Origin-Destination Trips and Skims Matrices

presented by

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Today's Webinar Content

- Matrix Estimation
- Data sources
- Florida Application

Origin-Destination Trips and Skims Matrices

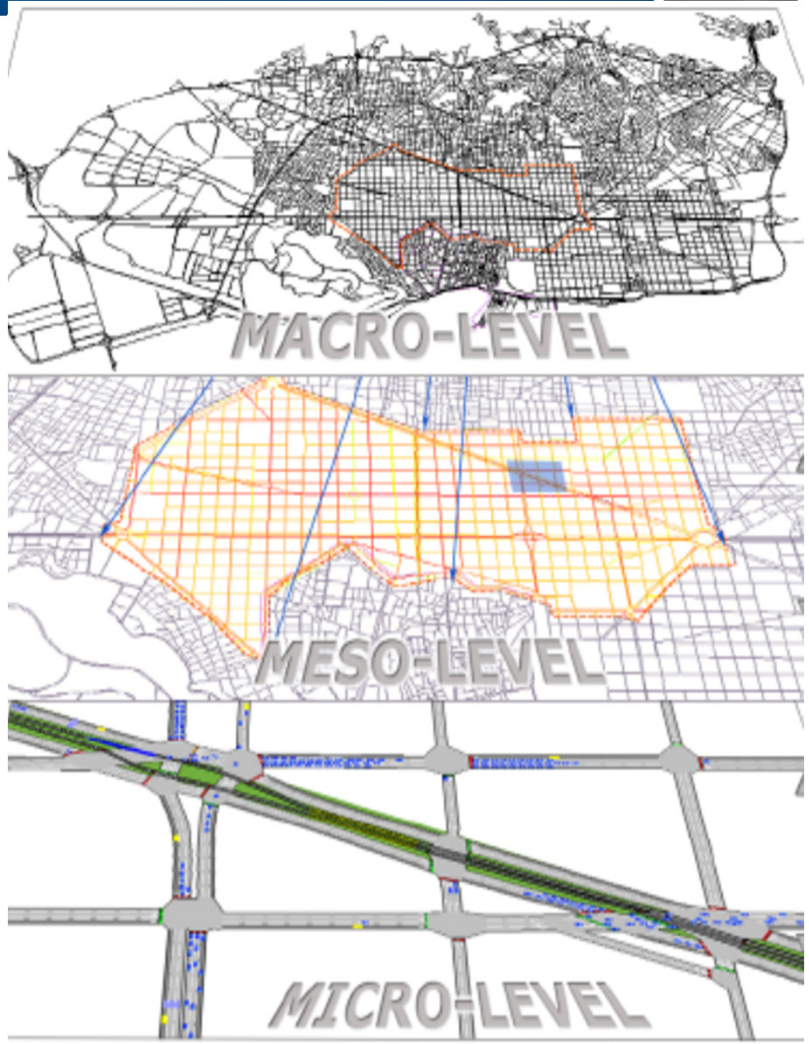
Matrix Estimation

Travel Demand Models = Matrices

- The essence of travel demand models (TDM) is to be able to represent where people begin and end their trips. That requires a spatial context (from point A to point B, on what specific routes, etc.) as well as time, (time of day, duration and delays of the trip, costs).

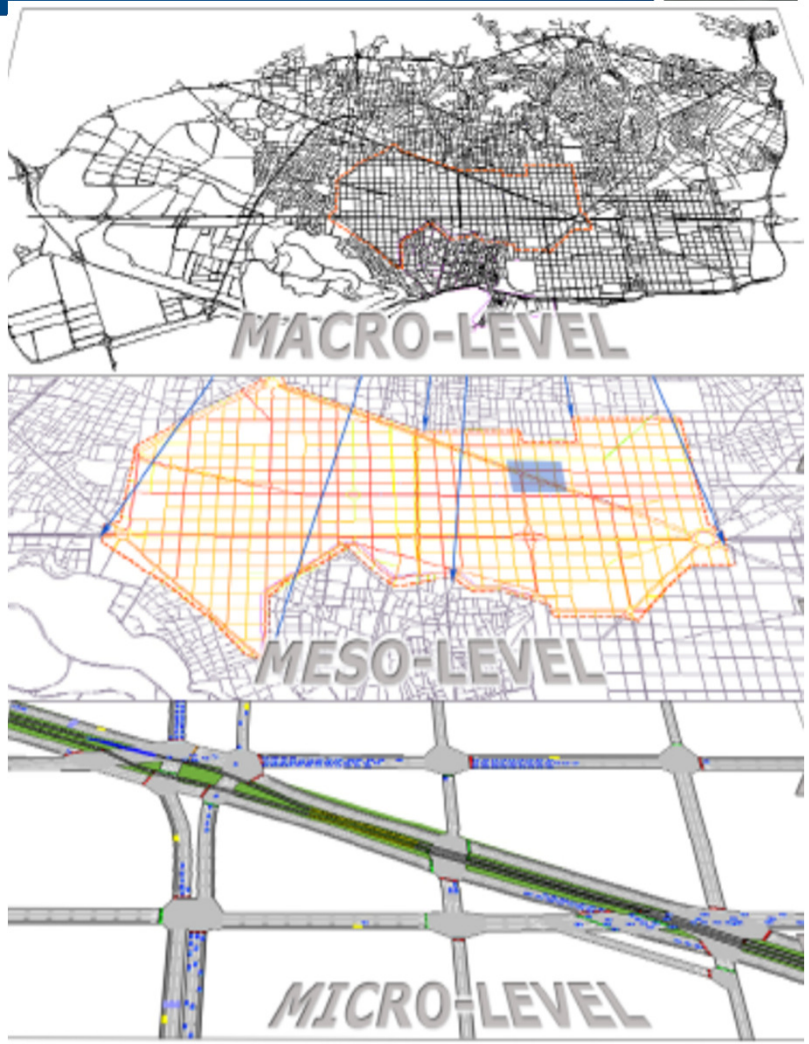
Time space dimensions

- Depending on the characteristics of the analysis, its scope, the geographic resolution and corresponding time, different techniques will be applied, which in turn will require more or less details in the data inputs
- A macro-level model involves whole regions, usually at the metropolitan planning organization level, or a Department of Transportation district. Long term planning is the main purpose of these models.
- At the meso-level, the users are dealing with modeling just a sub-area of the macro-level to evaluate specific corridors.
- The micro-level of traffic analysis focus on specific facilities' geometry and operations.

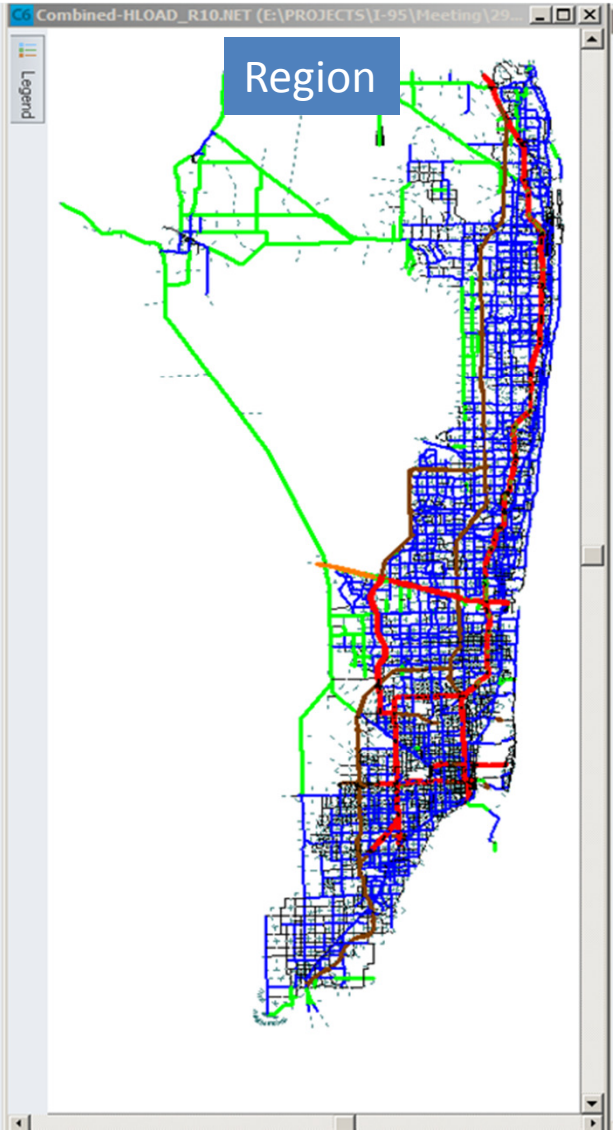


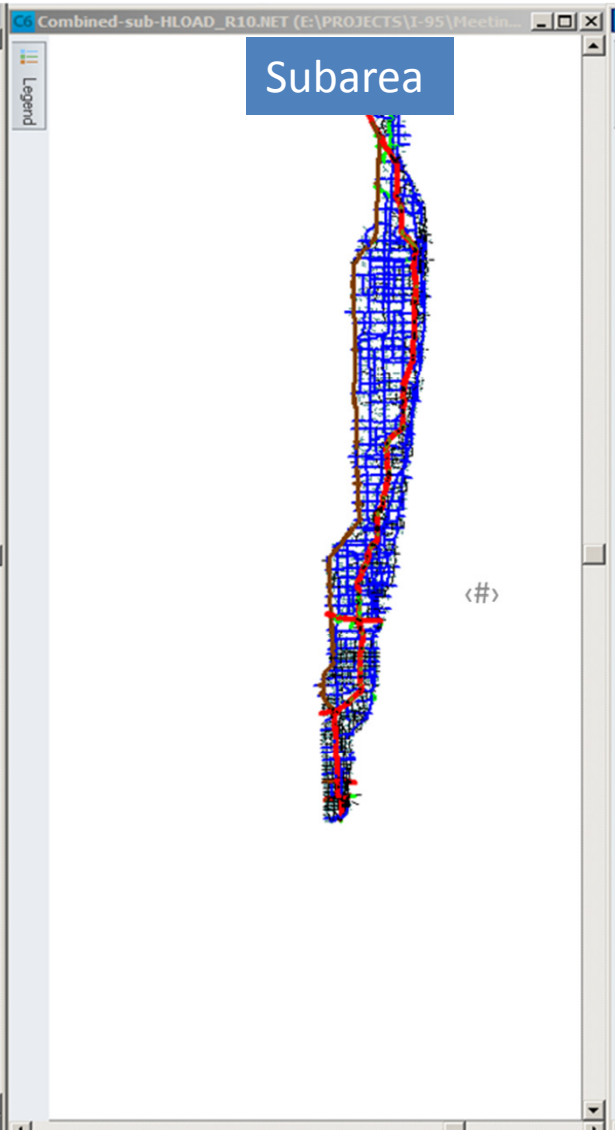
Time - Space dimensions

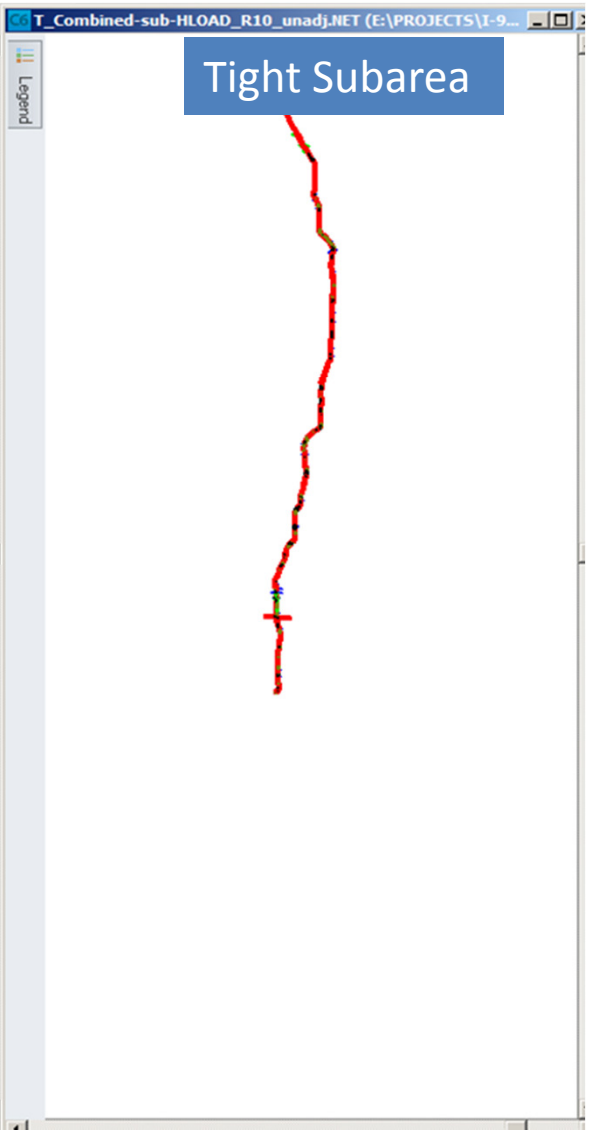
- Interestingly, data requirements could be as intensive in the macro level as it could be in the micro-level:
- A macro level requires a big number of perhaps external trips origin-destination (OD) surveys plus the internal observed trips, including large number of traffic count stations.
- The meso-level may require more detail data on the time distribution of those traffic counts, perhaps to sub-hour periods.
- A micro-level model involves very detailed geometry of specific facilities, where the spatial-temporal data on delays is critical and have an effect on traffic flows and route choices.



Highway Assignment Levels





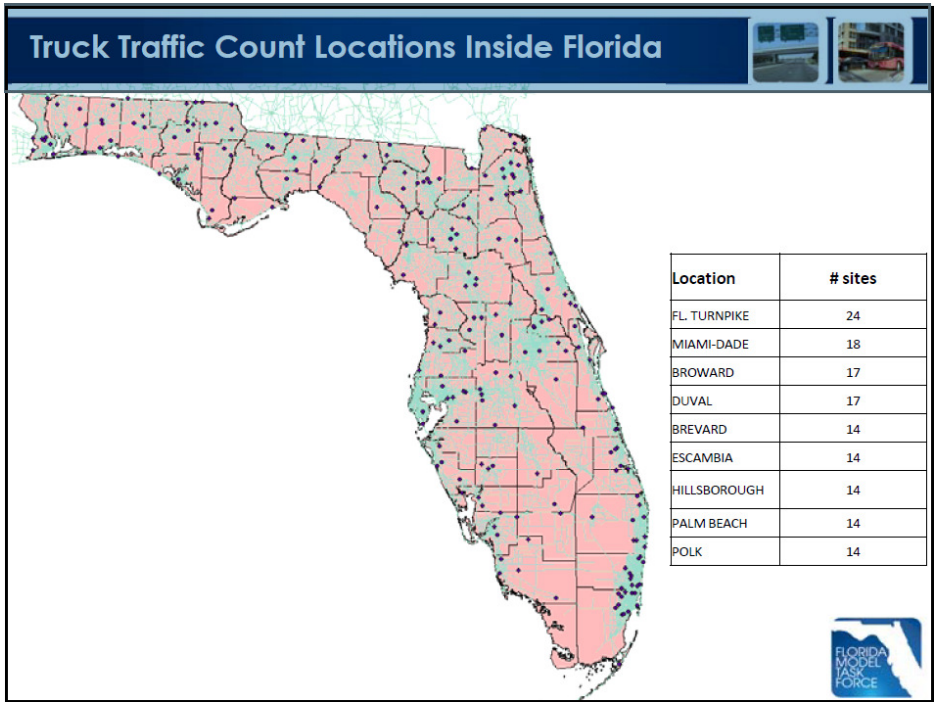


The Need for a Matrix Estimation

- Surveys can only collect data on a limited sample size. A TDM may have 2,000 traffic analysis zones (TAZ), which means there are 4 million cells in its corresponding OD table, while the network only has data on a 1,000 count stations.

- Example 1: Consider building an OD table for truck movements in Florida. There are only a few hundreds count stations with classified counts, plus GPS data from a sample a trucks.

- Example 2: Intelligent Transportation Systems (ITS) equipped facilities can provide detailed data on traffic counts, speeds, traffic flows at sub-hour level. An OD table from a regional model could be available through sub-area extraction, for peak periods. There is a need to match the regional travel patterns to satisfy the observed counts on the project facility.

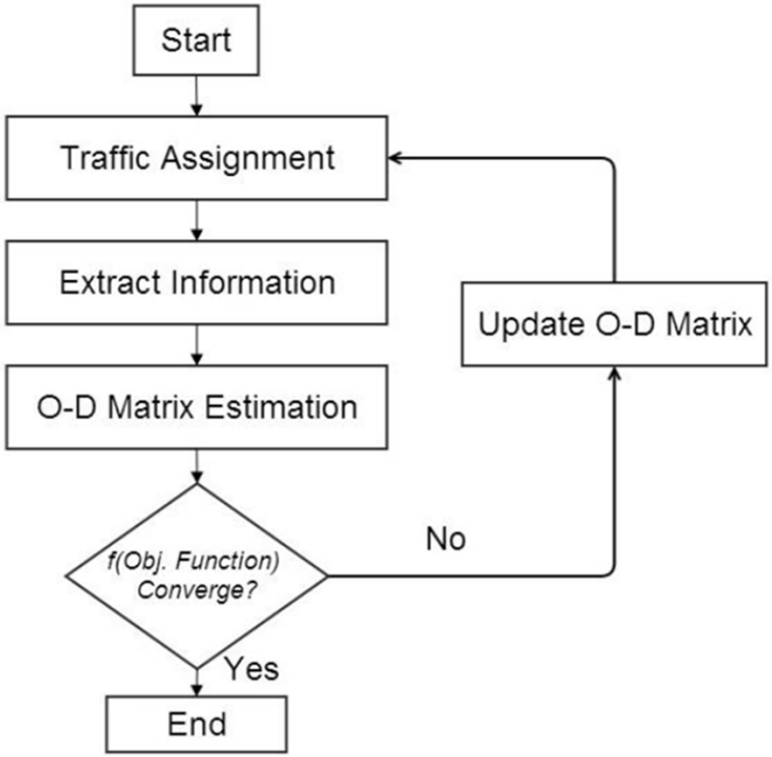


Location	# sites
FL. TURNPIKE	24
MIAMI-DADE	18
BROWARD	17
DUVAL	17
BREVARD	14
ESCAMBIA	14
HILLSBOROUGH	14
PALM BEACH	14
POLK	14

ATRI Truck GPS data. Presented at the Model Task Force by Dr. A. Pinjari (USF) et al.-March 2014

Matrix Estimation Process

- From NCHRP Report 765[1]: *The idea is simple: find a reasonable OD table that will reproduce known traffic counts. On large networks, there are many different OD tables that will reproduce traffic counts with equal quality, so there is a need for additional information to help choose an OD table. Most algorithms available today supplement the traffic counts with a "seed" OD table that is a best-guess approximation of the desired result. A seed OD table may be one that has been observed in the past, one that has been observed recently but imprecisely, or one developed from principles of driver behavior.*



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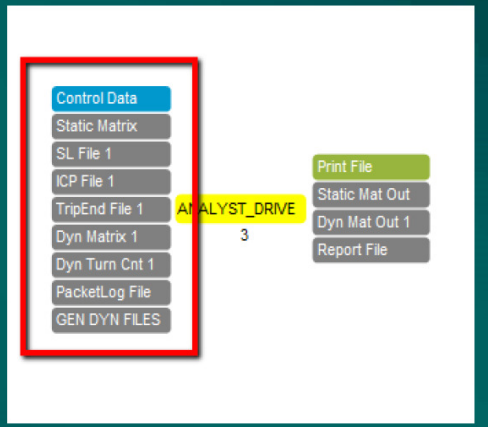
[1] NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design. Transportation Research Board, Washington D.C. – 2014

Matrix Estimation Process

- The OD matrix estimation (ODME) reads an initial, or seeded, trip matrix from which to modify based upon an iterative process of evaluating the ratios of assigned trips to counts on links with counts, the modification of the OD trips, and the reassignment of the modified trip matrix until the user-specified number of passes is reached.
- Also required as input are the minimum path files, one per iteration, which are generated during the equilibrium highway loading; and this process is continued until a statistically acceptable trip table and assignment is generated.
- When a time-variant OD matrix estimation is needed, as in a dynamic traffic assignment (DTA) modeling framework, then the ODME can also be made dynamic. In this case, a dynamic OD table gives the number of trips between each origin zone and each destination zone that start at a particular time. Dynamic OD tables require dynamic traffic counts and a dynamic seed OD table.

- Static OD Estimation
  - Prior OD Matrix
  - Link Counts
  - ICP (from Highway Assignment)
  - Trip Ends
- Dynamic OD Estimation
  - Prior OD Matrix
  - Link Counts
  - Dynamic Turn Counts
  - Packet Log File (from Avenue Assignment)



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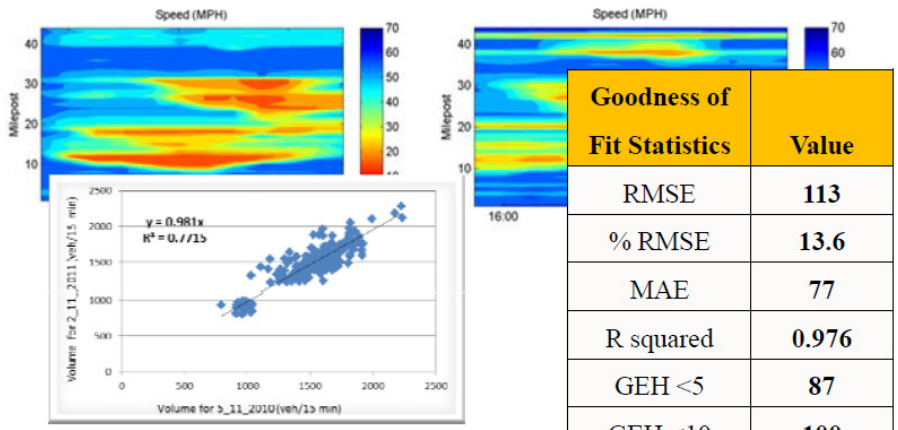
Matrix Estimation Calibration / Validation


- When developing OD matrices from counts (as it is usually the case), a good fit to the screenlines used is necessary, but it may not be sufficient. As stated previously, the ODME is mathematically under-determined (more unknowns than knowns), which means that it could have many solutions; i.e., it could be that many OD matrices could perfectly match the counts observed on the links.
- The seed matrix used as a starting point (in the ODME iterative process) has a great influence on the final solution; i.e., technically, one can use a seed of 1's and iterate from there to reach to an acceptable match to the existing counts. However, it may not represent the true OD matrix underlying those counts.
- The availability of good seed data, or a high confidence in the seed OD matrix being used, plus a good fit to the counts, and how well the resulting assignment trip lengths match the seed matrix trip lengths are all required elements for a good estimation.
- Big data (coming from Bluetooth or GPS devices) can provide help finding another source for these seed matrices. This combination of sources will lead to a carefully developed OD matrix that have enough resemblance to the true OD patterns in the study area.

Good Calibration is Essential


- Traffic flow model, demand, assignment
  - Sequential and iterative approach



Goodness of Fit Statistics	Value
RMSE	113
% RMSE	13.6
MAE	77
R squared	0.976
GEH <5	87
GEH <10	100

Multi-Resolution Research. Presented at the Model Task Force by Dr. M. Hadi (FIU) -March 2014

Origin-Destination Trips and Skims Matrices

Data Sources

Data needs

- **Demand Data**

  – Origin-Destination Trip Tables from an existing model

  –Tables should be broken into different periods of the day: AM peak, PM peak, and Off-peak (Mid-day, Night)

- Tables need to maintain the directionality of OD trips
- For each period, the Tables need to contain sub-tables by

  Vehicle class (SOV, HOV, Light Truck, Heavy Truck) by toll choice (Toll, Non-Toll)

- **Supply side data**

  - Network data

  - Signal control data

Data Needs

- Counts, speed, occupancy, and travel times based on Intelligent Transportation Systems (ITS) traffic detectors
- Travel time and OD matching measurements based on automatic vehicle identification (AVI) or automatic vehicle location (AVL) or GPS technologies
- Advanced strategy data (incident, work zone, ML pricing, ramp metering rates, etc.)
- Turning movement counts

Data Sources

- SunGuide data (TSS, TVT data, incident, DMS, etc.)
- Central data warehouse (RITIS/STEWARD)
- Weather data
- Managed lane dynamic congestion pricing rates
- Work zones
- Crash data (CAR System and Signal4)
- Signal control and ramp metering
- 511 data
- Private sector data: Inrix, Here (formerly known as Navteq), AirSage, etc. Note: FDOT has HERE and INRIX data available for public agencies use.
- Statistics office data (FDOT)
- Transit agency data
- AVI data (Bluetooth, Wi-Fi, ETC)
- Connected vehicles

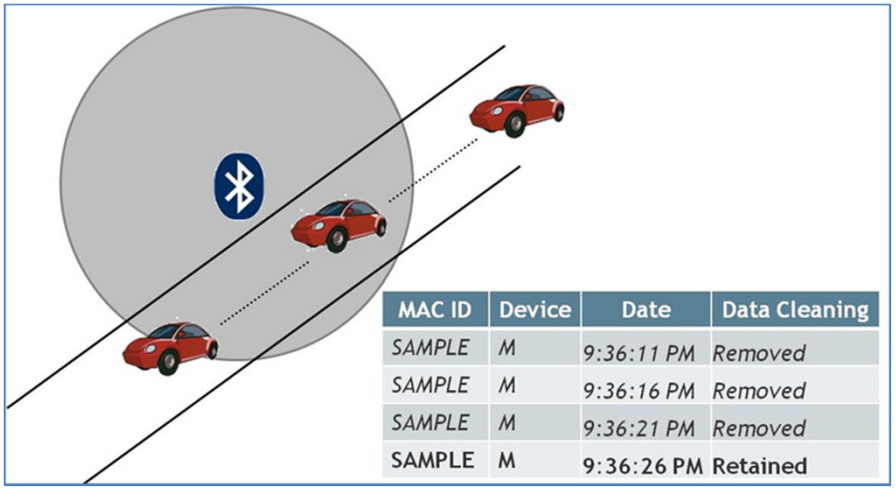
Data Sources: PTMS and ITS

- Whenever data is available, comparing Portable Traffic Monitoring Site (PTMS) and ITS count data may improve the reliability of the data. Manual counts of recorded videos could be conducted to determine the accuracy of the data. It was found in previous studies that the manual counts are closer to ITS data than the PTMS during the peak hours.

•The ITS data can be obtained from the Statewide Transportation Engineering Warehouse for Archived Regional Data (STEWARD). This system was developed as a proof-of-concept to centrally archive data from traffic management centers around Florida in a practical manner. The effort concentrated on archiving information from the SunGuide traffic sensor subsystem (TSS) and the travel time subsystem (TVT). The STEWARD database contains summaries of traffic volumes, speeds, occupancies, and travel times aggregated by 5-, 15-, and 60-minute periods, as requested by the user. Using a web-based interface, the user can specify date and time ranges and detector locations for which the data is needed. The user can also download all generated reports in comma-delimited formats, which can be easily imported into database management tools. Instructions to get access at: http://www.dot.state.fl.us/trafficoperations/ITS/RITIS.shtm

OD Estimation – Bluetooth Detection Technology

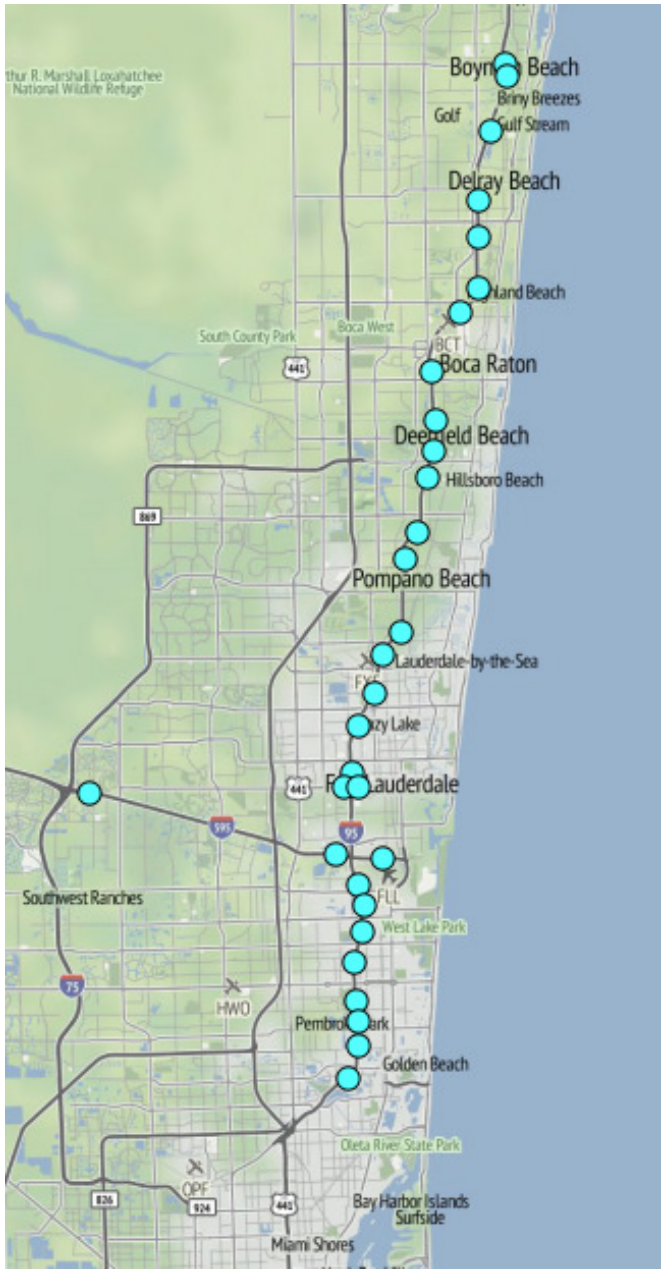
- Bluetooth Detector (Traffax) has 100-meter range and consecutive 5-second scan windows.
- "Discoverable" bluetooth devices are detected and time-stamped.
- Bluetooth devices have a unique MAC ID.
- Chronological MAC IDs are linked together to form "trips".
- Data analysis provides study area speed profiles and origin-destination estimates. More on this later…



MAC ID	Device	Date	Data Cleaning
SAMPLE	M	9:36:11 PM	Removed
SAMPLE	M	9:36:16 PM	Removed
SAMPLE	M	9:36:21 PM	Removed
SAMPLE	M	9:36:26 PM	Retained

Bluetooth Data Collection Effort

- 40 detectors deployed in the study area
- Duplicate detectors placed to reduce error
- Deployment designed primarily to sequester interchanges
- Data collection occurred May 9 – 16, 2013
- Estimated penetration rate ranges from 3%-9%



How to: From Bluetooth to OD matrix

This is the actual data from one bluetooth site

BlueTooth_Data_AllSites

ID	gId	BlueId	bDay	bTime	bDayTime	SiteId
27	27	00:A0:96:10:E4:28	8/21/2014	1:27:42 AM	8/21/2014 1:27:42 AM	1
28	28	00:A0:96:10:E4:28	8/21/2014	1:27:50 AM	8/21/2014 1:27:50 AM	1
56	56	C4:85:08:A7:B0:BF	8/21/2014	1:30:22 AM	8/21/2014 1:30:22 AM	1
57	57	C4:85:08:A7:B0:BF	8/21/2014	1:30:26 AM	8/21/2014 1:30:26 AM	1
58	58	C4:85:08:A7:B0:BF	8/21/2014	1:30:31 AM	8/21/2014 1:30:31 AM	1
59	59	C4:85:08:A7:B0:BF	8/21/2014	1:30:38 AM	8/21/2014 1:30:38 AM	1
60	60	C4:85:08:A7:B0:BF	8/21/2014	1:30:42 AM	8/21/2014 1:30:42 AM	1
61	61	C4:85:08:A7:B0:BF	8/21/2014	1:30:47 AM	8/21/2014 1:30:47 AM	1
74	74	C4:85:08:A7:CC:2B	8/21/2014	1:31:59 AM	8/21/2014 1:31:59 AM	1
76	76	C4:85:08:A7:CC:2B	8/21/2014	1:32:08 AM	8/21/2014 1:32:08 AM	1
77	77	C4:85:08:A7:CC:2B	8/21/2014	1:32:13 AM	8/21/2014 1:32:13 AM	1
88	88	00:07:04:E6:E8:43	8/21/2014	1:33:11 AM	8/21/2014 1:33:11 AM	1
89	89	00:07:04:E6:E8:43	8/21/2014	1:33:18 AM	8/21/2014 1:33:18 AM	1
91	91	00:07:04:E6:E8:43	8/21/2014	1:33:29 AM	8/21/2014 1:33:29 AM	1
92	92	00:07:04:E6:E8:43	8/21/2014	1:33:34 AM	8/21/2014 1:33:34 AM	1
93	93	00:07:04:E6:E8:43	8/21/2014	1:33:39 AM	8/21/2014 1:33:39 AM	1
94	94	00:07:04:E6:E8:43	8/21/2014	1:33:47 AM	8/21/2014 1:33:47 AM	1
96	96	00:07:04:E6:E8:43	8/21/2014	1:33:54 AM	8/21/2014 1:33:54 AM	1
97	97	00:07:04:E6:E8:43	8/21/2014	1:34:03 AM	8/21/2014 1:34:03 AM	1
109	109	00:1E:3D:35:D6:45	8/21/2014	1:35:07 AM	8/21/2014 1:35:07 AM	1
110	110	00:1E:3D:35:D6:45	8/21/2014	1:35:12 AM	8/21/2014 1:35:12 AM	1
111	111	00:1E:3D:35:D6:45	8/21/2014	1:35:17 AM	8/21/2014 1:35:17 AM	1
112	112	00:1E:3D:35:D6:45	8/21/2014	1:35:22 AM	8/21/2014 1:35:22 AM	1
113	113	00:1E:3D:35:D6:45	8/21/2014	1:35:27 AM	8/21/2014 1:35:27 AM	1

Record: 1 of 768152 No Filter Search

How to: From Bluetooth to OD matrix

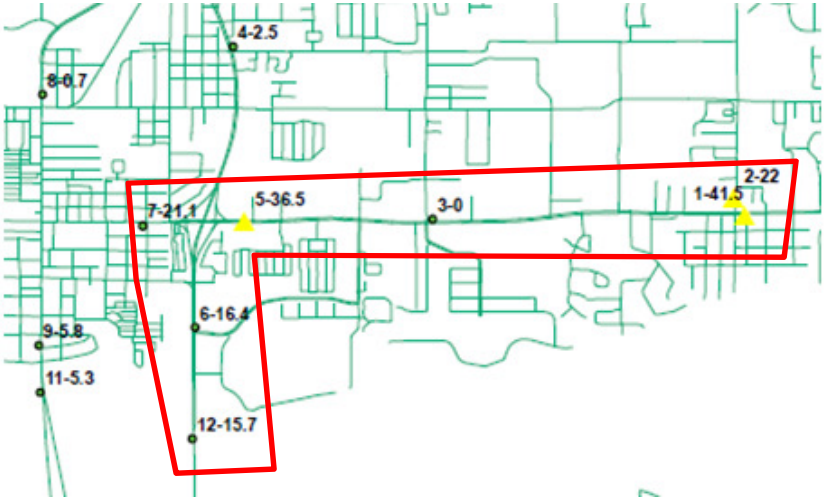
Combining all detector sites' readings to form a "trip"

Hits_For_Matrix

TripId	BlueId	Time_1	Time_2	SitePair1	SitePair2	SitePairs	Jumpers
3790	00:07:04:E6:C3:0E	8/27/2014 4:48:39 AM	8/27/2014 4:48:57 AM	1	2	1-2	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:48:57 AM	8/27/2014 4:50:06 AM	2	3	2-3	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:50:06 AM	8/27/2014 4:50:52 AM	3	5	3-7	☑
3790	00:07:04:E6:C3:0E	8/27/2014 4:50:07 AM	8/27/2014 4:50:52 AM	5	7	3-7	☑
3790	00:07:04:E6:C3:0E	8/27/2014 4:50:52 AM	8/27/2014 4:50:58 AM	7	5	7-5	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:50:58 AM	8/27/2014 4:51:41 AM	5	6	5-6	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:51:41 AM	8/27/2014 4:52:34 AM	6	12	6-12	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:52:34 AM	8/27/2014 4:54:24 AM	12	23	12-23	☐
3790	00:07:04:E6:C3:0E	8/27/2014 4:54:24 AM	8/27/2014 4:55:08 AM	23	24	23-24	☐
3791	00:07:04:E6:C3:0E	8/27/2014 5:36:48 AM	8/27/2014 5:38:29 AM	24	23	24-23	☐
3793	00:07:04:E6:C3:0E	8/27/2014 5:48:41 AM	8/27/2014 5:50:38 AM	21	13	21-13	☐
3794	00:07:04:E6:C3:0E	8/27/2014 9:57:11 AM	8/27/2014 10:00:55 AM	36	18	36-18	☐
3794	00:07:04:E6:C3:0E	8/27/2014 10:00:55 AM	8/27/2014 10:02:15 AM	18	24	18-24	☐
3795	00:07:04:E6:C3:0E	8/27/2014 10:51:32 AM	8/27/2014 10:54:25 AM	17	36	17-36	☐
3796	00:07:04:E6:C3:0E	8/27/2014 1:36:12 PM	8/27/2014 1:38:58 PM	13	22	13-22	☐
3796	00:07:04:E6:C3:0E	8/27/2014 1:38:58 PM	8/27/2014 1:39:34 PM	22	21	22-21	☐
3797	00:07:04:E6:C3:0E	8/27/2014 4:17:29 PM	8/27/2014 4:20:07 PM	21	13	21-13	☐
3798	00:07:04:E6:C3:10	8/21/2014 11:58:43 AM	8/21/2014 12:00:20 PM	13	22	13-22	☐
3798	00:07:04:E6:C3:10	8/21/2014 12:00:20 PM	8/21/2014 12:00:29 PM	22	21	22-21	☐

Record: 9148 of 106042 No Filter Search

This driver was not detected at Site #5.
The data records show that it went from site #3 to site #7, "jumping" over site #5
A couple of records added to fill in the "gaps"



How to: From Bluetooth to OD matrix

Then, by adding up all “TripId”s from every origin to every destination

qryZ_OD_Viewer

RowId	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19
1	0	2011	2122	81	1648	876	889	29	260	134	239	847	4	1	2	3	94	25	9
2	1204	0	1164	45	878	507	528	15	137	55	126	483	2	1	2	3	58	18	4
3	2054	1099	0	130	2146	1068	1096	39	302	158	276	1030	9	2	3	7	136	32	8
4	50	20	98	0	522	2511	666	33	77	7	68	2404	69	21	9	14	630	57	30
5	1457	824	2001	815	0	1539	2129	77	421	309	376	1462	41	8	9	11	243	49	19
6	829	470	1087	2716	1616	0	875	36	204	103	160	4580	146	27	19	34	1022	140	43
7	661	383	885	514	1769	1343	0	91	595	427	522	1167	51	7	8	6	248	63	16
8	22	14	25	34	61	69	86	0	871	88	819	61	8	0	1	1	29	0	0
9	204	116	254	95	414	190	595	874	0	225	2495	98	44	6	2	6	46	12	3
10	127	65	166	9	282	92	413	98	266	0	244	82	16	3	0	2	37	12	1
11	188	105	233	82	378	164	525	832	2548	215	0	85	51	7	3	7	55	13	3
12	803	450	1046	2603	1489	4826	742	34	139	92	101	0	165	28	21	35	1097	155	43
13	10	6	19	115	51	219	55	10	77	20	83	242	0	425	130	156	107	79	90
14	1	0	1	22	8	39	9	2	12	3	12	44	323	0	348	19	23	26	4
15	2	1	2	6	6	16													
16	6	5	9	22	16	57													
17	122	59	175	697	284	1145													
18	23	6	34	96	45	181													
19	13	9	14	61	29	97													
20	10	7	13	41	30	96													
21	12	8	14	50	37	101													
22	52	33	73	295	151	588													
23	477	264	617	1679	877	2924													

Record: 1 of 37 No Filter Search

qryZ_OD_Pct_Viewer

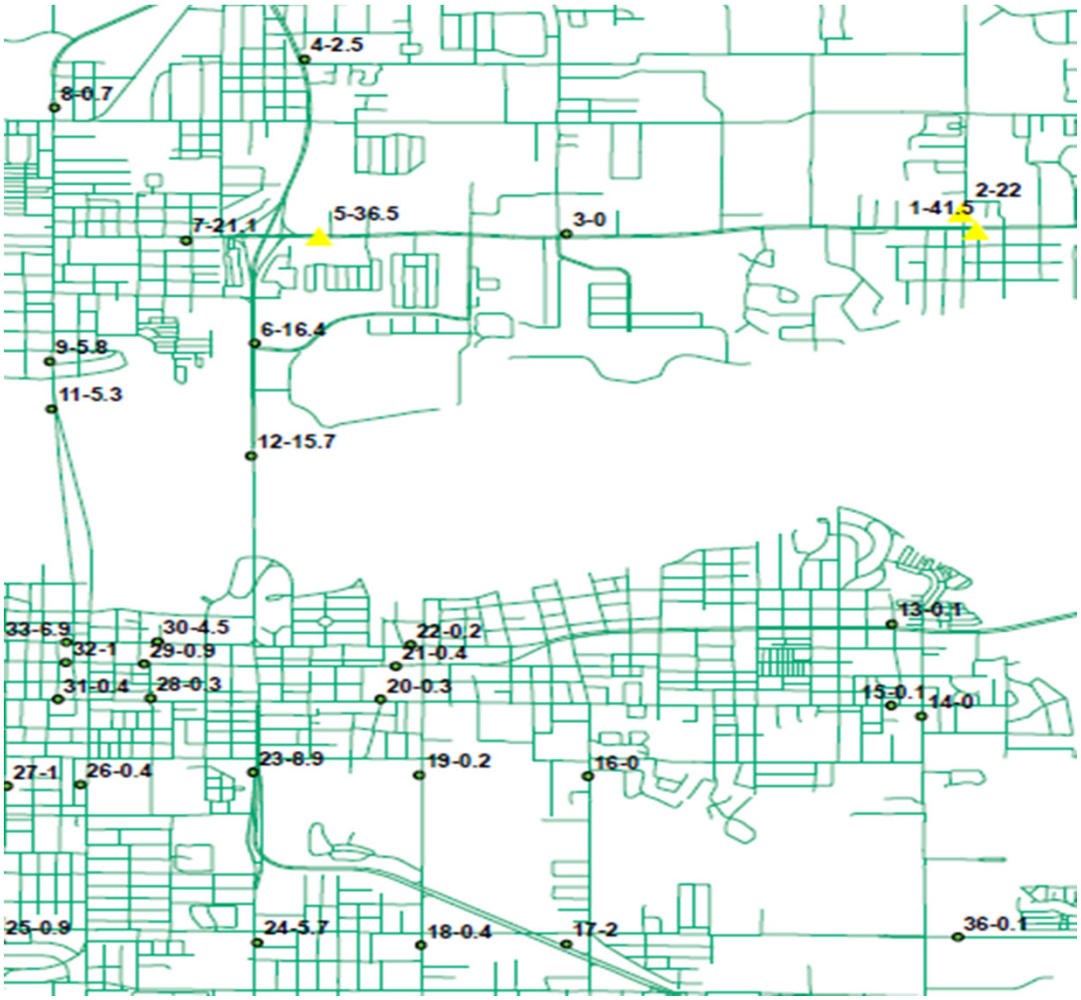
Row	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	s19	s20
1	0	48.7	51.3	2	39.9	21.2	21.5	0.7	6.3	3.2	5.8	20.5	0.1	0	0	0.1	2.3	0.6	0.2	0.4
2	50.8	0	49.2	1.9	37.1	21.4	22.3	0.6	5.8	2.3	5.3	20.4	0.1	0	0.1	0.1	2.4	0.8	0.2	0.3
3	38.8	20.7	0	2.5	40.5	20.2	20.7	0.7	5.7	3	5.2	19.4	0.2	0	0.1	0.1	2.6	0.6	0.2	0.4
4	1.3	0.5	2.6	0	14	67.3	17.8	0.9	2.1	0.2	1.8	64.4	1.8	0.6	0.2	0.4	16.9	1.5	0.8	1.4
5	22.5	12.7	30.9	12.6	0	23.7	32.8	1.2	6.5	4.8	5.8	22.5	0.6	0.1	0.1	0.2	3.7	0.8	0.3	0.6
6	8.5	4.8	11.1	27.8	16.5	0	8.9	0.4	2.1	1.1	1.6	46.8	1.5	0.3	0.2	0.3	10.4	1.4	0.4	1.3
7	13.9	8.1	18.7	10.8	37.3	28.3	0	1.9	12.6	9	11	24.6	1.1	0.1	0.2	0.1	5.2	1.3	0.3	0.8
8	1.8	1.2	2.1	2.8	5	5.7	7.1	0	72	7.3	67.7	5	0.7	0	0.1	0.1	2.4	0	0	0.3
9	4.9	2.8	6.1	2.3	9.9	4.5	14.2	20.9	0	5.4	59.6	2.3	1.1	0.1	0	0.1	1.1	0.3	0.1	0.4
10	16.3	8.4	21.4	1.2	36.3	11.8	53.2	12.6	34.2	0	31.4	10.6	2.1	0.4	0	0.3	4.8	1.5	0.1	0.4
11	3.9	2.2	4.8	1.7	7.9	3.4	10.9	17.3	52.9	4.5	0	1.8	1.1	0.1	0.1	0.1	1.1	0.3	0.1	0.4
12	8.7	4.9	11.3	28.1	16.1	52.1	8	0.4	1.5	1	1.1	0	1.8	0.3	0.2	0.4	11.8	1.7	0.5	1.5
13	0.3	0.2	0.6	3.4	1.5	6.5	1.6	0.3	2.3	0.6	2.4	7.1	0	12.5	3.8	4.6	3.2	2.3	2.7	1.5
14	0.1	0	0.1	2.2	0.8	4	0.9	0.2	1.2	0.3	1.2	4.5	32.8	0	35.3	1.9	2.3	2.6	0.4	3.6
15	0.4	0.2	0.4	1.1	1.1	3	0.6	0.2	0.4	0.2	0.4	3.2	27.6	49.5	0	4.6	3.2	2.4	1.9	13.4
16	0.6	0.5	0.8	2	1.5	5.3	0.9	0	0.4	0.2	0.4	6.1	14.3	2.8	5.2	0	32.5	12.1	0.6	8.3
17	3.6	1.8	5.2	20.8	8.5	34.2	4.6	0.6	2.2	1	2.2	36.6	3.9	0.8	0.9	12.6	0	8.3	7.1	1.6
18	1.5	0.4	2.3	6.5	3	12.2	1	0.3	0.9	0.5	1.1	13.9	4.6	2	1.5	11.6	15	0	13.5	2
19	1.4	1	1.5	6.6	3.1	10.5	1.8	0	0.8	0.1	0.8	10.7	9.6	0.5	1.1	0.6	20.9	21.6	0	10.2
20	1.2	0.8	1.5	4.8	3.5	11.3	2.6	0.1	1.4	0.4	1.3	12.3	10.1	3.5	8.2	10.2	6.2	3.9	11.7	0
21	0.5	0.3	0.5	1.9	1.4	3.8	1.1	0.1	0.6	0.2	0.6	4.1	66.9	2.5	1.1	2.5	2.6	2.5	5.8	2.1
22	1.6	1	2.2	9	4.6	18	2.8	0.4	3.4	0.9	3.6	18.9	2.8	0.1	0	0.2	1.1	1.7	3.1	1.5

Record: 1 of 37 No Filter Search

…it is then possible to find the percent distribution of trips

How to: From Bluetooth to OD matrix

Those percentages shown in a map for site #3

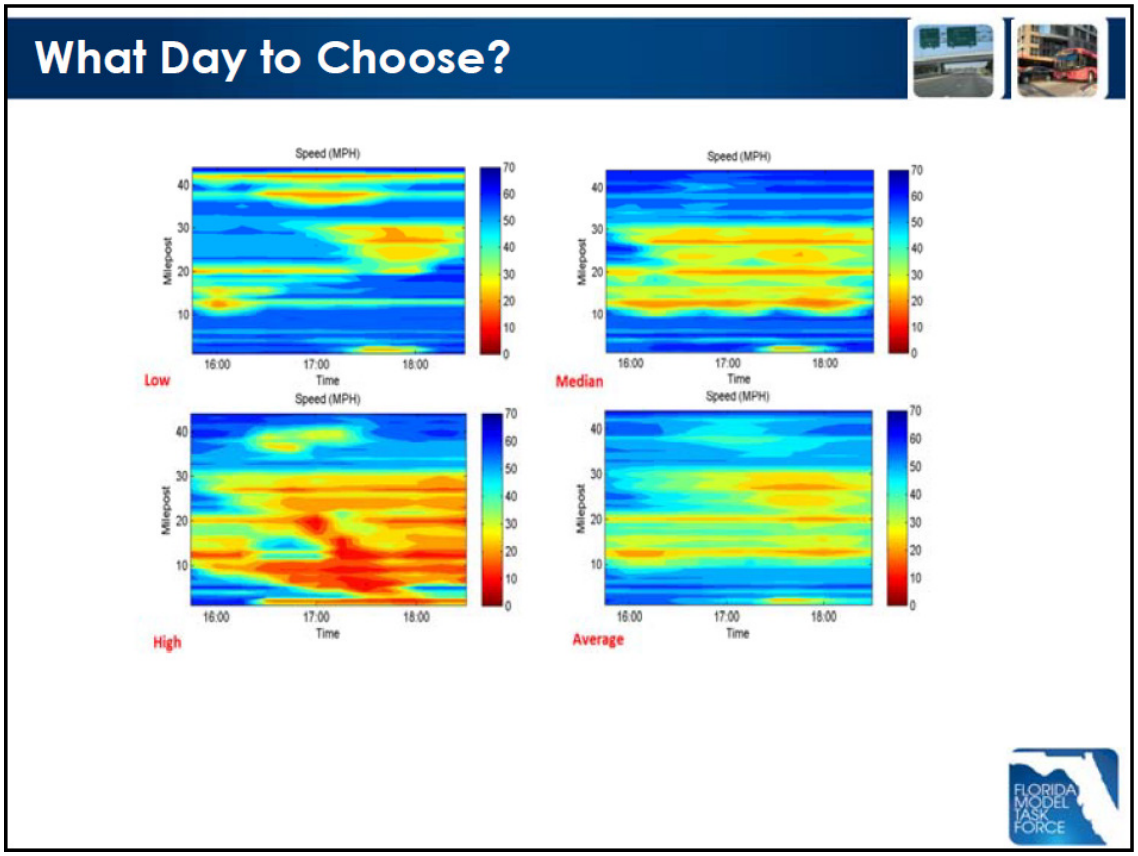


Data QA/QC

- Data from traffic detectors should be screened carefully to avoid inconsistencies; e.g., the addition of on-ramps and subtraction of off-ramps to estimate the expected volume for the station can be used as a reference when assessing the accuracy of the measurements

- Whenever data is available, comparing PTMS and ITS count data may improve the reliability of the data.

- For different purposes, a specific day or an average of all repetitive days may be used for calibration. Using the median day data may be better than using the averages, since the averages do not represent any of the real-world days.



Origin-Destination Trips and Skims Matrices

Florida Application

Application: I-95 Managed Lanes Research

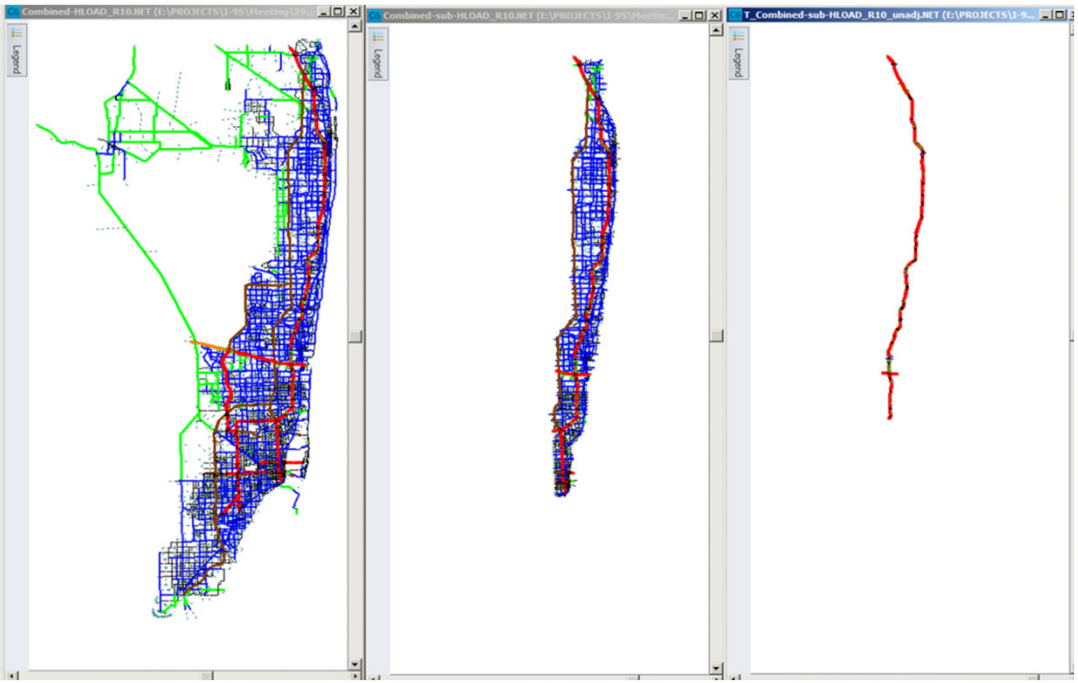
The specific objectives of this research were as follows:

1. Develop procedures for utilizing detailed data from multiple sources to calibrate the supply and demand sides of DTA models for use in modeling ML.
2. Develop procedures for the use of simulation-based DTA to model ML.
3. Assess the performance of the use of DTA compared to STA in ML modeling.
4. Test the ability of a DTA tool (Cube Avenue from Citilabs, Inc.), which is a strong candidate for use in Florida to model ML.
5. Demonstrate the application of the developed procedures to a ML implementation in Florida.

In this presentation, we are interested in the data and processes used to estimate the trip tables by class of vehicle and time periods.

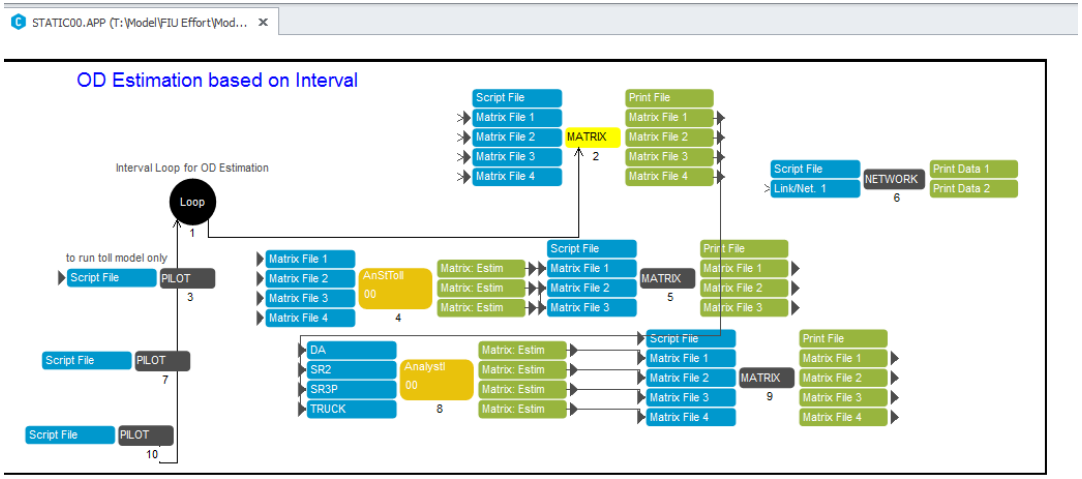
Application: I-95 Managed Lanes Research

- Detector data collected from existing Intelligent Transportation System (ITS) operated by the regional traffic management center was critical for the demand estimation, model calibration, and validation in this effort. The corridor of interest is instrumented with microwave detectors every 0.3 to 0.5 mile that report volume, speed, and density measurements in 20-second intervals for each lane. This data was supplemented by measurements from the Portable Traffic Monitoring Sites (PTMS) ramp counts, from the Statistics Office of the Florida Department of Transportation (FDOT). The PTMS include 15-minute ramp counts for two or three days per year. No speed or classification data are provided. Ramp counts obtained from the PTMS and ramp metering detectors represent the total origin and destination demand on the linear network and are very useful in the demand estimation process.
- In this study, it was found that there was an acceptable match between the used ITS and PTMS counts for the ramps. The PM peak on the mainline showed that the PTMS reported higher volumes, compared to ITS data. Manual counts of recorded videos were conducted to determine the accuracy of the data. It was found that the manual counts are closer to ITS data than the PTMS during the PM peak.

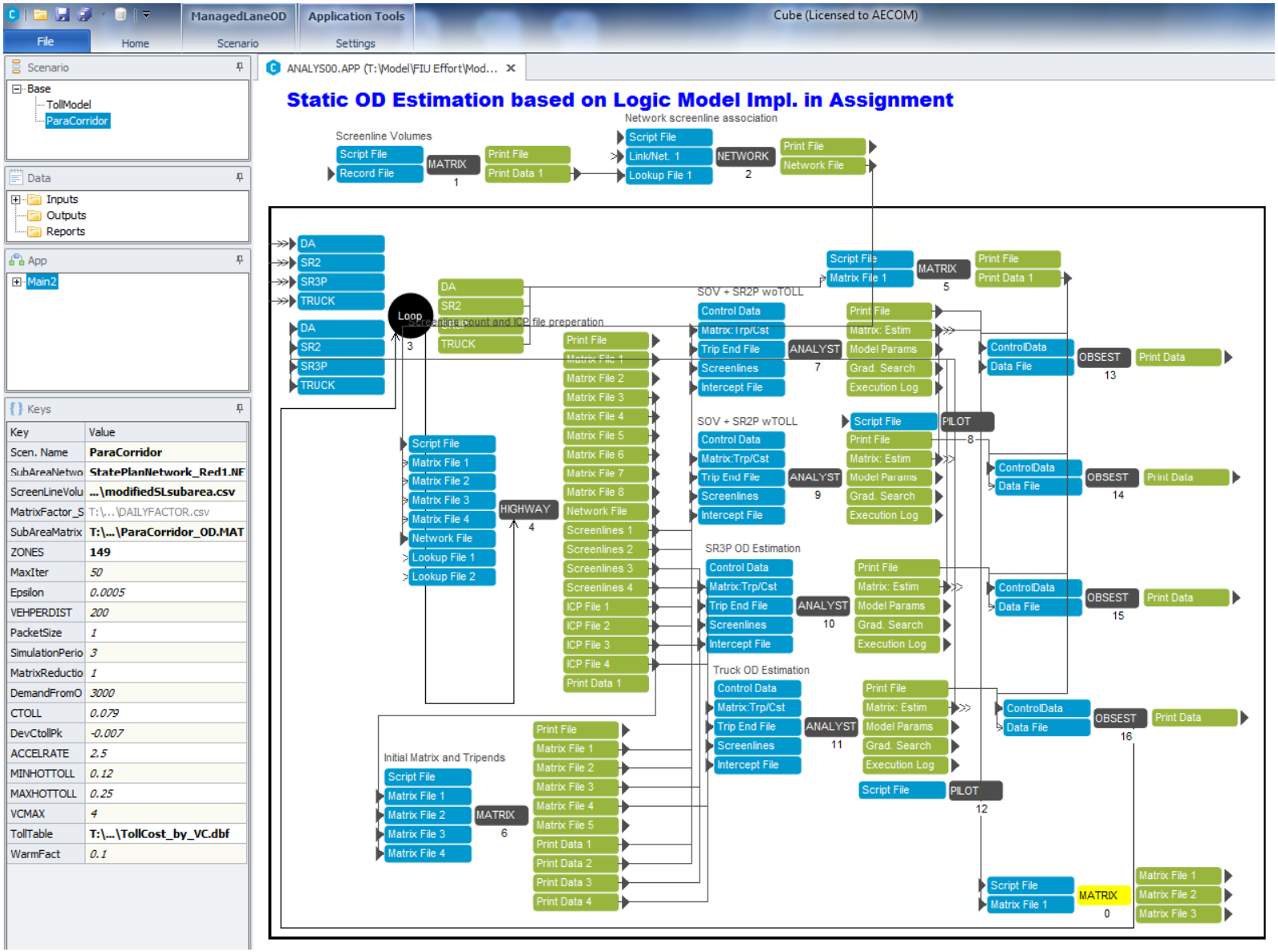


Application: I-95 ML, Static O-D ME

- The initial source of demand in this research is a trip table for a peak period, extracted from a regional demand forecasting model (the Southeast Florida Regional Planning Model (SERPM) model in the case of the I-95 managed lane case study).
- The next step is to convert the three-hour PM peak-period matrices obtained from the SERPM to 15-minute matrices using distribution factors that reflect the proportion of the trip tables for each 15 minutes of the day obtained, based on trip counts.
- The next step is to adjust these matrices using the Cube Analyst static matrix estimation program. This matrix estimation process performs the estimation by considering a number of input parameters based on the static assignment of Cube Voyager. This process applies a maximum likelihood approach to optimize the trip tables based on the deviation between traffic counts and assignment results and initial (seed OD) matrices.

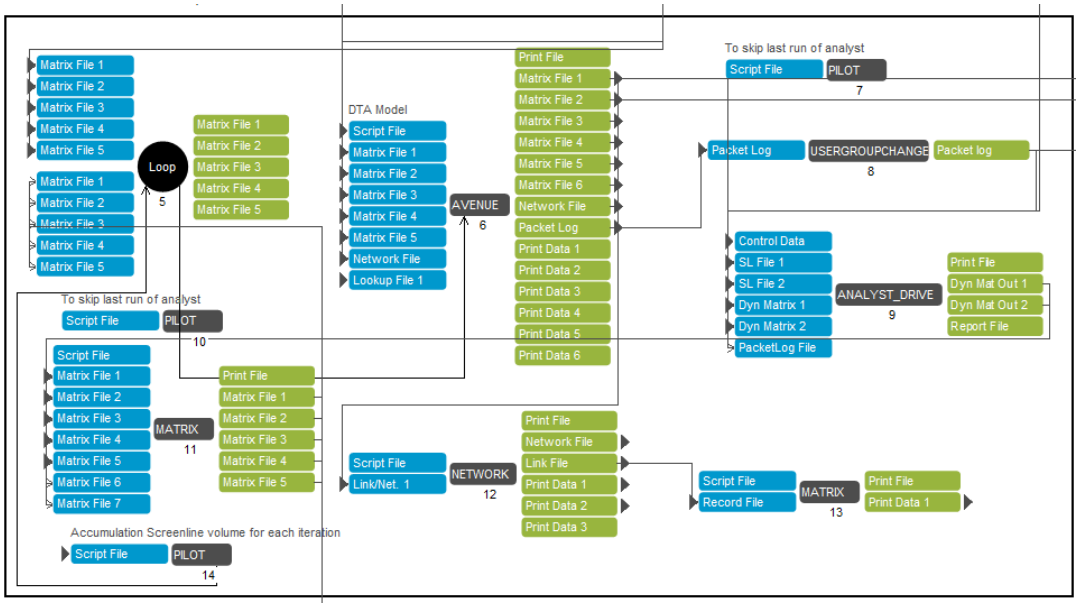


Application: I-95 ML, Static O-D ME

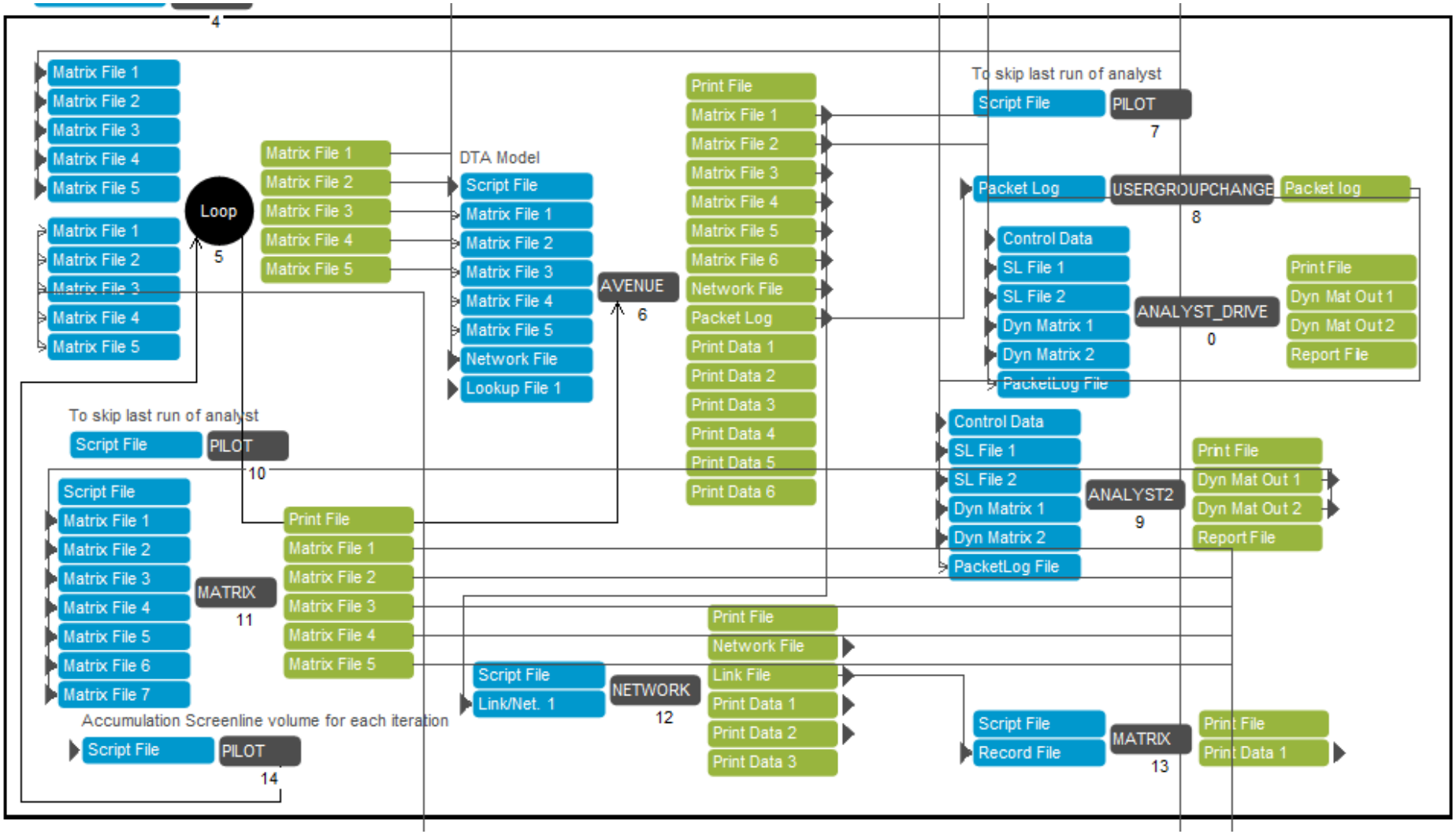


Application: I-95 ML, Dynamic O-D ME

- Instead of running Analyst with Highway assignment module for 12 consecutive periods of 15-minute intervals, Analyst Drive (the dynamic OD estimation tool) runs during the whole model period, coupled with the Cube Avenue assignment module.
- In the single Cube Avenue run, the model period is divided into 15-minute intervals. This procedure is supposed to be superior to static OD estimation, because Cube Avenue models the queues and queue spillbacks, and thus can capture the effects of congestion on subsequent time intervals.



Application: I-95 Managed Lanes Research



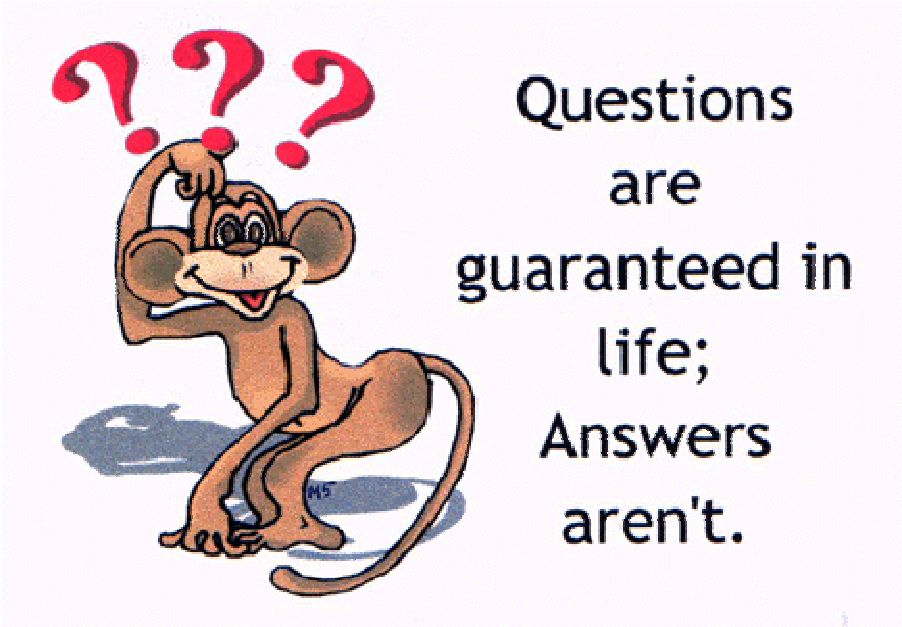
Application: I-95 Managed Lanes Research

Recommended improvements to the Analyst OD estimation process are listed as follows:

- Incorporating speed, density, and/or queue length in the objective function of Analyst.
- Allowing the user to specify lower and upper bounds for each OD pair cell (there is already a global parameter that is applied to all cells yet cannot be varied by cells).
- Allowing the user to better control the temporal variability of the results. In the Analyst optimization tool that is based on static assignment, the temporal variation cannot be controlled. The optimization process can achieve totally different local optimal solutions for sequential intervals, since the optimization does not guarantee achieving global optimal.
- Allowing the user to keep the proportionality between specific OD pairs (e.g., from all of the trips originated from I-95, with 30% directed to SR 836 and 30% destined to the Florida Turnpike).
- Incorporating zonal trip end, partial matrix, partial trips, and confidence matrix[1] in Analyst Drive for dynamic demand estimation.

1. Analyst Drive has this ability in the latest version

Questions



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