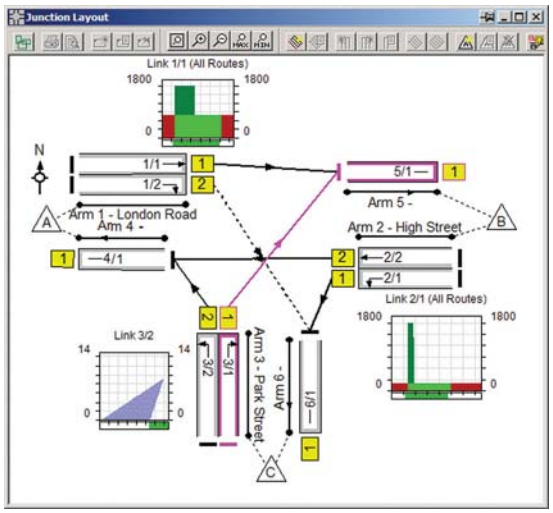


Joined up traffic model

***Paul Moore**, JCT Consultancy Ltd, introduces the new version of LINSIG, released*

One of the key benefits of LINSIG has always been its ability to allow engineers to model junctions in a way which closely follows the behaviour of real signal control equipment. This means that initial junction designs are realistic and fully include any requirements and constraints imposed by the signal equipment which will eventually operate the junction. The new version, LINSIG V2, retains this core ability but extends the software into new areas such as modelling small networks which previously had to be carried out using alternative software incurring the expense, delay and potential for error of transferring data between software packages.

Although LINSIG V2 includes a long list of improvements the key improvements include:

- A new traffic model based on cyclic flow profiles which can model successive stop lines allowing coordination of adjacent junctions to be accurately modelled. This allows LINSIG to model small networks of traffic signal junctions.
- An improved right-turn model allowing easier modelling of a number of blocked right turn scenarios.
- An extended signal controller model which can now simultaneously run multiple independent stage streams.
- A phase based design system which allows signal sequences to be built up using phases rather than stages possibly achieving a more efficient signal sequence.
- An enhanced signal timings optimiser that will optimise practical reserve capacity or traffic delay for each stage stream or for the network as a whole.
- A new detailed traffic assignment system allowing traffic flows to be specified using origin-destination matrices and routing patterns.
- A new reporting and printing system allowing detailed text and graphics based reports to be produced in a form that can readily be incorporated within most word processor documents.

As well as new network capability, Version 2 brings a range of improvements including the effects of right turn blocking.

Traffic model improvements

New Traffic Model – LINSIG V2 uses a new traffic model which is similar in style to the type of model used in existing network models such as SATURN and TRANSYT. A number of enhancements unique to LINSIG have been developed to allow improved modelling of opposed and blocking right turns. The traffic model has been designed to make similar assumptions and therefore produce similar results to other models such as the Webster & Cobbe based model used in LINSIG V1 and the TRANSYT traffic model, where possible. This has the benefit of reducing spurious differences in results when using different software packages.

Network Modelling – As the new LINSIG traffic model allows successive stop lines to be modelled, LINSIG V2 is able to model networks of junctions rather than just a single junction as in previous versions. The standard version of LINSIG released earlier in 2006 can model up to 3-4 junctions using independent stage streams on a single signal controller. A full network version of LINSIG will be released in 2007 which will model larger networks and include additional network modelling tools. The ability to combine detailed junction modelling and network modelling in a single software package may eliminate the need to develop separate LINSIG and TRANSYT models for a scheme with all the resource problems of maintaining these models as the scheme progresses.

Traffic signal model improvements

One of LINSIG's unique features has always been its use of a detailed traffic signal controller model similar to a UK TR2210/TR2500 specification controller. The new Version 2 of LINSIG improves on the existing model by adding a number of new features:

Multiple Stage Streams – The use of multiple parallel stage streams is becoming more common in the design of complex signal junctions. LINSIG can now explicitly model multiple independent stage streams on the same traffic signal controller allowing the controller design for the junction to be developed within the LINSIG model. This is particularly useful for junctions such as signal roundabouts which often require a number of stage streams.

Signal Plan Library – With the advent of multiple stage streams the staging designs which can be created in LINSIG have the potential to be much more complex than previously. To help manage different staging designs LINSIG now includes a signal plan library which can be used to build and store complex signal plans for the network.

Phase Based Design Editor – Signal sequences have traditionally been defined by grouping phases into stages, specifying a sequence of stages for each signal stream, and then optimising phase delays in each interstage period. Although this method is easy and intuitive for simple junctions it is often inadequate for more complex junctions. An alternative technique is to design the signal sequence using phases and phase intergreens alone. This is termed phase based design and can lead to a much more efficient signal sequence. The LINSIG Phase Based Design Editor allows a signal sequence to be designed using phases alone. LINSIG will then automatically identify stages and interstage structures required to implement this sequence on a controller.

SCOOT Configuration Data Calculator – LINSIG models are often used as part of the process of designing a junc-

tion which will be run under the SCOOT UTC system. The new SCOOT Configuration Data Calculator provides additional help with this process by using the LINSIG controller model to calculate a range of data needed when configuring the SCOOT database. This allows controller changes to be quickly incorporated into SCOOT.

Traffic signal optimiser

LINSIG V2 includes a new traffic signal optimiser which can automatically optimise traffic signal stage durations on each stage stream and optimise offsets between stage streams for either practical reserve capacity or traffic delay. It can also optimise stage durations and offsets over a range of cycle times with graphing of the results. This assists with the selection of cycle time by displaying the sensitivity of network performance to cycle time choice.

Traffic flow assignment

Traffic Flow Specification using Origin-Destination Matrices and Detailed Routing Patterns. In previous versions of LINSIG, traffic flows were specified separately for each link. As LINSIG V2 allows the modelling of larger networks with multiple successive stop lines, the previous method would have become increasingly tedious and error prone to use and therefore a new more detailed system of specifying traffic flows has been developed. LINSIG V2 allows an origin-destination (OD) Matrix to be entered for one or more junctions, and traffic routes between origins and destinations to be built. Traffic can then be allocated to routes which are used to determine the flow on Links at each junction. This new method allows a highly detailed picture of traffic movements to be built up which in turn allows the modelling of platoons to be detailed and accurate, with the minimum of complexity exposed to the user.

Calculated Traffic Flow Groups – LINSIG V2 uses traffic flow groups to represent different time periods or development scenarios. Often a flow group is calculated as a combination of several other flow groups, for example, base traffic plus development traffic. Previously in LINSIG, flow group combinations had to be calculated manually which could lead to substantial manual recalculation if a flow group, on which many others are dependent, changes. To assist with this process, automatically calculated flow groups have been introduced. A new flow group can be defined using a mathematical equation to combine other flow groups. When a base flow group is changed all dependent flow groups are then automatically recalculated.

User interface improvements

LINSIG V2 incorporates many user interface improvements into LINSIG. These include detailed graphical views, the ability to easily zoom and pan views, toolbars, customisable colours and text sizes, a wider range of text display options, and customisable junction layout grids with snap-to-grid facilities. Although many of these changes are minor in themselves, in combination they significantly improve the ease with which junctions and networks can be edited.

Two more major editing improvements are the new Error View and multi-step undo. The Error View constantly checks the LINSIG model for errors or warnings, reporting any found to the user. It acts as a central 'To Do checklist' listing any parts of the model which are incomplete or may require further checking. The undo facility allows any action taken in LINSIG V2 to be reversed. Up to 100 previous steps can be stepped through allowing 'experiments' with the model to be easily rolled back.

Reporting improvements

Report Generator – LINSIG V2 includes a completely new report generator which produces detailed printable reports in a format compatible with most modern word processors. The report generator allows any number of custom report templates to be defined allowing reports to be as detailed as desired. The reports can contain tables and also graphics based on LINSIG's graphical views. Reports can be quickly re-run for different design scenarios allowing design changes to be rapidly incorporated.

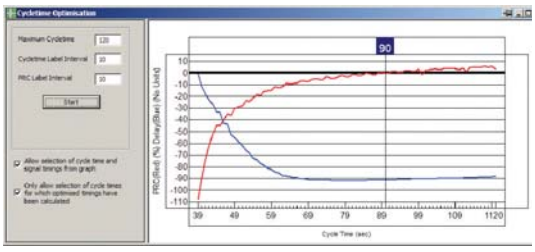
Graphics Export Facilities – Often the graphical components of a LINSIG report may need to be enhanced and supplemented before being used for presentation. LINSIG V2 allows graphical views to be exported to a number of formats, including DXF CAD format, for import into graphics and CAD software for further editing. Graphics can also be cut and pasted via the clipboard for easy insertion into other software.

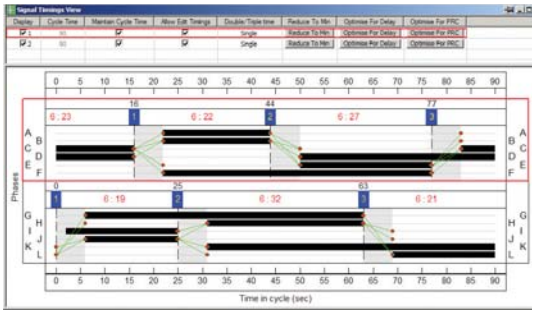
Conclusions

Version 2 of LINSIG introduces a number of new features as well as making a range of improvements to existing facilities. The most significant new feature is the ability to model small networks of junctions in great detail. As LINSIG is developed the size of network which can be modelled will be increased and further network modelling tools added.

As with all good engineering software it does not attempt to be a 'black box' and do the engineer's job, but aims to provide tools which reduce the engineers manual workload allowing them to evaluate a wider range of designs in a shorter time scale.

As LINSIG continues to develop, the aim is to increase the size of network which can be modelled.





ling with LINSIG Version 2

earlier this year, which offers many new features and numerous improvements