“Social networking is like being married: Facebook wants to know what’s on my mind, Twitter wants to know what’s happening and Foursquare wants to know where I am.” It’s an old joke on the internet but serves to show how accustomed users have become to interfacing different social media platforms to get the best out of online networking services. On the other side of the fence, it also demonstrates how media platforms recognise the benefits of accommodating one another and acting in alignment rather than competition. To take a very recent example, in November 2010 MySpace and Facebook announced a partnership that allows Facebook’s 600 million users to transfer their ‘likes’ and interests over to MySpace, creating a real-time stream of automatically tailored updates.

Not just a pretty interface

Alex Gerodimos and Nadia Feddo of TSS-Transport Simulation Solutions outline the mutual benefits of combining Aimsun traffic simulation software with third-party tools, such as Legion’s pedestrian simulation algorithms.

Legion and Aimsun have been scratching each other’s backs since 2007, when the two companies combined their software to create an initially limited but groundbreaking interface between the two modelling worlds of pedestrian and vehicle simulation. Subsequent developments have culminated in a new ‘plug-in’ that brings this integration to a completely new level – Legion for Aimsun takes Legion’s patented pedestrian simulation algorithms and inserts them into Aimsun to create an environment for concurrent pedestrian and vehicle simulation of the highest fidelity.

This plug-in has made it possible to run simulations where pedestrians can negotiate pedestrian crossings blocked by traffic spillback, board and alight all types of vehicles and generally exhibit normal behaviour, from entering and exiting buildings to climbing escalators and using cash points.

The concurrent simulation of vehicles and pedestrians now allows far more accurate results when conducting traffic assessments. Legion for Aimsun allows the modeller to realistically project the number and distribution of calls at push-button operated pedestrian crossings whereas before the modeller had to basically take an educated guess. Modellers can now calculate crossing times and delays for pedestrians – including the effects of spillback – without having to assume they can cross unimpeded even if there is actually a queue of cars blocking much of the crossing. Legion for Aimsun also allows accurate levels of service for right and left-turn vehicles when conflicting with pedestrians; in contrast to the earlier assumption that cars could turn on red or flashing amber, even if in reality pedestrians were completely blocking the crossing. The fact that Legion for Aimsun allows pedestrians to board and alight public transport vehicles now allows a detailed analysis of factors such as the effects of taxi ranks on pavement and kerb-side travel lane...
Integrating Aimsun software into the SCANeR driving simulation engine provides users with a far more realistic virtual world

usage, the effects of bus boarding on pavement flow or the effects of boarding and alighting public transport vehicles on signal systems such as priority or pre-emption.

In addition to public transport vehicles, pedestrians in Legion for Aimsun can also board and alight private vehicles and taxis. The ability to model kerb-side usage is particularly relevant for major events such as football matches or music festivals at stadiums and arenas, but is also useful for managing hubs of transport activity like airports and train stations; applications for staging pedestrians include lane requirements for airports that allow for both throughput requirement and pavement requirements for anything from taxis to hotel shuttles.

The combination of vehicles and pedestrians within one model allows for large areas to be evaluated in significantly shorter time periods, and the interfacing also provides emissions output for import into air quality models.

### VR with SCANeR

Driving simulation has been long used in research, industry and training but the question of its validity in test situations has yet to be resolved. Are levels of driving simulator fidelity sufficient for researchers to be able to extrapolate results to the real world?

Integrating Aimsun software into the SCANeR driving simulation engine has suddenly made it possible to drive in SCANeR immersed in a highly detailed virtual world and in a completely realistic traffic situation, providing a step forward in the journey to a parallel experience on real and virtual road networks.

This interfacing of two complementary simulation worlds opens up a whole host of applications: studying driver behaviour in dangerous situations that would be illegal or unethical to recreate in the real world, such as speeding or studies of driver distraction by in-vehicle information systems; helping car manufacturers to develop and test innovative driver assistance technologies; implementation and testing of V2V (vehicle-to-vehicle) systems and V2I (vehicle-to-infrastructure) systems; evaluation of ADAS (advanced driving assistance systems) in various traffic conditions; testing prototype navigation systems against real-time alerts for congestion, incidents or road works; emergency vehicle training in rush hour conditions...

Oktal project manager Thomas Nguyen That explains that: “To embed SCANeR’s innovative electronics systems, which include features such as realistic surrounding vehicle movements or advanced driver behaviour models, into a virtual world, they need more complete information on a larger scale: information about traffic density on major roads, accidents, road works or rerouting. This allows a previously unimaginable level of realism. However, it also means dealing with thousands of cars and kilometres of lanes and the ability to simulate traffic on the scale of a whole city or even an entire region. This is where Aimsun steps in.”

The SCANeR API and Aimsun SDK were used to create a SCANeR module embedding Aimsun and exchanging simulation information in real-time. Both models need to share a common description of the road environment: road geometry, intersections, signs, limitations, etc. The standard and open RoadXML format was the perfect solution. SCANeR uses it as a native file format and import and export functions have been developed in Aimsun. Using RoadXML as an exchange file format allows users to import, create and edit complex road networks through SCANeR studio terrain and Aimsun tools. Nguyen That cites an example: “A user might import the SCANeR database in Aimsun and prepare a complex traffic situation, or export a network from Aimsun, import in SCANeR studio and generate all the databases needed to drive in the virtual environment: a 3D database for the visual module, a road description for dynamic vehicle road-query and a road network description for the SCANeR traffic module.”

And the advantage of all this for Aimsun? It has the highest quality showcase available, allowing stakeholders to get behind the wheel and experience for themselves what a proposed scheme will feel like from the citizen or driver’s point of view. This is a key factor: unlike highly trained engineers, non-technical people perceive and comprehend traffic from the atomic rather than the collective perspective. We have all driven or been passengers on a bus but few of us have ever seen what road traffic looks like from a helicopter (although mapping technologies and traffic information systems are bound to change that).

### Traffic Signal Optimisation

TRANSYT is first and foremost a product for modelling networks of intersections. Its traffic signal optimisation software ensures maximum green light times for the heaviest traffic flows and adjusts the signal cycle time based on changing demands during peak times, such as the rush hour. The TRANSYT-Aimsun link is a component for TRANSYT that allows the user to optimise fixed time signals in Aimsun networks.

TRANSYT includes two built-in traffic models: the platoon dispersal model (PDM) and the cell transmission model (CTM), which require little calibration effort and are quick to set up and fast to run. However, they do not set out to offer the same degree of simulation as microsimulation. For its own part, Aimsun does not include functionality to optimise signal timings in response to congestion levels and requires signal control plans as an input, which can be a tricky and time-consuming process if done manually.

To help bridge the gap, TRL has developed a new tool that links Aimsun and TRANSYT to give users the best of both worlds. The tool imports Aimsun signal timing data into TRANSYT and then uses the TRANSYT signal optimiser in conjunction with the Aimsun traffic model to produce an optimum set of signals.

Previously TRANSYT generated optimal traffic signals using its own algorithms but
now, thanks to Aimsun’s SDK platform, the user is able to define the optimiser objective. It may be, for example, a traditional TRANSYT style performance index based on stops and delays but it could also be based on many of the other available outputs from the micro-simulation model. TRANSYT works with fixed time signals but the method is applicable to any type of signal control within the Aimsun network and is mostly automated, minimising the need for user input and the risk of inputting rogue data.

A further application of the TRANSYT-Aimsun link is that TRANSYT can be used to visualise, validate and edit signal plans for an Aimsun network.

VERSIT emissions modelling

In line with the growing demand for reliable studies of the impact of traffic control systems on pollutant emissions and air quality, modelers are abandoning traditional methods of estimating pollutant levels based on average traffic measures such as flow and mean speed. Instead, they are adopting something that offers far higher fidelity of outputs and associated decisions: instantaneous emissions models combined with microsimulation modelling.

The Dutch consultancy and engineering company DHV uses Aimsun to analyse the effects of dynamic traffic measures and traffic control design in projects worldwide. To assess the environmental impact of traffic, DHV also uses the statistical emissions model VERSIT+, which was developed by Dutch independent research organisation TNO.

To create a tool for the direct evaluation of impact of dynamic traffic measures on the air quality, DHV and TNO came together to develop a dedicated model of VERSIT+ linked to the Aimsun traffic simulation model, known as VERSIT+ micro.

“VERSIT+ predicts emissions for various vehicle specifications such as fuel types, drive trains or injection technologies and is based on a database of 15,000 measured driving cycles mimicking all aspects of real-time driving behaviour,” says Jorg van Wijk, traffic management consultant at DHV.

The VERSIT+ micro is an intelligent sub-model of the very complex VERSIT+ model. Instead of one hundred models for every vehicle specification, four vehicle categories were defined based on the average vehicle fleet per category; for each category DHV and TNO composed a typical fleet composition on the Dutch urban roads and highways taking into account the age and technology of the vehicles in a particular year.

The latest version of VERSIT+ micro calculates PM$_{10}$, CO$_2$ and NO$_X$ emissions on the basis of factors such as the instantaneous velocity and acceleration of vehicles. With this version it is also possible to estimate the local concentration and to visualise the results on the Aimsun network or an aerial picture. VERSIT+ micro can easily be combined with GIS tools too. With these features DHV has a powerful, calibrated tool for visualising emission hotspots and the effect on local emissions of measures such as roundabouts versus intersections with traffic lights, one-way streets, variable speed limits and rerouting.

“DHV supports the national and local governments by comparing measures on their ability to improve traffic performance and air quality,” said DHV traffic consultant, Erik Toes.

“Field experiences show the integrated modelling of traffic and environmental enables a more balanced decision process. Various municipalities in the Netherlands have made their policy decisions, improved traffic management systems and realised new infrastructure, based on the combined results of Aimsun and VERSIT+ micro.”

Linking each package together with Aimsun provides a win-win situation: traffic simulation fidelity on the one hand with the additional insights offered by third-party products on the other. Aimsun’s ability to help modelers understand traffic patterns in detail can fill in the blanks for Legion, Versit and TRANSYT, while these three tools in turn provide great functionality for pedestrian, emissions and signal optimisation modelling in Aimsun. In the case of Oktal’s SCANeR simulator, meanwhile, Aimsun provides excellent fidelity in creating a realistic traffic network and gains a very impressive display case for its capabilities.

The future will certainly see more collaborations of this kind. By adopting the cross-pollination of ideas and relationships that lies at the heart of social networking, the Aimsun software is swift to adapt to the stream of incoming suggestions and always ready to add a new ‘friend’. So what’s on your mind today.