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...joining the geospatial jigsaw

Monitoring, Mapping and Modelling Saltmarsh

Big Geospatial Data helps modernize the Statistical Field

Where does the Smart Cities drive leave Urban Planning?

3D Mobile Mapping Technology Inspires Positive Change

The revolution of GIS in map making

Australia – A Nation Embracing its Geospatial Future

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COVER STORY

Aerial data collection equipment recently used to help monitor, map and model the level of Saltmarsh along the coast of Scotland.

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Copy Dates Editorial: 11 September
Advertising: 18 September

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Views of the GIS Professional Contributors

It was a pleasure getting this issue together – the theme Big Data sounds abstract and perhaps has first association with cloud computing, servers and other not-so-spatial aspects. We take a look in on Australia and their history of managing geospatial data and Singapore for an interesting case about a smart cities – and the management of geospatial data that is hard to get as it involves areas that are not easily accessible from the street.

Digging into the huge amount of geospatial data that nowadays involves city architechures, Niall Conway reflects on the new profile of a city planner. What are the skills they should have… or acquire? It again shows that geospatial data is everywhere!

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

With all of the talk within the geospatial industry now turning to the topic of earth observation it makes sense that the Copernicus Programme seems to be the real flavour of the moment. Directed by the European Commission in partnership with the European Space Agency (ESA), this single earth observation programme, the world's largest of its kind, is now well and truly operational.

The 6.7 billion euros programme consists of numerous satellites (called 'Sentinels') capturing realtime information about the world for the purpose of achieving better decision-making, increased innovation, and better climate preparedness. The freely available online Copernicus data will allow geospatialists in particular to explore massive new opportunities.

Niall Conway,
contributing editor

UAVs have come a very long way in a very short period of time. They have progressed from the novelty toy gift under the Christmas tree, to small, low-cost, smart platforms carrying an array of miniaturised sensors to gather thermal data, multispectral and NDVI imagery, and Lidar for many applications. Reaching their current potential has recently been aided by improved battery life, autonomous flight capability, object avoidance technology, waterproof drones capable of take-off and landing on water, and commercial aerial survey solutions using improved horizontal and vertical positioning systems such as RTK GPS and PPK at more affordable prices.
What will really release the vast future commercial potential of this exciting technology from its current constraints though is the need to develop a robust infrastructure for safe drone operation; including proper legislation, standards, beyond line-of-site operation, and a secure air traffic management system.

David R. Green, contributing author

URISA Board Candidates Announced

URISA's Leadership Development Committee recently presented its recommended slate of candidates to the URISA Board of Directors and the Board has now approved the slate for its 2017 election. Those elected will begin their three-year Board terms following the GIS-Pro 2017 conference in Jacksonville, Florida, USA in October 2017. URISA is presenting the following candidates for URISA President-Elect and for Directors on the Board.

• ***bit.ly/2w2UDV6***

Airbus Global Elevation Data Added to ArcGIS

Airbus Defence and Space WorldDEM4Ortho elevation data is soon to be part of the growing ArcGIS Online Living Atlas of the World. Covering the entire earth's land surface, this is the most consistent and accurate elevation model for ensuring that imagery is properly calibrated to geographic standards on a global scale. This data will be available for online end-user applications and developers creating apps with a specific need for elevation information. Navigation systems, for instance, can use 3D road data to give drivers better estimates of fuel costs based on the terrain.

• ***bit.ly/2w2HMIS***

Global Elevation Data in ArcGIS.

MAPSearch Launches ENvision Solar

ENvision Solar screenshot.

MAPSearch has launched their online mapping platform ENvision which enables users to locate, display, and analyse energy infrastructure using the same data licensed to their GIS customers. The platform is customisable and its assets can be searched, sorted, and displayed according to numerous details, including owner, operator, voltage and more.

• ***bit.ly/2w2AzCf***

Wirral Council Migrates Existing Corporate GIS to Cadcorp

Wirral Council joins Warrington, Sefton and Halton Borough Councils in selecting Cadcorp for intranet and internet web mapping capabilities. At Wirral Council, geographical information is shared with the public through self-service and with 40 teams across the Local Authority. Cadcorp will supply the council with its off-the-shelf web mapping product, Web Map Layers. This application offers a Local Knowledge feature allowing both the public and council to query location based information, such as rights of way and electoral boundaries. Cadcorp's desktop GIS, Map Modeller will be used by the council for administering the data layers.

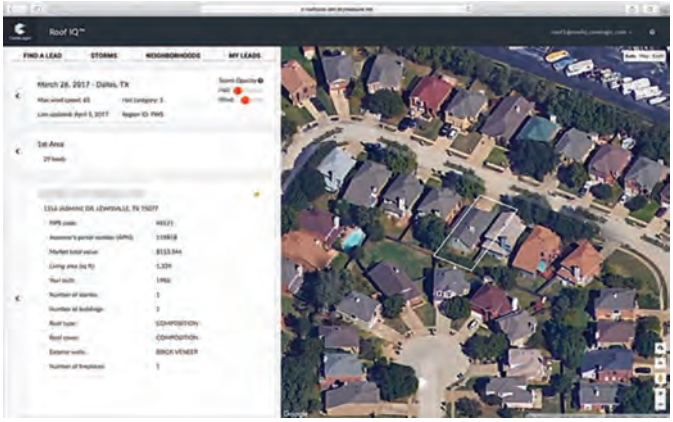
• ***bit.ly/2w2Wppc***

New Brighton in the morning. Image courtesy Simon Birch via Flickr.

Storm Damage Identification Service

CoreLogic, a leading global property information, analytics and data-enabled solutions provider, has announced the launch of Roof IQ, that pinpoints specific homes damaged by storms so roofing professionals can more effectively identify what needs to be done. The service uses advanced geocoding technology, as well as its comprehensive property-level database, to target individual homes within a storm's path that have suffered significant damage from wind or hail.

• ***bit.ly/2w2QgJT***



Roof IQ software.

Top 5

Most popular news and articles last month on www.gis-professional.com

GIS Challenges and Trends in 2017	bit.ly/2w2ylCQ
A Look at Low Code and No Code Platforms in GIS	bit.ly/2w2UxwG
The Role of Geological Data in the SMART City Agenda	bit.ly/2qvic7J
Geospatial IoT and the Digital Twin	bit.ly/2w2K1pt
Three D's Drive Government	bit.ly/2w2S0Tf

SuperSurv 10 Selected for Coastal Protection in Thailand

Supergeo's mobile GIS-app SuperSurv 10 has been selected by the government agency that is in charge of protecting marine and coastal resources in Thailand for spatial data collection. The core mission of this department is to conserve and restore the precious flora and fauna resided in the marine and coastal ecosystem.

• ***bit.ly/2w33tlM***

Phang Nga, Thailand.

INSPIRE 2017: Digital Europe Thinking out of the Box

From 4 to 8 September 2017 in Kehl, Germany, and Strasbourg, France, the INSPIRE Conference 2017 will be the place to meet and discuss the progress reached so far in the implementation of the INSPIRE Directive and to examine new opportunities and possibilities for accelerating the implementation of the INSPIRE Directive by 2020. During the Conference, representatives of the public and private sector will elaborate how to 'INSPIRE a digital Europe: Thinking out of the box', to manage the challenges in the implementation and to learn from the achievements of the neighbours!

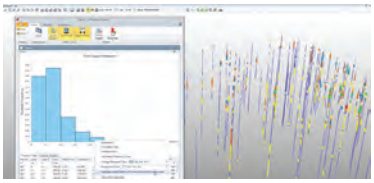
• ***bit.ly/2vak1w1***

INSPIRE Conference 2017

Statistical Tools for Mine Planning

Hexagon Mining has introduced Sigma, a comprehensive package of statistical and geostatistical programs to analyze and evaluate drillhole, blasthole, and model data. Part of the MineSight mine planning suite, Sigma includes time-saving workflow features for resource geologists and other mining professionals tasked with building a block model.

• ***bit.ly/2w2J4xt***



Screenshot of the Sigma tool.

BY SHARON ROBSON AND JOOST BOERS

Esri UK User Conference 2017
Forward thinking with a great buzz

On the 16th May 2017 for the fourth year running, the QEII Conference centre in bustling Westminster, within walking distance to the houses of parliament, Big Ben, Westminster Abbey and the London Eye in the distance played host to the popular Esri UK Annual Conference. With record breaking attendance of 3,000 visitors it was clear that the industry were here for the event and not the sightseeing!

'GIS Enabling a Smarter World' was the theme of the conference and delegates were welcomed in the Plenary by Pete Wilkinson, Head of Professional Services Group Esri UK, who gave a brief overview of the day before handing over the Stuart Bonthrone, Managing Director Esri UK.

The conference itself boasted an impressive 60 individual sessions across a number of tracks covering a vast range of topics from training and demos to examples of how ArcGIS has assisted with projects within various industries and organisations.

Stand out sessions included the plenary opening session with Stuart Bonthrone, managing director of Esri UK. He hit the nail on its head by looking at the urban geospatial aspects as well as the need to protect the environment: "The UK's steadily growing population is creating challenges that affect us all. There is the urgent need to build more homes and schools for young families, expand our healthcare services to meet the needs of our aging population, improve our transportation infrastructure and increase food production. Yet, at the same time, we need to preserve our natural landscape, protect wildlife habitats and ensure public safety in an ever-changing context of risks ranging from flooding to terrorism. The challenges are getting tougher. So the solutions need to get smarter."

Stuart Bonthrone opening the conference.

ENGAGING WITH LOCAL COMMUNITIES

Another standout presentation made was by Zennon Hannick, CTO of Comic Relief, the charity that's moving towards engaging communities and is using ArcGIS to visualise relevant data, make decisions and to create engaging and locally relevant content: "If you consider that you are likely to be within 30 miles of a Comic Relief funded project, you can understand how far more compelling it is to engage with local people through geo-targeting around a locally funded project. The result is better awareness, better fund raising and vitally better understanding of how raised funds actually make a difference to people's own local communities."

Sessions on the use of GIS with urban planning by Land Use Consultants focused on finding spots for new housing and the Greater London Authority on long-term planning for infrastructure. National Trust presented a session on understanding and restoring the natural world using ArcGIS. Huw Davies, head of conservation information at National Trust, unveiled that "60% of species in the UK have decreased in number over the last 50 years and, as a major British landowner, we are helping to reverse this catastrophic decline in biodiversity. We are using ArcGIS to identify

Keynote speaker guerrilla geographer Daniel Raven Ellison.

A packed QEII Conference foyer during a break.

threatened habitats, implement conservation schemes and monitor the success of wide-ranging initiatives to create thriving natural environments." During the day, other sessions focussed on the role of GIS when coping with floods, optimising mobile phone networks, facilitating meetings and retail results. Esri UK also took care of various sessions on working with ArcGIS - professionals shared how to get the most out of the package. And this was just some highlights from the long list of knowledge available from a wealth of different angles.

TIME TO CELEBRATE

Of course, the conference was an ideal time to highlight performances achieved using the Esri software. This year, a record number of applications were received. The winners of the awards were called on stage:

- Planning & analysis: Hampshire Fire & Rescue Service
- Operational Awareness: Transport for London
- Field Data Collection: TEAM2100 CH2M and Environment Agency
- Asset Management: Tarmac
- Community Engagement: University of Exeter

And actually, a bit of the best was kept until last. Keynote speaker guerrilla geographer Daniel Raven Ellison concluded the day with a thought provoking concept of highlighting the city of London as a nature park city, of course illustrated by various maps and interesting facts. A side lesson of the afternoon being that the delegates in the room seemed to better appreciate foxes than hedgehogs.

WHO EXHIBITED?

Alongside the conference was a packed room of over 20 exhibitors. The room had a good position for attendees to visit all exhibitors during the lunch and refreshment breaks. Ordnance Survey, Britain's mapping agency, was in a prime position as the events platinum sponsor.

Gold sponsors of the event included Harris Geospatial Solutions, who demonstrated their latest automated exploitation solutions to solve complex problems in a variety of industries including agriculture, utilities and defence; while 1Spatial showcased their 1Integrate for ArcGIS solution, which provides automated data validation and management for the ArcGIS platform.

EOS Positioning was exhibiting alongside MGISS, the UK distributor of the Arrow series of High-Accuracy GPS and GNSS receivers for mapping, field data collection and inspection; GeoSLAM exhibited their market leading "go anywhere" 3D mobile mapping technology alongside their UK distributor Opti-cal Survey Equipment. The companies gave live demonstrations of the handheld ZEB-REVO mobile scanner.

Other exhibitors included Avineon, DigitalGlobe, Differentia Consulting, Helyx, HERE, MarkLogic, BlueSky International Ltd, InstantAtlas, TomTom, Royal Geographical Society, Edina, Field Studies Council, The Geographical Association, British Cartographic Society, 42 Engr Regt, MapAction and Transport for London.

Despite being a UK conference the whole event had a global forward thinking feel and a great buzz, full of opportunities to network, learn and expand our knowledge of how GIS is being used more and more in day to day living - super conference and trade show provided by Esri UK.

BY JOHN ALLAN

3D Mobile Mapping Technology Inspires Positive Change

Future Proofing Singapore

Singapore is home to some of the most profitable financial services, manufacturing and oil-refining corporations in the world. An island state just off the coast of southern Malaysia, its small size has clearly not impeded the success of residents or firms choosing to locate themselves there. But with its accomplishments come some very specific challenges for a city which is limited by space but still demanding growth. This article discusses how 3D mobile mapping is contributing to one of the most ambitious digital twinning projects the world has ever seen, in the hopes of paving the way for better future-proofing and infrastructure planning for Singapore's Government.

Future planning is a vital focal point for Singapore's powers that be, and so technology projects that support and prepare for any necessary improvements in legislation, commercial operations or infrastructure have seen significant increases in funding.

HOW TO FUTURE PROOF SINGAPORE'S SUCCESS

Examples of challenges range from the commercial to the medical. For example, a boost to the economy and infrastructure may subsequently require improved wide-reaching, high quality coverage of 3G or 4G networks. Conversely, with a population increase there may be a need to update existing protocols for emergency evacuations in the most densely populated part of the state.

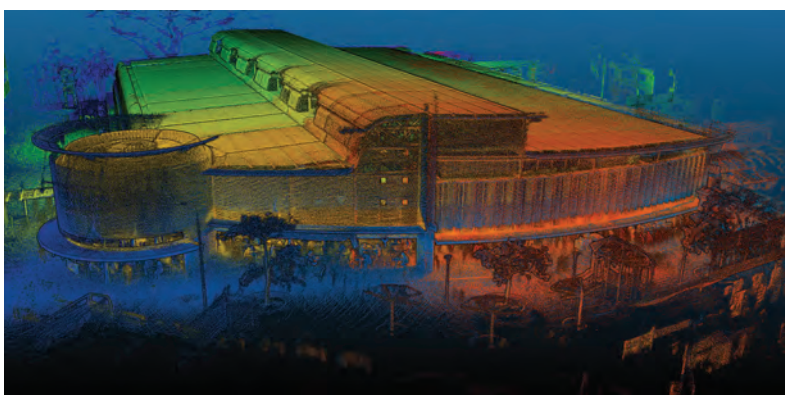
To respond to 21st century challenges, comprehensive, interactive, easily interpreted data is useful to a whole host of stakeholders – and not just those familiar with urban planning and development. But how do you best facilitate this, given an environment that is so densely populated, routinely altered and complex in arrangement?

THINKING 'SMARTER'

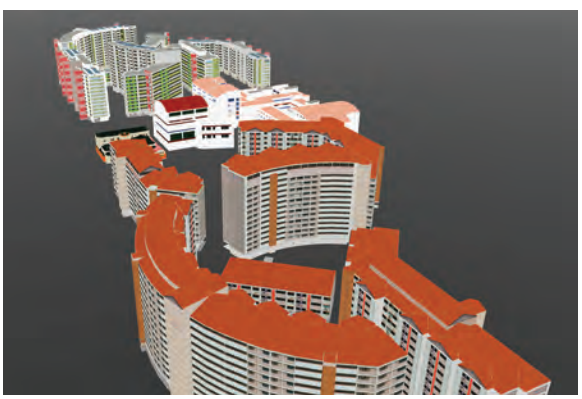
One answer is to explore the concept of 'smart cities', using 3D mobile mapping and other technology to create an interactive, highly detailed platform which can be used by any third party to solve emerging and evolving challenges for any given location.

Defined as an "urban development vision to integrate information and communication technology (ICT) and Internet of things (IoT) technology in a secure fashion to manage a city's assets", a 'smart city' will allow Singapore to develop solutions to tackle urban problems more effectively and efficiently. 3D mobile mapping is a crucial element of this.

For this particular region, one key smart city solution is titled 'Virtual Singapore', a dynamic 3D city model and collaborative data platform, including 3D maps of the region. Championed by the National Research Foundation



Point-cloud of a building.



Building models created from the scans.

(NRF) and delivered by a joint partnership between Dassault Systèmes, the Singapore Land Authority (SLA) and Government Technology Agency of Singapore (GovTech), the scope and scale of the project is huge.

Once completed in 2018, Virtual Singapore will be the authoritative 3D digital platform intended for use by the public, private and research sectors. The tool will contain previously-collected and real-time data, allowing users to simulate both present and future scenarios. Costing $73 million (SGD) for the development of the platform as well as research into latest technologies and advanced tools over a period of five years, Virtual Singapore relies on the key input datasets from multiple sources to build up a clear, accessible, comprehensive tool to analyse Singapore's built environment.

HOW 3D MOBILE MAPPING SUPPORTS VIRTUAL SINGAPORE

Interactive 3D maps require accurate data acquisition and digital replication of data in order to create an as-close-to-reality environment as possible. This is where new handheld scanning technology comes into its own.

AAM, an international geospatial services company specialising the in collection, analysis, presentation and delivery of geospatial information, has been working with the SLA to build and develop a national 3D map of Singapore since 2013. Combined with AAM's data, Virtual Singapore will integrate existing geospatial and non-geospatial data sources to describe the city with the necessary dynamic data ontology, whether this be demographics, movement of people or climate to name a few.

The project commenced with an airborne LiDAR and imagery survey to produce terrain and building models. After importing the 160,000 standalone 3D building models into Virtual Singapore, an obstacle emerged. Certain housing blocks maintained by Singapore's Housing and Development Board would require additional measurement at ground level, since an aerial survey would not adequately capture information on 'void decks' in enough detail.

This issue soon became city-wide, due to the prevalence of these 'void decks', which are open spaces typically found on the ground floor of the region's apartment blocks. These spaces are routinely used for community endeavours such as socialising, functions, and other commercial enterprises such as grocers, dental clinics or bakeries. Arguably, one of the most interesting functions of these void decks is the ability for pedestrians to walk across blocks at ground level, rather than circumnavigating around them.

Despite having access to the original floor plans, they were outdated, having not incorporated any changes to the void deck during the lifetime of the building, such as disability adaptations like access ramps or handrails. As such, after a ground vehicle based mobile LiDAR and imagery survey to add in models for transportation (roads, bridges, tunnels etc), it was soon apparent that further enhancement of detail within these blocks would be necessary.

CHOOSING THE DETAILED SCANNING TECHNOLOGY

Virtual Singapore requires semantic 3D modelling, which comprises detailed information such as texture and material representation of geometric objects. In real terms, this means that models of buildings

Handheld mobile mapping allowed for scanning and positioning the buildings.

encode the geometry as well as the components of a facility, such as walls, floors, and ceilings, down to its fine details, as in the composition of granite, sand and stone in a building material.

A new stage to the project was therefore conceived to enhance the existing building models. Using the original data taken in the airborne and ground level scans as a foundation, additional measurements taken using a handheld scanner would then create a better picture of the textures on building façades to include these void decks. Better detail would also mean increased >

Presentation of Virtual Yuhua district.

accessibility for all, given the optimised nature of the map when viewed on the web.

AAM modelled 60 buildings in this fashion during an initial trial project in the Yuhua precinct of Singapore, followed by a larger project of 400 buildings in Ang Mo Kio. This gave the opportunity for AAM personnel to test out a number of different scanning methods for capturing the required ground data – and the GeoSLAM ZEB-REVO handheld scanner proved to be the most innovative and efficient method for the task at hand.

HOW THE TECHNOLOGY WORKS

Handheld mobile mapping systems utilise laser light to identify unique 3D structures within a survey environment, this is then coupled with software to build up a three-dimensional map of the survey.

In many scanning solutions, a combination of GPS satellites and fixed tripods provide the ability to capture information to create a 3D map. However, in enclosed, indoor or underground spaces whereby direct line of sight to satellites is impossible or impeded, precisely like these void decks in Singapore, GPS-reliant mapping solutions are not suitable.

ABOUT THE AUTHOR

John Allan is Vice President of Sales and Marketing at GeoSLAM. An experienced Sales and Marketing professional, John has successfully built S&M infrastructures and channels for both established and start-up companies across the world.

John has extensive global contacts in the GIS, Remote Sensing/Photogrammetry and Maritime industries.
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As such, AAM's chosen tool utilises technology that was developed by the robotics industry, Simultaneous Localisation And Mapping (SLAM). GeoSLAM's ZEB-REVO uses a 3D SLAM algorithm to establish its position autonomously and collects over 43,000 measurement points per second with an average accuracy of +/-15mm. As well as requiring minimal training and a 'walk and scan' method of data collection, rapid mobile mapping is conducted with a ZEB-REVO much more quickly than traditional surveying methods, such as cumbersome tripods or trolleys with trip hazards.

For a project the size of Virtual Singapore, the ability to survey locations up to 40 times faster than static traditional scanning tools was a huge plus point. Saving time walking through the desired scan location led to significant cost-saving without compromising on data quality.

After capturing the scan data, most professional CAD or modelling packages allow direct import of scan data, and once complete, AAM could export their map into the required file format - in this case, the CityGML file format. Ultimately, using a ZEB-REVO resulted in a much quicker process from start to finish, which then subsequently speeds up the next stage of the Virtual Singapore project.

RESULTS

With a ZEB-REVO, AAM's field teams were able to quickly capture a dense and accurate point cloud of an entire void deck, which was then used to model the deck geometry and incorporate this into the existing building models.

Once processed, the data allows a much better understanding and analysis of these structures. Throughout the course of the Virtual Ang Mo Kio project, 376 buildings with void decks were scanned using the ZEB-REVO, taking approximately 100 hours – a huge time-saving exercise which would have ordinarily taken up to 40 times longer if using traditional surveying methods.

LOOKING AHEAD AT SINGAPORE'S FUTURE

Virtual Singapore, when complete, will offer four major capabilities, namely virtual experimentation, test-bedding to validate the provision of services, planning and decision-making and future research and development (R&D). The GeoSLAM ZEB-REVO provided a huge contribution into ensuring that tight deadlines could be met without compromising the quality of data being produced. In fact, the ZEB-REVO was actually faster and more accurate than other methods trialled.

The speed of data acquisition and huge reductions in personnel on-site time have led to massive cost savings. Similar large-scale engineering projects have seen savings of two-thirds when compared to traditional, static scanners. With such clear cost-saving benefits, together with the opportunity for highly detailed and rapid results, it is little wonder that AAM chose to use the ZEB-REVO for this daunting and large-scale project.

The R&D capabilities of Virtual Singapore are expected to soon allow the creation of new technologies for public-private collaborations to create value for the region.

MORE INFORMATION:

- https://www.tech.gov.sg/TechNews/DigitalGov/2017/03/5-things-toknow-about-Virtual-Singapore
- www.geoslam.com

BY ADENA SCHUTZBERG

Smart Speakers, Voice Assistants and Location

Do you speak to a voice assistant? Perhaps you ask Google Assistant via Google Home to check the local weather or have Alexa via an Amazon Echo tell you a "knock knock" joke. You might request more complex tasks like finding a local restaurant with open tables for tonight. For now, those are about the extent of current assistants' spatial capabilities.

I dug into the Amazon Echo's "skills," the name for the voice activated apps it runs. The most utilitarian skills related to maps and location offer answers to questions like "How long will a known commuting route take today?" or "Where is a person (who must be sharing their location information via an app on their phone)?" Alexa can also offer a response to "Where is my favorite food truck?" I also found several skills that store the locations of objects. The user announces where something is, "My keys are in the right-hand desk drawer," so it can be recalled later, with "Where are my keys?"

There are some "educational" games offering geographic trivia questions or fun facts. One game challenges the player to identify contiguous states in the U.S. starting from one coast to reach the other coast. Several skills report back the latitude and longitude of a city, though I'm hard pressed to identify a common use cases for that skill.

Google Home doesn't have skills or apps, but rather depends on the search engine's ability to mine data from the Internet. Queries about traffic, local events and businesses, weather and travel information are fair game. Users can build "recipes" that use location information to trigger an action in a supported device by using the scripting tool IFTTT ("If this, then that"). For example, with supported sensors and connected appliances, it'd be possible to start the oven when a specific vehicle crossed a geofence.

Apple's entry into the smart speaker space, the HomePod, based on the iPhone's Siri, was announced in June and is expected to ship in December of this year. My suspicion is that like Amazon and Google's offerings, it will support only basic location queries at launch.

WHAT'S THE ADVANTAGE?

Why are smart speakers so popular? I'll suggest part of the success relates to location. For Google and Apple, these speakers take the "smarts" of their respective in-phone assistants and bring them into the home for the family to use. For Amazon, the Echo and its progeny, the Dot, Look and the Show, put Alexa's smarts, and an open shopping cart, in every room. If consumers follow the smart speaker vision to its logical conclusion, these devices will be located across a property such that users can get a response to a request from any square inch, inside or outside the house!

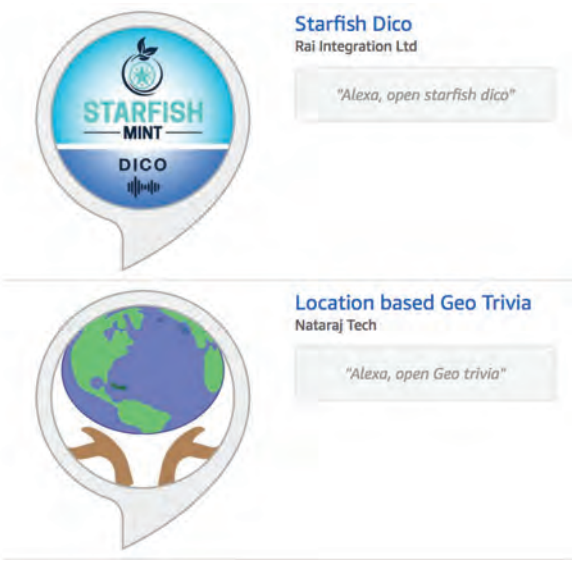
The other reason for the speaker's popularity is the interface. Speaking the "wake word", from wherever in the house the user happens to be, prompts a response. That can prevent a lot of wasted time getting out of bed, washing hands or settling children before getting the information of interest!

With over 25 years experience, Adena Schutzberg helps organisations use geospatial technologies through the ABS Consulting Group. She is a member of the Esri Education Team.

WHAT'S NEXT?

Perhaps the most valuable products of the widespread use of these assistants, both at home (via smart speakers) and away (via a mobile device), are the data collected about each user. Data on what an individual asks or orders from these locations can lead to incredibly detailed service offerings and marketing opportunities. The future may hold some mix of exceedingly valuable suggestions and endless annoying promotions.

From a geospatial standpoint, I hope these assistants will include more support for spatial queries via voice. I'd like to be able to ask, "When can I expect the 88 bus at the stop at the corner?" and "When should I expect it to start raining in Prague tomorrow night?" The future, I suspect, will not be a quiet one.



Two of the Amazon Echo's top rated location skills. Starfish Dico tracks and communicates with selected individuals and Location Based Geo Trivia offers a question and answer game.

BY NIALL CONWAY

Australia - A Nation Embracing its Geospatial Future

Despite having a population which is relatively small to its geographic size, Australia is a country which punches well above its weight on the global geospatial stage. In this article Niall Conway provides an overview of the Australian geospatial industry, its active community, as well as the many geospatial initiatives which are taking place in the land Down Under.

Although Australia's first map by Western definition can be traced to the relatively recent date of 1810, it is actually a land with a long, rich history of maps. The second largest continent in the world contains a complex web of Aborigine migration routes known as Songlines which were used by indigenous tribes for essential seasonal migration through the lands of other tribes. According to this tradition, each tribe owns a verse of the 'song' which contains rich metaphorical language to describe the local landscapes of the tribe. By sharing Songline verses with one another, other tribes would be able to navigate the unfamiliar landscape by reciting the borrowed verses, thereby ensuring their tribe's survival.

While such customs are less well known today, it is fair to say that maps still remain as important as ever to the continent's people. In many ways, it is the success of the Australian natural resources industries which helps to explain why the local geospatial industry is as strong as it is. Since Australia's early agricultural and mining days, through to the resources boom in states such as Queensland and Western Australia over the past decade, industry leaders have a strong history of investing in the mapping profession in order to protect the nation's natural and man-made wealth.

GROWING COMMUNITY

The Australian geospatial community, together with the space sector, provides direct employment to approximately 100,000 people (PwC, 2013). The country boasts a thriving geospatial community which receives strong support from local bodies like the Spatial Industries Business Association (SIBA), Surveying & Spatial Sciences Institute (SSSI), and it has an active representation on international bodies such as Geospatial Information & Technology Association (GITA). Perhaps a most recent indication of the country's emerging status on the global geospatial stage is that

in March 2017, Sydney attracted industry leaders to the city when it merged the International Society for Digital Earth (ISDE) annual conference with Locate17, the spatial and surveying conference of Australia and New Zealand.

The geospatial industry receives broad support from the Australian government at all levels - federal, state, and local, and with bodies such as ANZLIC (the Australian and New Zealand Spatial Information Council) leading the development of the Australian Spatial Data Infrastructure (ASDI), this nation seems well on course to fulfil its Smart Cities and energy security agendas. Furthermore, Australia is using its expertise in the geospatial field to help overcome its relative geographic isolation, and it is now actively involved in the international geospatial community. At the inter-governmental level, Australia is represented on the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM), the Group on Earth Observation (GEO), and it has an active membership base within the Open Geospatial Consortium (which recently made Geoscience Australia one of its Principal Members). With regards to other overseas involvement, the Australian Cooperative Research Centre for Spatial Information (CRCSI) has recently announced a collaborative research project with the Japanese Aerospace Exploration Agency which is focused on using satellite positioning to assist the agricultural industry. Australia has also established working agreements with both the European Space Agency (through which it receives data from the Sentinel satellites) and with NASA (which recently helped Australia to launch three earth observation satellites, the nation's first satellites to go into orbit in over 15 years).

Domestically, Australia is also sowing the seeds for home-grown geospatial innovation. The Australian government regularly supports corporate hackathon events which encourage entrepreneurs and innovators to solve real world problems using geospatial solutions, and it has recently simplified its procurement process in order to help smaller tech businesses to tender for public contracts. The government has a strong commitment to providing open data through its data.gov.au portal, and earlier this year the government-owned company PSMA launched the groundbreaking Geoscape platform which will soon provide high-resolution geo-coded built environment datasets for the whole country. Perhaps one final indication of the opportunity which the geospatial field now presents, is the notable example of Campbell Newman's, the former Premier of Queensland, forays into the industry. Not long after introducing world leaders to Brisbane for the G20 Summit in 2013, Newman stepped away from political life in order to focus his attention on the business of location-driven agricultural robotics. Considering Australia's attempts to scale up its agricultural industry and become the 'food bowl' of Asia, this move into the geospatial world by Newman, and others like him, could be a very wise one.

In relation to the idea that Australia's geographic isolation from international markets is a disadvantage for the industry, Igor Stjepanovic, local entrepreneur and founder of the popular crowdsourcing platform Gruntify, disagrees. His business has exported and partnered right across the Middle East and North America, with Asia and Europe soon to follow. According to Igor, Australia's opportunities are now global, and he believes that a business's success simply comes down to its ability to compete in terms of ideas as well as to attract the attention of clients.

Nevertheless, the Australian geospatial industry is not without its challenges. Despite currently boasting a strong geospatial community, Australia will require more IT and surveying skills if the industry is to scale to its full potential. However, with recent immigration reforms requiring employers to favour locally sourced skills over those from overseas, some question marks regarding the industry's ability to do so remain. Although Stjepanovic, whose company has previously used the 457 Visa system to sponsor overseas workers, respects the government's decision, he does warn of growing competition for professionals with the right mix of skills. He adds: "In our particular field, the skills shortage is compounded by not having enough graduates study surveying, spatial and software development courses. We are hopeful that young Australians will step up to the challenge and start to fill the skills gap that is emerging."

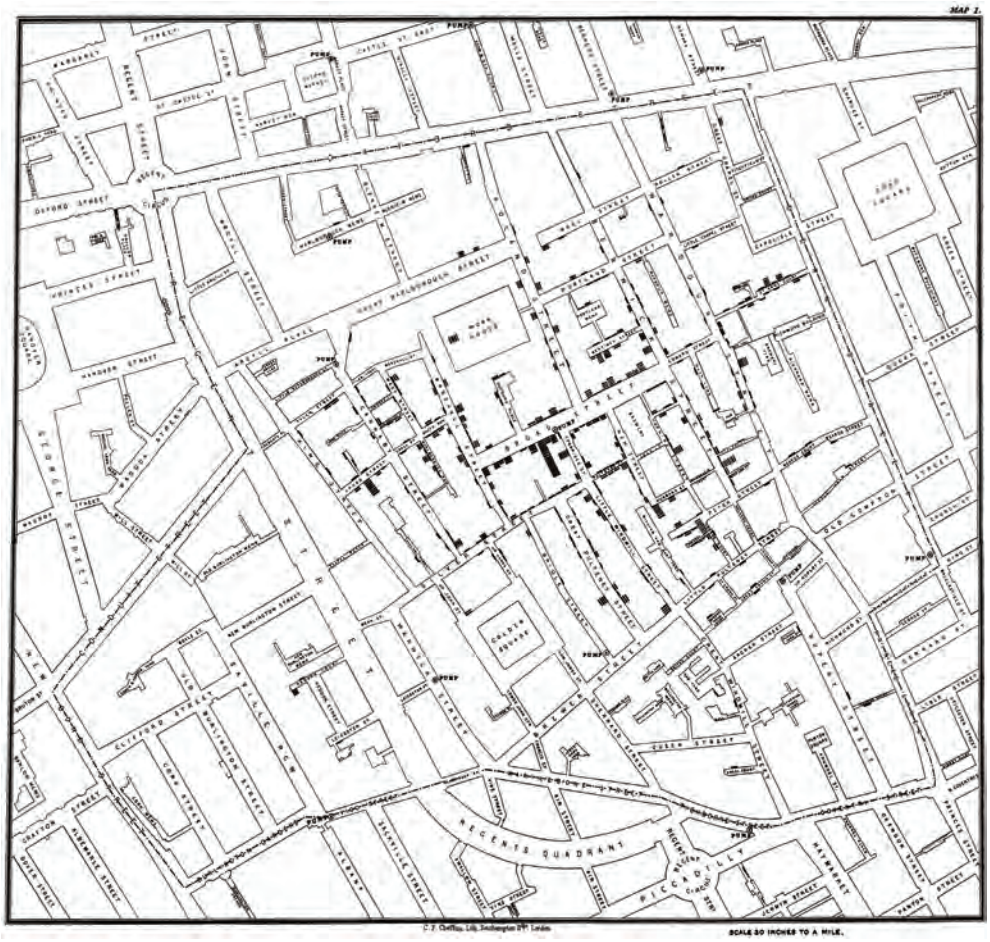
Despite facing potential hurdles to the industry's growth, Australia is a nation which 'gets' the importance of geospatial technology and information. The industry has so far played a key role in helping the country to avoid recession for some 25 years, and Australia boasts a thriving geospatial community which receives widespread support. Perhaps due to the sheer size of the country and the long association which it has with maps, the Australian people understand the value of location, as well as the many opportunities which it presents.

BY SABINE DE MILLIANO

The revolution of GIS in map making

Visualising that what we do not know yet

GIS is crucial for map making nowadays and we could barely imagine cartography without digital data acquisition, processing, analysis and visualisation. But the art of map making is much older than GIS. Ever since the first maps were created thousands of years ago, cartographers have been busy with the collection, processing and careful representation of the world around us – in many output forms and crafted with various tools. How did GIS and data acquisition developments in the 20th century revolutionise this process and, consequently, our use of maps? This article highlights some of the developments we now take for granted, but also changed the world of maps forever.



A map by John Snow mapping the cholera outbreak in London, 1854. (Image courtesy of University of Delaware)

The production chain of modern maps is all digital in most cases. Data is collected in digital form and stored in a geospatial database, after which datasets are processed, combined and styled before they are graphically represented as a map. Sometimes maps still end up being printed on paper, but many modern maps now remain digital. Think for a moment about the maps you use in daily life. From your car navigation system to a running app on your smartphone and simple maps shown on news websites; digital maps are everywhere. Where maps once were a special and powerful tool only available to the happy few, maps are now a commodity that most people take for granted. How did the world of maps evolve to this point?

TWO SEPARATE WORLDS

Today, one dataset can have numerous output maps and one map can be made up of numerous datasets. In modern map making, data and representation are two mostly separate worlds. But this has not always been this way. Long before the digital era, maps were also their own database. In case (all copies of) the map got lost, the data that map represented was lost as well – there simply was no spatial database to recreate the same map again. Data was created based on travel experiences, gathering people's individual

knowledge, manual measurements and various types of historical resources. All these sources were combined and brought together in one dataset: the map itself. This required specific creative skills of the map maker to interpret and combine the (often subjective) data.

EPIDEMIOLOGY

One of the earliest recorded uses of geographical data for analysis was in the 1800s for epidemiology. In 1832 there was a cholera outbreak in Paris, and geographer Charles Picquet was able to identify the source of the disease by marking the location of deaths on a map. They appeared to be clustered around a particular water source. In 1854 a similar analysis was done successfully by John Snow during a cholera outbreak in London. They were the first few GIS users, even though that term was only introduced more than 100 years later.

OBJECTIVE AND UP TO DATE

Much has changed since various data acquisition innovations emerged in the 20th century. An important development was the invention of flight, which enabled aerial photography and its use as a source for military map making since World War I. With the innovation in both photography and the aircraft industry it now became possible to regularly fly over a region to capture it, which later also became an important data source for civilian cartography. A similar pivotal development was gaining the capability to put satellites into orbit, such as NASA's Landsat programme since the 1970s and ESA's ERS programme in the 1990s. Aerial photographs and satellite imagery could now provide cartographers with objective and up-to-date data sources to create or improve maps. Together with the development of GPS and its commercial use growing since the 1980s, this greatly improved the data acquisition step in map making – and made data acquisition a discipline largely separated from cartography from now on.

BITS ON TAPE

Despite the rapid technological advancements in aerial photography and the boosting space industry, computers still had very limited memory in the 1960s, which made the development of the first generation of GIS a real challenge. Some technological breakthroughs were required first, such as map scanners and the development of software to represent geographic information as digital bits (to save on tape and later on other media). These developments made it possible to digitise, manipulate and analyse that which was once only available on paper. A new field of expertise was born with people now focusing on the digital storage and analysis of geographic data.

GUI

Another development worth mentioning is the invention of the graphical user interface (GUI) for computers, which made it much easier to perform geographical analysis. While some readers might cherish memories of the earlier command line interfaces, the ease of use of modern desktop or online GIS cannot be denied and it has made GIS more accessible for a large group of users. This greatly improved the possibilities for the visualisation of complex spatial information to various end users in dynamic and, in the internet era, now even interactive maps.

SHOWING THE UNKNOWN

Although we take the existence of GIS for granted today, it has existed only for roughly half a century. The possibilities to combine various data sources digitally and the development of spatial analysis tools radically changed what we can do with geographic information. Spatial relations can be detected that would have been (nearly) impossible to find without the power of a GIS. And such relations can now be visualised in new ways, either static or dynamic, targeted for a specific audience. Where maps once were a way to show that what we already know or can perceive, GIS now enables us to create maps showing that what we do not know yet. This has led to an ever-expanding set of mapping possibilities we still benefit from every day.

One of the earliest recorded uses of geographical data for analysis was in the 1800s for epidemiology

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BY NIALL CONWAY

Big Geospatial Data helps modernize the Statistical Field

Geospatial tools and information are going mainstream, as is evident following the recent opening of a new data science campus at the Office for National Statistics headquarters. Niall Conway explains how the fields of Statistics, Big Data and Geospatial are beginning to converge in order to deliver better insights to government.

Technology, including geospatial, is revolutionising how we go about our lives. With the help of satellites, computers, smartphones and other devices, it is estimated more data has been created in the past two to three years than in the entire previous history of the human race. However, while this information is being consumed and shared in massive volumes it's estimated that less than 0.5% of all data is ever analysed and used.

This is the key difficulty for knowledge professionals in the Big Data age. While on the one hand we have the capability to create massive amounts of accurate and timely information, on the other hand it leaves us with the question of how to manage and make sense of it. Perhaps more than any other profession, this is turning out to a massive challenge for the statistical profession - one which is responsible for generating real world insights which will eventually be relied upon by high level policy and decision-makers. Since a statistician's job is to get the right data, of the right quality, to the right person, at the right time, there is enormous pressure on them to get it right. When they do, in general, nobody notices. When they get it wrong however, everybody does, and in the digital connected age, this is a risk which is not worth taking.

NEW DIRECTION

Earlier this year, the UK's Office for National Statistics (ONS) opened a new data science campus at its headquarters in Newport, south Wales. This £17m investment forms part of the government's drive to modernise how it collects and presents data about what is actually happening in the nation. Within this centre, statisticians will broaden their understanding of how to harness real value from Big Data as a means of measuring the shape of the economy. In many ways this centre represents a complete cultural shift towards increased engagement, increased accountability, and increased transparency by government. As explained by one ONS representative: "we want to utilise the same expertise that is used to sell advertising in the commercial space and use that to understand the world for public and social good."

So far, this sounds great. However, what does this have to do with the world of maps and locational well information? Well, the modernisation of the statistics profession means that the field is moving well beyond the use of spreadsheet data and colourful but often basic visualisation aids. Through the use of APIs and linked data from various sources, governments and relevant bodies are attempting to gain real-time situational awareness so that they can deliver data-driven decision-making with confidence. As well as using information which is gathered from sensors, mobile data, and existing statistics, the ONS will also be using earth observation >

information for the purposes of understanding the complex fabric of life in the UK. By combining satellite imagery with vast quantities of national mapping data from the likes of Ordnance Survey, the ONS will be able to better understand the patterns of economic and social activity across the country. In order to understand the potential which geospatial information presents the ONS, one needs to understand how earth observation data is currently being harnessed by the private sector. In the USA, for example, Walmart is currently using imagery in order to monitor the number of customers parked in their shopping centres, a technique which is intended to better inform staffing and logistical decisions. Elsewhere imagery is used to track tanker ships in the ocean, to estimate the stocks of available natural resources, and even, thanks to NASA's recently released night-time satellite imagery, to better monitor settlement patterns and nocturnal activity.

However, earth observation imagery is just one of the many Big Geospatial Data types which is being used to gather better insights into the geography of the UK. Satellite imagery will be supplemented by traffic sensor data in order to track commuter patterns, as well as the volume, speed, and occupancy rates of the traffic. Bodies such as the ONS will be able to provide this information to relevant authorities for the purposes of better coordinating and monitoring road-works activities, to automate incident detection, and to better manage the flow of traffic. Combined with cellular statistics and usage, the UK government will also be able to understand 'why' people move and commute as they do, and to understand how spaces are used differently depending on the time of the day. As well as helping to inform more immediate decisions regarding crowd control and security issues, these innovative techniques will help inform the complex policy-making decisions regarding the 'night-time economy' and the national property market.

However, mapping the UK using modern statistical techniques is unlikely to stop there. Street level data such as Google Streetview imagery will be used to enhance an understanding of what is displayed on a map, and to explore the relationship between demographic patterns such as health, education, and levels of deprivation. Similar to how data can be used to better manage movement within a country, modern statistical information can be used to revise outdated procedures and strategies, and to better plan for the location (and re-relocation) of required resources and services.

By embracing new approaches, bodies such as the ONS are leading the way in terms of how Big Geospatial Data will be used to improve government decision-making and spending. However, if truly valuable results are to be derived from such approaches, then stakeholders will need to develop a solid understanding of the economic, social, and environmental benefits which can be derived from such information. Of key importance here is that the principles of openness, including the associated considerations of methodology, regulation, privacy, funding and management of the data, are not just understood, but upheld.

BY KURT DARADICS

The Employee-Monitoring Solution Transforming the Modern Workplace

Advances in mobile, cloud, and geographic information system (GIS) capabilities are making it possible for organizations to let employees work remotely. This workforce has come to expect a baseline level of flexibility and created a new set of burdens for employers. But employers need to be aware of the efficiency and well-being of individuals who aren't physically present. One startup is enabling such employers to keep better track of personnel using monitoring technology and spatial analytics.

Employees can use the Antris mobile app to check in anywhere, at any time.

The AntrisPRO dashboard lets organisations monitor field personnel from the office with interactive analytic maps.

A REAL-TIME AUTOMATED COMPLIANCE TOOL

Antris is a solution designed for organizations with employees who either work alone remotely, or perform high-risk duties. The software communicates with the worker's mobile device, automatically notifying the appropriate personnel once the worker leaves home or the office, and monitors the trip's progress. If something unexpected occurs or if the employee fails to check in, Antris instantly notifies emergency contacts or managers. Also, administrators can access a centralised online dashboard that enables them to view the status and location of employees in real time. For remote workers in industries such as oil, gas, forestry, or social services, having real-time operational intelligence is crucial for maintaining cost-effectiveness and compliance with safety standards.

A SAFE, SMART WORKFLOW

Consider an organization such as a utility company, which is responsible for sending a variety of operations workers into the field, often in dangerous weather conditions. Such assignments often present travel or personal risks; require monitoring trip plans to tabulate travel mileage and costs; and involve acquiring, analysing and reporting activity data. Manual processes, thumbtack mapping, and buddy systems are typically used to monitor out-of-office activities, staff safety, and reporting. These systems can be time-consuming, inefficient, and inaccurate.

Antris provides automation and precision to improve efficiencies, reporting, data accuracy and reduce costs. It is quickly implemented into daily work routines and coordinators and managers can use its cloud application, AntrisPRO, to confirm workers' safe arrivals and departures, their current location, and their expected return and indicate whether they need support. Once a trip is complete, the data can be analysed to evaluate workplace efficiencies, process time sheets, and bill clients.

OPERATIONAL INTELLIGENCE ON A MAP

Antris uses spatial analytics to enable real-time mapping updates of employee locations, allowing workers to check in through their mobile devices. The app then sends automated notifications to supervisors when workers may be at risk. Unlike fieldworker safety solutions that require an investment in special devices, Antris allows communication with commonly used smartphones, laptops, tablet devices, satellite phones, and GPS messengers. In addition, the cloud-based AntrisPRO gives supervisors both the ability to track mileage automatically and give a detailed report of total travel mileage for each user. It also captures data for the number and frequency of trips taken, which is displayed in a heat map of overall reach within the covered area.

By having a snapshot of staff's time in the field, organizations can now assess and evaluate areas of improvement that are essential for time management. With its simple-to-use technology, Antris is ideal for employers of any size and in any sector.

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BY DAVID R. GREEN ET AL.

Monitoring, Mapping and Modelling Saltmarsh | The UAV Way

Recent work suggests saltmarshes are particularly good for demonstrating how the coast can change in response to environmental influences. The pace of current Scottish relative sea level rise (Rennie and Hansom, 2011) may lead to inundation of coastal saltmarsh, and so it is critical to be able to monitor the response of saltmarsh to sea level rise, map saltmarsh topography, and to model rates of marsh elevation change on a real-time basis. However, changes in saltmarsh vegetation differ according to local circumstances, and can be very difficult to map from the land. In this article we aim to: demonstrate the practical potential of using UAV-based remote sensing platforms and sensors to monitor, map, and model coastal and estuarine saltmarsh.

This is where aerial imagery comes into its own. It provides an overview of the saltmarsh that cannot be obtained from the ground and with geo-rectified photography it becomes possible (with more than one survey) to map both area and volumetric changes accurately. In contrast to conventional vegetation mapping, aerial imagery is non-selective in its data capture and multispectral and hyperspectral imagery adds even more information about these changes for scientists who are attempting to interpret coastal change from a variety of perspectives.

REMOTE SENSING AND SALTMARSH

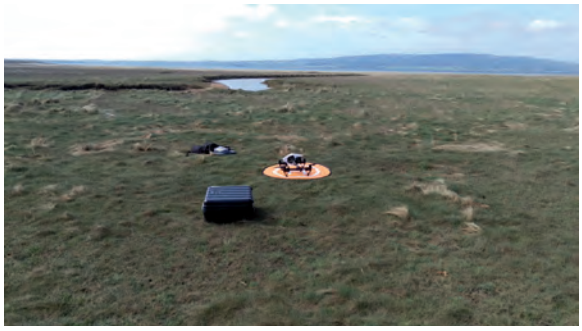
The Saltmarsh Survey of Scotland (SSS) (Haynes, 2016) identified key areas relevant to the study of saltmarsh including: the value of remote sensing (past, present and future) to provide valuable insight into sediment movement, its interrelationship with saltmarsh vegetation and changes to saltmarsh communities; the need to collect time-series high-resolution topographic data (e.g. Lidar) to provide real-time accurate information about the location and rates of saltmarsh erosion and accretion; the need to investigate the decline in the extent of saltmarsh pioneer communities; the potential for saltmarsh surveys to inform management practices and policy in Scotland and improve the conservation and management of saltmarsh.

Collection of data from remote sensing platforms has considerable potential. Numerous studies of saltmarshes have been undertaken using both airborne and satellite remote sensing platforms and sensors (Klemas, 2013), including studies using multispectral, thermal, CASI hyperspectral (Kumar and Sinha, 2014) and Lidar sensors (Rosso et al., 2006). Many different types of satellite imagery and data (including Landsat TM (Hobbs and Shennan, 1986); ROSIS, CASI (Wang et al., 2007; Silvestri et al., 2003; Sadro et al., 2007), MIVIS, IKONOS, QuickBird (Belluco et al., 2006), AVIRIS, and MODIS (Mishra and Gosh, 2013) have all been used in various studies to monitor and map saltmarsh environments and characteristics.

Classification of remotely sensed data has been shown to provide a means to help accurately monitor the spatial structure and evolution of saltmarsh vegetation over time; for understanding saltmarsh soil elevation and its dynamics; monitoring biophysical characteristics, photosynthetic capacity, nitrogen content, blue carbon storage, and the physiological status of saltmarsh vegetation; to infer overall condition and productivity; and allow for

Some of the team in the field at Dornoch saltmarsh (image courtesy: David R. Green)

Dornoch saltmarsh (image courtesy: David R. Green)



Aerial data collection equipment (image courtesy: David R. Green)

the development of effective management strategies in high priority areas. Studies have shown the value of remote sensing to characterise saltmarsh topography at a scale relevant to ecological processes; for evaluating changes in saltmarsh morphometry and community structure over long time scales; to quantify and map the dynamics of saltmarshes, specifically to wetland topography and vegetation structure; and to integrate plant community mapping and local tidal hydrodynamics with fine scale topographic analysis.

Remote sensing has been shown to offer considerable potential for the long-term study, monitoring and mapping of coastal saltmarsh at different spatial, temporal and radiometric resolutions to provide information that is not always accessible through field observations. There are now opportunities to acquire, process and integrate high-resolution datasets derived from miniaturised remote sensing platforms (UAVs or drones) with the aid of image processing software, soft-copy photogrammetry, and GIS into multi-dimensional geo-visual representations of saltmarsh for analysis, interpretation and communication.

UAVS

UAVs can provide very high-resolution maps and models of changes in the saltmarsh environment in virtually real-time. A number of recent studies have highlighted the potential of small drone platforms to acquire high-resolution aerial photography and the use of Structure from Motion (SfM) to construct 3D models of the surface. Such studies have focused on the role of remote sensing, and information extraction.

UAV sensors can: (a) offer comprehensive (i.e. non-selective) high-resolution, spatio-temporal data capture over inaccessible areas of saltmarsh; (b) create 3D models of saltmarsh micro-topography, soil and vegetation; and (c) enhance knowledge and understanding of saltmarsh functioning and the spatial extent of vegetation composition and habitat change over time that affects ecosystem functioning. Such data can inform: (a) coastal policy for improved and sustainable coastal management; and (b) raise awareness and educate the public about the importance of saltmarsh, the benefits of natural coastal protection, and adaptation management.

RESEARCH

This research is currently exploratory in nature and sets out to test the viability of using UAV platforms and sensors to monitor and map saltmarsh. The primary purpose of the work is to develop a robust methodology for the practical use of low-cost UAV-based platforms and sensors to acquire aerial data and imagery. The study is being conducted at a number of selected saltmarsh sites around the Scottish coastline based upon the Saltmarsh

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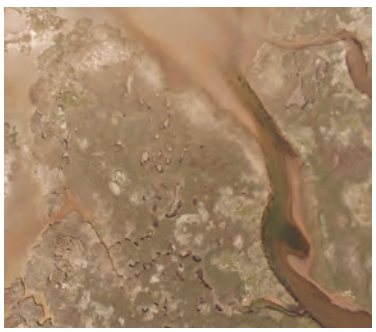
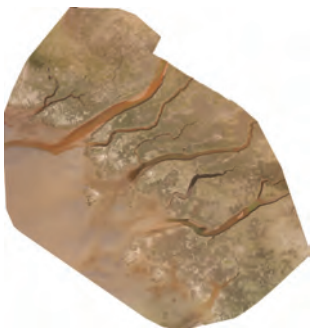
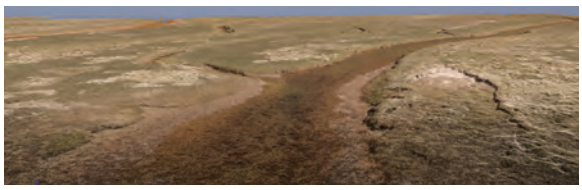
The DJI Inspire 1 UAV aerial platform (image courtesy: David R. Green)



A UAV aerial photograph of the saltmarsh (image courtesy: Jason Hagon)



An UAV aerial mosaic of the saltmarsh (image courtesy: Jason Hagon)



A 3D model of part of the saltmarsh (image courtesy: Jason Hagon)

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Cameron L. Gourlay is Data Processor for Andrews Survey.

Jamie Bowie is a cartographer at the University of Aberdeen.

Survey of Scotland, and following consultation with saltmarsh experts to optimise the identification of different types of saltmarsh hotspots where information is needed.

UAV overflights of the selected saltmarsh sites are being conducted at regular intervals using a small commercial, off-the-shelf, drone carrying a number of small colour cameras and a number of other miniaturised sensors e.g. an NDVI camera and a thermal camera to acquire colour stereo-photography and imagery. The flights are undertaken at a low-altitude (<50m) in order to maximise the spatial resolution of the photography and imagery. Ground Control Points (GCPs) are surveyed in at each site using a ground-based RTK GPS unit, or a small RTK GPS unit mounted on the UAV platform to ensure accuracy of the geo/ortho-correction of the imagery and mosaics. Pix4D photogrammetric SfM software generates high-resolution DTMs and DSMs, and ortho-mosaics of the selected saltmarsh sites. Single-date imagery, DTMs and DEMs of Difference (DOD) will be interpreted to create vegetation maps and establish where sediment has been eroded and where accretion has taken place.

On-screen digitising, image interpretation and digital image processing (e.g. classification techniques) will be used to prepare maps of the vegetation types and communities in the saltmarsh. Reference documentation and co-incident ground-truthing (where access is possible) is used to ground-truth the saltmarsh vegetation. Pix4D soft-copy photogrammetric software will be used to develop 3D models of the saltmarsh micro-topography (a DSM and DTM) and will be used to provide: (a) insight into the saltmarsh surface characteristics; (b) identify surface geomorphological features of the saltmarsh; (c) identify areas of erosion and accretion within the saltmarsh; and (d) correlate vegetation patterns and distribution with the geomorphology and topography of the saltmarsh. The imagery and 3D model will form the basis for developing geo-visualisations of each saltmarsh site.

INPUT TO A GIS

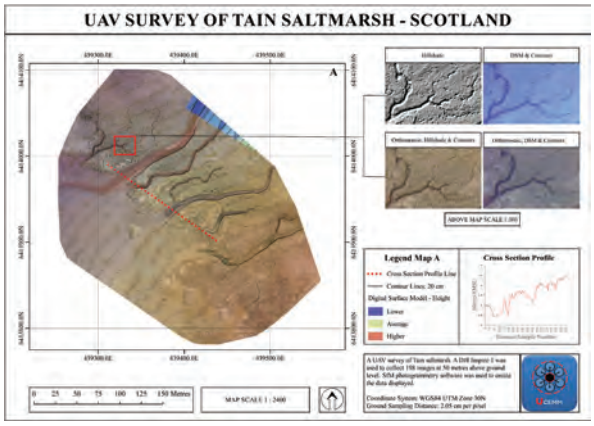
Ultimately outputs from the UAV-acquired aerial data will provide input to a GIS. The use of geo-visualisation tools and techniques to communicate information will promote greater awareness and understanding of saltmarshes and engage the public in understanding the ecosystem services provided. The use of 3D models and Virtual Reality (VR) tools and technologies will be used to communicate information to coastal managers, in planning and informing decision-making, and to drive scenario discussion with policy and community stakeholders (e.g. the in-combination impacts of sea level rise, flood risk management and coastal reclamation and their effect on saltmarshes and management responses).

CONCLUSION

Saltmarshes are recognised to be a key feature of our coast, offering important habitat for wildlife and vegetation and a major part of our current and future climate change mitigation and adaptation responses at the coast, helping to safeguard our homes and activities. They can be, for example, low-cost, carbon-storing, self-repairing and coastal flood protection features that have the ability to keep pace with sea-level rise. Low-cost UAVs now provide a practical means to provide high-resolution, small-area multi-temporal aerial

surveys of coastal and estuarine saltmarsh with the potential to collect data more cheaply and quickly, and to present it in novel ways that can significantly enhance our understanding of their characteristics, form and function over both space and time. Such information will be very relevant to the scientist and policy maker in managing this resource, and also in an educational and awareness capacity for the public to perceive and better understand the importance of managing this area of the coast.

An extended version of this article is online at http://bit.ly/2vlM77B



GIS map of the saltmarsh (image courtesy: Jason Hagon)

FURTHER READING

For more information, please email David R. Green: d.r.green@abdn.ac.uk

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BY NIALL CONWAY

Where does the Smart Cities drive leave Urban Planning?

Urban planning is a profession which is experiencing big changes as a result of advances in geospatial and other technology. In this article Niall Conway explains why planning is too important a profession to risk becoming sidelined by innovation and explains what needs to be done.

The expression 'the future ain't what it used to be' has been used for quite a while to express our struggle to keep up with the unpredictability of modern life. It is natural therefore that this term will resonate with any profession, in any industry, which has a focus on strategy.

. . . planners deal with a wide range of stakeholders . . .

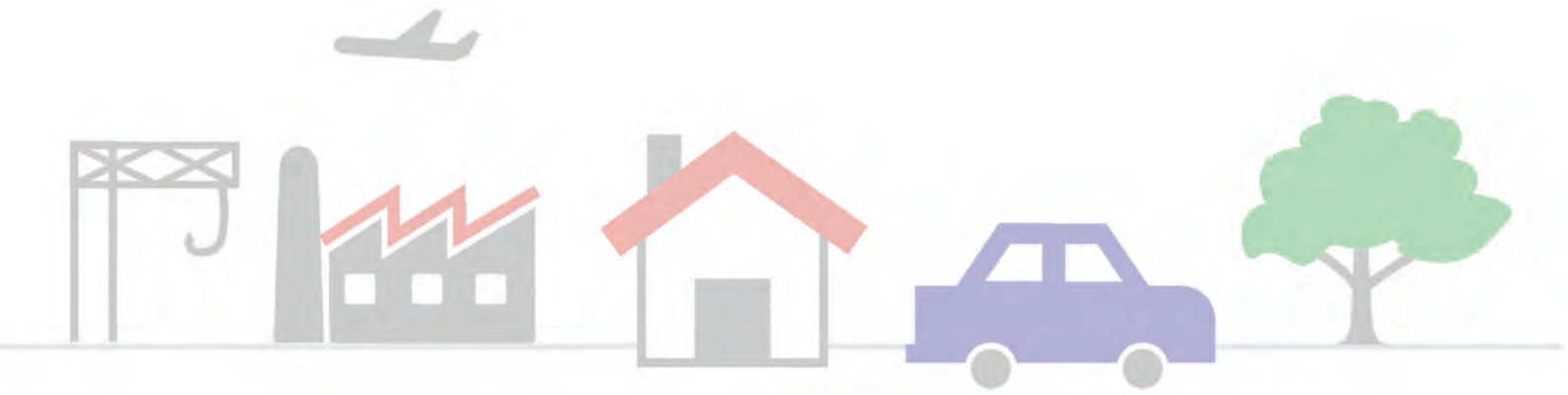
In the era of Smart Cities urban planners, like other professions, are approaching a crossroads. Do they continue to plan for growth and development and to engage with stakeholders in an increasingly digital world using yesterday's established processes and systems? Or do they acknowledge the fact that our current way of doing things are being redesigned into applications and algorithms which can perform the very same job to a similar or higher degree, and therefore adopt a new approach.

CURRENT METHODS

Before we explore the options which are available to urban planning professionals we first of all need to understand what exactly a planner does, how he or she does it, and how this is all being turned on its head by locational technology and information.

Planning is a cognitive activity which has been around for as long as humans have been building settlements and communities. The planning profession which we know today was first institutionalised at the end of the 19th century, largely as a response to the negative side effects which the industrial revolution had on the human and natural landscape. Planning was about taking back control in an increasingly urbanised complex world. It was about implementing regulation and order, about ensuring livable and healthy urban spaces, and about ensuring that cities could continue to function as they were intended: to create wealth.

Urban planning is a one of the most complex and multidisciplinary professions which exists. It is a discipline which is grounded in geography and maps, and it is focused on ensuring that the right development is planned for the right location at the right time. In order to carry out the planning process, the field divides itself into numerous sub-disciplines: land-use planning, transportation planning, development assessment, strategic planning, planning policy, natural resource planning, waste management, economic development, and heritage planning (but to name a few). Along the way, planners deal with a wide range of stakeholders: members of the public, policy-makers, politicians, business owners, engineers, architects, archaeologists and natural scientists (again but to name



a few). To counter a common misperception, planning is not about driving ahead with a singular vision. The reality is that planning is about establishing and using predictable processes in order to balance the interests of all stakeholders in order to build a sustainable future.

The digital world of Smart Cities is changing the nature of planning in a big way, and this could be a problem. Aside from certain sub-disciplines, planning in general, is not a technical profession. Planners are conceptual thinkers, relationship-builders, and problem solvers. Their profession is grounded in an awareness of what is happening in the local and wider world, and a recognition of the effects which decisions can have on people and places. Unlike the IT world, which is about rapid change and innovation, planning is about steadiness, calculated strategy, security and predictability. A planning system is a means to achieving an end, not an end in itself.

As mentioned earlier, the planning profession is for this reason at a crossroad. With more and more companies seeking to take a slice of the lucrative Smart Cities market, and with ongoing deregulation of council functions, cities are feeling the pressure to compete. As a result, planners knowledge is slowly becoming commoditised by data driven solutions, and the collection, modelling, and analysis of complex geographic information is becoming more and more the job of the computers than it is of humans. Vast quantities of real-time Big Data from satellite imagery, mobile devices, and sensors are being used by companies in order to build a more accurate understanding of the world, its inhabitants and the dynamics within it. Combined with Streetview imagery and precision mapping, machine learning algorithms can determine and gauge the effects a planning decision will have on the built environment to astonishing accuracy. And this is before one considers the effects which augmented reality, driverless cars, BIM, cyber-security, and ecommerce will have on both cities, and the professionals who plan them.

. . . planners need to learn how to think about cities in terms of layers and shapes . . .

FUTURE METHODS

In 2017 a new cultural mindset among planners is required. Considering the geographic nature of the profession's focus, developing an understanding of geospatial technology is the obvious starting-point. In the age when multiple (sometimes unqualified) parties are becoming involved in the city building process, planning, a collaborative and consensus-building profession by nature, should ensure that it is at the forefront of the Smart Cities drive. In order to ensure that the planning professional and the cities which he or she is responsible for do not become siloed the industry must ensure that the profession promotes and nurtures the right skills among its community. As a starting point, planners need to learn how to think about cities in terms of layers and shapes - whereby services are represented by points, roads and pipelines as lines, and administrative and other boundaries as polygons. The profession also needs to adopt a new technical terminology which includes terms use as attribution, geoprocessing, topology, modelling, and interoperability. By doing so, planners will ensure that their profession, one which is too important to see sidelined by innovation, remains relevant as it moves into the 21st century.

In conclusion, I realise that some of the mentioned suggestions regarding the upskilling of planners would require a massive undertaking by employers. However, if one is to believe that job automation is an inevitable reality waiting to happen then this undertaking, especially within the private sector, cannot start soon enough. The future may not be what it used to be, however it is certainly not outside of our control.

BY ABIGAIL PAGE

The UK on a World Stage

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

Whether or not you're a fan of the boat race, Cambridge becomes the centre of the universe at least once every four years – even when it morphs into Oxford. I'll explain.

The Cambridge Conference is an event that invites geospatial leaders from around the world to meet, share ideas and developments, and renew their enthusiasm for the innovative use of geography in person. This year, the conference was held in Oxford at Keeble College, and hosted by the Conference's originators, Ordnance Survey. I was honoured to be invited along, to take part as a guest at the Cambridge Conference dinner. Quite by chance, I sat next to former AGI Chair, Alistair MacDonald.

He told me some fascinating stories about his time in the Directorate of Overseas Survey. Even though geo-technology was in its infancy 25 years ago, the Directorate of Overseas Survey still had an important remit to export UK geospatial survey expertise. Today, despite the increasing competition of global geospatial offerings, there is clearly just as much interest in what the UK has to offer. Geospatial Media ranked the UK in March 2017 as second to the USA in a worldwide study of geospatial readiness. In June 2017 the Open Knowledge Foundation updated the index tracking the state of open government data (https://index.okfn.org/place/), and we still see the UK in second place –but of course, there are many ways to measure geospatial adoption or maturity, most of which are subjective and open to debate!

My ambition as Chair of the AGI is to see us coming out on top on the world stage – but that will take time. How can we make sure the UK is taking advantage of our homegrown expertise, knowledge, and insights? We have some of the world's most detailed geographic information at our fingertips; we've become great advocates for opening up access to data, and you'll find Brits on the programme at many international geospatial events.

But how can we ensure that citizens benefit from what we do? And that our country thrives on the world stage by getting more from the data its cities have already generated? We all know that national policy decisions depend on a contextual understanding of what will be affected, how, when and where – but perhaps it is time to remind ourselves how these four elements could be better connected, and thriving, as a result of using geospatial data.

At any and every opportunity, it's important for AGI members – and the wider community – to advocate the value of geographic information. In every scenario, cross-sector. I am delighted that, on this front, AGI has been able to make significant progress in recent months.

Damian Testa has been appointed as Senior Public Affairs manager, a jointly funded role with the Royal Geographical Society with IBG under our memorandum of understanding. He's ideally placed to position our message on the value of geospatial information, and has already met some of our leading industry bodies in land and property; engaged with the Geography in Government Group; and looked at the use of GI across the network of Local Enterprise Partnerships.

In consultation with AGI Scotland and the RGS-IBG Transport, Economic Geography and Urban Geography Research Groups, Damian is also compiling a response to Transport Scotland's call for Evidence for their National Transport Strategy and he's been reviewing the recently drafted briefing note on Earth Observation prepared by the Parliamentary Office of Science and Technology.

At the AGI, we're determined to make ourselves heard: geospatial is essential, and the UK has a lot to offer. If you're curious about getting involved with our advocacy work, or you'd like to stay updated on what we're doing to support you and your work, I urge you to stay in touch – and, of course, to come along to Smart Geospatial (#GeoCom17) in October.

BY IAN MASSER

The Global Geospatial Industry Outlook reviewed

The Indian company Geospatial Media and Communications has produced a thought provoking report on the Global Geospatial Industry and published it on the Internet. Ian Masser reviews this report.

The 128 page report is divided into four sections, these were: describing the methodology that was developed for the exercise; discussing the main global geospatial industry trends and emerging business processes; a geospatial readiness index of fifty nations; and details of the sponsors.

GEOSPATIAL TRENDS AND BUSINESS MODELS

The authors point out that 'geospatial technologies have become all-pervasive, driving major disruptions across industry segments.' As a result, the economic value of the sector is more than USD500 billion. They also surveyed more than 500 companies to gauge the landscape of the industry and understand where it is heading.

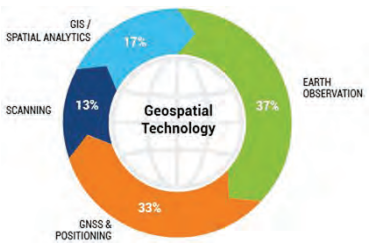


Figure 1: The components of modern geospatial technology.

The main components of the geospatial industry are shown in Figure 1. From this it can be seen that conventional GIS and spatial analytics accounts for only 17% of the geospatial technology industry as against 37% to earth observation and 33% to GNSS positioning.

GEOSPATIAL READINESS

A methodology was developed to calculate the geospatial readiness index for the 50 selected countries is based on four separate policy areas or pillars: geospatial infrastructure and policy framework, institutional capacity, user adoption level, and industrial capacity. Each topic is then broken down into sub categories. For example, the first topic is subdivided into data infrastructure, positioning infrastructure, platforms and portals, open and linked data and standards, and policy framework.

The detailed scores for the sub pillar scores provide a great deal of detailed food for thought as do those for the aggregate scores (Figure 2). These indicate that the United States holds the top position in the global geospatial readiness index because the country 'has it all - an efficient geospatial infrastructure, an enabling policy framework, an excellent institutional capacity, the strongest industry capacity and an in-depth user adoption across all industry verticals' (p.112). It is followed by the United Kingdom, the Netherlands and Canada while developing countries such as South Africa are ranked close to

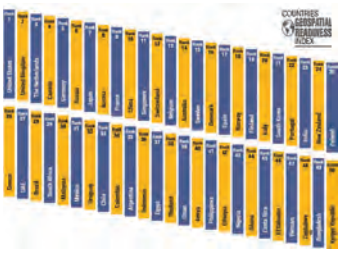


Figure 2: Geospatial Readiness Index.

the top of the lower half of the table although it 'has been progressive in the use of geospatial technology by developing and adopts latest technologies and formulating South Africa's frameworks and policies to enhance the uptake of spatial information in the country' (p.113).

Inevitably, the findings of this analysis raise more questions than answers and this reviewer would have welcomed more discussion of the detailed findings. For example, I was puzzled about how China and Russia achieved relatively high scores while New Zealand featured below India and countries such as Chile were ranked 33. Nevertheless, it should stimulate some interesting discussions about its findings.

Download the report: geospatialmedia.net/global-geospatial-outlook-report-2017-download.html

ABOUT THE AUTHOR

Ian Masser was Founder Chairman of the Association of Geographic Information Laboratories in Europe, President of the European Umbrella Organisation for Geographic Information, and the Global Spatial Data Infrastructure Association. His publications include twenty books and more than 300 papers.

Got an event to list?

Go to www.gis-professional.com/events

GEOSMART ASIA 2017
22-24th August 2017, Putrajaya, Malaysia
http://geosmartasia.org

INSPIRE CONFERENCE 2017
4-8th September, Kehl, Germany; Strasbourg, France
http://inspire.ec.europa.eu/conference2017

BIG DATA SERIES 2017 - DOHA
18-19th September 2017, Doha, Qatar
https://www.tresconglobal.com/bigdata/#home

INTERGEO 2017
26-28th September 2017, Berlin, Germany
http://www.intergeo.de/intergeo-en/index.php

2ND INT'L CONFERENCE ON GIS & REMOTE SENSING
2-3rd October 2017, Vienna, Austria
http://gis-remotesensing.conferenceseries.com/europe

ESRI EASTERN AFRICA USER CONFERENCE
4-6th October 2017, Dar-es-Salaam, Tanzania
http://www.esriea.co.ke/user-conference-2017

URISA GIS-PRO 2017
23-26th October 2017, Jacksonville, USA
http://www.urisa.org

GEOCOM 2017
26th October 2017, London, UK
http://www.agi.org.uk/events/calendar/geocom17

BIG DATA SERIES 2017
20-21st November 2017, Riyadh, Saudi-Arabia
https://www.tresconglobal.com/bigdata/#home

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23-24th November 2017, Abuja, Nigeria
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