Micro-simulation
Traffic Modelling in Asia

Systra
MVA
MICRO-SIMULATION
TRAFFIC MODELLING IN ASIA

WHAT IS MICRO-SIMULATION?

Traffic simulation software has become increasingly more popular as a traffic analysis tool used in transportation analyses to model and analyze the operation of complex transportation systems under congested conditions.

Micro-simulation models can analyze private and public transport operations under constraints such as lane configuration, traffic composition, traffic signals, PT stops, etc., thus making it a useful tool for the evaluation of various alternatives based on transportation engineering and planning measures of effectiveness.

The key difference is that Micro-simulation modelling is able to simulate the movement of individual vehicles travelling within a road network through the accurate replication of driver behaviour. In this regard micro-simulation modelling is distinct from strategic, cordon area and local models within which all vehicles exhibit a common, uniform behaviour.

Micro-simulation software typically uses a stochastic modelling approach that provides the capability to assess dynamic phenomena, for example selective vehicle priority. They are able to model the impact of variability upon network behaviour, and are therefore capable of representing complex traffic problems, for example the impact of parking or incidents upon the network.
WHY USE MICRO-SIMULATION

Micro-simulation can offer benefits over traditional traffic analysis techniques in three areas: clarity, accuracy and flexibility:

CLARITY: A comprehensive real-time visual display and graphical user interface illustrate traffic operations in a. The animated outputs of micro-simulation modelling are easy to understand and simplify checking that the network is operating as expected, and whether driver behaviour is being modelled sensibly.

ACCURACY: By modelling individual vehicles in congested network conditions, micro-simulation offers distinct advantages because of more accurate modelling of traffic operations at complex and simple intersections or merges includes non-standard traffic behaviour. Individual drivers of vehicles make their own decision on speed, lane changing and route choice, which represent much better the real world than other modelling techniques.

FLEXIBILITY: Micro-simulation can assess a greater range of problems and solutions compared with conventional methods. Examples include: vehicle-actuated signals, demand dependent pedestrian facilities, queue management, public transport priorities, incidents, toll booths, road works, signalised roundabouts, shock waves, incidents or flow breakdown, or slip road merges. Furthermore, all transport modes can be included in one simulation, such as cars, trucks, buses, LRT, bicycles and pedestrians, etc.

FURTHER ADVANTAGES OF MICRO-SIMULATION:

- Analysis of projects with high social impact by 3D visualization
- Planning and design of high-value projects with potential large savings if Micro-simulation models are prepared and detailed analysis carried out
- Over-saturated traffic network conditions (e.g. intersection exit-blocking or queue spill-back) where up- and down-stream effects can be taken into account
- In cases where network infrastructure changes dynamically throughout the modelled period (e.g. SCATS signal control, demand-dependency, bus priority at signals)
- Multi-modal studies, as Micro-simulation includes all modes in one simulation: cars, trucks, busses, LRT, rickshaws, bicycles and pedestrians, etc.
MVA MICRO-SIMULATION MODELLING SERVICES

MVA offers specialist expertise in microscopic traffic modelling, ranging from assessment of road network design layout & optimization schemes, through to 3D visualization of proposed traffic schemes that accompany traffic studies and impact assessments.

Types of services offered include:

Development – Design, Impact Assessment & Mitigation
- Single site (Residential, Commercial etc.)
- Access arrangements and adjacent junctions
- Car park design and circulation
- Masterplan
- Traffic management schemes
- Optimization of development levels
- Development of improvement schemes

Urban Traffic Network Management
- Junction / Link / Network capacity analysis
- Network performance
- Lane configuration / assignment
- Signal control
- Signal coordination / Adaptive signal control
- Complex intersections
- Roundabouts (priority and signalized)
- Implementation of development schemes
- Parking / Route guidance system

Expressway and Highways
- Any type of interchange (single-point, cloverleaf, diamond, etc.)
- Weaving and merging sections
- Interchange ramps and slip roads
- Ramp metering
- Toll plazas

Public Transport Operations
- Bus Operation
- LRT / BRT schemes (interaction with traffic)
- Priority measures (bus lanes, queue jumps etc.)
- Actuated signal control
- Design of PTI and coach / bus stations
- Operation of tram terminals
- PT capacity analysis (demand-driven)
- Analysis of PT schedules (including testing varying degree of randomness)

Pedestrian (and mixed) Assessments
- Retail (internal)
- Other developments (i.e. hospital)
- Rail station (internal)
- Airport operation (internal)
- Ferry Terminal
- MTR station
- Sports venues (internal)
- Evacuation scenarios

Facility Planning and Design
- Retail (external)
- Rail stations (external)
- Border control points
- Sports venue (external / parking / dispersal after major event)
- Toll plazas
- Airports (landside)

Temporary Traffic Management
- Temporary traffic management schemes
- Incident management
- Lane blockages (e.g. truck load spills, vehicle break downs, crash), re-routing
- Road works
- Sporting events, parades etc.
- Rerouting and diversion effects on larger networks
MVA EXPERIENCE AND USE CASES

- **Development – Design, Impact Assessment & Mitigation**

- **Annapurna Fim Studios, India**
  Development of a VISSIM model to visualize and test the proposed road access scheme, internal vehicle circulation and pedestrian access. The simulation assisted in recommending adequate vehicle circulation, provision of sufficient pick-up/drop-off points and provision of basement car park ramps.

- **Delhi and Kolkata International Convention Centre, India**
  Development of a VISSIM model to evaluate and recommend external vehicular access schemes, internal network routing, traffic circulation and provision of pick-up and drop-off points.

- **Yau Tong Bay Redevelopment Micro-simulation Traffic Model, HK**
  Development of a micro-simulation model showing the traffic conditions in the neighbourhood junctions with the proposed Yau Tong Bay Redevelopment.

- **Traffic and Transport Consultancy for Ponte 16 Development, Macau**
  Development of a micro-simulation model showing the proposed internal and external traffic arrangement for the proposed hotel/casino development at Macau.

- **Wynn Resorts Macau**
  Development of a micro-simulation model showing the existing traffic condition in the vicinity of the proposed hotel/casino development at Macau and also using the model to simulate the recommended traffic arrangement / circulation.

- **Wangfujing International Brand Center, Beijing**
  The VISSIM model was used to evaluate external access, internal circulation & ramps, pick-up and drop-off points and barrier control. Recommendations on peak period capacity constraints and operation of the automated barriers.
Comprehensive Transport Study for the National University of Singapore
The VISSIM model covered the entire NUS road network including proposed Warren Campus expansion to study improvements of external/internal connectivity, public transport operations and recommend adequate traffic and pedestrian linkage.

Xiangluowan Tianjin Binhai New Commercial and Business District
Development of a VISSIM model of the proposed new commercial and business district to assess junction and link capacities, routings and overall network performance of a number of proposed scheme options.

Brunei, Traffic Improvement Schemes in Bandar Seri Begawan (BSB)
Development of a number of VISSIM models in order to analyse current traffic conditions and testing of recommended traffic improvement schemes in various areas in BSB.

Lippo Cikarang Traffic Study, Indonesia
Testing of proposed traffic circulation, external access routes and internal plot-connections for a mixed-used development on a 300ha site with improvements of the existing interchange connection to the Jakarta-Cikampek Highway.

Motorola Interchange KL, Malaysia
Development of a VISSIM model to evaluate of a number of scenarios to expand a major 3-tier interchange in Kuala Lumpur. Recommendation of adequate development access via additional dedicated highway ramps.

Temple of Heaven Performance Zone schematic design study, Beijing
Development of a VISSIM model to visualize and analyze the proposed traffic network, illustration of predicted traffic conditions at focus locations and testing of external/internal linkage and ingress/egress to/from major performance venues.

Interchange in Bandar Seri Begawan, Brunei
The VISSIM model was used to test and analyse weaving and merging sections, slip roads and lane assignment of a major roundabout in Brunei. Testing of optimised signal timings and coordination.

Tramways, Hong Kong
Development of a VISSIM model to test and optimise signal timings and improve signal coordination in the Sheung Wan area to reduce excessive tram delays during peak hours.
PUBLIC TRANSPORT OPERATIONS

Macau, BRT Study
Development of a VISSIM/ VISUM model of the north-western part of Macau to assess benefits and impact of the proposed alignments of a dedicated bus lane along the western shores of the Macau Peninsula.

Brunei, Development Master Plan, Integrated Public Transport System
Development of a VISSIM model to assess feasibility and impact on the traffic network in association with proposals of a Light Rail Corridor in Bandar Seri Begawan and to visualize the preferred scheme.

PEDESTRIAN ASSESSMENTS

West Kowloon Terminus (WKT)
The LEGION pedestrian simulation of West Kowloon Terminus provided on analysis of different passenger types within the terminus. The model results were used to understand behavioural patterns of passengers at various checkpoints within the terminus.

Station Planning, Kai Tak Station
Development of STEPS and VISWALK models to identify potential issues of the proposed station layout and to improve service utilization, efficiency and reliability. The model was also used to assess station operation after mega events at the nearby Kai Tak Stadium.

FACILITY PLANNING AND DESIGN

Changi International Airport Terminal 1, Singapore
The VISSIM model simulated all arrivals' traffic facilities, including taxi stands, private vehicle & limousine pick-up areas and car park operation in support of improvement scheme recommendations due to lack of boarding capacity during peak periods at Arrivals level.

Preliminary Design for West Kowloon Terminus
Visualization and testing of proposed traffic schemes around the terminus station, access schemes, operation of internal traffic circulation, taxi pick-up/drop-off areas, bus/coach station, car parks, good vehicle access and provision of basement car park ramps.

Galaxy, Macau
The VISSIM model assisted in identifying issues on traffic circulation and capacity constraints at the proposed drop-off and pick-up area at the Galaxy resort in Macau. Testing of efficiency of pedestrian circulation and access.

TEMPORARY TRAFFIC MANAGEMENT

MRT Kuala Lumpur - Blue Line, CBD Section
Analysis of TIA/TTM Works to report potential traffic congestion hotspots due to rerouting and constraints as a result of TTM schemes within the CBD area of Kuala Lumpur during staged construction of the MRT Blue Line CBD section. Recommendations of network improvements for various TTM schemes.
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