Big Geospatial Data Helps Modernise 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 GBP17m 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.

Big Geospatial Data Types

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.

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