SIMULATION IN ACTION AT WORK ZONES

CORSIM

McTrans's CORSIM (CORridor-microscopic SIMulation program) has "been used to model work zones by taking advantage of high-occupancy vehicle (HOV) lane and incident features," says the Center's Dr David K Hale. The program has the ability to classify HOV lanes as 'closed to all traffic' and incidents as causing 'blockage at point of incident' in any given time periods. It also has a calibration setting for the location of an incident warning sign.

When field data was unavailable for a research project set up to evaluate arterial work zones, CORSIM was used to develop specific configurations and to obtain relationships between relevant factors and work zone capacity. This was estimated as a function of factors including the percentage of left-turning vehicles and the distance of the work zone from the downstream intersection.

ww.mctrans.ce.ufl.edu

S-Paramics

Developed by SIAS subsidiary Paramics Microsimulation, S-Paramics software is being used in a research project funded under the Scottish Road Research Board's 2012-2013 research programme. This aims to achieve a better understanding of the operational impacts of driver behaviour on the approach to road works to enable practitioners to develop safer and more effective traffic management regimes.

Malcolm Calvert from SIAS says: "It is clear that, while the layout of many traffic management configurations at road works does not dramatically differ from the 'normal' merging of two lanes into one, the throughput observed can differ dramatically. Yet despite the very great impact this can have on capacity, delays, safety and emissions, the reasons for this are not well understood.

"In order accurately to model roadworks, it is critical to have an understanding of how driver behaviour [in road works] may differ from that in 'normal' circumstances." The research will include a review of case studies to identify the discrepancies that exist between modelled and observed driver behaviour. In evaluating the interface between the driver and the road environment and between the driver and other road-users, the study will examine the relationship between the observed behaviour and the academic knowledge base in the area of human sciences. The outcomes will include recommendations for modelling driver behaviour at road works and some initial ideas on how positively influence driver behaviour to improve traffic conditions.

www.sias.com

Quadstone Paramics

Some parts of New Jersey's Route 139 date from the 1920s and need total renewal. The route is a key connection between the north of the State, Jersey City's waterfront and the Holland Tunnel which links the State to Lower Manhattan in New York. It consists of a two tiered roadway with the upper being signalised and a lower having controlled-access. Both levels are connected with surface streets and the tunnel via bi-directional viaducts.

Around 80,000 vehicles use it each weekday, keeping it at or nearly at capacity for much of the day. Its regional importance predicated the minimising of road works through a multi-phased construction programme, each phase creating its own impacts and demanding specific mitigation methods.

New Jersey chose Quadstone Paramics to simulate solutions including time-of-day lane closures, reversible lanes, traffic detours, adaptive signal controls, and police direction of traffic as well as the likely effects of incidents. This process provided criteria for the elimination or implementation of individual strategies and the company says the visualisation capability added a fresh level of understanding of the consequences of each option.

On-the fly network editing also allowed for visual 'what-if' testing of changes to signal timings, signal phasing, and detour options at project meetings.

www.paramicsonline.com

Vissim

Developed by German company PTV, the Vissim traffic in cities simulation model software package is, according the company's Dr Axel Leonhardt, widely used in work zone traffic modelling to gain accurate estimates of remaining road capacity. It is critical, he says, to adapt software parameters realistically to model driver behaviour and, using field observations, to take account of speed distribution – which is a particular consideration in the US.

Leonhardt agrees with the FHWA report that calibration of detailed models can be a challenge. "If, due to cost and time pressures, project managers and engineers need to make savings, it is the calibration that tends to suffer. Without this, simulation will still give results, but they will not be as good," he says.

He accepts that, realistically, it is not always possible to perform field measurements, although this is ideal, and points out that engineers can take advantage of experience from elsewhere. "There is, for example, a good deal of technical literature available on deployments and that will at least give them some starting points for modelling." He goes on to suggest that driver information/assistance technologies, and emerging cooperative vehicle systems (car2Car/car2infrastructure communications), "can also improve traffic efficiency and safety at work zones. Microscopic simulation is an excellent methodology for designing and assessing them".

www.ptvgroup.com
www.aktiv-online.org

Aimsun

Traffic management during the construction of a new water tunnel close to the Queensboro Bridge in New York City involved a contraflow on the bridge approach, street closures and a detour route. These diversionary plans were evaluated before implementation. The US$210,000 project for the New York City Department of Transportation, with KLD as contractor, combined traffic engineering and simulation. The latter confirming the engineering analyses for assurance of the proposed maintenance and protection of traffic (MPT) plan.

Field conditions posed several challenges in developing the simulation model. Among these, several intersections on the bridge approach have traffic enforcement agents to prevent gridlock and when conditions permit, advance vehicles can override signal settings and alter vehicle discharge characteristics.

The solution involved:

- Use of Aimsun's 'sunshine control' or 'yellow box' feature in the simulation model to avoid gridlock, by preventing vehicles entering an intersection unless gaps were long enough to allow them to clear it
- Adjustment of vehicle behaviour parameters inside the 'yellow box' to reflect field discharge rates at stop lines.

One bonus was that 66 days of continuous volume data for the bridge was available for the analysis making it possible to reliably identify the bridge's capacity.

Aside from calibration issues, the turning radii of large trucks and buses detouring to the contraflow required special attention using AutoTURN turn simulation and AutoCAD computer aided design software. When larger vehicles were seen to use the middle of three lanes on 58th Street to enter the contraflow, the stop lines were adjusted to accommodate them. The combined solution was of material help in finalising the operating configurations for the MPT plan - specifically the contraflow element. The project has received an American Council of Engineering Companies (ACEC) national recognition award.

www.nyc.gov/dot
www.kldcompanies.com
www.aimsun.com
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www.autoturn.com