RSK/ BT/ University of Birmingham/ Geomatrix Earth Science for FINDIT: not just mapping- measuring

Winner of the Street Works UK Best Collaborative Work award 2017

Street Works UK is the UK industry association representing utilities solely on street works issues. Street Works UK represents some 56 utility companies and contractors engaged in the street works sector, and 18 specialist sub-contractors who provide equipment, materials and services supporting street works activities. Our members represent major contributors to economic growth and work to deliver gas, electricity, water and telecommunications to both individual consumers and UK plc. In order to continue this drive for further improvements within the industry – we have developed the Street Works UK Vision for Street Works, which revolves around seven main principles:

- Safety
- High Quality
- Minimise Disruption
- Keep the Public Fully Informed

- Sustainable Methods and Materials
- Avoid Damage to Underground Assets
- Innovation

This case study is an example of the street works sector delivering on these principles and turning the vision into reality.

Overview

A collaboration by RSK, BT, University of Birmingham and Geomatrix has combined years of collective experience and new research into a revolutionary sub-street mapping system, that not only locates buried utilities more accurately, but also indicates its condition (damage and blockages) and provides engineering information about the surrounding ground.

The project packages the innovations the project team has developed into a commercial product which has been demonstrated at BT's research test site. RSK, Geomatrix Earth Science, BT and the University of Birmingham have developed non-destructive methods to detect factors critical to the maintenance and development of subsurface infrastructure. These factors include blockages, space limitations in the ground and damage to services by ground collapse or disturbance. Identifying damage or blockages in pipes or ducts that limit their capacity is an enormous problem. It is typically done by pushing flexible rods or cameras through the conduit to identify the location of blockage. Currently, geophysical sensors are used to detect the location of buried infrastructure, but until now there has been no reliable method for detecting these critical aspects.

To overcome these limitations and open up new applications for geophysical sensors this project is:

- using existing technologies in a novel way by optimising survey design and combining multiple existing sensors for detecting the targets of interest.
- applying RSK's bespoke data processing techniques, which have been used on numerous commercial projects in recent years, to image variations in soil properties and water content, and to determine the condition of buried infrastructure, including damage and the presence of blockages.
- undertaking field trials at BT's unique test facility to demonstrate real-world applications to encourage wide industry uptake.
- producing outline business models for telecommunications, water and energy supply sectors.

For the first time, utility owners are able to assess accurately, using rapid non-destructive mapping, the factors that affect the condition and long-term stability of their assets, and determine the capacity to install further infrastructure in congested ground. FINDIT will result in fewer and shorter utility streetworks (less occupation of the street), which cause lengthy disruptions and cost the UK economy about £7 billion a year. Beneficiaries will also include property and land developers, transport infrastructure owners and operators, and civil engineering consultants and contractors responsible for design-and-build projects through avoiding project costs and overruns from unforeseen ground conditions.

This project brings together innovations made by RSK in processing and analysing geophysical data with the results of research undertaken by the University of Birmingham through its Mapping the Underworld and Assessing the Underworld programmes. It also brings together BT as a client and Geomatrix Earth Science as an equipment supplier to establish a complete supply chain model that has delivered a pioneering technology solution. It is this collaborative approach which has allowed the FINDIT project team to make a step-change in the development of mapping and condition assessment technologies.

The utility mapping market has adopted the latest developments in GPR 3D array systems for their ability to deliver the 'usual' information more quickly. However, these technologies collect large amounts of additional data that are never analysed. The FINDIT project exploits RSK's ability to extract new information from high-density GPR survey datasets using novel data processing approaches it has recently developed, which is combined with new data processing algorithms for Birmingham and optimised sensor technologies from Geomatrix Earth Science. The electromagnetic signals the GPR antennas record contain rich information about the material properties of all the substances that they have travelled through, thereby opening up the ability to determine variations in soil properties and water content, and the condition of buried infrastructure, including damage and the presence of blockages.

This £500,000 project is supported by Innovate UK funding. In addition to the direct involvement of key industry players in the research, it has also generated interest from

Network Rail and other client bodies that own utilities infrastructure or are affected by buried utilities.