

...joining the geospatial jigsaw

Why Geospatial Needs to Listen to GDPR



Talking with Perry Peterson

Geo-referencing and Visualising Retail Store Stock with the Aid of Geospatial Technologies

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COVER STORY

Transportation data is often geospatial linked. The use of personal and location data can be linked to privacy-sensitive activities. Read more in the article by Niall Conway on this subject on page 14.



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Perry Peterson, the founder of a PYXIS, talks with Niall Conway about the Open Geospatial Consortium's new Discrete Global Grid System standard which will be released soon.



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Nigeria is beginning to embrace the potential of geospatial technology in order to develop their economies. This is particularly so for land administration and real estate.



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A key component of many MSc degrees offered in Universities in the UK is the importance of external links to what some of us might call the 'real world'.



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Views of the GIS Professional Contributors



Attending the GeoCom17 conference, in October in London, it struck me how important geospatial information really is – and how it is already woven into society. London Transport used to count individual tube tickets to know of travel patterns in rush hour, as David Johnson of ONS showed us, there was an early consciousness that the information was valuable. And even in ‘regular’ statistics, he indicated

that there’s a demand to add location data. This also is an issue in agriculture, where the traditional image of the farmer on his tractor is ploughing on. Completely wrong! He now is surrounded by a number of screens, linked up by satellite communications, to get the best results of the fields. In the farm office (not longer than a kitchen table either), satellites also monitor the state of the crops. It’s fascinating to see that we are also aware of the vulnerabilities and possible threats that geolocated data can include. Let’s think of that!

Joost Boers, content manager
joost.boers@geomares.nl



The government is pulling the UK’s land resources into sharp focus. It’s making reference to new housing, in particular, and we know the pressure is on to rapidly develop services that can improve vital infrastructure. I’d like to think the UK’s new Geospatial Commission will adopt ‘geo momentum’ as its motto (wouldn’t that be good).

Abigail Page, AGI Chair

2017 has been a groundbreaking year for the geospatial community on a number of fronts. In the business arena, major developments include the significant investments in Mapbox and Descartes Labs, Pitney Bowes’ partnership with Hortonworks and Cloudera, Boundless’s major contract win from the NGA, and the acquisition of US company DigitalGlobe by the Canadian MDA corporation. Other notable developments include the launch of the Copernicus’s programme Sentinel 5P, Esri’s partnership with Autodesk which focuses on integration between GIS and BIM technology, the opening of the UK’s ONS’s Data Campus in Wales, the release of the OGC’s DGGS standard and the Australian government’s commitment to develop a national space agency. Following on from this year’s Boston conference, the 2018 FOSS4G in Dar-es-Salaam, Tanzania will mark a significant breakthrough for the opensource community, as will the release of QGIS 3.0. On the employment front, I expect that demand for geospatial and machine learning skills will grow among the larger global corporations with Python and R programming languages being valued in particular.

Niall Conway, contributing editor



Fund for the City of New York Advances OGC's Underground Pilot Project



Underground infrastructure. Image courtesy: University of Illinois.

The Open Geospatial Consortium (OGC) has announced that the Fund for the City of New York (FCNY) has funded OGC to develop prototype data models for underground utility networks and for the soils surrounding

them. The goal is to ensure that underground utility data is collected in a manner that allows information about different utilities to be integrated and used inter-operably. This will allow cities to create a coherent map of what is under the asphalt and will enable improved operations support, analysis, and modelling. The utility data models that are being developed through the OGC Innovation Program include water, sewer, gas, electric, telecommunications, district heating, and transit.

• bit.ly/2ih1RQt

GIS People Announced 6th Fastest Growing IT Company

GIS People have been named in the CRN Fast50 as the 6th fastest-growing IT company in Australia. CRN announced its ninth CRN Fast50, comprising the fastest-growing IT solution providers in the Australian IT industry. Technology companies from all around Australia flew in for the awards ceremony, and the Founder and CEO, Igor Stjepanovic went on GIS People's behalf.

• bit.ly/2ifnWPr



GIS People 6th most growing IT Company in Australia.

Satellite Images of Greece Flood Help Government Response

A flood west of Athens, Greece, was caused by heavy rain on 15 and 16 November 2017 and caused the death of 22 people. European Space Imaging captured 30cm resolution images of the area using the WorldView-4 satellite on 21 November 2017. The images clearly show the damage wrought by the torrents of water and mud, and the path the water took as it flowed down the sides of the mountains and into gullies.

• bit.ly/2ijPGCN



Greek streets at the time of the floods from 15 and 16 November 2017.

More Than 20 New Feature Enhancements for LISTECH Neo

LISTECH has announced the latest version of its geospatial software LISTECH Neo. The updated geospatial software offers Least Squares adjustment of measurements for traverse and network frameworks, and supports Singapore cadastral survey submissions and GDA2020 coordinate systems and transformations.

• bit.ly/2iji1ZO



Listech Neo 2017 update includes Singapore Cadaster Module.

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3D Mobile Mapping Technology Inspires Positive Change	bit.ly/2fQ9FYT

OGC Calls for Participation in its 'Geospatial to the Edge' Interoperability Plugfest

The Open Geospatial Consortium (OGC) is calling for interested participants in its 'Geospatial to the Edge' Interoperability Plugfest. OGC Plugfests, initiatives of the OGC Innovation Program, provide a venue for sponsors and technology implementers to come together to solve geospatial interoperability challenges in a collaborative, agile process.

• bit.ly/2ii0gdu

Transforming Global Mapping and Intelligence

Radiant Solutions, a geospatial services business unit of Maxar Technologies (formerly MacDonald, Dettwiler and Associates Ltd.) has adopted its strategy for combining its legacy businesses. Radiant Solutions will deliver capabilities to transform global mapping and intelligence missions by revealing information and insights that help national security and commercial customers better understand and navigate the changing planet.

• bit.ly/2ij3ItE

Autodesk and Esri Partnering for Infrastructure

Autodesk and Esri have entered into a relationship to build a bridge between BIM and GIS mapping technologies. Together Autodesk and Esri plan to enable a broad range of industries to gain better context by visualising data of the man-made world, the environment, citizens and the networks that weave it all together.

• bit.ly/2ih0f9x



Autodesk and Esri announced a partnership.

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'One to Watch' Award for 3D Repo

BIM technology innovator 3D Repo has scooped the 'One to Watch Company of 2017' award at the Construction Computing Awards. Master of Ceremonies Chris Cowdrey, former England cricket captain, presented the award at a black tie ceremony held on 16 November 2017 at the Radisson Blu Edwardian on Bloomsbury Street, London, UK. The award was collected by Rob Jackson of Bond Bryan on behalf of 3D Repo. Bond Bryan Digital is famous for its LEGO Architecture meets BIM series featured in 3D Repo.

• bit.ly/2ijj76

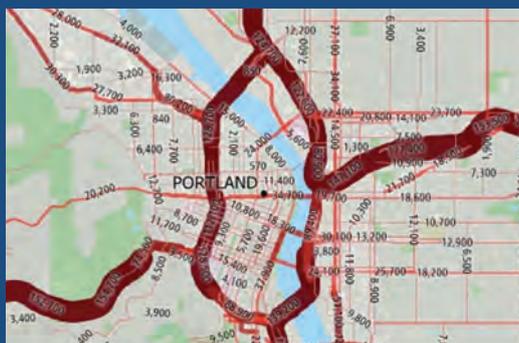


One to Watch award collected by Rob Jackson, 3D Repo.

U.S. Traffic Count Data for Use with Maptitude

Calliper has released a free Average Annual Daily Traffic (AADT) map layer. Annual average daily traffic is the total volume of vehicle traffic on a highway or road for a year divided by 365 days. The AADT data is critical for companies that rely on daytime populations and activities, such as retailers, shopping centres, and corporate marketing departments, because traffic counts are a key factor in analysing trends, allowing them to tailor their business to better suit their customers.

• bit.ly/2ijULLn



Mapitude mapping software including U.S. Traffic Count Data.

Satellite Imagery Aids Rescue Efforts for Hurricanes



Natural colour image of Hurricane Harvey - by moderate resolution imaging spectroradiometer of NASA's Terra Satellite.

The calls for assistance started days before Hurricane Harvey came barreling across America's doorstep this summer. First responders and government officials needed answers to prepare and protect communities. Remotely sensed imagery was provided - at no cost and almost daily - through the USGS Hazard Data Distribution System (HDDS) for analysis on the extent, severity and evolution of hurricanes Harvey, Irma and Maria.

• bit.ly/2ij0tgm

VR Simulation of Offshore Wind Farm

3D models from Bluesky are being used to communicate plans for a new offshore wind farm in Scotland. The interactive models allow users to 'teleport' around a virtual environment, viewing the proposed turbine development from the coast in the real-world context of existing buildings and trees. Created by environmental consultancy company SLR and commissioned by Inch Cape Offshore Limited (ICOL), the scale 3D model has already been used for public consultations and a visual impact study for the proposed scheme off the east coast.



SLR 3D model visualising the impact of windfarms.

• bit.ly/2igrzEH

Environmental Award for LINZ

Land Information New Zealand (LINZ)'s efforts to help fight Wilding Conifers – a rapidly spreading invasive pest tree – were recognised at this year's Spatial Excellence Awards. LINZ's web-based mapping and monitoring tool for authorities to assess and improve efforts to control the spread of this significant pest, picked up the top prize in the Environment and Sustainability Category.

• bit.ly/2ig7e2z



Images showing how wilding conifer can spread if left unchecked – Mid Dome, Upper Tomogalak catchment, from 1998 to 2015. Image courtesy: Richard Bowman, LINZ.

Uninterrupted Panorama Imagery and Measurable Oblique Images



This photo from Nearmap shows residential construction in the Las Vegas area including measurements. Image courtesy: Nearmap, Business Wire.

Nearmap, USA, has launched new forms of location content: Nearmap Panorama and Nearmap Oblique. They are available through a new MapBrowser interface. Nearmap has long provided vertical imagery (also

known as orthorectified imagery) covering about 70% of the U.S. population. It now extends its location content to include new aerial geospatial data services—Nearmap Panorama and Oblique imagery.

• bit.ly/2ii1PYN

GIS to Transform Service Delivery



Oxfordshire. Image courtesy: Riccardo Cuppini via Flickr.

Oxfordshire County Council, committed to delivering top quality services and value for money on behalf of the county's 600,000 plus residents, is investing in a new GIS (Geographic Information System) to help transform service

delivery. The council is aiming to increase the number of digital tools it uses, based on location, to transform its service delivery while making savings in the cost of delivering those services.

• bit.ly/2ik0mBn

Augmented Reality App for Increased Security

Ordnance Survey (OS) partner, Aligned Assets, supported GIS Day on 15 November 2017 by making available its Augmented Reality (AR) application to all local authorities and emergency services in a free trial. Symphony AR was created to enable



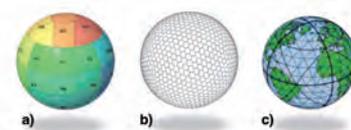
Symphony Augmented Reality screenshot.

information held within an organisation to be displayed as AR. Any data which has a spatial element can be shown as augmented reality markers, this may be addresses themselves, other spatial data such as sports facilities, listed buildings, commercial properties and more.

• bit.ly/2ifyiPI

Standard to Improve the Way Information is Referenced

The Open Geospatial Consortium (OGC) has approved the Discrete Global Grid System (DGGs) as OGC

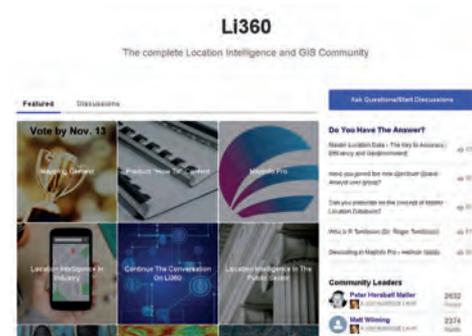


Building a standard to connect locations with a grid.

Abstract Specification - Topic 21 (OGC 15-104r5). The goal of DGGs is to enable rapid assembly of spatial data without the difficulties of working with projected coordinate reference systems. The OGC DGGs Abstract Specification standard defines the conceptual model and a set of rules for building highly efficient architectures for spatial data storage, integration and analytics.

• bit.ly/2ifsW6F

Global Collaboration Community



Pitney Bowes Li360 community screen.

Pitney Bowes has made available the Li360 Community, an online community for clients, product engineers, partners and the "GIS curious" to explore Location Intelligence capabilities, applications and tools to resolve challenges in the market.

• bit.ly/2ifreSN

California Redistricting Panel Example for Other States



California redistricting.

Maptitude for Redistricting is the software of choice for the California Redistricting Panel. Members of the California Citizen's Redistricting Commission went to Washington, D.C. in July 2017 to accept the Roy and Lila Ash Innovations Award for Public Engagement in Government. The panel,

which used Maptitude for Redistricting to draw their 2012 Congressional and State Legislative boundaries, have been recognised for effectively eliminating gerrymandering.

• bit.ly/2ig0TUD

Talking with Perry Peterson

A number of weeks ago, I made contact with a certain Perry Peterson, the founder of a Canadian-based company called PYXIS, in order to request an interview about the Open Geospatial Consortium's new Discrete Global Grid System (DGGs) standard which will be released soon. Over the course of numerous emails, Perry, who was one of the Chairs of the OGC's DGGs working groups, agreed to an interview about the standard which he helped develop emerged as a more suitable option.



Perry Peterson, founder of PYXIS.

My initial reluctance to write an article was due to a perceived complexity of an aspect of the industry which is now much more understandable thanks to the efforts of Perry and others. This Global Grid system overhauls and simplifies an incredibly complex aspect of the geospatial industry, one which is based on the scientific aspects of tesseral geometry, projections, spatial indexing, and coordinate reference systems which underpin locational accuracy. In a world which is becoming more complex due, in particular, to the massive volumes of data from sensors, satellites, and many devices, such simplification is of utmost importance. Therefore, DGGs, which is, it should be noted, a response to a UN Proposal for a Global Statistical Geospatial Framework, reflects an effort to remove some of the barriers to involvement in the spatial analysis process which face less-technical professionals. In terms of how it works, DGGs removes the challenges of integrating data sources from a need for the multitude of various grid reference systems and scales around the world. It replaces traditional coordinates with cells that store information about that fixed location, thereby making access to data that defines the geospatial world much simpler. Simon Chester of the OGC uses the spreadsheet analogy in order to describe how DGGs works, whereby each area of land and its data contents references a unique cell. A single DGGs partitions the earth with triangular, rectangular or hexagonal cells of equal area, each of which can be refined into a limitless number of smaller and smaller cells. Therefore,

by replacing reference to Lat/Long positioning with a system that provides a cell for every location at every resolution, the difficulties which are associated with integrating spatial data from a wide range of sources and, more importantly for myself at least, in explaining DGGs are overcome. By standardising the geospatial grid system, DGGs will allow for geospatial information (raster or vector) from any source, and spatial reference, scale and frequency to be held in a single cell. As a result, by understanding the relationship between data within cells, DGGs will make it possible for everyone, not just geospatialists, to perform integrated analysis of very large, multi-source, multi-resolution, multi-dimensional, distributed geospatial data like never before possible.

“The DGGs will provide the capability to properly integrate global geospatial, social and economic information. It also allows communities with data attributed to fundamentally different geographies to integrate this information in a single consistent framework.”

Dr. Stuart Minchin (Chief, Environmental Geoscience Division, Geoscience Australia)

Now that we have established what DGGs is and how it works, it is worth understanding how the standard materialised in a practical sense. The first step in

this regard is to understand the OGC’s process of accelerating geospatial standards and particularly standards which advance interoperability. In this regard, DGGs emerged from its own standards working group which acts as an incubator, network hub and a starting point for business development and strategic technology planning. Throughout the process, DGGs was developed, refined and improved through numerous testbeds and pilot projects involving established bodies such as Environment Canada, GEOSS, USGS, NASA, Natural Resources Canada, Australia’s Bureau of Statistics, Geoscience Australia, and the UN-GGIM. Furthermore, the standard was examined at a specially dedicated workshop at the EU INSPIRE conference and today DGGs can be viewed in action through the browser-based PXYIS Studio client application. By removing the inherent complications associated with unique grid reference systems globally, DGGs is dramatically simplifying the management and analysis of increasing volumes of EO and non-EO data. AI-based supercomputers are expected to more efficiently use CPU and GPU resources for parallel and distributed processing of data in cases of say, environmental, climatic or even demographic modelling. In time, the incorporation of 4D encoding and volumetric pixels into DGGs, as well as the increasing interoperability between DGGs, OGC Web Services and IoT platforms will accelerate its likely uptake. According to Perry, the interest and uptake among the private sector is already happening. This, he says, is demonstrated by the awarding of major purchase agreement to a geointel company, and investments in the technology

by major GIS software and survey companies.

“We have reached a tipping point in our ability to make effective use of Big Data to derive economic and societal value. DGGs represents the paradigm shift that will allow us to transcend some of the critical barriers to realising the true potential that Big Data promises to deliver.... DGGs will revolutionise the way we perceive, work with and visualise spatial information.”

Dr. Matthew Purss (Senior Advisor – Geospatial Standards, Geoscience Australia)

Solving the geospatial data integration challenge with DGGs adoption as seen in the UN Global Statistical Geospatial Framework will advance our capabilities, make spatial data more useful, and provide insightful engagement in our changing world. At its core, the DGGs standard is about removing the technical barriers to entry so that end-use decision-makers - from scientists to citizens - can participate in the spatial analysis process. Although I, personally, will not miss the complexity of grid references systems and scales, I hope that future generations will still be able to appreciate the significant effort and collaboration which has brought us to this exciting phase in the geospatial world.

GeoDATA 2017: Connecting Buyers and Sellers

GeoAware hit just the right note with this year's GeoDATA 2017 London Showcase.

The event took place at the ILEC Conference Centre in West London on 30 November. It attracted 32 exhibitors and a busy crowd of enthusiastic participants. There was plenty of space in the exhibitor area which never looked either crammed or sparse. The rooms for the three-stream seminar programme were separate and sound-proofed. Each talk started dead on time and lasted twenty minutes, leaving a ten minute gap before the next presentation. Time

and space was managed with ease.

There is no entry charge for attendees. It is the exhibitors

or GIS, to identify themselves. There were surprisingly few. He described the traps awaiting ignorant and incompetent mappers and then, for fun,

... make sure your maps don't mislead.

who pay to be there and so this is an event focused on enabling them to achieve a return on their investment. The seminar slots were all taken by exhibitors who were identified by their company name to the point that few presenters were actually introduced. Rather than allowing questions in the seminar room, those wishing to follow up on any points were encouraged to go to the presenter's stand for a one-to-one discussion. This helps the exhibitors to cultivate potential customers, whilst also ensuring that there were no overruns in the seminar rooms.

DON'T USE THE DEFAULT!

There were few spare seats at the presentations, which were not always sales pitches. For KOREC the advance of geospatial technologies was set against the Gartner hype curve and we were presented with some good news: location-based 'geographical' jobs are set to grow by 35% per year. Let's hope that is not one of Gartner's 'inflated expectations'. At the other end of the day, Steven Feldman gave a keynote with fake maps as its theme. He started by asking those in the audience who produce maps, but had not been trained in cartography

showed some intentionally misleading maps. His messages: don't use the default – particularly for choropleth maps; make sure your maps don't mislead; and be particularly wary if the results reinforce what you expected to see.

GEOSPATIAL FOR ALL

The presentations catered for all levels of knowledge and were not therefore too stretching. Amongst the highlights of those that GISPro attended was a talk by GeoXpere, producer of a medium format aerial camera which fixes on to the exterior of any plane. They claim to fill a gap between UAV and conventional manned aerial survey platforms. The prize for professional presentation goes to Topcon for not attempting to oversell UAVs: what a breath of fresh air. Verisk Analytics, GeoAware's parent company, stressed the value of data – it has been dubbed 'the new oil' although, as he pointed out, the two commodities don't have many common characteristics. As well as the volumes of new data produced daily, he mentioned the value of 'curated verified data'.

This was a pleasing day and it is hard to imagine anyone leaving GeoDATA 2017 disappointed.



Figure 1: Martin Tocher presenting.



Figure 2: The trade show provided an overview of new developments

Mentors are Wasted on the Young!

I don't really believe that, but it's a nice way to introduce the idea of mentors for more experienced practitioners in the geospatial technologies. That's right, I'm talking to you, a GIS Professional reader with a few years, or even a few decades, of work with GIS, GPS, imagery, and the like.

Note that "mentor" is both a noun, "an experienced and trusted adviser" and a verb "to advise or train (someone, especially a younger colleague)." I like to think that once individuals are working GIS professionals, they with input from a supervisor, can identify and access any training to fill skill gaps. Therefore, I prefer to think about mentors as experienced advisors. This definition expands the role of mentors to suggest that anyone from six to sixty (and beyond) might benefit from this kind of relationship.

WHEN TO GET A MENTOR

How do you know when a mentor might be valuable in your work? I think anytime you feel uneasy about what you are doing or how you are doing it. I can hear some readers saying, "That's all the time!" But seriously, I suspect some individuals feel that way just as they begin a job. I can report that my first six months at a new job were so busy with just learning what I was supposed to do, that I didn't recognise any "unease" until some months later.

Some mentors can be helpful for short term challenges of a few months, such as managing your first project or hiring your first employees. It may even make sense to have different mentors for different issues that come up. Other times, a mentor match can span years.

WHY TO GET A MENTOR

Mentors may or may not provide specific answers or action items to address a situation. What they do provide however is a different perspective. Have they seen anything like it before? How did they handle it? How did another colleague address it? Those observations and anecdotes can be very valuable. I always feel more comfortable returning to my situation knowing I'm not alone in tackling the problem and that others have seen similar things through with some level of success.

WHO TO PICK AS A MENTOR

You might think that someone who knows a lot about your position, maybe someone on your own team, would be a good mentor. In some cases that's probably a good choice. In others, it may be more valuable to choose a mentor on another team or from another office, or even another company, to provide perspective from further afield.

HOW TO GET A MENTOR

That's perhaps the toughest question. I'd start with your immediate supervisor, making clear if you think someone who works with you, or someone who does not, might be a better choice. Give the search some time; it may be that the request needs to filter through a few networks until there's a match.

LOOKING BACK

I've met with my mentor for several months now. While she's made specific suggestions and provided pointers to courses and processes that were valuable, those have not been the big takeaway. Some of the most valuable input I received, that makes me feel more comfortable, is simply confirmation that working with other people is inherently a challenge. I'd been working on my own for about 17 years, so I think I needed to be reminded of that fact.

I'm convinced no one is too experienced to benefit from such a relationship. There's always value in exploring work challenges and successes with someone who's been in similar situations. Think about it: Is it time you, even if you have some gray hair, look for a mentor?



Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.



Why Geospatial Needs to Listen to GDPR

When it comes to the European Union's General Data Protection Regulation, a suitable analogy to think about is a courtroom based TV show. Every few episodes, the judge will 'throw out' a case because a lawyer did not collect evidence using legal means. The key thing to remember for geospatialists who watch these types of shows is that under GDPR, the incorrect collection and use of information will soon be considered as a punishable offense in itself.

The GDPR regulation, which comes into force from May 2018, is an effort to uphold privacy and anonymity rights of all European Union citizens regarding their personal information. It does so by expanding the scope and definition of 'personal data' for the digital age and it governs the business practices on how companies collect, manage and use the personal data of their European customers. In the age of social media sharing, open and volunteered geographic data, GDPR reflects an effort by government to reign

in organisations who often know as much, if not more, about these citizens than the governments themselves do.

Although GDPR is often more associated with sectors which collect a large amount of information on individual customers, such as banking, insurance, and health, it is, in fact, very relevant to the geospatial industry. To think otherwise, could be a very big mistake. Consider it this way. The purpose of GDPR is to regulate the use of multiple data formats which help to identify,

either directly or indirectly, any person. Direct identifiers, it should be noted, are the data types which can be easily referenced and associated with an individual (including descriptors such as a name, an ID number or username, an exact location, or a detailed description of a person's physical attributes).

What GDPR does, therefore, is force data custodians to recognise the less obvious (indirect) information types (including locational data) which can be 'linked' to an individual. Consider the following scenario. A description such as a 'brown-haired female' is of little relevance to anyone, including GDPR regulators. A description such as a 'brown-haired female who visited a certain shop', although still quite broad, narrows things down significantly. If say a marketer were to aggregate this basic description with indirect identifier information such as the approximate time of visit, waypoints on the subject's chosen transport route, CCTV footage of the individual or spending details, then the anonymity of this 'brown-haired female' is placed at risk. When thinking about information in this regard, GDPR highlights the fact that an individual's private life today depends on the standard to which third parties manage, guard and anonymise both locational data and non-data.

In abiding by these new legal mechanisms, it helps that geospatialists already understand the locational component of



CCTV brings a risk to the anonymity of a 'brown-haired female'.

information (some 80% of all information) and that this information needs to be managed correctly. At the same time, however, geospatialists will need to re-examine this data and decide how to prevent it from being linked with other spatial and non-spatial datasets including transport, administrative, demographic categories. The processes and lifecycles around data collection and management will also need to be examined carefully. This includes the design of online forms, the authorisation of GPS tracking on mobile apps and the use of geolocated social media content. Custodians will need to generalise or filter identifiable features or patterns from geospatial information. A jogging app, for example, will need to ensure that it doesn't capture and store potentially revealing details on user's private activities (such as visits to political or religious institutions) while a provider of aerial imagery will need to filter out or obscure identifiable features on, say, someone's home. And just in case there is any motivation required, the custodians of such data will, from next May onwards, be liable for fines of either 4% of annual profits or 20 million euros for any non-compliance breach. Compliance with GDPR is, therefore, as you may expect, not going to be an easy task. Organisations which need to comply with the regulation may, after all, currently be using legacy IT systems and/or outdated processes. More worryingly, in many cases, organisations will not even be aware of the types of data which they have in their possession. The requirements of GDPR are, one could say contradicted by the fact that organisations at the same time need to improve their data-sharing and interoperability capabilities in order to stay competitive. This,

combined with the lack of in-house GDPR experts in data management departments, could make things very complicated indeed. Nevertheless, where there is a headache there is an opportunity. The first step will be to recognise that data is both a valuable and potentially dangerous substance which needs to be controlled, if not defused. In order to do so, organisations will need to consider a range of legal, data management and technological approaches to protect European citizens anonymity. This will include the tricky process of implementing privacy by default and privacy by design in applications, of safeguarding information using machine-learning; of implementing cyber-security and encryption technologies, and of explaining legal aspects of consent and permission-setting to customers in an understandable manner. Throughout this process, it is very likely that powerful geoprocessing, spatial analysis and other geo-intelligence tools (such as geofencing) will be used to meet the emerging challenges of 'geo-privacy'.

Although GDPR is a big challenge, it presents the geospatial



Running apps need to ensure that potentially revealing details of the user's private activities aren't stored by default.

community with an opportunity to reinvent itself and to build better relationships with, and products for, customers. By designing transparent and flexible data management processes and by better understanding the digital footprint of data subjects, companies will be less likely to cross a 'familiarity' threshold which could potentially damage trust, reputation, and bottom lines. If not, just as in the aforementioned TV shows, justice will be served.



When combining geolocated information like transportation data, there's a risk to touch one's private life details. Image courtesy: William Murphy via Flickr.

Commercial UAV Show for Innovations at First Hand

This was the fourth year the UK Commercial UAV Show was held in the ExCeL Centre, London, UK, and for the first time this year was moved from the month of October to 15-16 November 2017. This event has always been a very good opportunity for the UAV enthusiast, commercial UAV and related companies, and the public to get first-hand insight into this technology, the many platforms and sensors available, the breadth of applications, and all the associated technologies such as batteries and apps for autonomous flight, as well as drone insurance, pilot training, and various other items of interest such as the growing array of specialist carrying cases now available for drones of all sizes.

The show is a mixture of a conference with speakers, an exhibition, posters, and a number of shorter live talks held within the exhibition area. For me, the exhibition has always been the place to be at this event, to see what's new, to see the range of applications and technologies on offer, and a great chance to network; this is a real opportunity to catch up with people and to talk to technologists, UAV pilots, software resellers, practitioners, trainers, speakers, and insurers, and even to see some controlled UAV flights. The small lecture theatres available in the exhibition area have also proven very popular over the years, providing a chance for people to hear about a wide range of subjects, ranging from

safety and legislation to many interesting applications.

Whilst initially there were some very large drones on show and a number of early players promoting small affordable platforms, as well as a range of sensor companies, and peripherals on show, the exhibition has changed a little bit again this year to include many companies from previous years and, in addition, more small stands from academic institutions, researchers, and small applications companies. In part this is a result of the speed at which UAV and related technologies have continued to evolve and their growing popularity in the last 5 years moving the UAV from a toy to a very serious airborne data acquisition platform for monitoring,

mapping, modelling, and increasingly surveying.

There has been very rapid growth in ever more sophisticated drones – a few distinctly commercial and lower-cost platforms and some more specialist custom examples – and now a growing number of VTOL platforms (wing+rotor), and multispectral, Lidar, and thermal sensors. There are also more links emerging between UAV technology and Geographical Information Systems (GIS), remote sensing, and visualisation software and applications, particularly with the range of relatively low-cost remote sensing sensors now on offer, and soft-copy photogrammetric software providing almost plug-and-play Digital Terrain Models (DTMs) and Digital Surface Models (DSMs).

This really is exciting technology and well worth a visit to see how all these UAV technologies are growing in everyday use. All too often UAVs get bad press, but it really is important not to let these incidents cloud the vast potential of this aerial technology for the future. Huge strides have been made to dramatically improve the everyday safe and legal operation of platforms of all sizes. Even the smallest drones available these days are a huge step-up from the first UAVs available. UAVs are – I believe – here to stay and are serious contenders for many commercial applications. Make this a date in your diary for next year – even if you do not intend to buy or fly one – it is an important venue to find out more about this technology and above all to hear about it from those involved in the industry.

Interest from the audience for new developments.



Insights of GIS Data Uses During GeoCom17 Conference

An impressive line-up of speakers climbed the stage of the Royal Geographical Society in London, UK, on Thursday 26 October for the AGI Annual Conference, GeoCom17. Professionals in the geospatial data industry gathered to hear the newest developments and learn about the offerings the industry could contribute. There also was time for honours as Rollo Home received the AGI Chairperson's Award for Outstanding Service and Diana Murray was presented with the AGI Award for Career Achievement.

The theme of the day was 'Smart Geospatial', highlighted by Editor of Techworld Charlotte Jee, who explained the challenges existing in a world more and more reliant on IT – and the solutions it may bring. On one hand, there are the flying taxis starting to operate in Dubai, whilst during a presentation of the newest iPhone, the face recognition failed. In the panel, she welcomed John Abbott of HM Land Registry who gave an insight in the amount of data they are collecting and at the same time making accessible. The organisation also is very aware of new technologies and exploring ways to make best use of them. Lisa Woodall of Ordnance Survey was impressed by the advances Google Maps was making, according to her, incrementally by sourcing data from other organisations and including them. "We need to collaborate", was her conclusion.

NEW APPROACHES

The second forum of speakers included David Johnson of ONS Data Campus – he is preparing the campus for a formal launch and showed the audience different ways to look at data.

After the lunch break, supported by 1Spatial, four businesses shared in

7-minute talks their recent insights and developments, all of them making use of geospatial data, or creating it. Javier de la Torre, CEO of CARTO, demonstrated that 'everything is going to be geospatial' and even streaming: data visualisation has his strong attention and he gave examples of uses of new developments.

Keynote speaker of the day was Prof Kate Jefferey. She linked neuroscience to navigation: how do people use their brains for navigation and will people that rely more on navigation develop this in their brains?

CORNERSTONES OF THE GIS PROFESSION

AGI Chair Abigail Page was honoured to present the AGI Chairperson's Award for Outstanding Service to Rollo Home, former AGI council member who had contributed to several AGI Conferences. He also coached professionals in their career and within the AGI. "He showed a new level of ambition", was Abi's motivation for the inspiring personality.



Demonstration of geospatial data in the early days: underground tickets being counted manually to determine travel patterns.

She also presented the AGI Award for Career Achievement to Diana Murray for her significant long-term contribution to the industry during her career where she contributed to linking geospatial information to history and archaeology.

After these official moments, time came for the informal networking during the GeoDrinks that were sponsored by Europa Technologies – one of the partners of the event. They were showing the developments in the exhibition that had the attention of the delegates during the breaks and during the drinks, as an opportunity to see what new developments are available and how they can use it in their daily practice.



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EFGS Ireland Conference

Modern Insights and Techniques in Dublin Castle

On 2 November 2017, GIS Professional's Niall Conway attended the opening day of the annual EFGS conference in Dublin, Ireland. Although he only managed to attend half of the two-day event (the national Earth Observation Symposium was held on the same dates), it was enough time to appreciate the fact that decision-making and governance are on the cusp of major change.

First up, my first memorable memory from the EFGS conference which geospatialists may appreciate occurred after I had arrived at the conference. While checking in at the centre's cloakroom I glimpsed a gentleman who appeared, like many others, to be in unfamiliar surroundings. 'Surely not..', I thought before looking over my shoulder to see Jack Dangermond, Esri President and co-founder, eventually set off in a direction to give his keynote speech. Perhaps the next best thing to being starstruck is realising that those stars, including giants of the location industry, can sometimes seem a bit lost also. So, a not long after Hurricane Ophelia made it's arrival to Irish shores, Dublin, this time, gladly welcomed a range of experts from

national mapping and statistical bodies who were focused on the more constructive task of integrating data across public sector bodies and institutions. In case you are, by the way, still uncertain as to the purpose of EFGS, then just remember that statistics and geography both focus on using quantitative and qualitative techniques and tools to derive insights from the world. Although they are now considered as distinct subjects, due to a certain degree of institutionalisation over the years, it is clear that global challenges are now necessitating more collaboration and integration between them. Spreadsheets and maps have, however, not existed in isolation before now - they are simply different mediums for telling a story which have been fused together through technology. As an example, just remember that Jack Dangermond's very own shapefile format contains a statistical component, the .dbf, which holds attributes on the features represented on a map. Furthermore, this file can be opened in either GIS or spreadsheet software, can be saved in common RDBMSs and can be aggregated, updated and

analysed using SQL language. It is little coincidence therefore that, in the face of today's data deluge, both the distinction between statistics and geography and the various commercial and opensource tools developed by members of the respective communities have started to blur. Getting back to business, the EFGS conference was organised under three main themes which are relevant to the integration of statistical and geospatial information by governments. The first theme was the UN's Agenda to advance the use of geospatial information by governments and to ensure that decisions on the infrastructure and systems which they manage are based on accurate data. A key requirement in this regard, which was emphasised by another keynote speaker, Greg Scott of the UN-GGIM, was the development of a global framework of accountability and transparency based on Sustainable Development Goals (SDGs) and national spatial data infrastructure (SDIs). The second theme focused on enabling collaboration between often distinct parties. For this purpose, the UK's Office of National Statistics Silicon Valley-esque Data 'Campus' and Finland's Spatial Statistics on Web 2 project were discussed as examples of effective transitional action by governments. The third and final theme of EFGS17 focused on best practice by government.

• bit.ly/2jMDWsh



Digital Transformation in Emergency Response Management

The D4H Technologies suite of products solves some of the problems common with emergency response. Three of the biggest challenges are tracking equipment, handling communications and logistics, and managing paperwork and data. D4H meets these challenges by monitoring key metrics for rescue teams such as response readiness, team availability, qualifications and experience.

With the use of a laptop or mobile device and access to the Internet, teams can record every detail of an operation or training exercise. D4H software then performs analytical charting, draws heat maps, and benchmarks reports to outline the team's areas of expertise. It then connects the global rescue teams and enables them to share data and perform paperless reporting.

STREAMLINING MOBILISATION

Operation Statewide Collapse Operations Response Exercise (SCORE) was a full-scale exercise designed to assess the State of Massachusetts Technical Rescue's capabilities and measure interagency co-operation, communications, and interoperability in a mass search and rescue operation between the state's Urban Search and Rescue (US&R) assets, the Massachusetts National Guard teams, and the Department of Fire Services hazmat teams.

ABOUT THE AUTHOR



Katie Decker is the Community Manager for the Esri Startup Program, a free three-year program that gives emerging businesses the tools to build

mapping and spatial analytics capabilities into their products.

As Community Manager, Katie enables hundreds of startups to successfully leverage Esri's technology and global business network. She also helps to foster their collaboration with a wide array of organisations and industries such as - local, regional and national governments, utilities, transportation, natural resources companies, commercial organisations and more.

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The exercise involved providing medical care in a hostile environment and command and control from a separate location for over 72 hours. During the exercise, role players acted as casualties in simulated structural collapses caused by a car bomb detonated outside a school during parents evening.

THE CHALLENGE OF SCALE

The state deployed their Information Support Team (IST), utilised for large-structure or wildland fires, mass-casualty incidents, hazardous materials incidents, floods, natural disasters, large preplanned events and exercises in support of any state fire mutual aid activation.

Because the exercise incorporated concurrent incidents involving multiple, diverse teams, D4H Live Response would provide a valuable element of co-ordination, oversight, and command to support tracking different agencies.

A HOLISTIC SOLUTION

The D4H Live Response platform was deployed to solve problems faced by the first responders from the IST. The simple and easy-to-use software helped users organise, structure, and share all the information during the simulation and ensured that all decisions, actions, and commands were documented and ready for audit and evaluation. It even provided a complete collaborative incident response management system with real-time situational awareness and planning tools to facilitate effective event co-ordination.

The software uses ArcGIS Online technology to provide an incident management system with powerful geographic capabilities. With a single click, users can publish incident-related data on maps to share with other agencies and the public while simultaneously importing layers such as locations of emergency shelters and affected properties.

ENHANCING COMMUNICATION AND SITUATIONAL AWARENESS

During a volatile event, inconsistent data will inevitably be shared, resulting in challenges when trying to analyse the situation as a whole. D4H Live Response helped users manage consistency of information over multiple operational periods during the exercise.



Figure 1: A View of the D4H Dashboard on a Tablet Device.

Geo-Referencing and Visualising Retail Store Stock with the Aid of Geospatial Technologies

When the Internet first became available to staff at the University of Aberdeen, we were soon approached by a small Internet provider in Aberdeen (Internet for Business (IFB)) to look into the concept of developing a more visually interactive experience for online shoppers than the standard list-type shop-front that existed then on the Web. The idea was to use early digital Ordnance Survey (OS) map data as an interface to allow shoppers to navigate street maps – as if walking along a street – to a shop-front – and then ‘walking’ into a higher resolution digital plan of the store to search for items. At the time, the technology to do this was not quite ready. Today, by contrast, geospatial and Internet technologies have advanced so much that it is now possible to develop such an interface using low-cost, off-the-shelf software. In this article we outline the possibility of achieving this goal with some of the widely and freely available software as a means to better manage store stock for customer display.

In the retail sector, businesses strive to understand the decision-making processes and spending habits of consumers in order to improve product sales. Data is continually being generated from consumer activities and purchasing behaviour. Intelligent Business Information Systems (BIS) are well-established within the sector, providing management tools for tracking and analysing sales

performance that can be utilised to inform the development of future sales and logistical strategies, though these systems are quite limited in their ability to record and process spatial data.

GIS IN THE RETAIL SECTOR

The use of GIS to date has generally been restricted to applications outside the store environment, such as determining

the optimum site location for a store based on customer demographics. ‘In-store’ applications have, however, been few, and although there are benefits from using GIS technology, they have not yet been widely embraced by the retail sector, especially in relation to their potential in-store management.

Within retail stores, new seasonal items are continually being introduced to the shelves to create a dynamic store environment when updating the display of merchandise. To date, there appears to be no evidence of a visual merchandise location tool for managers to refer to when trying to help explain sales performance of goods. This study demonstrates the development of a simple spatial information system for geocoding display areas, providing the basis for locating stock, and helping to quantify the effects of visual merchandising on purchasing behaviour. The system proposed here also provides the basis to track sales performance to help provide an input to operational decision-making. GIS provides tools to track goods at the shop-floor level and to develop an understanding of how areas within the stores are performing, not only in relation to sales, but also employee performance. For example, it may be the case that staff perform more successfully in particular zones of a store that they are responsible for, or in areas that they favour, providing useful

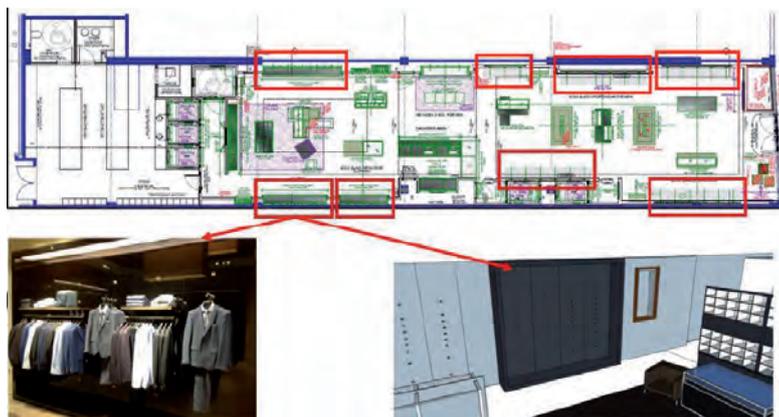


Figure 1: Designated zones in the store.

information for managers when assigning operational tasks.

THE OPERATIONAL STORE ENVIRONMENT

The research outlined is based on a small retail store. The vendor sells luxury fashion products and is part of a large international fashion retailer chain. The sales area of the store is approximately 155 square metres and the stock room covers an area of approximately 65 square metres. The other stores within this retail chain all have a similar operational environment, and therefore the methodology proposed could be applied throughout the chain.

The store environment is dynamic, with products being replaced by 'new-season' collections; new colours and clothing styles are introduced throughout the year. A strategy exists in which clothing lines are displayed using the colour palette for the season in particular 'zones' of the store. This is highlighted in Figure 1, which shows the same area within the store with different colour palette displays.

Goods delivered to the store from the supply chain are held within the stockroom in designated areas until they are moved onto the shop floor for display. Goods that are out of season, or required by other stores within the retail chain are also kept in the stockroom until they are transferred out of the store. On the shop floor, items



Figure 2: 3D model.

are displayed in a particular visual manner or 'architecture', which is deemed to be visually appealing by the visual merchandising department. Guidance for display configurations is provided by head office, but as different stores within the chain may be configured differently, variations in these displays are inevitable; the model display, therefore, is merely a guide, although a set number of items are required within the displays.

The display of items is also linked to sales figures, with poorly performing items given more prominence within the store. Furthermore, different stores within the chain have differing seasonal product colours and stock-levels, which change depending on the sale of items, requiring the configuration of items be changed to match a given ratio of sale to full-price floor space (Figure 2).

Sometimes Items within the back stockroom never make it out onto the shop floor. This can lead to inaccurate perceptions as to the saleability of the product, and may therefore be removed from a store and shipped elsewhere. Such decisions are currently usually made based on incomplete information. The essential point to

consider is that stock continually enters and leaves the store, and items are moved around within the shop floor, and is dependent on the operational requirements.

There are exact standards or 'architecture' for displaying products within the store, which are consistent for all stores throughout the retail chain, regardless of the item category or colour being displayed. The store is divided into designated zones, depending on the product category. Items are sub-divided further and displayed in sections or 'bays', which are defined spaces for displaying a category of merchandise, for example sports category or formal category (Figure 3). Within the 'bays', items are displayed on hanging rails, folded on shelving, or placed on display tables. Folded items are displayed in columns of four; and fifteen items are hung per hanging bar in groups of three. An exact number of hangers must be on a T-bar rail (15), and an exact number of items must be placed on a shelf in a specified number of columns. This configuration is standard across all of the stores within the wider retail chain, regardless of whether the items differ in style and colour from store to store.

The product display system is based on a modular system, which can be adapted to the operational requirements. Shelving, rails and display tables are moved to adapt to visual merchandising requirements that showcase seasonal stock. Small recesses in the wall of the store are connection points for display components; the components are shelving and hanging rails, which are known as 'T-brackets'. The connection points are evenly spaced within the bays, into which the hanging brackets and shelves clip. There are, therefore, multiple connection points within a bay that offer the ability to display items in a variety of configurations. The ability to create an in-store location address for products is therefore possible due to the design layout process that every shop in the retail chain must comply with.

THE PROBLEM

The store used here as an example to illustrate the use of geospatial technologies holds, on average, three to four thousand items of stock at any one time. However, there is currently no record of whether an item is held in the stockroom or in the sales area. There is also no method of using or recording spatial data, and no methods for storing and retrieving information about the historical location of goods in the store. There is also no understanding of the effects past

visual merchandising techniques have on sales of merchandise. Currently only the number of items sold and the type of items sold are recorded in purchase transactions. There is no record or history of where an item was placed and any relationship between the location of goods and sales performance is not quantified.

Visual display and item location decisions are made by managers who rely on previous experience, with knowledge that is mostly anecdotal. Problems arise when managers fail to emulate previous sales targets and are required to justify their results and actions to more senior managers. For example, items of stock not selling as well as in previous years require an explanation so that decisions can be made to help improve sales. Higher levels of sales of an item from previous years may be down to the previous manager at the time placing the item in a prominent position within the store (the item being displayed on a mannequin for example). This information would not be available to a current manager who would need to explain why the sale of the item is not performing as previously.

Currently, there are no visualisation tools in use to display, transmit and communicate pertinent ideas and information to the required audience that can lead to a lack of crucial information being communicated, as well as having the potential for miscommunication.

THE DATA

The store data used was sourced from sales figures and staff performance indicators taken from the store database. This included data that indicated product type, product colour, product price, past sales figures, and customer purchasing history.

A standard digital camera was used to take photographs as the basis to develop a 3D point cloud model of the store. Pix4D software was used to develop the model, and ESRI's ArcScene programme was used for viewing the resulting model.

Physical measurements of the store and display components were also completed using a standard tape measure and a range finder.

A floor plan of the project area – to scale – was sourced. The schematic provided the starting point on which to build a CAD model, providing the horizontal dimensions of the floor space and acting as a base template for the construction of a 3D (Google) SketchUp model. Interior dimensions of the study area were measured, and included vertical measurements of storage and shelf spacing, including tables, drawers, fixtures and furnishings. The spacings between clipping components were also measured, and provided the foundation for geo-referencing of the display units. This information was used to create a 3D visual model in a CAD file format with a '.dae' file extension. The model was integrated with VR technology, so that it could be viewed through a VR headset. This was undertaken by downloading a plugin specifically designed for viewing 3D SketchUp models and then loading the application onto a smartphone.

The SketchUp model was also converted to be compatible with ArcGIS for viewing in ArcScene and was converted from a Collada file (CAD format) into an ArcGIS-readable file format with a .skp file extension to be used in Esri's ArcMap, and viewable in ArcScene. The conversion was performed using ArcMap tools. A point cloud model of the project area was



Figure 3: Scan model of a retail store.

developed using photogrammetric tools and techniques. A number of high quality images were taken that covered the project area with a 70% overlap of the images (with reference points). Using the Pix4D software the images were processed and stitched into a mosaic that was viewed as a point cloud. With the underlying architecture in mind, each component into which the shelving and hanging brackets is clipped was geo-referenced. This gave the area in which stock is stored or displayed a unique address or a geo-location. All bays and connection points were given an identification number matched to XYZ coordinates where each clipping point was geo-referenced within in-store the spatial system. This was also undertaken in ArcMap by creating point shapefiles for each clipping point. The shapefile attribute tables contained information on the item displayed at that location i.e. xyz coordinates; the date; number of sales of the item; and whether folded on a shelf or hanging on a bracket component.

AND... THE BENEFITS?

This high-resolution spatial model created has the potential to benefit retail shop managers in a number of different ways:

- By providing them with an approach to derive information from in-store sales to aid in decision-making regarding to day-to-day store sales operations, and especially to help gauge the success of visual merchandising.
- Providing a novel means of spatial record keeping for a retail store, and offer quantitative support for what is otherwise anecdotal knowledge and experience-based information.
- The addition of spatial location within a store also provides a quantitative basis for deciding where best to place items in the

store and also to provide a basis for comparisons between stores to be made, another aspect that is useful for the area manager. This approach would also provide more useful data and information about customer purchasing behaviour within a store.

- The spatial referencing system developed for the project area provides a solid foundation for recording merchandise placement and generating historical data that may be used for analyses. Determining the relationship between location of products (in-store) through visual merchandising and product sales could be conducted through spatial analyses i.e. determining whether there are hot-spots and cold-spots within a shop, regardless of the item on display. This would require that the location of merchandise items be known in-store, and matched to number of items sold from the location. This would now be possible using the reference system generated in this project.
- This new system of tracking items in-store would provide management with an accurate ratio of goods on display to goods in storage. In addition, staff members not familiar with the stockroom layout would be able to find goods much faster. The area manager oversees more than a dozen stores in the area, and the sales data must therefore be accessed at least daily.
- By monitoring the time taken by management to access and interpret data, and the time taken by using a visualisation system, the time-savings can be calculated and value added can be quantified in terms of time. Similarly, because product items will have a known location, tracking the item in store is possible (this is currently not the case); this information will save time when the products have to be gathered for shipment out of the store. Visualisation can help to

improve these processes through time-savings.

FUTURE DEVELOPMENTS

Some further developments are envisaged. Incorporating data from all stores within the retail chain would be useful as well as conducting a comprehensive analysis of consumer purchasing behaviour with regard to 'in-store' place. Sales data from the BIS could also be collected daily to provide details of the type of item sold, time of sale, and the sales staff responsible. With this data, it would also be possible to determine whether sales staff perform better in some zones than others. Such information would add an extra dimension to Key Performance Indicators (KPIs) as a staff metric, providing the management with information for training schedules and targeted improvement agendas.

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Applying **Geospatial Technologies** to Real Estate Decision Making In Nigeria

Countries such as Nigeria are beginning to embrace the potential of geospatial technology and information in order to develop their economies. This is particularly so in fields such as land administration and real estate development where relevant stakeholders are taking advantage of increasingly affordable software and ever-growing volumes of crowdsources and open data. Unlike developed countries, which were limited by the slow roll-out of heavy telecommunications infrastructure, these industries are being fast-tracked by more easily-deployable Wi-Fi networks to both urban and remote regions. Bolaji Afolabi explains how this is happening.

In the real estate service industry today, it is not a question of whether or not you use a computer but rather to what degree the computer can support your operations. Essentially, this comes down to which computer hardware you use and which computer software or application can enhance efficiency in your real estate operation.

Today, real estate professionals in Nigeria are adopting geospatial technologies in their day to day decision-making operations. This includes identifying property location on Google maps, using GPS receivers in picking the coordinate of lands and buildings, and preparing property maps on GIS software. Dependence on geospatial technology and information continues to grow. Furthermore, the increasing user-friendliness and easy integration of geospatial hardware and software to the real estate decision-making process helps professionals such as myself to identifying landed property locations, to analysing shortest route to properties under consideration, and to determine the proximity of a property to infrastructure and services. In 2015, the Estate Surveyors & Valuers Registration Board of Nigeria (ESVARBON), the national professional regulatory body for Estate surveyors, stated in their Valuation Reporting Template document underlined the importance of geospatial: "Site description in a real estate



Real estate development in Nigeria. Image courtesy: Satanoid via Flickr.

appraisal document must show GPS coordinate, property size dimension, neighbourhood utility networks, aerial photographs, maps etc.”

The regulatory body is aware of the need to enhance real estate reporting frameworks with locational intelligence which can only be facilitated by geospatial technologies. Accordingly, there is little doubt that growing awareness on GIS, increasing integration of GPS to smartphones, and the reducing cost of computer systems are important factors contributing to the growing use of geospatial technologies in real estate decision making in developing countries such as Nigeria.

Aside from the above observations by the Nigerian regulatory body, geospatial technologies continue to transform real estate service delivery in a number of other areas. The first is in the representation of Real Estate activity in the country. GIS has a powerful ability to display land-based features in relation to subject properties, to assign data values to features on the map and to produce hard-copy property maps that can be embedded in valuation reports, brochures, and investment analysis reports.

“Site description in a real estate appraisal document must show GPS coordinate, property size dimension, neighbourhood utility networks, aerial photographs, maps etc.”

The second area in which geospatial is transforming the real estate industry is in the field of Property Analysis. GIS technology can be used as a mapping and organising tools to make real estate developments comparable with one another. It can also



Office building in Nigeria. Image courtesy: Satanoid via Flickr.

help to reorganise property data into different spatial units, categorise and colours according to preferences and criteria; to keep a record of how spatial data might affect property values such as topographical nature of land areas and to keep track of economic activities in a nearby neighbourhood or proximity to a

terms of the Spatial Analysis of Real Estate Market Drivers. A real estate market analyst, such as myself can use GIS technology to measure the distance between one existing or proposed development in relation to another, to identify patterns in property values and how they can be influenced by nearby economic forces such shopping centres or offices etc. As long as locational intelligence is a necessity in real estate decision making, the application of geospatial technologies in this industry is indispensable.

commercial highway. This capability can then be used to compare real estate information across various locations.

The final area in which geospatial technology is transforming the Nigerian real estate industry is in

Bolaji Afolabi is the Author of GPS in Real Estate. He is a Real Estate Consultant, a Passionate IT Expert and a Registered Urban Planner. His real estate and geospatial technology experiences cut across Nigeria and other countries in Sub-Saharan Africa.



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Benefits for Research and Education

A key component of many MSc degrees offered in Universities in the UK – particularly those that fall under the heading of ‘vocational’ programmes – is the importance of external links – to what some of us might call the ‘real world’.

The reasons behind establishing these links are many, but include: to (a) bring outside expertise into the classroom through the provision of guest lectures; (b) provide a way to help students engage with practitioners in the discipline or profession; (c) broaden student horizons; (d) help students begin to network with professionals and practitioners; (e) provide opportunities for students to undertake projects of interest and of use to industry; and (f) provide a pathway to a future career.

Whilst the word ‘industry’ could just be used to mean the commercial world here, in this article the

use of the word is broadened to include consultancies, government agencies, and even academia, all of whom can provide valuable input to the student experience for many MSc degree programmes.

THEORY AND PRACTICE

With an increasing demand for MSc degree programmes that lead to a job being one of the drivers for many students returning to University – either immediately after their first qualification – or later in life – perhaps as a way to change direction or to seek employment – most MSc GIS degree programmes generally seek to combine an element of theory and practice within the modules offered to students.

Theory is clearly very important to GIS education – after all it is an inherently practical subject – providing valuable insight into the philosophy of GIS and

essential background to gain an understanding about geospatial analysis. However, being able to ‘practice what you preach’ is crucial to applying GIS in the workplace. Prospective employers typically look for graduates with both a good background knowledge and understanding of the breadth of the subject matter, but also seek individuals with good practical skills and an ability to communicate with a wider audience. In addition, the individual with a positive, outgoing, and team spirited personality can be a great help in securing a position at interview. Whilst academic programmes clearly strive to assist in developing these personal attributes, employers often perceive there still to be a gap between academic education and the needs of employers as far as providing the right combination of transferable skills to allow a successful transition from the

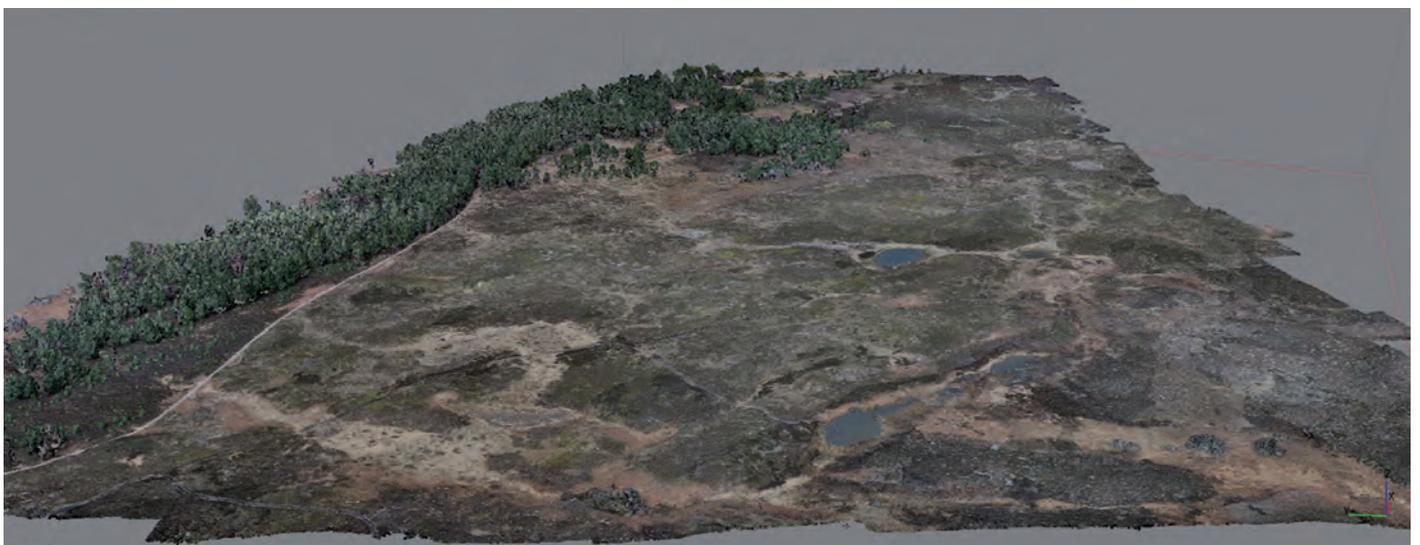


Figure 1. Glacial geomorphology mapping (Muir of Dinnet National Nature Reserve, Scotland, UK) (courtesy of UCEMM and Mat Kellett, Topcon UK).

educational environment to employment.

To this end, exploring different ways to engage with potential employers is vital in order to help academic programmes prepare students seeking employment for the demands and rigours of the outside world, whilst at the same time providing potential employers with the means to access academia and to provide a direct line and platform to be able to offer their advice and to determine how they can best play a role in developing the links necessary to bridge the perceived gaps.

LINKS WITH INDUSTRY

At Aberdeen, the MSc in GIS programme has sought to try to address the perceived gaps in a number of different ways. These include:

Guest Lectures: Inviting guest lecturers from 'industry' to: (a) add value to the coverage in modules; (b) expose students to aspects of GIS that are best delivered by a professional/practitioner; (c) convey examples of current 'real world' GIS applications to students; and (d) help students to interact and network with researchers and practitioners; in some cases leading on to the provision of external dissertation projects, work placement, and supervision.

Dissertation Projects and Supervision:

In addition, external organisations are frequently sought to provide dissertation placements, internships, and supervisory roles in association with the University. This may take the form of a project with supervision, a summer internship, and in some cases a longer-term job opportunity both leading up to and after the student graduates.

Making the Most of Masters (MMM) Programme:

For a



Figure 2. UAV Flying - Cameron L. Gourlay (MSc in GIS) with Dave Scott and Ben Daniels of Bristow Aerial Solutions Ltd. (Aberdeen).

number of years the MSc in GIS degree programme has also been involved with the Making the Most of Masters (MMM) project that seeks to place students with external organisations who put forward a dissertation project for completion.

External Industrial Advisory Board (EIAB):

Another successful approach has the establishment of an External Industrial Advisory Board (EIAB) for the MSc in GIS degree programme comprising representatives from different types of external bodies, organisations, commerce, and government who can bring different knowledge, expertise and backgrounds to the programme. They also provide feedback on the programme modules and content, and advise on specific areas of common interest. The EIAB usually meets once a year to discuss the degree programme and its content, as well as to provide input to the programme in different ways ranging from the provision of guest lectures, site visits, projects, and supervision.

Linking Research to Learning and Education:

As a way to bring various elements of academic research to the students in the MSc in GIS degree programme, developing links to research projects is also important. Within the University there are two research centres that currently offer opportunities for student projects: AICSM (Aberdeen Institute for Coastal Science and Management) and UCEMM (UAV Centre for Environmental Monitoring and Mapping). The latter, in particular, has seen a number of successful commercial links developed to explore the environmental applications of UAVs or drones for remote sensing, monitoring, mapping and modelling. Examples have included both MSc and PhD projects on: vineyard monitoring and mapping; stream channel modelling; coastal monitoring; river habitat studies; saltmarsh, bogs, and wetland monitoring and mapping glacial geomorphology (Figure 1); farm mapping, and the remote sensing of cliffs for Search and Rescue (SAR).

External Collaboration:

Collaborative work with both non-commercial organisations and commercial companies offers many benefits for the student experience, including access to hardware and software, expertise, project supervision, guest lectures, site visits, training, and contact and networking opportunities with, in some cases, a summer internship that can later evolve into longer-term graduate employment. In recent years our students have been able to work with Aberdeen City Council (ACC), Scottish Natural Heritage (SNH), the Moray Firth Trout Initiative, Knock Farm Ltd., the Esk Rivers and Fisheries Trust, the NHS, Chevron, Fugro, Shell, Positioning Resources Limited and Andrews Survey, as well as GPS and UAV/drone suppliers and operators including Positioning Resources Limited, Borich Aircams Limited, Buzzflyer Limited, EagleSystems Limited, GeoDrones Ltd. and Bristow Aerial Solutions Limited (UAS Operations) (Figure 2).

Workshops: The final stage of the MSc in GIS degree programme involves students presenting their dissertation research work to a wider audience. Although they complete a written document from their project research, they are also expected to present their work - in the form of scientific poster and presentation

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- as part of an open invitation workshop. This provides a valuable opportunity – just prior to graduation - for external bodies to see first-hand the work of the students they have been involved with, and an informal way for them to meet with and assess students (Figure 3).

Conferences: The ESRI UK Scottish Conference held annually in Perth, Scotland is also an excellent opportunity for students to find out about some of the current GIS applications, to meet with GIS practitioners, to start to network, and to meet with some of the ESRI UK staff, as well as to be able to hear about some of the upcoming and future developments in ESRI products.

Student Profiles: The MSc in GIS Degree programme also maintains up-to-date student profiles including career paths. These are particularly useful for vocational degree programmes and provide valuable indicators for future prospective students to consider their possible career paths and job opportunities when graduating with an MSc in Geographical Information Systems (GIS).

FUTURE

Future plans to extend the current links to the outside world will include workshop sessions for mock job interviews, and open-day meetings with potential employers to provide students with insights into realistic approaches to assessment and to meet with representatives of industry who actively use geospatial technologies in their work, and to consider the range of job opportunities on offer.

To date our experience with the 'real world' has all been very positive and an aspect of the MSc in GIS Degree Programme that students thoroughly enjoy and benefit from in both the short- and long-term, with many ending up in long-term employment in their chosen field when they graduate.

The obvious benefits for the employer, besides being able to find good candidates for jobs, is to be able to liaise directly with the academic world to see what we do, how we do it, and for us to benefit from their expertise, in-kind contributions, and to see how we can better meet their educational, research, and training requirements.



Figure 3. Jason J. Hagon (MSc in GIS - now with GeoDrone Survey Ltd.) with George Ritchie (Positioning Resources Ltd.) at the annual MSc in GIS Presentations Workshop.

Geo Momentum

Geospatial. Commission. These two words are sending shivers of eager anticipation and, perhaps, just a little trepidation down many of our spines. But are we likely to feel the impact anytime soon?

The government is pulling the UK's land resources into sharp focus. It's making reference to new housing, in particular, and we know the pressure is on to rapidly develop services that can improve vital infrastructure. I'd like to think the UK's new Geospatial Commission will adopt 'geo momentum' as its motto (wouldn't that be good).

We also know that the new Commission's remit will be that of strategic oversight. It is widely accepted that the 'cousins' – HM Land Registry, Ordnance Survey, the Valuation Office Agency, the Hydrographic Office and British Geological Survey – would benefit from working closer together. And the Commission will have to develop a strategy that ensures public sector location data can support economic growth, pro-actively: stimulating investment in the UK economy, generating jobs, and improving services. As a British citizen, that sounds good to me.

Every government feels the pressure to deliver value from its resources. It's hard to recall a moment in peacetime when our public sector has ever been so constrained by tight budgets. The advent of this Commission could not come at a better time – for anyone living in or doing business with the UK, and for all of our AGI members.

The truth is, we're not seeing drawn-out, linear, gradual technological advances anymore. The potential uses for location data aren't likely to diminish thanks to forward-thinking geospatial organisations and their desire to share the #geojoy. The challenge with this exponential development of technology is that its impact can take people by surprise. For the new Geospatial Commission, this is something to bear in mind along with the rest of us.

To keep the UK competitive in the geospatial arena, we particularly need to see a focus on skills – how do we make sure everyone is made aware of the potential for geospatial? How do we keep our organisations equipped with the very best talent to integrate location data into their workflows? We need this, while exploiting the advances in spatial data usage that we know (as geospatial enthusiasts) have the opportunity to be transformational – from digital twins to autonomous vehicles. This will be a key area of focus for AGI during 2018 and one our members have told us is important to both them, our wider community and the UK economy as a whole.

Geographic information reaching the point of ubiquity and the ability to permeate every aspect of our lives, but there is still a real role for us as specialists – and a mission for AGI. We heard this loud and clear during AGI's annual GeoCom conference this year.

David Johnson, deputy director, ONS Data Science Campus, shared the interdisciplinary nature of the work at ONS: "We have to bring all of these skill sets together - but geo is the absolute key to everything we do." Helen Ferrier, chief scientist, National Farmers Union, spoke about the challenges of meeting the drive for increased productivity in the Industrial Strategy through driving value out of data.

As we look ahead to 2018, this is our challenge. The AGI is the membership organisation that's focused on sharing the value of and potential for geographic information in the UK. We are being presented with an opportunity at the highest level. It is our challenge, now, to share the #geojoy even more – and ensure we're all working closely together to help bridge the gaps.



Abigail Page is Chair of the AGI's Council which is formed from elected members of the AGI. Its main role is to set the strategic direction for the organisation. www.agi.org.uk

Got an event to list?

Go to www.gis-professional.com/events

GEOSPATIAL WORLD FORUM

16-19th January 2018, Hyderabad, India
<http://geospatialworldforum.org/>

CONSERVATION OF ARCHITECTURAL HERITAGE (CAH)

23-26th February 2018, Cairo, Egypt
www.ierek.com/events/conservation-architectural-heritage-cah-2

GI4DM 2018

18-21st March 2018, Istanbul, Turkey
www.gi4dm2018.org

GIS/CAMA CONFERENCE

19-22nd March 2018, Houston, United States
<http://giscoma2018.sched.com>

EVERYTHING HAPPENS SOMEWHERE 2018

10th May 2018, Birmingham, United Kingdom
www.geoplace.co.uk

ESRI USER CONFERENCE

9-13th July 2018, San Diego, United States
www.esri.com/about/events/uc/

ESRI GIS CONFERENTIE

19-20th September 2018, The Netherlands
www.esri.nl/evenementen

3RD INTERNATIONAL CONFERENCE ON GIS AND REMOTE SENSING

27-28th September 2018, Berlin, Germany
<http://gis-remotesensing.conferenceseries.com/Europe>

AGI Foresight Report 2020



THE ASSOCIATION
FOR **GEOGRAPHIC**
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The AGI Foresight Report 2020 gives insight into the issues we believe will have a significant impact on our economy, environment and society over the next five years. The purpose of the Report is to both observe and challenge the current role of Geographic Information (GI) in relation to these issues.

The Report highlights five key themes that are of relevance, not only to the GI industry, but to anyone with a vested interest in how technology and information will change our world and businesses in the next five years. These five themes - Open, Big Data, BIM and Future Cities, Innovative Technologies and Policy - form the backbone of our Report, bringing together papers from experts across industries and disciplines.

They show that the GI community can, and must, play a big part in helping us to understand and maximise benefits from these areas, and meet head on the challenges and opportunities the next five years will bring.

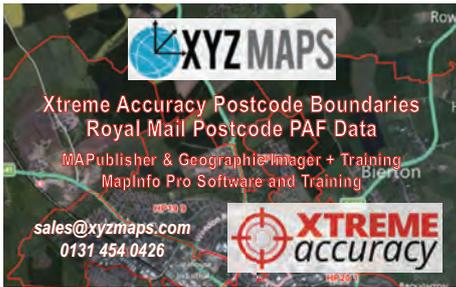
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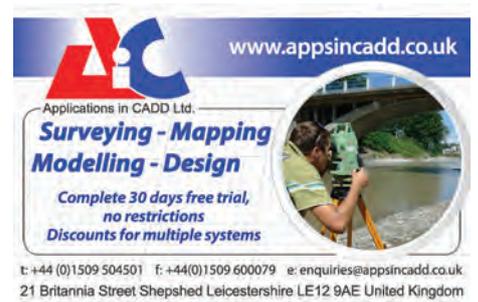
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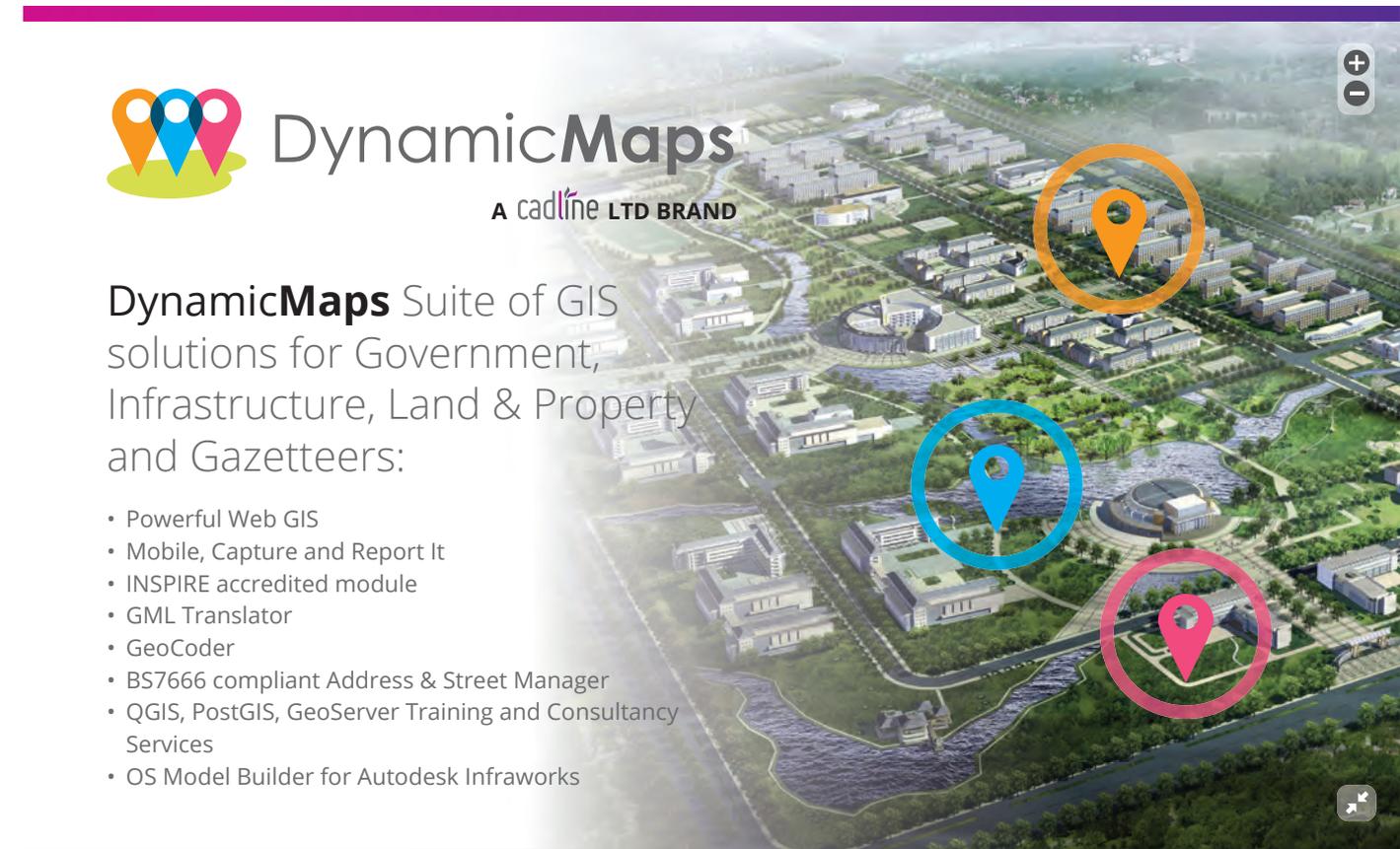


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