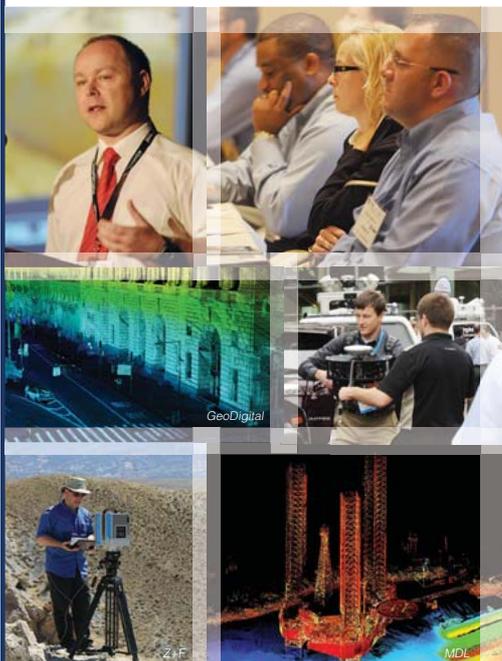
"...children under the age of twelve have real difficulties navigating traditional library catalogues and respond better to 3D spaces..."



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KEYNOTE ADDRESS More to be announced!



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 Greg Bentley, CEO, Bentley Systems

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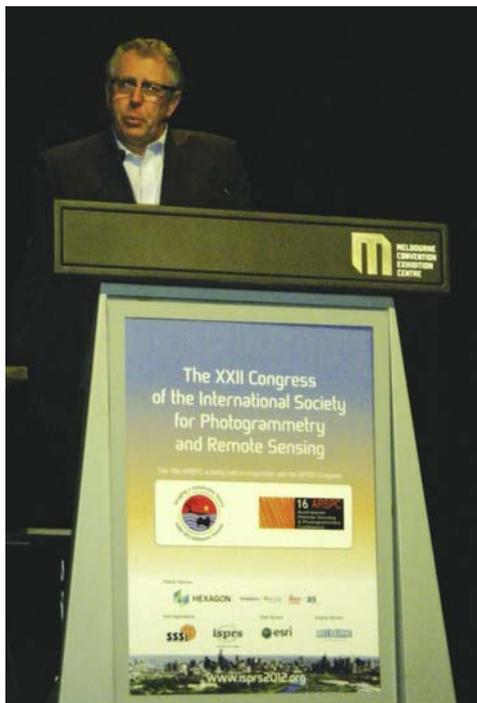
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Melbourne, Australia hosts ISPRS Congress 2012



The XXII Congress of the ISPRS) was held from 25 August to 1 September 2012 in the beautiful, vibrant city of Melbourne in Australia. Dr **Martin Smith**, University of Nottingham, reports for *GW*.

Cliff Ogleby the Congress Director opened proceedings.



The Congress is the major event in the International Society for Photogrammetry and Remote Sensing's calendar in its four-year cycle of activities. The programme consists of all the ingredients of a major international conference: a mixture of technical sessions, workshops, exhibition, technical tours, ISPRS business meetings and social events. The welcome reception on the first evening provides an early opportunity to develop new acquaintances and to meet old friends.

The vital ingredients in a Congress are the participants with new and exciting presentations, exhibitors with their novel ideas and technology, and willing, dynamic people to champion the official positions and roles within the Society. Provide these ingredients with an exciting location and you have the making of a highly successful Congress, which we had in Melbourne.

The opening ceremony was a mixture of events with an aborigine welcome, welcomes from Congress Director **Cliff Ogleby**, from **Gary McGuire** President of the Surveying & Spatial Sciences Institute (SSSI), **David Black** from the International Council for Science and **Orhan Alton** the President of ISPRS. Orhan presented the progress ISPRS had made over the last four years and his summary proved to be a good insight into some of the highlights of technical advances that were to be presented in the technical sessions and exhibition over the period of the Congress.

With the Congress officially opened by Cliff Ogleby, the technical sessions, business sessions and exhibition were soon underway. ISPRS activities

span a wide ranging of fields from satellite remote sensing through airborne and mobile mapping to terrestrial close-range historic recording and engineering/metrology technology and applications.

The programme was very full for the nearly 2000 delegates from 74 countries; it was packed into only eight days between the opening and the closing ceremonies. The business of the Society includes drawing the work of the old Commissions to an end and starting to form the new Commissions by gathering like minded individuals together and developing plans for the next four years. National representatives (one plus two advisors; for the UK this is **Samantha Lavender** with advisors **Paul Newby** and **Martin Smith**) attended the four general assemblies where the ISPRS officers have an opportunity to report on their work over their period in office. There is also the award of prizes, and discussions leading to the strategic planning for the next four years. The General Assembly also includes the appointment of Society officials and deciding on where the next Congress will be held.

Recognition

The opening ceremony gave an opportunity for individuals to be recognised for their contribution to the work of ISPRS. Emeritus Professor Ian Dowman (UK) and Professor Li Deren (China) were elected honorary members in recognition of their distinguished services to ISPRS and its aims. **Paul Newby** (UK), **Dieter Fritsch** (Germany), **Martien Molenaar** (the Netherlands), **Shailesh Nayak** (India), and **Heinz Rüther** (South Africa) were elected ISPRS Fellows in recognition of their sustained, excellent service to ISPRS and its aims. A full list of awards can be found at <http://www.isprs.org/documents/awards/awards2012.aspx> Well done to all the recipients.

There were a number of key items on the agenda of the General Assembly besides the changes to the operations and regulations of

ISPRS and in particular there is always great interest in the election of the new ISPRS officials, appointment of leaders of Technical Commissions and the location of the next Congress. The new officials of the ISPRS Council are:

President: Chen Jun
Secretary General: Christian Heipke
Treasurer: Jon Mills
First Vice President: Orhan Altan,
Second Vice President: Marguerite Madden.

The next Congress in 2016 will be held in Prague in the Czech Republic and the Director is Lena Halounová (<http://www.isprs2016-prague.com/>). Full details of the officials can be found at:

<http://www.isprs.org/structure/council.aspx>.

The new Commission chairs are as follows:-

Commission I Sensors and Platforms for Remote Sensing, **Charles Toth**, USA
 Commission II Theory and concepts of spatial information science, **Songnian Li**, Canada
 Commission III Photogrammetric computer vision and image analysis, **Konrad Schindler**, Switzerland
 Commission IV Geospatial Databases and Location Based Services, **Jiang Jie**, China
 Commission V Close-Range Imaging, Analysis and Applications, **Fabio Remondino**, Italy
 Commission VI Education, Technology Transfer and Capacity Development, **Jianya Gong**, China

By the end of the congress the new commission presidents had started to draft terms of reference, Working Group structures, which is the way the work within the commissions is managed, and identifying working group leaders. Full details can be found at

<http://www.isprs.org/structure/tcp.aspx>. The Commissions and Working Groups hold various events and a major mid-term symposium so if you are interested in participating make contact with the Commission or Working Group officers.

Major advances

Since the last Congress there have been some major advances in sensor technology both in cameras and laser scanning. The exhibition provided an excellent opportunity to see some of the sensors at close hand and talk to the nearly 80 exhibitors who had come from around the world, with a strong contingent from China. 60 megapixel single cone cameras, 260 megapixel multi-cone cameras, multi-cone oblique cameras and many more, were all on display along with a range of 'must-have' accessories such as flight planning systems, and integrated systems for position and attitude measurement.

Laser scanners are making equally rapid advances, both airborne, mobile and terrestrial

UK reps from left to right: Martin Smith, Samantha Lavender and Paul Newby.



and there is a growing choice of scanners to suit applications. For example, there are now airborne scanners with high pulse rates for high density point clouds or scanners for high or low altitude flying. There were many papers covering different aspects of this exciting field from data collection to handling point clouds.

It is clear from the exhibition and technical papers that UAVs, including small helicopters, are becoming a serious proposition for flying small air surveys. The development is rapid in the platform design and payload lift as well as onboard sensors. Handling the images and data can be challenging but some excellent results and products have been achieved. There appears to be very different regulation on their use around the world but slowly, even in some tightly regulated areas, experience and confidence is growing.

The use of multi sensor data through data integration and fusion leads to opportunities for extraction of new information, increases in efficiency through automation, new products and new applications. Point clouds, colour, thermal and multispectral images are providing interesting datasets and topical for many papers.

The technical papers have been divided into two groups dependent on whether they have been fully peer reviewed or not. So there are the normal Congress proceedings, which are produced in the *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* (Proceedings Volume: IAPRS, Vol. XXXIX, eISSN 2194-9034 (Internet and USB), ISSN 1682-1750 (Print)) and there are Annals which are the peer reviewed papers (*Peer Reviewed Papers in the ISPRS Annals, Vol 1*, eISSN 2194-9050 (Internet and USB), ISSN 2194-9042 (Print)). Both these sets of papers are available on the ISPRS website at <http://www.isprs.org/congresses/melbourne2012/> along with further information about the Congress.

The Congress Director Cliff Ogleby, Technical Programme Director Mark Shortis, and all those involved in organising the event should be thanked for a warm welcome and an excellent Congress.

“The use of multi sensor data through data integration and fusion leads to opportunities for extraction of new information . . .”

AutoDesk 123D Catch: How accurate is it?

By Jim Chandler and John Fryer

123D Catch is free software for creating 3D meshes from user-supplied digital imagery. In this article **Jim Chandler** and **John Fryer** assess its accuracy and applications.

“... minimal user input is required...”

In April 2011, Autodesk provided access to a free and simple to use package for creating 3D meshes from user's digital imagery, a technique which many of the more traditional readers of Geomatics World would perhaps recognise as “photogrammetry”! However, software to carry out photogrammetric measurement has traditionally neither been cheap nor simple to use. The ability therefore to automatically generate a 3D model from any digital imagery, for free, appears to be extremely significant. The question for readers is naturally, how accurate is it? This brief report outlines an initial approach adopted to answer this question.

How does it work?

Autodesk 123D Catch can be freely downloaded (<http://www.123dapp.com/catch>) and remains free to use for non-commercial purposes, at least currently. It simply requires the user to supply a minimum of three images of an object acquired from different viewpoints, which are then uploaded to a server for processing. Although exact details are not provided by Autodesk, the processing undoubtedly involves SfM (Structure from Motion) methods, which initially involves identifying common image features across images using a freely available algorithm called SIFT (scale invariant feature transform) or perhaps the more robust version ASIFT. A bundle adjustment is then used to compute parameters to represent the inner and exterior camera geometry, combined with a dense point cloud to represent the object, (James and Robson, 2012). 123D Catch evolved from Autodesk's project Photofly, originally launched in 2010.

No restrictions appear to be placed upon either camera type or focus setting, so some form of camera calibration is clearly being conducted. The processing strategy appears similar to the Microsoft Photosynth initiative, in that minimal user input is required other than providing the images, which critically makes the software very easy to use. 123D Catch appears to offer increased benefits, particularly for visualisation and options to extract data for subsequent use. Both these packages represent a significant development for those interested in

photogrammetry or, perhaps more significantly, those simply interested in capturing three-dimensional information cheaply and easily. However, a key question is just how accurate are the data generated by such a wholly image-based approach that uses no external object control constraints and includes fully automated camera calibration.

Aboriginal cave re-measurement

To answer this question, a past project conducted to record an aboriginal cave site was reprocessed. The cave (Figure 1) is approximately 9 m in length and is of interest because of engraved features which resemble an emu foot: a token for the local aboriginal community that lived in this area of the Blue Mountains, New South Wales, Australia. This site had been recorded in 2004 using a series of overlapping stereo-pairs acquired using a 6 megapixel DCS 460 digital camera, equipped with a 24 mm lens. Of significance for this latest study, was the inclusion originally of twenty 3D control points which were established using a Leica 1100 series reflectorless total station. These data were used to conduct the original photogrammetric survey, extracting high resolution DEMs/orthophotos and a fly-through visualisation (<http://www.youtube.com/watch?v=yLX2wCcEH50>). Further details concerning this earlier work are described more fully in a series of papers: (Chandler et al, 2005; 2007; Chandler and Fryer, 2005; Chandler and Bryan, 2007).

For this latest test, the sixteen original images were uploaded to the 123D Catch server and were processed successfully and automatically within just fifteen minutes. In 2004, this processing stage had required four days work, with a high level of user input and experience, particularly in generating initial estimates for the exterior orientation and using an external self-calibrating bundle adjustment to calibrate the camera. The reduction in time and immediate generation of results was a particular contrast. Visually, the mesh looked superb (Figure 2) and indeed a 3-D fly through visualisation (<http://www.youtube.com/watch?v=hyCmrG3YShI>) suggested a far wider area of successful measurement than had been achieved previously. The control points were then measured individually in 123D Catch as “reference points” and measured on a single frame, hence interpolated from the 3-D mesh generated by 123D catch. The model was scaled using a known distance using the “define reference distance” command. The model and measured data were then exported as an Autodesk FBX file, and embedded in this ASCII

Figure 1: Aboriginal cave



file are the measured control coordinates, mesh vertices and a variety of other data of relevance to the camera calibration/restitution process.

Accuracy assessment

The 123D Catch control points and original control coordinates derived from the reflectorless total station were then used in a 3-D similarity transformation to determine the optimum rigid body transform between the two coordinate systems. Seven parameters were estimated: 3 translation, 3 rotation and 1 scale. The residuals derived from this least-squares estimation are presented in Table 1.

As the overall standard deviations suggest, the fit to the original control is just 12 mm, 11 mm and 4 mm in XYZ respectively. Although such accuracy is comparatively low (1:600) compared to normal stereo close-range photogrammetry (1:1,000-1:10,000), the results are certainly acceptable for many applications, particularly when considering that the restitution includes camera calibration for each photo, the whole task was fully automated and 123D Catch reduces the resolution of each original image to just 3 megapixel. Finally, the process is solely image based and no control constraints have been applied other than applying an approximate scale factor. The original field work would have consisted of nothing more than acquiring the imagery and a single measured distance between two well identified features.

During the original data-processing conducted in 2004, a self-calibrating bundle adjustment (Erdas Imagine/ LPS/in-house software) had been used to derive a set of parameters to model the focal length, principal point offset and radial lens distortion, which was assumed to be stable for all frames. In the least-squares adjustment for this original

Pt Nr	X	Y	Z
101	-0.01	-0.03	-0.01
102	-0.004	-0.017	0.000
105	-0.016	-0.003	-0.005
106	0.003	0.009	0.004
107	0.000	0.018	-0.003
109	0.002	0.006	-0.001
110	0.008	0.006	0.007
111	0.004	0.009	-0.002
112	0.021	0.012	0.000
114	0.009	0.001	-0.001
115	0.017	0.006	0.005
116	0.013	-0.002	0.004
117	0.003	-0.003	0.000
118	0.009	-0.005	0.007
119	0.003	-0.005	0.000
120	-0.009	-0.004	-0.001
122	-0.011	-0.002	0.000
125	-0.016	-0.003	-0.004
126	-0.024	0.007	-0.005
Std.Dev.	0.012	0.011	0.004

Table 1: Residuals at control points.

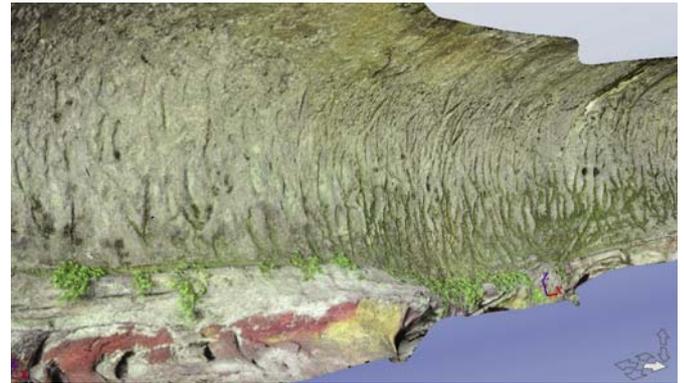


Figure 2: Aboriginal cave, meshed using 123D Catch

restitution, the overall residual fit to the control was 3.5 mm, 1.7 mm, 3.4 mm in XYZ respectively. Clearly this earlier estimation achieved a higher accuracy (1:1,600) than Autodesk 123D Catch could manage, but a significantly greater effort had been required!

Discussion

Examining the residuals graphically and in three dimensions was revealing (Figure 3), the viewpoint being similar to the camera position adopted for Figure 1. Note also that viewing using standard red/green stereo glasses will enhance the three-dimensional effect! Figure 3 demonstrates a clear systematic pattern in which residuals are highest towards the edge and middle, but are in opposing directions to the approximate camera axes. This could be explained in two ways. First, the accuracy of the estimated focal lengths for each frame could be questioned, the inaccurate estimates creating the “push/pull” effect so graphically represented. Alternatively, the systematic pattern could be accounted for by considering classical principles associated with vertical aerial photography used for mapping. Although a series of stereo pairs were captured, they were effectively in the form of a classical aerial “strip”, in which the normal end lap simply varied sequentially.

This is an inherently weak geometry, one that is recognized, tolerated and accepted because it is usually managed and minimised through the use of a series of ground control points. Such control would constrain each image individually, forcing it to fit the known object space. Without such a control constraint, any strip would have a tendency to wobble as small systematic errors make their presence known. Indeed the authors have

“Now, simply by acquiring a few additional frames, a 3-D record can be captured”

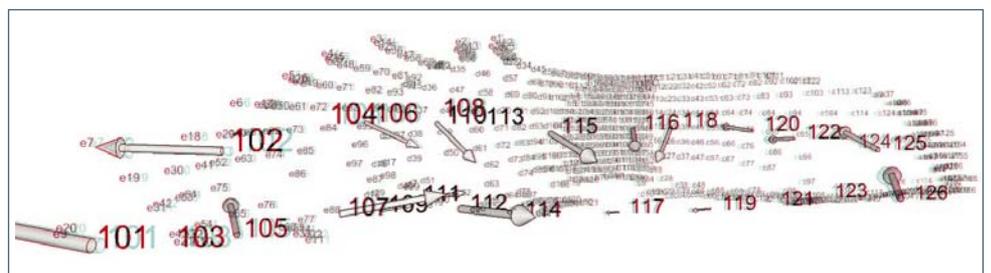


Figure 3: Residual fit following 3D similarity transformation.



Figure 4: Additional cave survey

seen and modelled this type of effect before (Fryer et al, 1994). This earlier study revealed that a measurement error introduced into the centre of the block will propagate to the geometrically weaker periphery, as can be seen repeated for the Emu cave examined here. Autodesk 123D

Catch is wholly image-based, and provides no opportunity to constrain individual frames in the manner required for this particular configuration. The simple solution would have been to strengthen the image block by including additional frames which capture larger areas of the cave from different positions. This would have no doubt prevented the wavering/drifted effect so graphically represented in figure 3, but unfortunately such imagery wasn't acquired at the time.

While the example of the Emu Cave worked extremely well, that is not the only strip or set of images submitted to 123D Catch by the authors. A cave with many more complicated 3D curved surfaces had been photographed in 2004 but proved almost too complicated for manual processing at that point. This imagery was similarly resolved by 123D Catch in a matter of minutes (Figure 4).

Applications in geosciences

The ability to create 3-D models from imagery freely will undoubtedly create new opportunities and applications. One particular area is in the geosciences, where there is a need to capture objects in the physical and natural environment effectively and at different scales. Geographers, geomorphologists, archaeologists and geologists are used to acquiring imagery to record the landscape in two dimensions. Now, simply by acquiring a few additional frames, a 3-D record can be captured. Levels of accuracy do not always need to be high but it is often simply necessary to capture the relative position of one feature in relation to another. The first author established ISPRS working group V6 "close range morphological measurement in the Earth sciences" in 2008

(<http://isprsv6.lboro.ac.uk/>). This was to both raise awareness of ISPRS within the geoscience community and to allow members of ISPRS to recognise the opportunities and needs of geoscience. At the recent ISPRS Congress in Melbourne, (August 2012) it was pleasing that ISPRS Council approved the continuation of the initiative. The new working group title for 2012-2016 will be ISPRS V5 "Close-range measurements for bio- and geosciences" and will be chaired by Dr Dirk Rieke-Zapp.

Comparable to laser scanning?

Techniques like 123D Catch will undoubtedly

provide geoscientists with a useful tool. Indeed, there is evidence the SfM techniques combined with the increased densification of point clouds through MVS (Multiview Stereo) is capable of producing datasets which are comparable to terrestrial laser scanning. This is significant as these high resolution datasets are generated at lower costs and with reduced data collection times (James and Robson, 2012). Despite this optimism it should be recognised that image-based methods do require significant image texture to be effective and accurate. Current testing using a range of imagery (digital SLR's and smart phones) of a cliff suggest the need to distinguish between the accuracy of individual measured points and subsequent point density necessary to capture an accurate surface representation. Work is ongoing!

This brief test has provided an assessment of the accuracy of Autodesk's 123D Catch.

Although not at the level of accuracies routinely achieved in normal terrestrial photogrammetry using other packages, the accuracy achieved was certainly useful for many applications. If more imagery at a diverse range of scales had been acquired originally and used to provide a stronger configuration, accuracies would certainly have been improved. The real significance of Autodesk's 123D Catch is that it is free, which will certainly help increase the number of applications that use this approach. It is hoped that this short article will help the wider surveying, geomatics and heritage recording community more fully to realise the potential of 123D Catch and of spatial measurement from images.

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John Fryer is Emeritus Professor of Surveying and Photogrammetry at the University of Newcastle, Australia and retired as the Head of School of Engineering in 2004. He has had a long-term interest in close range photogrammetry.



Judicial Review. A new consultation – and is it reasonable?

By Carl Calvert

The legal process of Judicial Review has been growing and the Government regards many of them as frivolous and delaying progress. Our legal correspondent **Carl Calvert** untangles the current consultation process.

The Ministry of Justice (MoJ) are currently (13 Dec 2012 to 24 Jan 2013) running a consultation on Judicial Review. The importance of that consultation is that Judicial review is a lawful way to challenge the way that public bodies have made decisions and not the decision itself. Examples of such decisions are:

- Decisions of local authorities in the exercise of their duties to provide various welfare benefits and special education for children in need of such education;
- decisions of the immigration authorities and Immigration Appellate Authority;
- of regulatory bodies.

Just because any one of us doesn't like a particular decision it cannot be challenged in the courts by way of Judicial Review. The only challenge that can be made is on any or all of:

- Fairness;
- Illegality; and
- proportionality.

Fairness means that no public body can act so unfairly that it is an abuse of power and not following *natural justice* is also seen to be unfair.

Decision makers need to understand and apply the laws under which they operate. If they fail to do so then their decision and action, or failure to act will be *illegal*. Sometimes there are no statutory powers to enable the public body to do or not do certain things in which case the body is said to have acted *ultra vires* (beyond their powers). Of course, any decision must be in accordance with the Human Rights Act.

Unreasonableness or irrationality were first examined in the *Wednesbury* case where:-

'If a decision on a competent matter is so unreasonable that no reasonable authority could ever have come to it, then the courts can interfere... but to prove a case of that kind would require something overwhelming...'

Lord Greene, *Associated Provincial Picture*

Houses Ltd v Wednesbury Corporation [1948]
1 KB 223, HL.

So, that's Judicial Review. Why do the government wish to reform it? In the consultation paper the arguments are put forward that many small cases are being brought which have no prospect of success and this is causing delays adding to public costs and 'stifling innovation and frustrating much needed reforms.' In the reforms there are three key areas. Firstly, the time limits in which proceedings can be brought; secondly the procedure under which proceedings can be brought; and finally, the fees charged for bringing such proceedings.

The first set of questions asked in the consultation refers to Time Limits and seek to find what is practicable and how extensions of time can be decided upon.

In the matter of applying for permission there are two matters: the first is to restrict an oral renewal only where the subject matter has already been before a court and secondly where the case is seen as '*totally without merit*'. Fees, the final matter provides for two questions: the first is whether there should be fees for an oral hearing, and if so should they be the same as for a full hearing.

The last question relates to 'Equality Impacts' in that the MoJ want to hear about any individuals or organisations which would be either positively or adversely affected by the proposals.

Law of unintended consequences?

Judicial review is a very powerful tool with which to challenge the state and the consequences of any reforms need to be assessed. Of course, as with much legislation and also reforms, the 'law of unintended consequences' tends to operate.

With changes in the presumptions of planning law, large infrastructure projects like the new High Speed rail line and the proposed fifth runway for Heathrow somewhere, the use of an unreformed Judicial Review may prove to be unreasonable. But it will be of great importance to see what the result of the consultation brings for, in any event, it will only be possible to question the process of making the decision and not the decision itself.

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Our columnist reflects on last year's dining, attends the first conference of "BMACHO", learns more of Flinders and Baudin and takes a trip to Port Macquarie.

• *John Brock is a Registered Surveyor in Australia and is a stalwart of FIG and its Permanent Institution for the Art and History of Surveying.*

Mario Fenech, Corey Payne, Darryl Brohmann and the writer.



Tours galore and an important election

By John Brock

Life is great at the moment. Topp Tours to Hill End and Bathurst and a Christmas celebration at Hillview Homestead took us gold panning in a former gold rush era river and dining where 16 NSW governors had previously called their country retreat from 1884 to 1957 (two hours south of Sydney on the Southern Highlands at Sutton Forest).

Dining with the Stars

Last year saw me dining out with stars at various events. To name a few: Australian fast bowling legend **Glenn McGrath** at a Rugby League match; Austrian Royal Archduke Dr **Michael Habsburg-Lothringen** and his wife **Pia**, with Belgian Ambassador **Frank Recker** and wife **Anna** at their residence, while we were at the International Map Collectors Society Symposium in Vienna; famed Australian batsman **Doug Walters** and bowler **Len Pascoe** (whose uncle **Jim Durtanovich** is a cadastral surveyor for the City of Sydney) and Rugby League players aplenty including **Mario Fenech**, **Darryl Brohman** and a room full of former Australian players at the Ambassador Club Grand Final luncheon at Bankstown Sports Club.

The pride of Lord Carrington

We were privileged to attend the first conference of BMACHO (Blue Mountains Association of Cultural Heritage Organisations) at the prestigious Carrington Hotel in Katoomba (3 hours west of Sydney) where we were feted with colourful tales and folk songs of the history of the settlement and development of the Blue Mountains area listed as a UNESCO World Heritage site. This superb hotel was built in 1882 as the Great Western but when NSW Governor **Lord Carrington** visited it in 1886 he granted permission to the owner, **F.C. Goyder**, to rename it after him. A most magnificently restored icon of an era of glamour and elegance,

this venue was once described as "The largest and best known Tourist Hotel in the Southern Hemisphere"; a title well deserved.

Baudin and Flinders Chance Encounter

The Australian National Maritime Museum is one of my favourite venues and a lecture by **David Hill** on two of my preferred historical

figures, **Baudin** and **Flinders**, could not be missed. David had just published a book about the time when each of these fabled navigators were circumnavigating Australia in 1802 and just happened to "bump" into each other at a place in the southern ocean off South Australia later to be named Encounter Bay in honour of their most ironic engagement. After dining together and exchanging a rather broken discussion, as neither spoke the other's language, they parted company little knowing how their destinies would once again intertwine on the Island of Mauritius (then called the Ile de France) where Flinders would be under house arrest for six and a half years and Baudin would be buried there. In fact Baudin died on 16 September 1803 with Flinders arriving on the island on 17 December the day after Baudin's vessel *Le Géographe* had left for France.

Port Macquarie Topp Tour

Five days in the northern NSW coastal town of Port Macquarie was "Peter Pan in survey land" for me because the settlement was discovered and named by NSW Surveyor-General **John Oxley** on one of his expeditions in 1817. Another surveyor, **George Evans**, travelled with the S-G and he had previously been responsible for making the survey traverse past the end of the line of the route established by **Blaxland**, **Lawson** and **Wentworth** in 1813 as well as naming the new inland town after **Lord Bathurst** in 1814. Everything is named after S-G Oxley (including an injured koala at the wildlife hospital), hotels, bottle shops, highways, schools and even the local infamous financial advisor! The museum and many of the local attractions all display reverse survey shields, Gunter's chains and historical surveying maps from the the environs. Even the local weatherboard historic mansion Roto House was built for a local surveyor named **John Flynn** in 1890 with many of his personal artifacts displayed within the property testifying to him being one of the wealthiest residents of the town. Great stuff indeed!

Elections for ISNSW

After the results of the elections for the Board of the Institution of Surveyors NSW Inc. and the Cumberland Group of Surveyors were announced, I had been elected onto the Committees for both organisations. I look forward to contributing to the promotion and development of the surveying profession in New South Wales and will keep the readership of *GW* informed of any events or items which may be of interest to you all.



On Wednesday 12 December, RICS Geomatics and RICS China hosted their first international Geomatics conference in mainland China, reports **James Kavanagh**, Director of the RICS Land Group.

RICS hosts international Geomatics conference in Wuhan, China

RICS has been steadily building relationships with Chinese geomatics industry bodies and has welcomed numerous Chinese delegations to RICS and at training events such as the UK-Sino geospatial programme at University of Nottingham.

The conference title was *The Future of Geomatics and Geographic Information Technology – urban planning, talent development, environment and economic expansion*. It was held at the Hubei Province Geographic Information Building in Wuhan, also home to one of most globally renowned geomatics university departments and one of the largest in China. Wuhan University and Hong Kong Polytechnic University were academic sponsors for the conference.

The conference started with a welcome dinner in one of the more salubrious restaurants in the Wuhan metropolitan area. The dishes on offer were quite amazing and not those usually found in western Chinese restaurants. The different speakers (a mix of international and Chinese), sponsors, academics and state employees networked and socialised easily and discussed global geomatics issues. Wuhan (a city of nearly 6 million people) is famous for its cuisine and hot summer weather; temperatures can reach over 40°C in summer and is geographically situated in the centre of China on the Yangtse River. It is also famous for being the focus of the revolt against the Qing dynasty that led to the foundation of the Chinese Republic in 1912 (an event immortalised in the award winning movie *'The Last Emperor'* directed by **Bernardo Bertolucci**).

Significant growth in face of many threats

Over 140 delegates attended the one-day event which provided a platform for geomatics professionals from around the world to exchange their ideas and share expertise. The role and potential for geomatics in China is well known with initiatives such as the Compass GNSS system, Digital Cities, Mapworld and the medium scale mapping of a vast area of western China. Anyone attending FIG Rome 2012 and InterGeo 2012 will have noted the significant increase in Chinese attendance and exhibitors. China, like many rapidly developing economies faces enormous pressure on natural resources, land, housing and from natural disasters such as flooding, earthquakes and ongoing desertification. The extensive and integrated use of geomatics and consistent geographic information can help with these issues.

The main sponsors were FIG, Hubei Province Society for Geodesy, Photogrammetry and

Cartography and the Chinese Society for Geodesy, Photogrammetry and Cartography. Sessions opened with some words of greeting in Chinese by RICS Honorary Secretary **Rob Mahoney** FRICS who then set the scene for what the delegates could expect from the rest of the day. **Zhang Jianren** president of the Hubei society and Professor **Li Jiancheng** from Wuhan University also spoke during this opening session, welcoming delegates to Wuhan.

The next session was devoted to Land Markets and Crowdsourcing. Rob Mahoney and **Robin McLaren** both built on the 2011 RICS outputs in these areas and linked geomatics directly to economic development and land rights (land markets), advancing technology and people-centred data capture for efficient land administration. Wuhan University supplied two excellent translators with verbatim transcripts supplied by speakers beforehand.

Over 7000 graduates a year!

Copious amounts of green tea were consumed during the break and the next session focused on geomatics education. Professor **Guo Jiming**, Wuhan University and Dr **Meng Xiaolin**, UK Director of Sino-UK Geospatial Engineering Centre, gave two contrasting views on firstly geomatics training (and a bit of history of geomatics and mapping in Wuhan) in China and the ongoing training of qualified Chinese geomatics professionals. The numbers are quite astonishing, 1,600 undergraduate students, 300 masters students and 120 PhD students are in the School of Geodesy and Geomatics at Wuhan, whilst China on the whole produces over 7000 graduate level geomatics professionals every year.

Lunch was followed by a tour of the Hubei province geographic information building and its excellent history of surveying and mapping exhibition, which uses interactive displays, computer graphics, hardcopy mapping and instruments to convey the long and distinguished history of Chinese mapping.

The afternoon session focused on technological innovation in Synthetic Aperture Radar (SAR) by **Ding Xiaoli** (Hong Kong Polytechnic University), President **Zhang Jixian** on remote sensing products and **Shan Jie** (Wuhan university) on crowdsourcing. These presentations were given in Chinese but with English language slides, a combination that worked well. Each speaker focused on specific technological aspects of their area and Shan Jie in particular gave an excellent insight into the ongoing use of 'drone' and UAV applications in urban mapping in China.

“China... faces enormous pressure on natural resources, land, housing and from natural disasters such as flooding, earthquakes and ongoing desertification.”



James Kavanagh at Tiananmen Gate, Beijing.

The penultimate session featured two international speakers: Dr **Jonathan Iliffe** from UCL on marine and hydrographic applications in geomatics and Prof **Gethin Roberts** from the Ningbo (China) campus of University of Nottingham on large scale deformation monitoring. Marine and hydrographic survey is quite new to Wuhan; as Dr Iliffe mentioned in his presentation, it is probably further from the sea than any other major city in China and hydrographic and land survey training tend to be carried out on different courses in China. There is however a strong appetite to understand marine survey and its combination with land geospatial data, and its use in everything from coastal management to renewable resources and shipping.

I gave the final summing up and closing speech and stated that this was the start of a beautiful relationship and the first of many RICS conferences in China. The conference then closed but many stayed on to converse and network. One thing that we can really take from this event is that geomatics is a truly global language and even though speakers used English and Chinese, everyone did seem to understand each other. RICS China and Wuhan were very gracious hosts and finished proceedings in the only revolving restaurant in Wuhan, where delicacies such as shark fin, sea cucumber and boiled snake were on offer.

“One thing that we can really take from this event is that geomatics is a truly global language.”

On to Beijing

I then travelled onto Beijing (3 hours flight) the next morning and after a whistle stop tour of Tiananmen square, the forbidden city and Mao Zedong’s open tomb, gave a CPD lecture to over 70 students, RICS members and academics at the land and resources department at Renmin University in Beijing. Rapid urbanisation, land rights and resource management were high on the agenda for most attendees with many students and academics interested in land value and development viability issues.

The new leadership in China has land reform high on its agenda, currently 30-year leases are available in rural areas and 70-year leases in urban ones but development is happening so fast that rural areas are being depopulated, under utilised and even built upon before issues of property rights are dealt with. As always, investment confidence is key and geospatial information (open and accessible) is key to understanding the shifting dynamics of social geography and economics.

Beijing was snowy and -5°C but still bustling with energy and activity, as was

Wuhan. An exhausting but ultimately successful trip came to an end with a midday flight back to the UK. Same time next year?

And in other news. . .

Look out for new CPD requirements coming into effect from 1 January this year. In response to feedback, we have made it simpler for members to manage and record their CPD. Read full details of the changes online. Demonstrating professional and ethical standards is a part of these requirements. **Philippa Foster Back**, from the Institute of Business Ethics, and **Keith Richards**, Chair of RICS’ Ethics Sub-Group talk about the importance of business ethics and additional information is available online.

Corporate Responsibility report

In line with our corporate goal of being a responsible organisation, RICS became a signatory to the world’s largest and best supported corporate responsibility initiative - the United Nations Global Compact (UNGC) in October 2010. We are fully committed to following the ten principles of the UNGC, which cover environment, labour relations, human rights and anti-corruption. As part of this commitment and to show progress in these four key areas, RICS published its annual *Corporate Responsibility Report* this week. The report updates employees, members and stakeholders on our carbon footprint for our three major UK locations, employee and community engagement and capacity building and fostering the development of knowledge in global sustainable development through targeted guidance and research. Read more online on how you can contribute to raising funds for our corporate charity WaterAid, resource efficiency in our buildings and how RICS is helping to improve livelihoods in developing countries.

RICS launches Property Guru online game

RICS’ first online game, *RICS Property Guru*, launched on Wednesday 5 December and will be live for one year. Property professionals can register to play the game, which aims to hone their expertise by asking increasingly difficult property knowledge questions. At the end of each month, the person with the highest score becomes Property Guru of the month and their picture, score and mini biography will be featured on rics.org. It is hoped that the game will ‘go viral’ and attract thousands of participants in the year it is live - engaging with existing members and raising our profile among potential new members. Find out more and play the game now.

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