

Intelligent transport systems



- Through the use of ITS technology, it is aimed to deliver safer, more efficient and environmentally sustainable transport solutions.
- CARRS-Q operates Queensland's first advanced driving simulator, enabling the study of human behaviour in different driving conditions, with a high degree of realism, but free of crash risk.

State of the Road A Fact Sheet of the Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

THE FACTS

What is ITS?

- The term *Intelligent Transport Systems (ITS)* refers to information and communication technology (ICT) applied to transport infrastructure and vehicles to improve safety, efficiency, productivity, travel reliability, informed travel choices, environmental performance and network operation resilience.
- Interest in ITS has been motivated by considerable advances in ICT, growing pressures of congestion and road trauma brought about by increased motorisation and urbanisation worldwide.
- Intelligent transport systems vary in complexity. They can include simple systems such as: car navigation; intelligent speed adaptation; railway crossing warning systems; variable message signs; and automatic number plate recognition or speed cameras to monitor applications such as security CCTV systems. They also range to more advanced applications such as cooperative systems that integrate live data and feedback from a number of sources, including other vehicles, weather information and traffic monitoring systems.
- Through the use of ITS technology, it is aimed to deliver safer, more efficient and environmentally sustainable transport solutions.

The Australian situation

- Although there have been significant improvements in Australia's road toll, every year a substantial number of people die and many more are severely affected by road crash-related injuries.

- During the 12 months ended March 2012, 1,301 people were killed in Australian road crashes. This represents a 2% decrease from the previous 12-month period.¹
- Australia's ongoing high road toll presents a critical challenge to all of us.
- The National Road Safety Strategy 2011-2020² is based on the "Safe System" approach and revolves around safe roads, safe speeds, safe vehicles and safe people.
- ITS solutions may provide valuable tools for assisting to reach the National Road Safety Strategy's vision: "No person should be killed or seriously injured on Australia's roads".

CARRS-Q's simulator is available for researcher and industry use through contract or collaborative arrangements.

CARRS-Q & ITS

- Within the area of ITS, there is a strong and increasing need for solid research expertise to guide interventions, strategies, and policies in Australia and overseas.
- CARRS-Q has the research tools and expertise to design or evaluate ITS industry or government-led interventions.
- CARRS-Q works closely with the agencies that carry the prime responsibility for road safety in the tertiary, public, and private sectors and offers the expertise and experience of over 70 highly-skilled

- research staff drawn from a range of disciplines including psychology, public health, civil and mechanical engineering, human movements, computer science, mathematical studies and optometry.
- The Centre's staff and project profile present an impressive collaboration of research and award-winning programs in the fields of road safety, accident prevention and traffic and transport improvements. The Centre has a strong focus on human factors and their interaction with other aspects of the transport system. CARRS-Q's core research business consists of six themes, of which one is the Human Behaviour and Intelligent Transport Systems (ITS) Interface.
- Our ITS multidisciplinary activities range from blue-sky research, such as exploring the use of EEG (Electroencephalography) signals to drive a car, to applied research such the interaction pattern between car driver and vulnerable road users, or to predict when driver's vigilance will be significantly altered.
- The research activities of the ITS theme are centered around the:
 - Use of ITS for the assessment and analysis of drivers' performance in a controlled environment (driver simulator or open/closed roads); and
 - The modelisation, implementation and evaluation of different interventions including new driver assistance systems of the future or new railway crossing devices.

CARRS-Q ITS PROJECTS

The following table lists a sample of CARRS- Q's ongoing ITS-related research projects:

ITS-related research topic	Details
Rail crossing projects: <ul style="list-style-type: none"> • Use of ITS to improve railway crossing safety • Affordable Railway crossing • Baseline level crossing video 	How to improve level crossing safety in sustainable manner by examining new technology, assess risks (near misses), cost benefits and human factors (RailCRC)
Understanding the effect of VMS messages on driving behaviour	Study on VMS messages related to speed and headway influence driving behaviour
Understanding the interactions between two wheelers and car drivers	Driver simulation study
Context aware augmented map systems for cooperative vehicles	How to build a real time virtual driving situation map from networks of sensors and communication capabilities including Vehicle 2 Vehicle and V2 Infrastructure to assist drivers to improve situation awareness
Eco-driving and safety	Understanding the effects of eco-driving instructions on safety and the use of ITS to promote Eco-Safe behaviour
Assessing crash risks on curves with ubiquitous data mining	How information about the environment, driver and vehicle could be used to assess crash risk on curves
An examination of monotony, fatigue and vigilance: Implications for road safety	Identification of the state of monotony using neuro psychology theory
Monotony and its effects on driver/operator vigilance: A new statistical model	How to predict vigilance decline in a monotonous driving environment (Bayesian network approach)
Use of mediated eye contact to prevent road violence	Use of augmented reality to convey eye gaze directions between drivers
Comparing 4WD and sedan's driver behaviour	Use of ITS to observe the difference of driver's performance
Advanced Driver Training Assistance System to assist 4WD driver trainer	Use of vision based recognition system to assess driver behaviour

CARRS-Q EXPERTISE

- Professor Andry Rakotonirainy directs CARRS-Q's ITS theme, supported by 8 PhD students and 1 postdoctoral researcher.
- Our research is achieved by taking a systematic, interdisciplinary approach. Our researchers work at the interfaces between traditional scientific disciplines and the ITS theme involves key experts, including:
 - Em/Prof Mary Sheehan – Psychology and Road Safety
 - Prof Rod Troutbeck - Traffic Engineering
 - Prof Simon Washington - Traffic Engineering - Statistics
 - Prof Narelle Haworth - Traffic Psychology
 - Prof Jeremy Davey – Fleet Safety

International collaborations

- Scientific excellence is only meaningful if placed in an international context and CARRS-Q has created a significant international network of collaborators in Europe, USA and Asia.
- The centre has a strong international profile, with senior academics regularly invited to join international program committees, become journal editors or invited speakers.

- Many CARRS-Q senior staff are invited members of the prestigious US academy of Science Committees of the Transportation Research Board (TRB) which is part of the prestigious US Academy of Science.
- Prof Andry Rakotonirainy is a regular guest research director to the French Institute of Sciences and Technology for Transport, Development and Networks (IFSTTAR), a member of the Canadian Centre of Excellence in Automotive Innovation and a member of an international expert assessor group of the European Union 7th Framework Program project.

Research infrastructure

CARRS Q has a broad range of research infrastructure, including:

- Advanced driving simulator (six Degree of Freedom 6DoF) featuring traffic and sensor simulator functionalities;
- Research vehicle equipped with technology such as Eye Trackers (FaceLab), Multimedia Data Logger (Vigil Vanguard), Radars (Ibeo), Lane Detection (MobileEye) and Head Up Display;
- A set of physiological sensors (GSR, EEG, heart rate monitors, accelerometers, etc); and

- High Performance Computing (HPC) infrastructure (used for the graphics of our driver simulator).

Data access

CARRS-Q is able to access to a variety of data sources for approved purposes through liaison with data custodians, including:

- Coroner's database;
- State crashes: Queensland Department of Transport and Main Roads crash database;
- Queensland hospital admissions;
- Emergency Department Information System;
- Queensland ambulance attendance;
- Queensland Injury Surveillance Unit;
- Insurance (property, injury) claim database;
- Major Australian fleets data; and
- Rural and remote driving and road crash data.

The Centre does not hold such data over time.

REFERENCES

1. Australian Government Department of Infrastructure and Transport. (2012). *Road deaths Australia*. http://www.bitre.gov.au/publications/2012/files/RDA_0312.pdf
2. Australian Transport Council, *National Road Safety Strategy 2011-2020*. <http://www.atcouncil.gov.au/documents/atcnrss.aspx>

STATE OF THE ROAD is CARRS-Q's series of Fact Sheets on a range of road safety and injury prevention issues. They are provided as a community service and feature information drawn from CARRS-Q's research and external sources. See the reference list for content authors.

FOR MORE INFORMATION

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