



AUSTRALIAN INSTITUTE OF TRAFFIC PLANNING AND MANAGEMENT INCORPORATED

AITPM TECHNICAL FORUM

Patron: The Hon Tim Pallas MP, Minister for Roads and Ports



Transport Research Postgraduate Students Presentations

Tuesday 22nd June 2010, 5:00pm – 6:30pm

Department of Transport Theatre, Level 5 / 121 Exhibition Street

AITPM is pleased to offer this opportunity to hear about the latest transport research being undertaken at Monash University's Institute of Transport Studies. Six speakers will give brief overviews summarising the major directions and findings of their research interests.

This seminar will strengthen the important relationship between traffic and transport engineering practitioners and researchers; with both standing to learn from their respective experiences.

We will also announce the recipient of AITPM Victoria Branch's undergraduate student prize to attend the AITPM National Conference in Brisbane from 21 – 23 July.

Guest speakers (all from Monash University's Institute of Transport Studies)

Ehsan Mazloumi	<i>Determining the optimal timing points and slack times in the schedule design process</i>
Mahmoud Mesbah	<i>A genetic algorithm approach to optimise public transport priority in an urban network</i>
Sara Moridpour	<i>Modelling heavy vehicle lane changing</i>
Kayvan Aghabayk	<i>Heavy vehicle car following and lane changing behaviour on urban arterials</i>
Nirajan Shiwakoti	<i>Enhancing the safety of pedestrians during emergency egress: insights from biological entities</i>
Amir Sobhani	<i>A theoretical approach to model the safety performance of intersections</i>

There is no charge to attend this forum.

You need to confirm your attendance so we can prepare your visitor's pass.

RSVP to <http://aitpmvic20100622.eventbrite.com> by Monday 21st June

For more information, email ewan.ramsay@transport.vic.gov.au, or telephone (03) 9655 8743

This event contributes towards your Continuing Professional Development (CPD) requirements, as required by many professional associations.

"Growing traffic skills and knowledge to deliver sustainable transport"

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AITPM Transport Research Postgraduate Students Presentations – Abstracts

Ehsan Mazlumi *Determining the optimal timing points and slack times in the schedule design process*

Bus schedule design involves determining the location of 'timing points' and the associated 'slack times'. At timing points, timetable based control strategies are applied to improve the on time performance of buses. Early running buses are held until the scheduled departure times, and buses running late will depart immediately after serving passengers. Scheduled departure times are defined by adding a slack time to the mean bus arrival time. Selecting too many timing points slows down the operation and increases the waiting time of passengers on board. Having too few timing points may not be sufficient to control the variations in travel times, increases the waiting time of boarding passengers. Selection of inappropriate slack times may also result in negative consequences. A large slack time delays the operation, while a small slack time may not be able to control unreliability. This research proposes a method to find the optimal timing points and the associated slack times by minimising a cost function which considers all the cost components. An optimisation method is coupled with the VISSIM micro-simulation software package to determine the optimal timing points for a section of bus route 246 in Melbourne. The results show that optimal timing points can save around 15 per cent of the total associated cost. They also demonstrate the promising ability of the algorithm to solve the problem for large scale routes.

Mahmoud Mesbah *A genetic algorithm approach to optimise public transport priority in an urban network*

Traffic congestion is a challenge facing many urban transport networks. While construction of new roads is not a viable option in many cities, improvement of public transport (PT) facilities can offer a solution. Introduction of exclusive lanes for PT vehicles is a green and low cost improvement which is focused in this research. Many approaches in the literature devised an exclusive lane based on a local perspective and some other studies evaluated priority lanes on urban freeways. It is of great importance to develop methods for introduction of PT exclusive lanes from a network perspective and on arterial roads. In this study, a method is proposed to locate PT exclusive lanes in an urban transport network. Considering all the stakeholders of the transport network, a comprehensive transport planning model is used to evaluate a given set of exclusive lanes. In the transport planning model, a traffic assignment model and a transit assignment model is included to consider the primary effect of the prioritization, as well as a modal split model to capture the secondary effects of mode shift. A Genetic Algorithm approach is applied to find the optimal solution. The procedure is implemented by a powerful interface with a Visum and computational issues are addressed for a large scale network.

Sara Moridpour *Modelling heavy vehicle lane changing*

Lane changing manoeuvres have a substantial impact on microscopic and macroscopic traffic flow characteristics due to the interference effect they have on surrounding vehicles. The interference effects of heavy vehicles' lane changing manoeuvres on surrounding traffic are likely to be greater than when passenger cars execute lane changing manoeuvre. This research provides new insight into the role that traffic parameters associated with the surrounding vehicles plays in the lane changing behaviour of heavy vehicle and passenger car drivers. From detailed examination of vehicle trajectory data, differences are identified in the lane changing of heavy vehicle and passenger car drivers. Then, a reliable model is developed to estimate the lane changing behaviour of heavy vehicle drivers. Drivers' lane changing behaviour has been characterised as a sequence of two stages: the decision to change lanes and the execution of the lane change. Hence, separate models were considered for those two stages of the heavy vehicle drivers' lane changing behaviour. Finally, the performance of the heavy vehicle drivers' lane changing model is examined macroscopically and microscopically using VISSIM microscopic traffic simulation model. The superior performance of the heavy vehicle drivers' lane changing model highlights the importance of developing an exclusive lane changing model for heavy vehicle drivers. Employing a purpose built heavy vehicle lane changing model has been shown to increase the accuracy of the microscopic traffic simulation model.

Kayvan Aghabayk *Heavy vehicle car following and lane changing behaviour on urban arterials*

Increased volumes of heavy vehicles are having an increased effect on traffic flow. Existing car-following and lane changing models of heavy vehicles are limited to freeways. As a result this study focuses on modelling the heavy vehicle behaviour in arterial traffic stream. The behaviour of passenger car and heavy vehicle drivers on urban arterials is compared in this study. The behaviour on arterial roads is then compared to that on Freeways. Considering the differences this study outlines areas of further research.

Nirajan Shiwakoti *Enhancing the safety of pedestrians during emergency egress: insights from biological entities*

Collective movement is important during emergencies, when rapid egress is essential for escape following natural disasters or terrorist's attacks. The problem in studying collective human dynamics under emergency/panic situations is that complementary data on panic to develop and validate the model prediction are rare, as they are difficult to capture. Therefore, a genuine question arises: can one depend entirely on the mathematics before scaling up and applying a model prediction in a human situation? Or can there be alternative empirical ways to demonstrate that what a model predicts is actually efficacious and improves safety to pedestrians? This research examines the role of non-human biological organisms (Argentine ants) in the development of a pedestrian traffic model both from theoretical as well as model validation perspectives. It is shown that such a framework, which integrates complementary expertises of traffic engineering and biology, has the potential in devising practical strategies and design solutions that enhances the safety of pedestrian crowds.

Amir Sobhani *A theoretical approach to model the safety performance of intersections*

This research presents a framework for assessing the level of safety at an intersection. The developed methodology is based on a Safety Analysis CHain (SACH) which has five segments including the traffic flow, number of conflicts, severity of conflicts, number of crashes and severity of crashes at an intersection. Three models are proposed to quantify these five segments. Traffic simulation has been utilised to model the number and severity of conflicts at an intersection. A numerical simulation model looks at each conflict and the human behaviour in the conflict to investigate the characteristics of the crashes. A severity model has been used to determine the severity of the measured crash characteristics. In the developed methodology the foregoing models run consecutively to represent the five segments of the SACH. The Casualty Crash Risk of a Manoeuvre in an intersection is derived to represent the safety performance of intersections. This measure represents the safety performance of intersections considering all segments of the SACH. The methodology was applied to an uncontrolled four leg intersection. The framework offers potential for proactively studying and comparing the safety performance of different intersection designs.