# Automated Utility Service Mark-out System (AUSMOS)

SGN Lane Rental Industry Publication

TRANSPORT FOR LONDON

# Introduction

There are 1.5 million kilometres of underground services in the UK, belonging to 650+ asset owners, to supply the UK with water, gas, electricity and communications. The laying, replacement, maintenance and emergency repair of these underground assets requires four million works to take place each year. The ability to accurately identify and locate buried assets is essential for ensuring the safety of operatives, reducing disruption, limiting emissions and saving time and associated costs.

Current mark-out practices have limitations and lead to utility strikes as the technology used is based on procedures that have limited capability It's been estimated that the economic cost of accidental strikes on underground assets is £2.4 billion a year.

There is currently a drive through various initiatives, such as UKPN's utility survey exchange to capture discrepancies in the location of cables. Similarly, London's Underground Asset Register (LUAR) is a pilot project by the Greater London Authority, a precursor to the National Underground Asset Register that brings together data from utilities, transport providers, telecommunications companies, boroughs and others assets owners to improve the capturing, recording and sharing of asset data.

Utilities companies such as SGN rely on drawings whether on paper or digital format when excavating the road. Creating a digital map that holds this information would make it safer to dig, increase efficiency, enabling emissions to be limited, works to be expedited and disruption in busy urban areas, like London, to be reduced.

SGN in collaboration with ULC Technologies set out to improve on current practices with the Automated Utility Service Mark-Out System (AUSMOS) project.

# The Project

Over 12 months, SGN working with ULC set out to develop, design and manufacture a robotic platform, comprising of an advanced suite of sensors capable of mapping buried utilities. The robotic unit could then mark-out these identified utilities on the road surface. Key tasks included:

- Artificial intelligence and machine learning integration to enable the complex data analysis for optimum location
- Sensor system development which involved identifying the optimum sensors for data capture and developing the appropriate architecture
- Robotic platform development replicating a lawnmower pattern and achieving suitable data processing resolution
- Control and drive system development to achieve the required drive accuracy for data collection and processing, appropriate for this robotic platform in urban areas
- Systems integration, testing and field trials

# Outcomes

The project successfully developed a prototype capable of autonomously mapping buried assets and subsequently able to mark-out the location on the surface of the road. The prototype was designed and manufactured through an iterative process through to successful deployment in a trial environment.

During the field trial, AUSMOS identified the underground assets, generating a 3D model on site and marking up of the road surface accurately, reinforcing the post processing solution, as well as integration methods used.

To facilitate further piloting of the system on the SGN network, a training package was produced.

# Lessons Learnt

The team developed a prototype platform that was capable of mapping buried assets. As part of the project delivery, its existing test bed was utilised where assets of different materials and sizes were buried at known locations and depths. Availability of ground truth posed strong benefits for the execution of test plans and enabled the overall cost and length of the project to be reduced.

The team rapidly develop the robot, as well as the accompanying post-processing software. Field trials provided the opportunity to scan diverse locations and qualitatively compare results to engineering survey drawings, as well as assess the promise of the processing algorithm in new environments. This phase demonstrated promising results that denser data collection in conjunction with more powerful processing techniques may result in improved mapping reconstruction and can yield difficult to locate pipes such as plastic pipes buried at greater depths. For the operator, this enhanced reconstruction and visualisation improves data interpretation and provides the opportunity to reduce the risk of accidental asset strikes even further.

# Conclusion

The project has proved the potential of developing this technology further and the improvements in quality and safety it could provide.

The next step will be to deploy AUSMOS on a pilot program across different work streams within SGN to identify appropriate use cases and improvements for future research and development phases.

As the project progresses to the commercialisation stage the transfer of data will be reviewed on how the system can benefit such projects like LUAR.

# TfL Lane Rental Scheme

Optimising customer journeys through the delivery of safer, innovative and sustainable roadworks

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