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BUILDING EXPECTATIONS

LENA NIETBAUR REPORTS ON A COMPANY USING SATELLITE IMAGERY TO MONITOR CONSTRUCTION PROJECTS, DETERMINE WHICH BUILDINGS ARE BEING USED AND WHICH ARE NOT, AND EVEN AUTOMATICALLY DETERMINE WHEN ROADS ARE IN NEED OF REPAIR

Knowing when are where new buildings are being constructed around the world is big business for companies active in the construction and maintenance sectors, such as vendors of office furniture and installers. In fact, according to market research, project leads account for about €72bn in revenue each year.

This is something Paul Indulger knows very well. His student job was to sell new building projects as sales leads to a US carpet company. The projects were researched manually by up to 12 workers in China, where Paul spent a total of two years during his studies and after graduating.

There was considerable information readily available to do this. New construction sites and the progress of building projects can be found online where they are listed by architects, in databases or announced in media articles.

But one big problem with search results from the internet is determining whether they are up to date. Sometimes incorrect information on a project's progress is even published deliberately.

When Paul met Leopold Neuerburg, who had previously worked at Google, they discussed the possibility of creating an advanced, technical method to research new building projects. They eventually came up with a search algorithm dedicated to discovering building sites. In particular, to verify the online search results and for continuous change detection, satellite images integrated into a database would be needed.

In 2014, together with Artem Ostankov, a specialist in big data and information retrieval, Paul and Leopold founded Building Radar to develop such a system.

The new company's first challenge, however, was that no standard APIs are available to access satellite images, all the interfaces for the various data sources differing extremely. Building Radar tackled this issue by developing adapters, allowing it to integrate different data sources into its platform.

A second major problem for the company was the reliability of the satellite data sources. Current data sources provided by the European Space Agency (ESA), NASA and other organisations focus on scientific use. They make satellite data available quickly but do not focus on permanent availability. They also occasionally take their servers offline for maintenance or don't perform properly.

For commercial use, it is absolutely necessary to have reliable data access – customers around the globe need to be provided with images of their area of interest, whenever they request them. Part of this problem can be solved by buffering the satellite data to guarantee

customers access. So while separate commercial access with a guaranteed minimum bandwidth from ESA and other public data providers would be nice, Building Radar is developing a cloud-based platform to store satellite data from various data sources and of different qualities, so clients can recall data based on their needs, providing snippets of their areas or buildings of interest.

Data sources

Building Radar's satellite-supported search algorithm has substantial advantages compared to manually-researched results. It can analyse a huge number of projects and involved companies, its online platform currently containing more than a million projects and 200,000 company profiles. As it can process huge amounts of data in a very short time, it can often discover new building sites months faster than traditional methods can, as well as validate potential discoveries using up-to-date satellite images – which also enables Building Radar to discover delays in construction.

The company currently focuses on optical satellite data, such as Sentinel-2 data provided by ESA and the European Commission. Sentinel-2, carrying a multispectral optical sensor and wide swath coverage, is part of a fleet of satellites designed specifically to deliver data and imagery central to the European Earth observation programme Copernicus.

"Optical images have the advantage that they are nice to look at and easy for the customers to understand," explains Paul. "Sentinel-2 data is very attractive to us because of its very high temporal and spatial resolution. We will use it to receive a broad outline and for monitoring huge building projects."

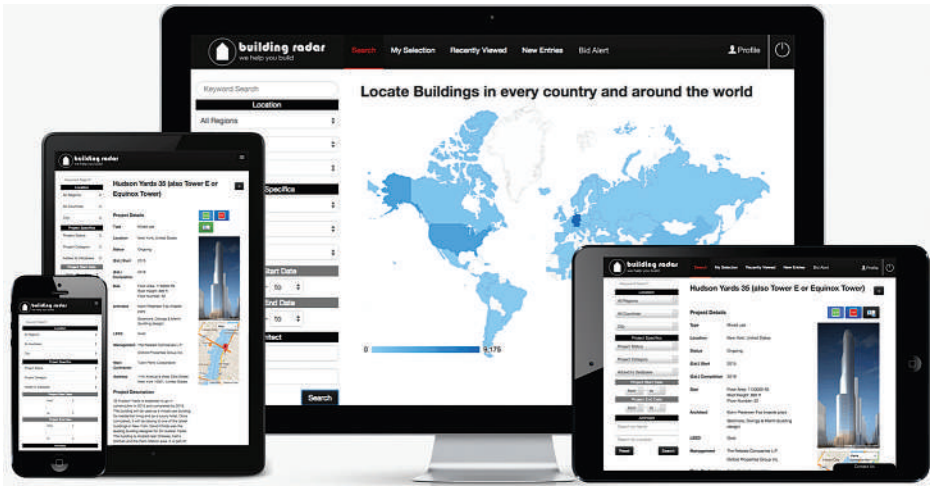
However, Building Radar can combine various layers of different data sources and formats in its database – the more it has, the better the results will be. Radar data could be of interest for the future in areas with high cloud coverage and infrared data could be used to determine whether a building is empty.

To enhance its image recognition abilities, Building Radar uses various computer vision algorithms, as well as deep learning and other technologies. In this area, it benefits from support from ESA and the German Aerospace Centre DLR, as part of the ESA Business Incubation Centre Bavaria programme to which it belongs.

New developments

In the next step in the development of its service, Building Radar will further develop its existing algorithms and train artificial neural networks, aiming for automatic analysis of a building site's state and change detection.

"For the computer vision algorithms and machine learning, very high resolution (VHR) imagery is essential to train automatic image recognition, for artificial intelligence to be able to recognise details such as a crane standing next to a burrow." explains Marc Bickel, VP computer vision and satellites at Building Radar.



Building Radar's cloud-based platform is optimised for the newest versions of all common browsers. Being based on HTML5, it also can readily be used on mobile devices (©Building Radar)

The Building Radar online platform, which already contains more than a million construction projects and over 200,000 company profiles, uses a custom-developed algorithm to identify new building projects around the world (©Building Radar)

Building Radar is now in contact with a number of VHR imagery providers, as it will also use VHR satellite data to monitor small construction sites and individual buildings.

"In general, satellite images are a topic of extreme interest to us, especially in connection with further data layers which we obtain through our search algorithm, such as average construction period, building costs or hotspots," explains Paul.

Building Radar's analysis of satellite-images has great potential for further applications and services. It is experimenting with detecting road damage, as well as analysis of surfaces, infrastructures and demography in pre-defined areas. This solution may open new doors for the use of precision satellite imagery worldwide.

THIS SOLUTION MAY OPEN NEW DOORS FOR THE USE OF PRECISION SATELLITE IMAGERY WORLDWIDE

Lena Nietbaur is responsible for communication and marketing at AZO (www.anwendungszentrum.de)

AZO

AZO's mission is to boost the user uptake of data provided by the European space programmes by aiding visionary entrepreneurs in bringing their innovations to market. It organises two ideas competitions for space applications: the European Satellite Navigation Competition and the Copernicus Masters. Furthermore, on behalf of the European Space Agency, AZO manages the ESA Business Incubation Centre Bavaria.

COPERNICUS MASTERS

Last year, Building Radar participated in Copernicus Masters, which annually rewards innovative products and services based on Earth observation satellite data in a number of topic specific challenges. Building Radar submitted its project for the European Space Imaging High-Res Urban Challenge and won this individual challenge as well as the title of overall winner of the Copernicus Masters. In addition to prize money and business support, it will receive a European Space Imaging data package of 40cm-resolution satellite data imagery worth up to €20,000 to help it develop its service.

Building Radar was named the overall winner of the 2015 Copernicus Masters Earth observation competition (©Anne Kreuz)