

OD Matrices and External Tools Development
For Medium Size Models
(Zoo Interchange Study)

UW-Madison TOPS Lab
Wisconsin Department of Transportation

Ertan Örnek

Study Area



- Approx. 100 Signalized Int.
- 6-mile N-S and 4-mile E-W freeway
- Major generators
- Busiest Interchange 350K AADT
- 50% volume exchange rate between US 45 and I-94 (high turning volumes)

Data Collection For Traffic Analysis Purposes

- Freeway Volume (Peaks)
- Signalized Intersection Counts (Peaks)
- Geometry
- Signal timing and phasing
- Origin-Destination Data
- Forecast
- ATR data reliability
- Do we count the demands?
- Geometric data collection requires effort
- Signal timing and phasing has to be read from controller reports or determined in the field.
- No Origin Destination data available for a reasonable cost
- Forecast is tough to obtain, if alternatives are not known early enough in the process

Goals

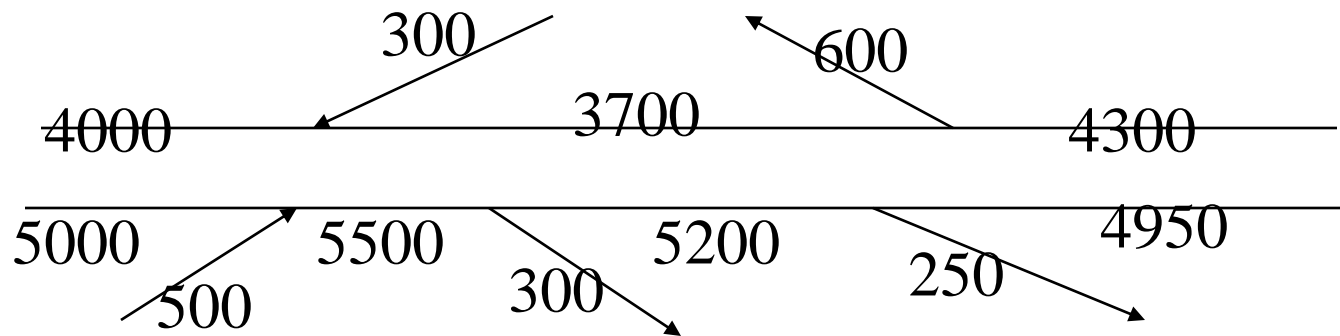
- Create a model predicting operational performance.
- Provide demand scenarios for macroscopic analyses (i.e. HCS Analyses, Synchro etc.).
- Stay consistent with planning agency data.

Simulation-centric Data Compilation

- Freeway volumes (Peaks): Balancing of volumes
 - Paramics requires us to input OD information, but this is not readily available. Instead, we first compiled the existing volume information and worked backwards from there to come up with a suitable OD. First step was to generate balanced peak count sets.
 - Within a small network volume balancing can reasonably be accomplished through simple mathematical processes.
 - Large networks will start having temporal discrepancies therefore balancing is significantly more complicated.

Simulation-centric Data Compilation

- Balancing Volumes
 - Zoo Interchange study corridors are continuously counted on the mainline but there are issues with data reliability
 - Question: Is it a good idea to use average counts?



Simulation-centric Data Compilation

- Signalized Intersection Counts
 - Most of the ramps terminates at signalized intersections.
 - Counts were taken at a particular date mostly inconsistent with the ramp volumes.
 - Peak of the intersection is not necessarily the peak on the ramp.
 - If demands exceeded capacity, the counts did not account for the queues

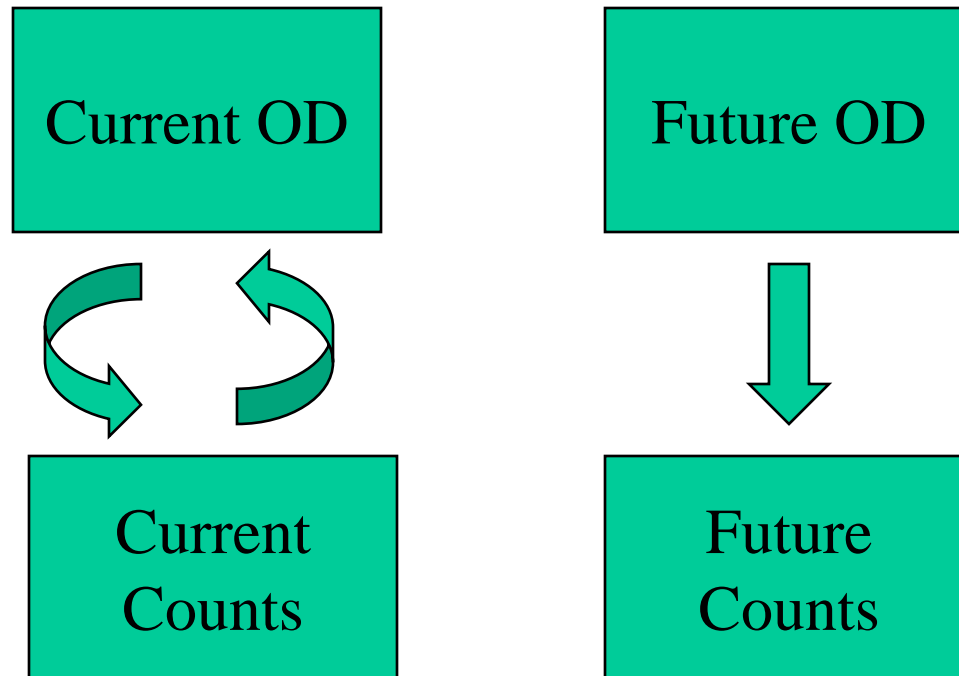
Simulation-centric Data Compilation

- Signalized Intersections
 - Phasing and timing
 - Geometry
 - Difficult to gather from different sources
 - Utilized Google Street view for some information

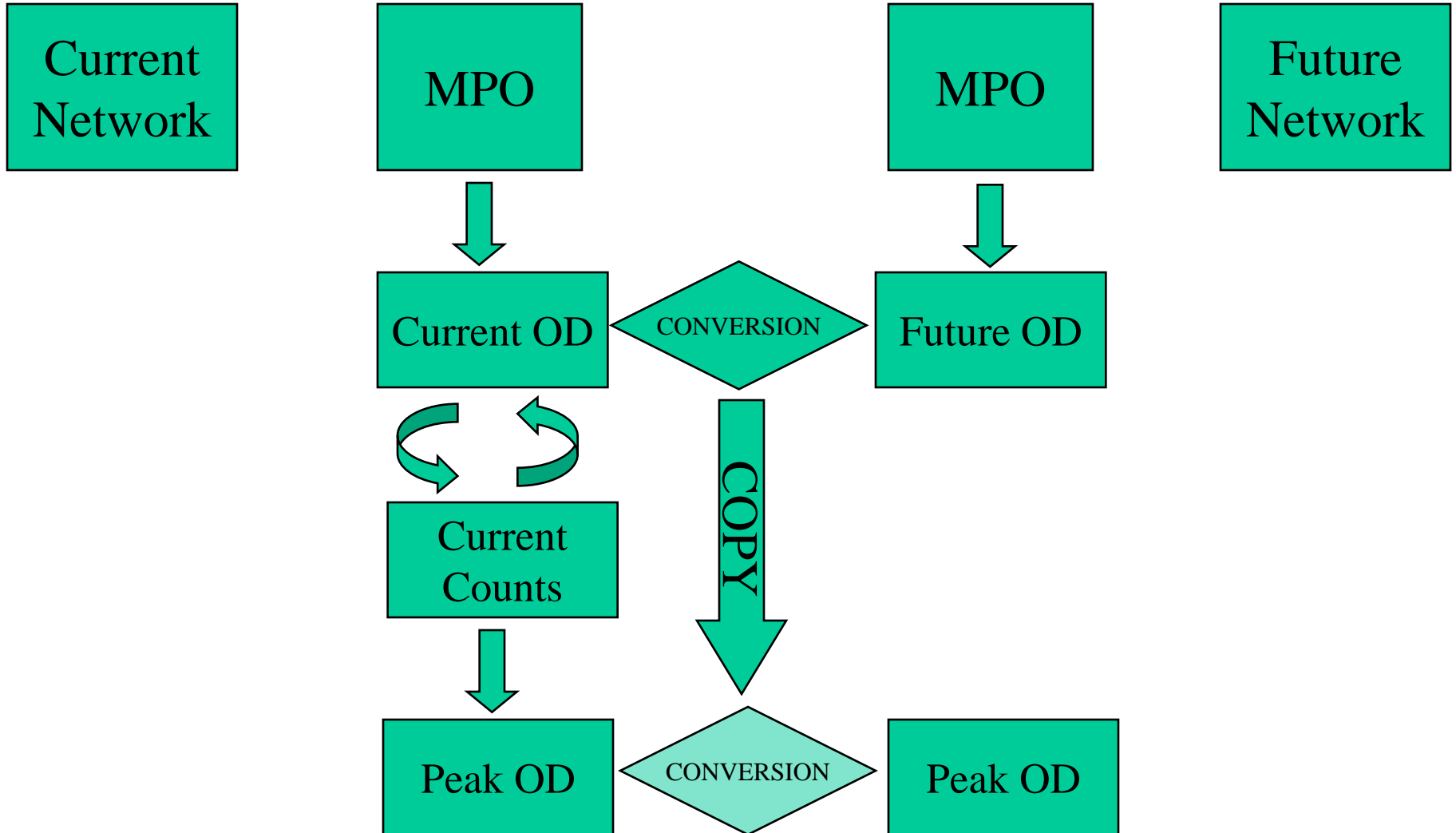
Simulation-centric Data Compilation



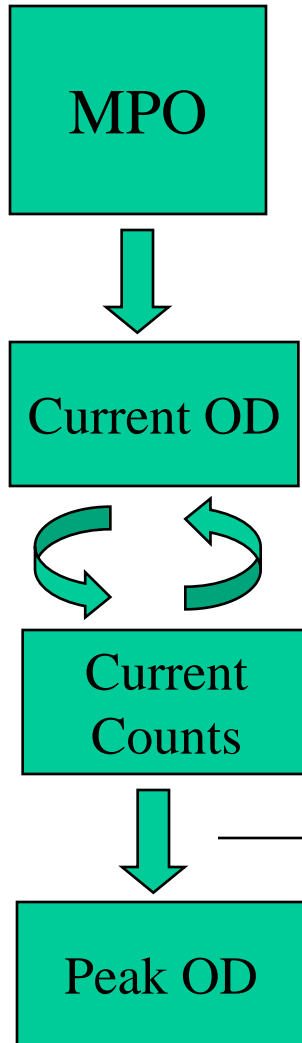
Origin-Destination Data



Origin-Destination Data



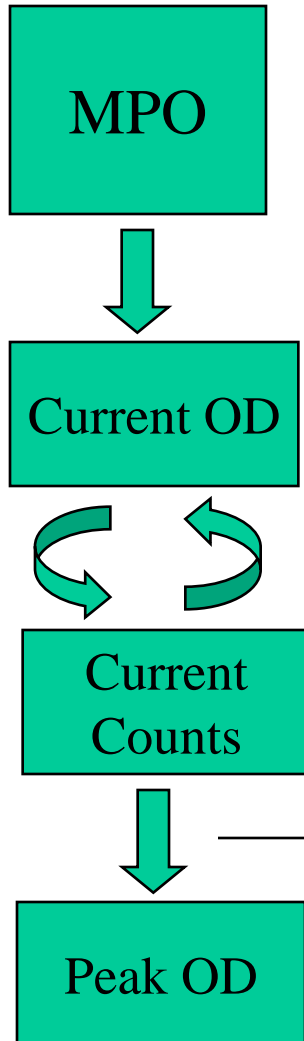
Origin-Destination Data



How To Generate a Peak OD in coordination with target counts?

- MPO provided us 24-hour OD
- Counts are for peaks and balanced
- The goal is to generate peak OD matrices that are consistent with the 24 hr OD matrix provided by the MPO and results in current counts on the network.
- Use Estimator
- Or generate your own algorithm

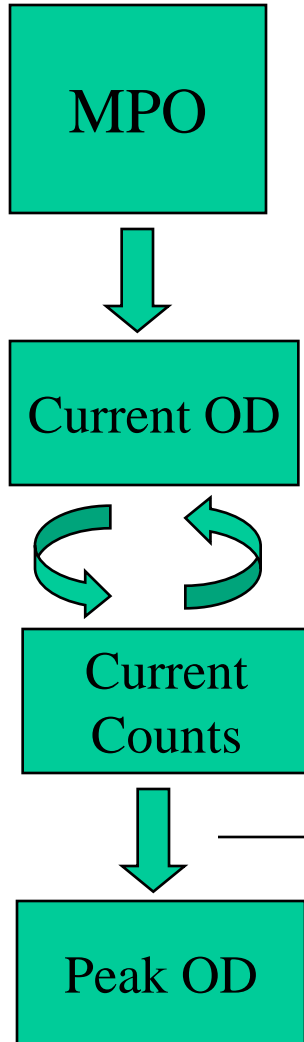
Origin-Destination Data



How To Generate a Peak OD in coordination with target counts?

- If you use Estimator:
 - Make sure all the volumes are balanced
 - Make sure you have just enough control values to target
- Estimator:
 - Time consuming
 - Sort of a black box
 - Actually runs the uncalibrated model with lower level loadings to estimate the OD. When you calibrate the model, OD may become unreliable.
 - It has many tools and estimation methods.
 - It is ready to use out of the box.

Origin-Destination Data



How To Generate a Peak OD in coordination with target counts?

- If you generate your own algorithm:
 - Make sure all the volumes are balanced
 - Make sure you have just enough control values to target
- Custom programs:
 - More time consuming to build but faster to run
 - They are transparent
 - Works well with fixed routes
 - Allow customization of constraints

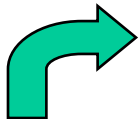
Example OD Generation

(In absence of peak OD data)

- Formulize mainline, ramp and turn counts on a spreadsheet based on existing OD. Tip: This information is available in Paramics Analyser files.

PM	1	2	3	4	5	6	7	8	9	10
1			190	353	10	114	49	100	200	13
2			277	288	26	0	18	50	243	0
3	350	191		700				50	56	
4	40	232	421		0	250				0
5	50	21		0			13	478	0	
6	83	130		3			100		83	
7	86	0				90				1
8	17	100			300					42
9	410	370	101		62	51				128
10	3	20		6			2	0	47	

Examples:



$$= OD(1,3) + OD(1,6) + OD(1,4)$$



$$= OD(10,1) + OD(10,2) + OD(10,2) + OD(10,2)$$

Example OD Generation

(In absence of peak OD data)

- Manipulate the OD values to reach target values for the turn, ramp and mainline counts.
- This can be done manually, using the solver function or building your own scripts.

PM	1	2	3	4	5	6	7	8	9	10
1			190	353	10	114	49	100	200	13
2			277	288	26	0	18	50	243	0
3	350	191		700				50	56	
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9	410	370	101		62	51				128
10	3	20		6			2	0	47	

Examples:



$$= OD(1,3) + OD(1,6) + OD(1,4) = 190 + 353 + 114 = 557 \quad \text{Target } 600$$



$$= OD(10,1) + OD(10,2) + OD(10,2) + OD(10,2)$$

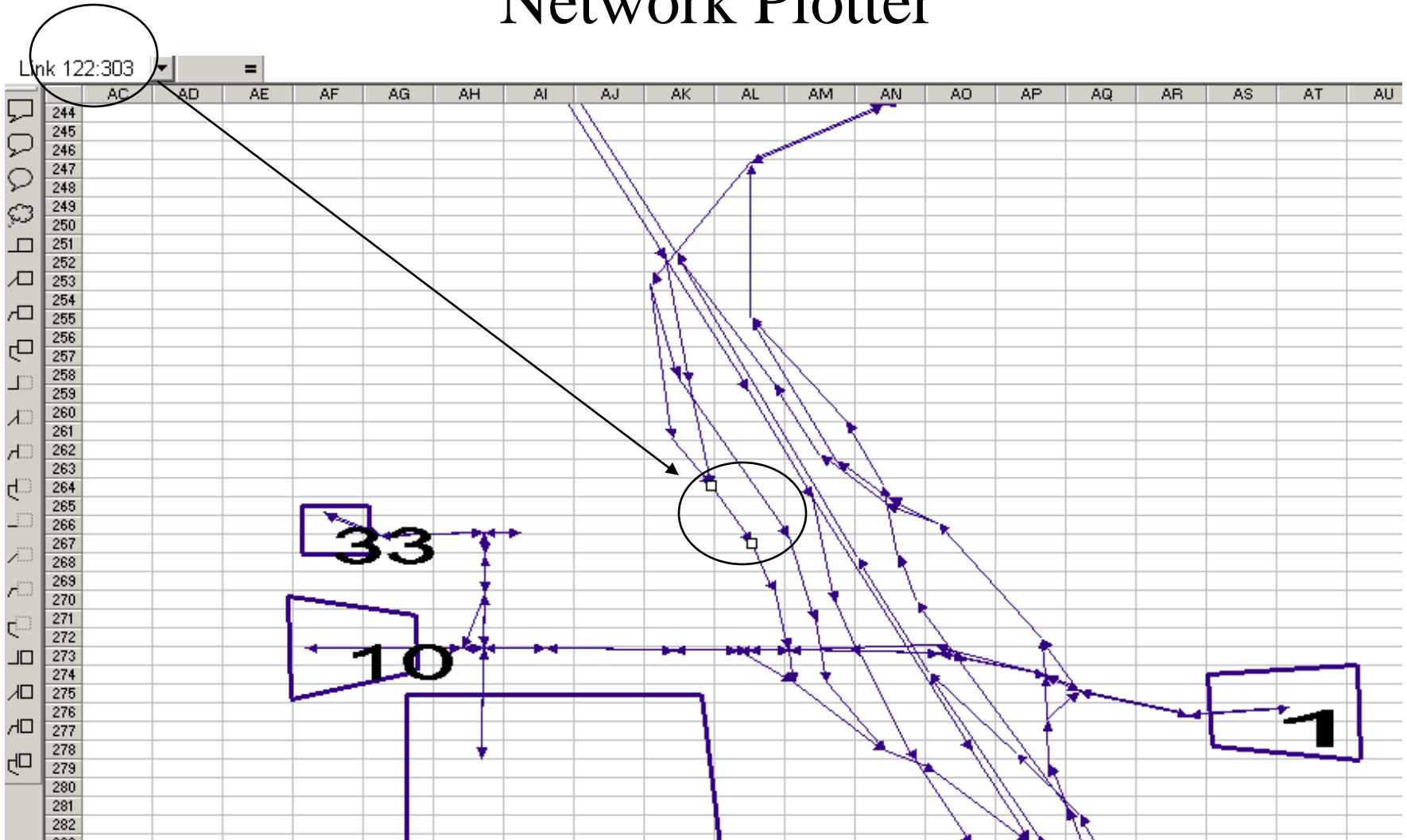
Tools

- Previous example trivializes the OD generation process
- For large models formulating counts by OD is difficult.
- A set of excel based tools were generated to make the process feasible.

Network Plotter

- Plots links in excel and names each link by its Paramics Link ID (e.g. Link 32:35)
- Allows association of link based data to the links and allows for easy and legible paper plots.

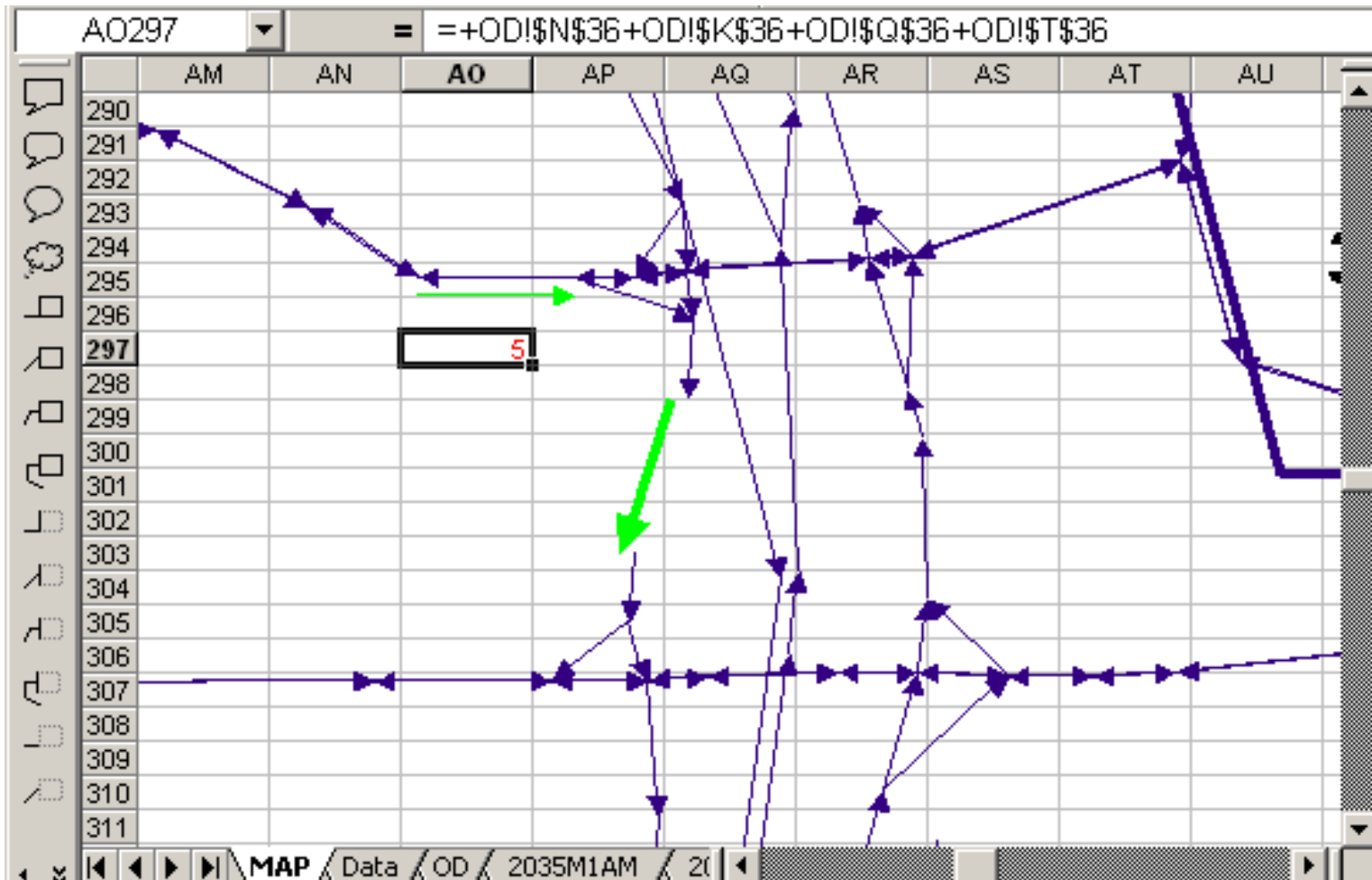
Network Plotter



Network Plotter + OD Based Estimated Turn Counts

- Estimate link or turn counts
 - Run a unitary matrix and record an analyser file
 - Point the application to the analyser file
 - Select a single link and press Ctrl+Shift+S to get the estimated volume based on available OD.
 - As OD changes the estimates are updated
 - Similarly, select 2 links + Ctrl+Shift+W to estimate turn volumes

Network Plotter + OD Based Estimated Turn Counts



Results Analyzer For Intersections

- Creates Turn Diagrams
 - Simplifies the turn diagram extraction from a Paramics run
 - Select a system of links that represent and press **Ctrl+Shift+Q** to extract the counts from the Analyser file into a 4-leg count diagram.
 - It works well with the legs in 4 distinct quadrants.
 - Allows refresh for the new runs

Results Analyzer For Intersections

