GTAconsultants

Operational Traffic Modelling for Sydney CBD

Construction is underway on Sydney's CBD and South East Light Rail (CSELR) network, which will reshape Sydney's transportation system and reduce the city's reliance on buses.

The following paper covers GTA's role in developing a new Sydney CBD transport model for Transport for NSW (TfNSW) to test light rail integration scenarios. GTA introduced an innovative, multi-layered modelling approach which considered the strategic, mesoscopic and the microscopic level.

Operational Modelling

In the early stages of the project, the preexisting Roads and Maritime Services (RMS) microsimulation model represented best practice modelling of traffic at a vehicle, pedestrian, entity level. The model, however, did not consider traffic effects from outside the CBD.

Consequently, the model was likely to overestimate congestion when traffic capacity was reduced in the CBD and, conversely, to underestimate congestion when capacity was increased.

The operational assessment approach taken to deal with this effect, included the development of an area-wide mesoscopic Aimsun model. This model allows the dynamic simulation of an area large enough to account for regional route diversion, as well as microsimulation modelling of smaller pockets that require the representation of dynamic individual vehicles in the detailed road network. This hybrid platform is proving to be an efficient method for data exchange or model transformation from the macroscopic level (Sydney Strategic Travel Model) (SSTM) and the Public Transport Project Model (PTPM)) to the mesoscopic/microscopic levels in Aimsun.

Model Behaviour

The Sydney Coordinated Adaptive Traffic System (SCATS) controls all signalized intersections in the modelled study area and allows adaptive phase times, cycle times and offsets to respond to fluctuating traffic conditions and public transport demands, and improve the efficiency of individual intersections. However, the introduction of light rail within the complex road network environment will require an overhaul of the existing SCATS signal control strategies to cover various new light rail traffic signal priorities. The implementation of SCATSIM into the Aimsun mesoscopic model has provided the following:

- an estimate of the magnitude of traffic issues,
- the ability to develop more appropriate congestion management plans and
- the evaluation of signal priority levels, as well as their impact on travel time reliability

The hybrid platform was designed to deal with interface issues between the models. There are some distinctive differences in vehicle detection emulation between the microscopic and mesoscopic models. The mesoscopic car-following model is simplified when the acceleration and deceleration constraints are removed. The new model estimates the earliest time that a vehicle can enter and exit the section, and uses this information to calculate the arrival time of a vehicle at a detector. The first-of-its-kind SCATSIM interface between SCATS and the mesoscopic model enables the exchange of information between SCATS and the simulator.

In addition, a recently added microsimulation pocket along the length of the light rail corridor can accurately replicate detailed light rail vehicle characteristics and ultimately increase confidence levels in the model's forecast travel times.

Operational assessment

In October 2015, during the implementation of the new CBD Bus Plan and the first closures of George Street, the assessment of actual traffic volumes within the CBD cordon after the first closures showed a reduction in trip numbers and peak spreading away from the busiest time periods. This demonstrated the successes of the ongoing travel management campaign by the New South Wales (NSW) transport authorities, which aims at reducing vehicle numbers in the Sydney CBD.

The model results showed a 2% overestimation of inbound and a 16% underestimation of outbound vehicle trips in the morning peak period. This relatively high underestimation of outbound volumes was due to the changeable nature of those trips. In morning peak traffic, diversions resulting from the proposed road closures and the new bus plan were likely to occur on alternative north-south routes, which correlated closely with the survey data.

Simulation Success

The use of the Aimsun modelling platform, in combination with SCATS, has provided Sydney with a cutting-edge tool that can successfully support the development of several demand management and operational transport strategies.

Need to know

- The Aimsun Sydney CBD model platform is the first of its kind to communicate with SCATS
- SCATS is an ITS developed in Sydney, Australia in the 1970s
- It manages the dynamic timing of signal phases at traffic signals
- The implementation of SCATSIM in the Aimsun mesoscopic model has enabled estimates of the magnitude of traffic issues, inside and around Sydney CBD, to be made

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