High-precision, underground visualisation for infrastructure works

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Credit: Konstantinos Smagas

Utility field work can be a real headache even with precise maps at hand. Admitting that they rapidly manage to locate the sought network, workers may end up damaging grids belonging to someone else. This type of scenario will soon be avoidable thanks to an assistive device developed under the LARA project.

The LARA device promise is to provide field workers with the ability to 'see beneath the ground'. Concretely, the device combines GNSS technology, 3-D GIS technology and geospatial databases with computer graphics and Augmented Reality in order to render complex 3-D models of underground networks—be it sewage pipes, gas conduits or electricity cables.

The potential impact of this technology is tremendous: according to a 2006 report (McMahon et all, 2006), utility companies from the UK alone create over 1.5 million street holes each year, often causing damage to third-party assets. All in all, these maintenance operations cost some EUR 5.8 billion to British society, and LARA hopes to brings these costs down significantly.

How does the LARA system work exactly?

Konstantinos Smagas: LARA is developing a software and hardware-based system that will eventually be capable of effectively managing geospatial data from underground utilities. It is combining different submodules—GNSS, Augmented Reality, 3-D GIS and geodatabase—in an integrated navigation/positioning and information system for tablets.

In practice, the LARA system will guide utility field workers in their daily operations: it will help them 'see' beneath the ground by rendering the complexity of the 3-D models of the underground grid where water, gas, sewerage and electricity networks tangle. They will be able to better monitor, document and manage utility infrastructures on-site.

First, by locating the work zone on a GIS viewer, they will obtain a visual representation of the underground infrastructure and its attributes. Then, they can take advantage of the augmented reality engine to have an intuitive view of this infrastructure in 3-D over a real image from the camera. Finally, after the work is done, they can use this same tool to generate reports and update existing infrastructure maps.

How does this increase productivity?

Being able to pinpoint underground utilities located in an excavation area prior to conducting the work is a game changer for public and private

utility companies. With the LARA system, they will know exactly where is what, thereby conducting far more accurate maintenance interv¬¬entions on their own underground infrastructure while keeping other neighbouring underground grids intact. Precise intervention will reduce the overall maintenance cost, minimising at the same time economic and social implications of lengthy surface works such as unnecessary traffic congestion, pedestrian disruption, material wastage, use of people's time, increased energy demand, visual intrusion and noise.

The project is getting close to its end. What have you already achieved so far and what do you still need to do?

At this stage, we have developed and tested our first prototype in the city of Kozani in Greece, leading all teams to work extensively on integration improvements and accuracy finetuning. As we had expected, several technical issues have been raised from work in real world situations. Some problems have been solved on the spot, while other solutions have been scheduled for the coming weeks.

In general, the results of first pilot assessment were very promising and provided valuable feedback for integration improvements, especially for our augmented reality technology which proved to be quite impressive. The final stage of the project, once we are done with this work and have delivered the final prototype, concerns the definition and refinement of the business models to be used to successfully bring the LARA system to market.

What about the pilot test in Birmingham?

In both locations we have selected the areas and datasets to be used for

the pilots. Now that the pilot in Greece is behind us, we are looking forward to test the system on the areas indicated by the Birmingham City Council where a multi Low/Zero emission re-fuelling hub is planned to be constructed. In the meantime, we also use controlled testing locations in the cities of Limassol and Nicosia in Cyprus to help us perform tests on a daily basis. The results from these pilots will feed us with useful tips to be used for improving the performance of the LARA platform.

How was Galileo a key enabler for LARA technology?

The LARA receiver is equipped with a high precision, low power, long autonomy GNSS receiver module able to achieve accuracies at the level of a centimeter. The receiver—which consists of a GNSS module, an IMU module and the GUI—is able to work with multiple constellations including Galileo, EGNOS GLONASS and BeiDou), but Galileo is key to helping us improve accuracy, increase availability and integrity. Of course, further improvement of the accuracy was required, which is why differential correction technology (EGNOS, DGNSS and RTK) are leveraged to reduce the geolocation error to around 1cm.

When will this system be made commercially available?

The complexity, and consequently the value of our solution, has been gradually increasing with each prototype version we released and tested. Our goal for the moment is to launch the full prototype of the system and deliver a product very close to a commercial solution by the end of the project. Our exploitation team led by Hewlett Packard in Spain is working on a business plan that will enable a successful market entry already by the end of 2017.

Speaking of which, what are your plans to raise

awareness among stakeholders?

It is clearly our goal to commercialise the system. Therefore, from the very beginning of the project, we drafted an active communication strategy that targeted immediate users. We took part in nine high caliber international workshops and demonstration events in Europe and co-organised an event in Malaysia.

Moreover, we have developed a stable relationship with industry-related magazines where we publish regularly, and we are preparing a commercial video for social media. Our primary users are public and private stakeholders that own or manage underground infrastructure and have complete and accurate data regarding their buried assets. Our ultimate goal is to provide these stakeholders with a plug-n-play, off-the-shelf solution that can be easily integrated into their daily operations and standardisation procedures.

More information: LBS Augmented Reality Assistive System for Utilities Infrastructure Management through Galileo and EGNOS: cordis.europa.eu/project/rcn/193818_en.html

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