CSIC | sensing the future

Innovative sensing for infrastructure

National Grid's London Power Tunnels

CSIC with industry partners National Grid and Toshiba Corporation

The project

The UK's high-voltage electricity system operator, National Grid, is constructing 32km of new segmental concrete tunnels below London in order to facilitate access to renewable energy for the future.

In 2011, National Grid launched London Power Tunnels, a seven-year project to re-wire the capital to deliver improved capacity and efficiency. CSIC is developing a software system, in collaboration with Cambridge-based Toshiba Research Europe Ltd, to remotely monitor the structural health of the tunnels.

The approach

CSIC has developed an innovative computer vision system to remotely monitor and record the structural health of the tunnel, testing a prototype of the new visual inspection system on a 2km section of utility tunnel. The low-cost rig captures very high-resolution images of the tunnel lining which are fed into a computer, aligned and modelled to construct a detailed 3D image of the tunnel walls available to be examined and analysed by contractors. The software allows images and data collected over weeks and months to be automatically compared for signs of deterioration between inspections.

The benefits

Visual inspections of tunnels can miss crucial warning signs in the deterioration of tunnel lining, particularly when sections of tunnel are inspected at different times by different people.

The risks and associated costs of personnel entering the cable tunnels to carry out inspections are high.

CSIC's smart, efficient and consistent monitoring of condition to enable maintaining and sustaining infrastructure offers financial and time economies to both contractors and stakeholders.

The Centre's pioneering computer vision tools transform image sets from varying and unknown coordinate systems into one single coordinate system used for change detection to identify anomalies before they become critical.

Using this novel method means inspections can become a relatively simple and straightforward task. CSIC's computer vision tools cut out time and cost, observe change in real time, localise where change occurs and visualise via augmented reality what lies behind the tunnel lining – better informing any required maintenance.

The response

"This technology has the potential to transform the way in which we monitor the structural integrity of our tunnel network and potentially removes the risks associated with inspection persons entering the cable tunnels."

Mark Farmer, Project Engineer, National Grid

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