



CSattAR Photogrammetric Monitoring System

The technology

CSattAR is a highly precise photogrammetric technique used to monitor structural movement at a fraction of the cost of alternative conventional systems.

The technology consists of off the shelf cameras and simple targets. In some cases existing features of the monitored surfaces can be used in place of the targets. Image processing software 'Sattar' enables the automatic tracking of the targets or surface points.

Applications

CSattAR can be used to monitor the structural movements of assets that are subject to external stresses, such as those that are influenced by nearby construction work.

CSattAR has been used to monitor the convergence, rotation, displacement and surface condition of a number of tunnels in the UK and abroad. This includes the Royal Mail Tunnel at Liverpool Street in London, which was subject to complex movements caused by the excavation of Crossrail Platform Tunnel Stations and a number of other construction activities. This is an ongoing project and the tunnel has been monitored in semi real-time for more than a year and a half.

In 2014 CSattAR technology contributed to the award winning Royal Mail Tunnel project that won the prestigious Ground Investigation and Monitoring Award at the International Tunnelling and Underground Space Awards.

CSattAR has been shortlisted for a number of product innovation awards including the British Construction Industry Awards, the Construction News Specialist Awards, the International Tunnelling and Underground Space Awards and the Ground Engineering awards.

The benefits

- low cost – saving up to 90% costs as compared to total stations
- accuracy and precision – the measurements provided by CSattAR are at resolutions of greater than 0.1 mm and at an accuracy of higher than 95% in measured movements
- redundancy – low cost targets means that it is possible to increase the redundancy of measurements by installing and monitoring more points: if a target gets knocked on site another target can immediately be utilised
- real-time visual inspection – the software can be used to inspect structures and monitored points in real time in advance of human deployment
- structural disruption – as the targets are installed on the surface of the structure they do not cause disruption, surfaces can also be monitored
- installation – the system is small in size and easy to install, in some cases it is possible to install the system in one day
- historic monitoring – the captured images are archived which means that it is always possible to return to them and monitor more points or re-inspect and re-investigate as needed

“Usage of CSattAR in a number of tunnel monitoring projects has increased our understanding of how these tunnels behave when they are subjected to various construction activities. CSattAR is an economical alternative to our conventional monitoring systems. It can monitor a large number of points with high resolution and remarkable precision. It also provides visual inspection which makes trigger management safer and more efficient.”

CSattAR has continuously and reliably been monitoring the structural behaviour of the Royal Mail Tunnel at Liverpool Street for over a year and half. It has equally been used in active tunnels such as those of the London Underground. I can foresee this technology being increasingly used by asset owners and in projects such as HS2, Crossrail2 and the Thames Tideway.”

Michael Devriendt (Associate Director at Arup)

For more information contact:

Mehdi Alhaddad
CSIC researcher
mma56@cam.ac.uk