



Geo-spatial mapping of road surfaces

The challenge

According to statistics in the latest Department for Transport report *Road Conditions in England 2014*, £4.2 billion was spent on roads maintenance in England in 2013/14. Public satisfaction with road condition is at an all-time low and the need to maintain roads cost-effectively is pressing.

Current standard methods for surveying the UK's highways are costly, requiring lane closures, speed restrictions and associated hazards to personnel exposed to live traffic. Disruptions to traffic flow can bring substantial economic impact to the region and local community.

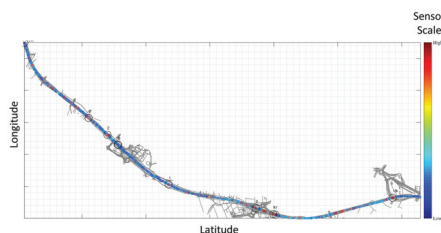
The project

CSIC has developed a novel method of geo-spatially mapping the condition of roads using highly-accurate and cost-effective sensing technologies that identify and prioritise defects.

CSIC's system has been developed in response to an engineering challenge from a geotechnical engineering client who required an accurate and detailed measurement of an 18-mile section of a three-lane road and hard shoulder. Data collected enables the client to identify and prioritise the areas of road requiring maintenance.

The approach

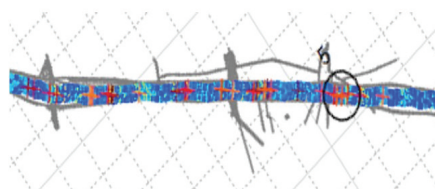
The road's asphalted concrete slab construction meant remedial work required costly and disruptive excavation and replacement of the 5m x 3m slabs. A laser-scanning system failed to capture defects on much of the road length on a previous survey and resulted in an inaccurate report.



CSIC Road Defect Mapping Survey



Laser Scanning Survey



CSIC Sensor Survey – red indicates high impact areas

CSIC's novel road mapping system uses sensors to measure road height changes and produces a detailed geomap of the road locations that exhibit sharp changes in height causing bumps that impact ride quality. The approach is cost-effective, requires only two people and takes less than half a day to complete. The resulting 3D-topographical map identifies the exact location and severity of problem areas as well as the impact on driving conditions. CSIC's method offers a 10-fold increase in spatial resolution and identifies defects more accurately than existing laser-based technologies.

The benefits

CSIC's geo-spatial road mapping method requires no disruption to traffic and can be completed without imposing speed restrictions or road closures, saving asset owners money. Turnaround of results and mapping report is rapid and the database and map produced show the precise locations and severity of defects.

The method enables engineers and asset managers to produce an effective risk-based maintenance and repair programme, and has the potential to be scaled-up to map extensive areas of road network.

The response

"The problem of how to identify, locate and categorise defects in long sections of concrete highway pavement, other than by time-consuming investigation requiring extensive traffic management, or expensive and indirect geophysical techniques, was proving difficult and potentially very expensive and disruptive to solve.

"CSIC's research in understanding the problem and then developing an innovative solution has resulted in an efficient and effective methodology for obtaining the information we needed, at the resolution we required, at a very reasonable cost. The solution developed delivers the consistent and accurate information we need to manage the problem."

Geoff Doherty, Principal Engineer, YGC Consultancy