

Innovation: Smart Transport And Roads



From imagination to impact

NICTA's new technologies makes traffic control systems smarter by giving them better, more comprehensive sensory input and making novel use of mathematical and computational techniques to establish an understanding of how traffic is flowing over the wide area network of traffic. It uses that information to compute changes at the level of each traffic light to optimise traffic flows across that network.

Background

As the world's major cities continue to grow, traffic congestion is becoming an ever-increasing problem. While investing in public transport infrastructure can alleviate some of the pressure, the number of vehicles using urban roads continues to climb. The total social cost of transport congestion in Australia currently exceeds \$10 billion per annum, a figure expected to double by 2020.¹

In the 1970s the NSW Roads and Traffic Authority (RTA) invented a new traffic control system which continually measures and adapts the flow of traffic through its major intersections. This system (called Sydney Co-ordinated Adaptive Traffic System - SCATS) uses sensors built into the road to detect cars waiting at intersections and a network of computers to coordinate the flow of traffic. It has undergone continual improvement and is now used across Australia and 130 cities in over 25 countries around the world.

In 2005 NICTA formed a research partnership with the NSW Roads and Traffic Authority to develop the next generation of traffic control systems.

Innovative Technology Improves Transport and Roads

Specifically, this is achieved by NICTA:

- developing new computer vision technology to provide reliable, low-cost vehicle detection and tracking, queue length estimation and vehicle classification at intersections. This information is fed into an artificial intelligence (AI) based control system running on an hierarchical network of computers.
- working with the NSW Government's Transport Management Centre at Eveleigh to develop better computer interfaces for RTA personnel engaged in traffic management. This work involves measuring the cognitive load (load on the brain) of traffic control room operators during emergencies and designing new computer systems which improve response time and reduce fatigue. Improved response times are critically important for getting emergency services and other traffic management vehicles to an accident scene quickly. They can also reduce the knock-on effect of a traffic jam, which increases exponentially with time.



- developing a new communications network protocol to ensure that school zone warning lights are always operating reliably, thereby improving safety in school zones. This is a complex combination of control and communications protocols that ensure that the lights are switched on at the right time, and are working, that messages are also sent over wireless to some crossings and via wired networks to others, making the protocol design difficult. This is done centrally and has to be transmitted to a large number of crossings simultaneously.

NICTA is trialling its computer vision and AI based control algorithms at a major intersection of the Illawarra and Princes Highways, near Albion Park, south of Wollongong. This system is predicted to improve the flow of vehicles through the intersection in peak periods by 5%, which translates into a flow-on significant improvement in travel times and safety.

All of these improved traffic management systems will initially be deployed in NSW. They are also expected to be implemented in other states of Australia and elsewhere in the world using the existing RTA distribution network. These research initiatives will also have environmental benefits through reducing local particulate pollution from vehicles delayed in traffic and minimising fuel wastage.

¹Bureau of Transport and Regional Economics, June 2007



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NICTA

NICTA is Australia's Information and Communications Technology (ICT) Research Centre of Excellence and the largest organisation in Australia dedicated to ICT research. NICTA drives innovation through high-quality research, research training and technology transfer.





Our researchers are located in five laboratories located in four cities around Australia: Melbourne, Sydney, Canberra and Brisbane. Working in specialised teams, they are focused on a series of specific research themes and business areas.

Our work as a world-class research institute and Centre of Excellence in science and innovation brings together many of Australia's and the world's top ICT researchers. NICTA provides them with the facilities and support they require, making our vision a reality.

NICTA's unique approach fosters and develops ICT research. We work closely with both industry and other research institutions to solve problems and make breakthroughs in ICT with real impact.

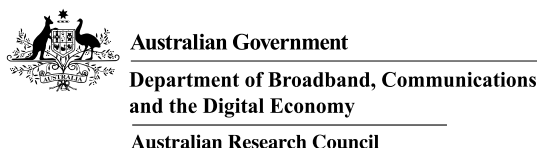
NICTA's focus on use-inspired research means our projects have direct relevance to the challenges faced by business, government and individuals around the world. The result is breakthrough technologies that provide commercial opportunities and have a positive impact on Australia's export earnings.

Our Research Themes:

-  Embedded Systems
-  Networked Systems
-  Making Sense of Data
-  Managing Complexity

Our Business Areas:

-  Biomedical and Life Sciences
-  Environmental Management
-  Intelligent Transport Systems
-  Mobile Systems and Services
-  Safety and Security
-  Software Infrastructure



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