Passenger Movement in and around Public Transport

Monash University's Institute of Railway Technology (IRT) is currently researching passenger movement in and around public transport, using various modelling techniques.

The project seeks the benefits of combining so-called 'big data' (data sets and analytics generated by networked computing, digitised databases and sensor technologies) with 'social data' (evidence produced by qualitative research methods capable of explaining why people behave in particular ways in specific social contexts).

Focused on a key form of urban transport infrastructure, the rail network offers an ideal setting to demonstrate the strengths of this combination. Data collected from various sensors will be analysed to produce pedestrian trajectories. Each individual trajectory includes large amounts of information in space and time including path choice.

"We will develop methods integrating the collected data with the simulation model in order to improve the accuracy of the simulation output. Animated agents represent a range of human types including gender, age and stature with all the impediments to movement associated with a wide range of passenger mobility", says Ravi Ravitharan, Director of IRT.

The project uses a novel solution that allows passive near real-time counting and flow metrics using hardware that is easily integrated into existing infrastructure.

The data collected from the sensors is undifferentiated. Social and demographic context is typically required for network planning and system design. Previous studies have indicated a wide range of qualitative variables that impact upon passenger behaviour. These factors include the prevailing culture, age, relative athleticism and ability of the passengers.

Accurate modelling of passenger movements has been difficult in the past to calibrate. With significantly improved data the nuances of passenger movements can now be modelled and simulated in a much more accurate and compelling way. Agent-based Modelling (ABM) and computational animation of data results in sophisticated imagery are underpinned by technical accuracy. It provides a tool for the development of station infrastructure, train carriage design with implications on timetabling and network planning.

This collaborative project involves The Institute of Railway Technology, the Monash Faculty of Arts, the Monash Faculty of Engineering, Monash Art Design and Architecture and an industry partner.

NEAR REAL-TIME MONITORING OF TRACK CONDITION AND TRAIN PERFORMANCE

IRT's instrumented revenue vehicle (IRV) technology has the potential to revolutionise the railway industry. It enables a planning culture instead of merely reacting to problems as they arise.

Aiming to overcome the limitations of track geometry cars, IRT designed and developed a sophisticated set of "instrumentation" that could be retrofitted to existing revenue vehicles.

The result track conditions can be remotely and automatically monitored using IRVs without halting standard revenue operations. To avoid revenue loss, track conditions are monitored continuously instead of once every few months. Such monitoring occurs close to real-time since the data is automatically transmitted directly from IRVs during operation.

Significance: a paradigm-shifting solution

The biggest cultural change within railway organisations utilizing IRV is from reactive to proactive maintenance and operation. This new technology has the ability to collect vast amounts of data about all aspects of railway operations – converting this into useful information that was previously unavailable.

Now, instead of the industry simply reacting to problems when they arise, IRVs provide timely and accurate information to analyse long-term trends and predict the condition of infrastructure well in advance. Being proactive means no longer playing catch-up, spending valuable resources, and interrupting services in the process.

It also allows railways to pre-empt evidence based maintenance needs before they become a problem. One can test the effectiveness of maintenance, and in worst-case scenarios implement temporary speed restrictions to avoid catastrophic failure, including derailments. With safety always a priority, the leading heavy-haul railway operators are now more than ever able to focus on "prevention rather than cure."

Written by Monash University

About Monash University's Insitute of Railway Technology (IRT)

Monash University's Institute of Railway Technology (IRT) is the premier track and vehicle railway research centre in Australia. IRT evolved from BHP's Melbourne Research Laboratories (MRL) in January 2000. The Institute enjoys an international reputation for excellence in railway research. It is fully funded by industry and is the largest industry funded business unit within Monash University.

www.irt.monash.edu
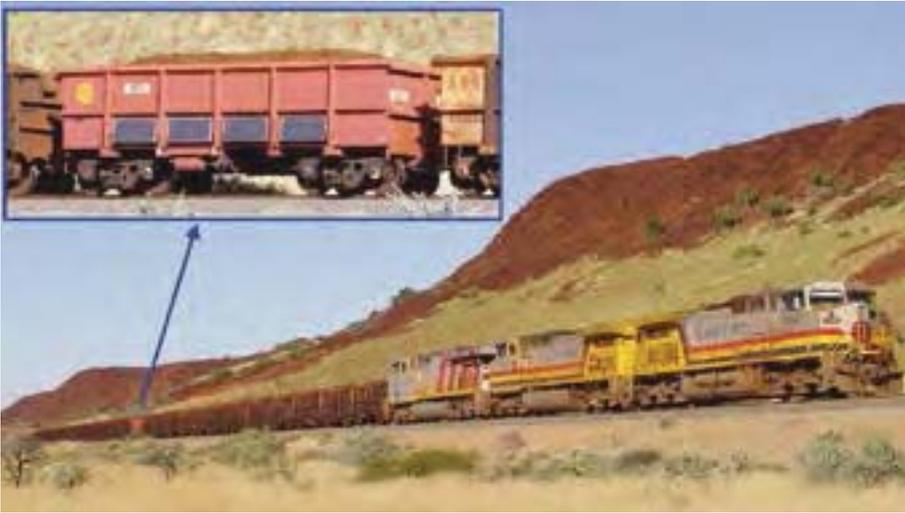
Its international client base includes BHP Billiton, Rio Tinto, FMG and Vale (Brazil) in the heavy haul industry, and mass transit and passenger services in Hong Kong, Singapore, Dubai, Taiwan, Kuala Lumpur and Melbourne. Many of the relationships with the mining industry have persisted for several decades, resulting in significant productivity enhancements and capacity development in heavy haul within the industry.

The Institute has recently received the prestigious Best Research & Development award at the Business/Higher Education Round Table (BHERT) Awards for their work on instrumented revenue vehicles.

"This award, along with the Clunies Ross Award that IRT researchers received in 2014, confirms Monash University's outstanding railway engineering and technology capabilities", says Ravi Ravitharan, Director of IRT.