Results of Competition: SBRI: Innovation in Automated Survey Processing for Railway Structure Gauging, Phase 2

Competition Code: 2010_SBRI_NR_MMM_GAUGINGP2

Total available funding is £1,049,000 + VAT

Participant organisation names	Project title	Proposed project costs	Proposed project grant
MAESTRANO GROUP PLC	Bringing further established gauging automation to Network Rail	£431,999	£431,999

Project description - provided by applicants
BRINGING ESTABLISHED GAUGING AUTOMATION TO NETWORK RAIL: Building on our successful Phase 1 project, Corridor.ai will complete the development of our solution to automate the UK railway structure gauging process and we will demonstrate repeatability and accuracy, using real Network Rail data over time. Corridor is bringing to the UK our internationally established cloud-based gauging platform for automated processing of rail intelligence from data - that we have developed and successfully applied on Australian and Japanese railways. The project we propose will enable Network Rail to benefit from our mature core technology: we will undertake the R&D required to create a bespoke application for them. This competition will allow us to work alongside Network Rail, and our subcontractors DGauge and SellickRail to develop, test and demonstrate the new modifications that are needed to meet specific requirements. This project should expedite commercial implementation so that Network Rail can benefit from radically quicker processing times to obtain actionable gauging information. Automating gauging data processing should also: improve rail workers' safety by reducing the need for (and frequency of) boots-on-the-tracks inspections; and improve flexibility for train operators and other Network Rail customers (and therefore railway passengers and freight users), by enabling faster and more accurate scenario testing.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GMV INNOVATING SOLUTIONS LIMITED	Smart Gauge - A scalable cloud based system for automated rail survey processing and gauging	£431,708	£431,708

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

During this Phase 2 of the 2-phase SBRI competition, GMV will develop a commercial cloud-based system in conjunction with NR and TfL to provide scalable automation of rail surveying and gauging assessments. GMV will focus primarily on the timeliness, completeness and accuracy of gauging data. Requirements stated by TfL and NR will be captured to ensure bespoke design on the final system and enhance robustness of the final product on route to market.

The final integrated system will rely on a highly scalable geospatial database and will be built on our-proof-of-concept Phase 1 system. The system will consist of a set of data processing pipelines to automate geospatial data ingestion, sc0 generation and structure classification. The core pipelines will make use of powerful deep learning models to identify and locate new and existing structures, autonomously identifying and labelling a minimum of 10 type of structures in raw point cloud data: crossings, lineside furniture, overbridges, platforms, signal and telecommunications structures, signals, underbridges, tunnels, viaducts and walls. The existence of foliage in these structure types will also be considered to guarantee avoidance of potential hard infringements caused by vegetation and its high accurate recognition. The deep learning models will produce segmented 3D models, enabling the creation of a digital twin of the surveyed track environment. This virtual environment will enable temporal analysis of the structures relative to the tracks.

The set of pipelines will be converted into microservices and deployed across cloud computing servers to ensure high data currency and capacity. To facilitate access and provide an interface for users into the system a secure web app will be created. The app will provide users with the capability to request new gauging assessment and access the generated sc0s, along with the identified 3D structure models.

The SmartGauge integrated solution encompasses the automation of 3D point clouds processing, railway asset identification and monitoring, accurate forecasting of foul clearances, and analysis of track movement (rate and direction). Overcoming these challenges will assist proactive planning of maintenance and renewal to mitigate gauging issues, reducing processing run time intervals from years to months and provide a foundation for a dramatic paradigm shift in the methodology used to maintain and operate the UK rail network.

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ATKINS LIMITED	Automation in Survey Data Procession for Structure Gauging Phase 2	£217,375	£217,375

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Project description - provided by applicants

Railway infrastructure gauging is the engineering discipline of ensuring that rail vehicles can travel along a route whilst remaining a safe distance from all stationary objects such as platforms, tunnels, bridges, signposts, etc.

Due to the long heritage of UK infrastructure, different railway lines were built with varying sizes of structures. The cost to enlarge infrastructure is often prohibitively high. Consequently, clearance distances in the UK are typically tight; vehicles must be assessed to each route they operate on; and infrastructure must be built, monitored and maintained to ensure that the vehicle corridor is kept clear.

This continuous monitoring of infrastructure incurs an ongoing cost: trackside infrastructure is scanned using laser measurement systems; and the geometric data is manually processed before it is added to the National Gauging Database. However, this processing is a major bottleneck in infrastructure gauging, taking months or years before laser-scanned data is made available for gauging engineers to use. Consequently, much of the data is out-of-date and is not available when needed, e.g. for new train introductions. Remedial surveys may be required to obtain current information.

This Atkins R&D project aims to further develop a Convolution Neural Network to automatically process point cloud survey data with increased speed and accuracy. 2D imagery will be added to the solution to enhance the system's capabilities to recognise complex assets: ten asset types, plus vegetation, will be detected. We plan an AI framework that can be scaled to any capacity using high-performance cloud computing.

This method will provide greater confidence in the data, leading to more accurate understanding of the clearances between structures and vehicles. Throughput and lead times will be greatly improved, providing gauging engineers with current, complete and accurate survey data. This will reduce overall costs and timescales for the introduction of new trains, or cascading trains to new lines. Assets with high gauging risk or value will be prioritised early in the project, so that Atkins can bring a useful service to market in minimum time.

SNC-Lavalin's acquisition of the Atkins group of companies created a global, fully-integrated professional services and project management company of over 50,000 employees, able to deliver a compelling offer to our clients in the Railway and Transportation sector. This project will combine the skills of SNC-Lavalin's Gauging and Infrastructure teams and Atkins Software and Data Science teams, bringing together a technical team with all the key areas of expertise.