

**DEVELOPMENT OF A CONVERSION ALGORITHM
BETWEEN TRACKS AND GETRAM MODELING
ENVIRONMENTS**

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Abstract

Through the use of a conversion tool named ITAC it is possible to convert a TRACKS network into an Aimsun network quickly and efficiently. Data conversion between modeling packages allows the current investment of time and money coding the physical description, operations and signals into the network to be retained, while benefiting from additional features another modeling package may have.

Introduction

Assignment practices in New Zealand have changed significantly over time from the use of 24 hour strategic models to the use of period models which explicitly analyse intersections during the assignment. Many of the improvements in software and modeling practice has been related to increases in the speed of the hardware. Conventional models are now being developed with 1000 or more zones, and at the individual driver level using micro-simulation software.

The use of micro-simulation assignment tools to assess traffic management regimes at a fine detail is becoming more prevalent throughout the world. Whilst macroscopic assignment packages such as Tracks, Emme2, Saturn and Trips can provide a level of model definition sufficient for planning and project evaluation purposes, tools are now available to provide for micro simulation of traffic management plans, new projects, ITS initiatives and bus priorities. The most prevalent of these micro-simulation tools currently in use (in NZ) are Paramics and Getram/Aimsun2.

Both conventional modelling and micro-simulation models have their applications. However, much of the data required by the micro-simulation models is already available in the conventional models, particularly if they are GIS based. This technical paper describes the methodology followed in the conversion of data from a TRACKS model into the Getram/Aimsun2 environment with minimal user intervention.

Software Suites

Tracks Environment

The TRACKS suite is a transportation modelling environment that offers the conventional sequential analysis of Generation, Distribution, Modal Split and Assignment. In addition the suite supports disaggregated modelling techniques, such as multi-nomial non linear logit models to perform simultaneous distribution and modal split, or simply the mode split function. Using route choice algorithms solutions of the expected flows on network links can be calculated. The expected flows are the average flows that would be expected under normal circumstances. Recent upgrades to the assignment has allowed time-slicing of origin destination matrices, which become the input to a dynamic public transport, vehicle assignment and parking model which is effectively a simulation model, although not micro-simulation.

Getram Environment

Getram provides a transportation modeling environment that allows microscopic traffic simulation through Aimsun, with a dynamic assignment using a heuristic adaptive algorithm

to determine route choice. Getram allows interfaces with other software packages such as EMME2 and Transyt.

The Aimsun assignment process depicts individual cars on the network and shows in real time, queues of vehicles developing and discharging. Aimsun is also able to present a three dimensional view of the assignment.

Differences in Assignment Methods

TRACKS assignment method is according to its route choice model, with the route selected at the start of a trip. Aimsun allows new decisions of the preferred route to be made according to traffic conditions along the network during the trip.

Reasons to Provide a Conversion Framework

The reasons to provide a direct conversion interface between modelling packages include:

- The network description for either a micro-simulation or conventional model holds a wealth of information that has taken time to collect and code. Data conversion between packages retains the investment.
- Consistency of inputs and evaluation frameworks for trip matrices, node numbers, intersection control inputs, PT routes and services, zones and centroid connectors. This allows outputs from Tracks to be fed into Aimsun and the results from Aimsun to be used in further refining the Tracks assignment.
- Conversion of input files to provide a physical road network, a description of that road network and details of the functioning and operation of the road that can be created in minutes ready for assignment.

The reasons to use dynamic traffic simulation tools include the ability to test traffic management regimes, look in detail at the operation of road sections and intersections and the testing of ITS prior to actual installation. It is now common for network models such as Tracks to be used to develop trip matrices, link flows and average weighted statistics, whilst simulation tools such as Aimsun provide the ability to fine tune traffic management issues, and to assist in presentation and interpretation of results.

Conversion of a Tracks Network into Aimsun

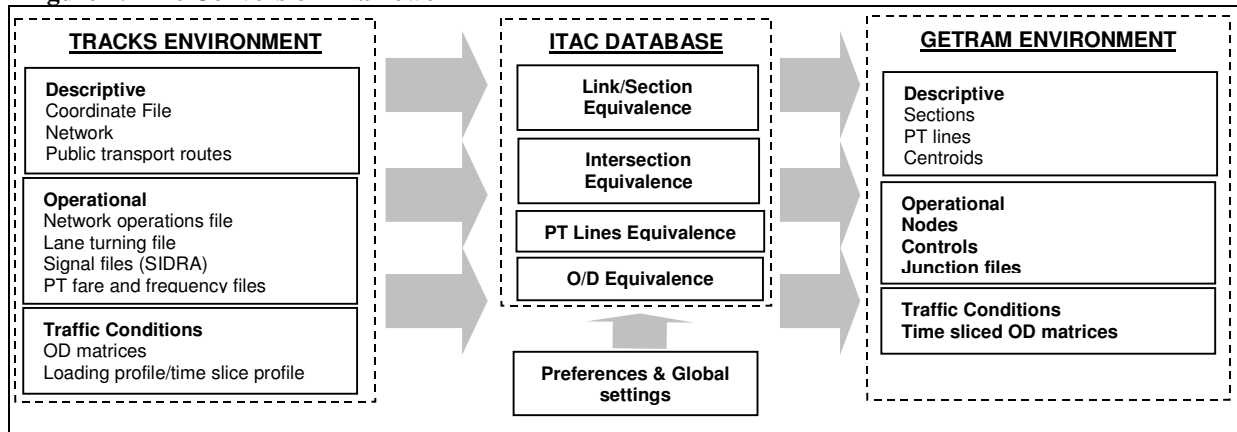
The information required for both model environments to develop the network structure and operational characteristics are similar in many respects. Both define the network description and traffic control regimes in quite some detail such that much of the data can be transferred directly from TRACKS files to Aimsun (and vice versa).

The Integrated Tracks Aimsun Conversion tool (ITAC) forms a database which provides the linkages between the two modelling packages and allows data to be passed seamlessly between the two applications (see figure1).

The ITAC database linkages cover 5 basic areas. The Link/Section equivalence table provides the connections between A node, B node links and sections. The intersection equivalence table provides the connections between nodes, controls and junctions. The traffic conditions are converted through the O/D equivalence table. The PT lines equivalence table

provides the connection between routes and PT lines. The preferences section provides a comparative connection for the way in which attributes are passed between the two environments. A further input to ITAC are the preferences and global settings which provide all of the default values to be used for attributes such as lane width and approach lane (lateral) length.

Figure 1: The Conversion Framework



The Conversion Process

In Tracks the network is stored as a series of nodes and links with attached descriptive attributes. The Tracks coordinate file provides the spatial form of the road network (usually) based upon a GIS centreline. As the network is GIS based, link lengths are automatically calculated based upon spatial geometry. The network file holds all of the descriptive data detailing the link type, number of lanes, approach lanes and approach control. An operations file, lane discipline file and signal files provide details of the operational characteristics of the network.

Aimsun by comparison identifies individual links as one way straight line sections where curves are created using polysections made up of many joined sections, intersections and junctions are separately identified. Aimsun networks are built from a series of text files which require each feature to be specified as an object with an identifier. Consequently the files that determine the layout of the network can be manipulated without the use of a graphical interface.

Aimsun requires four types of data inputs: the network description, traffic control plans, traffic conditions and PT plans¹. As many of the network requirements are already defined in the TRACKS files a conversion is relatively simple.

Network Description

The Aimsun network layout is developed from attributes of each individual section and centroid in the Network. As the sections in Aimsun correspond to links in TRACKS, the structure can easily be transferred from an A node, B node, co-ordinate system to each section being defined in their own right.

The TRACKS coordinate file structure specifies the node set at the end of each link, with intermediate points between the nodes. This enables the sections and polysections to be

¹ Getram User's Manual (2000). TSS-Transport Simulation Systems. P46

produced with left and right hand side coordinates calculated from the network centre lines. In TRACKS centroids are specified by their lower numerical node number, and their location and connectivity is obtained from the co-ordinate file. Additional information is required for the structure of the sections, if there are more approach lanes than link lanes, a lateral lane is assumed to exist. The section file also requires the street name, posted speed limit and link type which can be taken from the network file in TRACKS. Other information is obtained from the TRACKS operation file, the capacity calculation which is used and if tolls are present along a route.

Traffic control plans

The direction that traffic can take is controlled by the entries in the node file and the control plan specifications. This information can be taken directly from the TRACKS approach control type in the Network file, the turns by lane in the Lanes file, and the Sidra data files that TRACKS uses for signals. In TRACKS the delay at a roundabout is calculated using descriptive variables in the operations file, where the inscribed diameter and number of circulating lanes on the roundabout are specified.

Traffic Conditions

The origin destination (OD) matrices in Tracks can be exported directly into a text format allowing conversion into a Getram matrix. OD matrices are available by purpose including commercial vehicle trips, if a dynamic assignment method is used time sliced matrices are also available. When imported into the Getram environment different vehicle and driver assumptions can therefore be assigned based upon trip purpose, and time.

Public Transport Plans

The public transport inputs into Aimsun that are required are: vehicle types, timetables, routes and stopping locations. These inputs come from the TRACKS Public Transportation files. In TRACKS the routes are listed by node, with the frequency and fare sections listed separately.

Conversion Inconsistencies

Roundabouts and the way they are represented in TRACKS and Aimsun form the only major inconsistency between the packages. In TRACKS the roundabout is represented as a single intersection and delay is calculated based upon the circulating lanes and inscribed diameter. In this way the representation of the roundabout is as a notional entity. In Getram roundabouts are portrayed as a number of sections with independent intersections. At present roundabouts must be configured manually.

Conclusion

In the development of a conventional network model a significant investment must be made in developing the network description and operating characteristics. This data can also be used directly in the development of an Aimsun micro simulation network. Through the use of the ITAC database and software it is now possible to convert an existing Tracks model into an Aimsun network and operating files to gain the additional benefits of micro simulation. This conversion can be made without the need to spend time manually developing the physical network, operating characteristics and traffic conditions. Due to the internal linkages created in the ITAC database full computability between the two model structures, and results can be maintained automatically.