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Editorial

Matthew Frost BEng (Hons), DIS, PhD, PgCHE, MPWI
Lecturer, Loughborough University, Loughborough, UK

Tom Cherrett BSc (Hons), PhD, CMILT
Professor, University of Southampton, Southampton, UK

Welcome to this special themed edition of *Transport*, on the subject of smart infrastructure and remote monitoring in transportation.

With increasing pressure to increase capacity and minimise the maintenance downtime of our transport infrastructure assets, novel non-operationally intrusive ways to establish condition, monitor performance and aid in planning, design and maintenance prioritisation are required. Such remote and smart monitoring also allows a move from the traditional, 'find-and-fix' stance to a more 'predict-and-prevent' approach to maintenance. Novel monitoring tools not only help optimise the use of and spend on assets, they also make a contribution to health and safety by minimising the need for people to be present in dangerous areas to collect data.

With recent improvements in miniaturisation of sensors and communication technology, as well as a reduction in sensor cost, such remote-monitoring approaches are becoming widespread and additionally offer opportunity for further development of new tools and techniques, leading to their widespread deployment. We feel that this collection of papers is both timely and useful to practitioners and researchers working in transport infrastructure.

The first paper (Armstrong and Preston, 2019) presents a useful review and introduction to the concepts of remote condition monitoring in a railway environment. It presents the basic principles of using remote monitoring and then explores opportunities for the deployment of the systems within an examination of the new Thameslink rail routes in London.

The second paper (Abrams and Brown, 2019) remains in a railway domain but focuses on the remote monitoring for early warning systems of geotechnical assets. It explores through a case study the issues of trying to evaluate aging assets, coupled with some of the challenges linked to sensor selection and communication complexities, when working in remote areas where supply of power and communication to any system can be difficult.

The third paper (Alhaddad *et al*., 2019) looks at remote use of photogrammetric techniques that have become economic following improvements in the quality and affordability of digital cameras and video systems. The paper presents the deformation monitoring of an escalator tunnel on the London Underground. It not only discusses the monitoring set-up using off-the-shelf cameras but also the detailed processing that is undertaken on the real-time images to allow excellent precision and accuracy of the monitoring. This, linked to appropriate software, allows data to be evaluated in real time against thresholds to allow appropriate and timely remedial actions to be taken when necessary.

The papers so far have looked at sensors and monitoring on existing assets. The fourth paper (May *et al*., 2019) looks at the use of video clips linked to the global positioning system on smart phones to help with the planning and optimisation of spend on new roads and maintenance within the developing country environment of the Philippines. Many developing countries have missed out whole development phases of communication technology, so have missed out extensive 'wired' networks and moved straight to very-well-developed 4G phone networks. Therefore, the use of the built-in sensor capabilities of the now-ubiquitous smart phone has allowed a cheap remote-surveying app to be developed to aid in road planning. This shows how simple, novel, effective use of smart tools can aid development.

Xu *et al*. (2019), in the fifth paper, present a novel system of optimising the operation of traffic flow through signalised junctions by feeding off real-time vehicle-position data. This system offers scope to link to autonomous vehicles and potentially introduces into routine highway operation the kind of positioning systems and prioritisation used in advance radio-based railway and light rail signalling/operational control systems. The approach uses vehicle-mounted sensors to communicate with the traffic network control system to optimise throughput. It offers and interesting leap of technology between modes.

The last formal paper in this edition (Poyil *et al*., 2019), looks at non-motorised transport and development of infrastructure based on the usage of pedestrian and cycle travel linked to a geographic information system framework.

To conclude this issue a book review is published. This reviews the fourth volume of a compendium series of books based on papers written by the teams involved in Crossrail – *Crossrail Project Infrastructure Design and Construction: Volume 4*. The papers presented are from the annual Crossrail papers competition and date from 2016 and 2017. Much of the reported work concentrates on issues of fire protection and stations linked to the system fit-out. The book offers a unique insight

into these elements of the scheme. However, it should be caveated that the book was published prior to the recent high-profile issues with this element of the megaproject.

We trust that you find this collection of state-of-the-art papers interesting and thought provoking. We feel it illustrates just a small sample of the opportunities and challenges offered by the use of remote sensing for transport assets.

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