



Analyzing Congested Signalized Intersections

In the typical signalized intersection capacity analysis, volume data are coded in vehicles per hour and converted to a peak 15-minute flow rate using the peak-hour factor for a 15-minute (duration equal to 0.25) analysis. This is the standard method as prescribed by the Highway Capacity Manual (HCM) for undersaturated conditions.

However, the HCM provides for the multiple-period analysis of oversaturated conditions to account for unmet demand in each period in Appendix F of Chapter 16.

Data Collection

Volume is defined as the number of vehicles passing a point during a specified time period. Demand is the number of vehicles that desire to travel past a point during a specified period and is frequently higher than actual volumes where congestion exists.

Generally, volume data are collected by counting vehicles as they cross the stop line (those getting through the intersection), instead of counting upstream to more accurately measure the demand (those wanting to get through the intersection). This standard practice is fine for intersections with a demand less than capacity, but it is not acceptable for analyzing congested intersections. Where demand exceeds capacity, arrival volumes must be observed by counting the number of queued vehicles at periodic intervals as well as the departure volumes. A detailed method for doing this may be found in most traffic engineering textbooks, e.g., Traffic Engineering by Roess et al.

Analysis

Counting the unmet demand (the queue at the beginning of the red phase) for the first 15-minute period that does not serve all vehicles in each movement wanting to get through the intersection permits the HCM multiple-period procedure to model the oversaturated intersection

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TSIS-CORSIM 6.0 Release is Imminent

Beta testing for the TSIS 6.0 upgrade began in November, and this new version is targeted for release in early 2006. The following new features are planned for TSIS 6.0:

Simulation Logic. Version 6.0 now offers improved simulation logic for surface street lane changing, complex intersection modeling, freeway acceleration lanes, deceleration lanes, ramp meters, car-following, and origin-destination modeling. An enhanced random number generator will produce better distributions, for improved stochastic modeling.

Graphical Input Editor (TRAFED). 1) Import Tiger and DXF (Autocad) files in the background to draw a link-node diagram on top of it. 2) Snap to grid so nodes can be placed at even increments. 3) Change the background color. 4) Cut, copy, or paste multiple links and nodes at once. 5) Move selected links and nodes using the arrow keys. 6) Scroll beyond the edge of the network.

Actuated Control. Actuated controller parameters may now vary from time period to time period to simulate different time-of-day plans. The number of actuated controllers is now dynamic and limited only by the number of nodes in the network. The TRAFED input screens for actuated control have been radically changed to make it easier to specify actuated controllers in CORSIM.

Output Processor. The Output Processor has been redesigned to efficiently summarize any model result generated by CORSIM.

Vehicle Animation File. The TRAFVU animation module can now process animation files larger than 2 gigabytes. If desired, the user can now ignore any desired set of links during animation, which reduces animation file size.

Modeling Options. 1) CORSIM can now simulate up to eleven through lanes in one direction on a mainline freeway link, i.e., 5 through lanes plus 6 full auxiliary lanes. 2) The minimum desired free-flow speed on surface streets has been reduced to one mile per hour, to

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much more accurately.

In Appendix F of HCM Chapter 16, the process is defined to utilize this unmet demand to compute the Initial Queue Delay (d^3 in the HCM delay equation) to account for the additional delay created for the current period volume by the unmet demand queue from the previous period. This procedure also facilitates analyzing multiple periods (each period individually) by calculating the unmet demand from each period for use in computing the initial queue delay for the subsequent period. In this way, the cumulative effects of delay and queuing created by period-to-period unmet demand can be accurately modeled in oversaturated conditions.

Results

For situations where the v/c ratio exceeds 1.0, a multiple-period analysis can be much more comprehensive in predicting delay and queuing than the typical single-period approach. Results from an Honors Thesis by Ms. Halah Mourad at the University of Florida illustrated that as v/c ratios increase beyond 1.0, the differences between delay and queue estimates differ significantly. Ms. Mourad found:

“At v/c ratios below 1.00, the difference between the single- and multiple-period analyses are negligible. However, as v/c ratios surpass the saturation point, the difference between the single- and multiple-period analyses can become significant. For example, at a v/c ratio of 1.16, the multiple-period analysis control delay differed from the single-period analysis of the same data by approximately 110 percent, and back-of-queue values were about 60 percent greater. When v/c ratios reached very high levels, such as over 2.00, the multiple-period analysis produced values of control delay as much as 400 percent greater than analyzing the same data in a single period.”

HCS+

HCS+ has automated the procedures defined in HCM Chapter 16, Appendix F, to facilitate this more comprehensive analysis of oversaturated signalized intersections. It is important to have field data for at least the first oversaturated period, then the procedure can compute subsequent unmet demand values for use in determining the initial queue delay for better overall control delay and back-of-queue estimates.

NEW Products

WatsonOD

WatsonOD is a tool used for deriving and transforming origin-destination matrices into simulation input files from traffic volume counts. WatsonOD is a dynamic Microsoft Excel Add-In that is designed to generate origin-destination matrices for transportation engineering and planning applications by using a variety of distribution techniques. The tool also converts origin-destination distribution matrices into a format that is compatible with the input file format of traffic simulation models. WatsonOD only requires the user to provide basic traffic volume counts to produce results. It is a powerful tool that minimizes user input and produces reliable distribution results. WatsonOD includes several optional features such as matrix customization and network visualization charts. WatsonOD produces results for both arterial and freeway networks. The distribution types include deterministic, probabilistic, and custom. WatsonOD produces generic simulation input files for INTEGRATION and VISSIM.

TSIS-CORSIM 6.0 Release is Imminent

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approximate vehicles dwelling in locations such as airport passenger pickup zones. 3) Truck lane logic was modified to provide exclusive truck lanes in which non-truck vehicles are prohibited. 4) Sign control can now be active in one time period and removed in the next time period, or vice versa. 5) The user can now observe vehicles entering the network during the initialization period, if desired.

Measure of Effectiveness (MOE) Data in TRAFVU. TRAFVU now reports interval-specific data in addition to cumulative data. Time interval-specific data is more reflective of conditions at the time shown. TRAFVU and CORSIM now report exactly the same MOE values.

Run-Time Extensions. Run time extensions (RTEs) may now access CORSIM at more than one different processing control points, providing more control to an RTE and allowing a wider variety of extensions to CORSIM. New actuated control API functions enable RTE developers to access critical control parameters and obtain diagnostic state information regarding actuated control.

TRF Manipulator. The TRF Manipulator tool can be used in a script to repeatedly open a CORSIM (*.TRF) input file, manipulate the contents, and save the file with a new name. Well written scripts can make this tool do much of the previously intensive and error prone task of changing data for experimental research.

Please check the [McTrans](#) web site for TSIS 6.0 availability, ordering, and pricing information.

Did You Know?

HCS

The upcoming HCS+ Signals update will be capable of generating CORSIM animation for coordinated, lead-lag actuated controllers.

TSIS-CORSIM

For coordinated actuated controllers, the version 6.0 TRAFED graphical input editor can now automatically convert split times (or split percents) into the force-off times and permissive periods used by CORSIM.

TRANSYT-7F

In addition to HCS and CORSIM, TRANSYT-7F offers multi-period modeling, to accurately determine delay and other measures for oversaturated conditions.

UPDATED Products

HSA Software – New Release – Version 3.0

X32 Group, Inc. is pleased to announce the new release of HSA Software – Version 3.0. This new version incorporates many powerful features. In the past, the most frequent request from the software users was saving Collision Diagrams after editing. Now you can not only Save, but also Undo and Redo the changes you make when editing diagrams. A diagram is saved as a sequence of editing commands. You can move any number of steps back or forward in editing process, even after you open saved diagram, and then continue editing. If at some point you need to make corrections in accident data or add new records, you can do it and then continue editing without re-generating the diagram.

And there is more! In addition to moving and copying accident symbols, you can now Rotate them. This will allow using arbitrary road geometry layouts as a background for your diagram, including skewed intersections, ramps, curves, and roundabouts. If you want to display several intersections or driveways on your diagram, you may need to Reduce accident symbol size to make symbols fit better. You can do this now – just one button click for smaller or larger symbols.

And the last, but not the least major new update is Charts. You can create a variety of data charts displaying different accident categories and conditions. Charts can be generated for the entire time period studied, or per year. HSA Software 3.0 introduces the new proposed terminology in highway safety analysis – “Direction Daisy” (similar to “Wind Rose”). This is a chart that displays various accident parameters by direction of travel of vehicles involved. The daisy-chart may be helpful in revealing accident patterns specific to certain direction of travel or intersection approaches.

There are other helpful upgrades that enhance software operation. In addition the User’s Manual has been updated to incorporate all new features, and a new Demo is available.

Visual TEAPAC - A Whole New Way of Seeing TEAPAC!

Visual TEAPAC (Version 7) has been released with major enhancements to the 1-click seamless integration of every TEAPAC program. Primarily this consists of a new graphical input interface and enhanced, graphical output reports using color.

The new graphical front-end allows network creation, editing and display directly on-screen, including:

- drag-and-drop creation or editing of the analysis network,
- an optional bitmap background for ease of creating network and visualizing results (aerial photo, map, plan drawings, etc.), and
- right-click access to all data entry dialogs, as well as analysis results dialogs.

The new enhanced graphical output reports make results easier to read and nicer to look at, including full use of color and graphics drawing for arrows, phasing diagrams, permitted movements, time-space diagrams, intersection diagrams, cycle optimization graphs, daily count variation graphics, etc. All enhanced graphical results are printable on any color or black-and-white printer supported by Windows and pastable as bitmaps into any other application.

In addition to the generic changes described above which are found in all TEAPAC programs, SIGNAL2000 and all the TEAPAC PRE-processors feature a new ring-based timing display option and new permitted left turn features for enhanced HCM2000 capacity analysis, HCM capacity optimization and design of signals and signal arterials/networks. The SITE programs performs on-screen traffic assignments on the new graphical network display in the main window for enhanced site impact traffic planning studies which seamlessly interface with the other TEAPAC programs.

Visual TEAPAC has all the seamless data exchange features first offered by TEAPAC2004 for the 13 TEAPAC programs and 14 third-party programs, including:

- one data file carries all the data for all programs, with up to 500 intersections per file/analysis,
- one-click, instant transfer of control and input data from one program to another,
- one-click exchange of results to each other, such as peak period volumes, PHFs, projected volumes, optimized timings, etc., and
- upwards/downwards compatibility with prior TEAPAC data files.

Help files include the complete user guide, with free downloadable manuals in printable and searchable .pdf format.

Update Watch

Package	Version	Status	Target	Distribution
HCS+™	5.2	Complete	Available	Registered Users received CD
TRANSYT-7F	10.3	Complete	Available	Patch download
TSIS	6.0	Testing	March	Registered Users may upgrade
IDAS	2.3	Complete	Available	Sent to Registered Users
QuickZone	2.0	Complete	Available	Sent to Registered Users
TNM	2.5	Complete	Available	Sent to Registered Users
Turbo Architecture	3.1	Complete	Available	Patch download

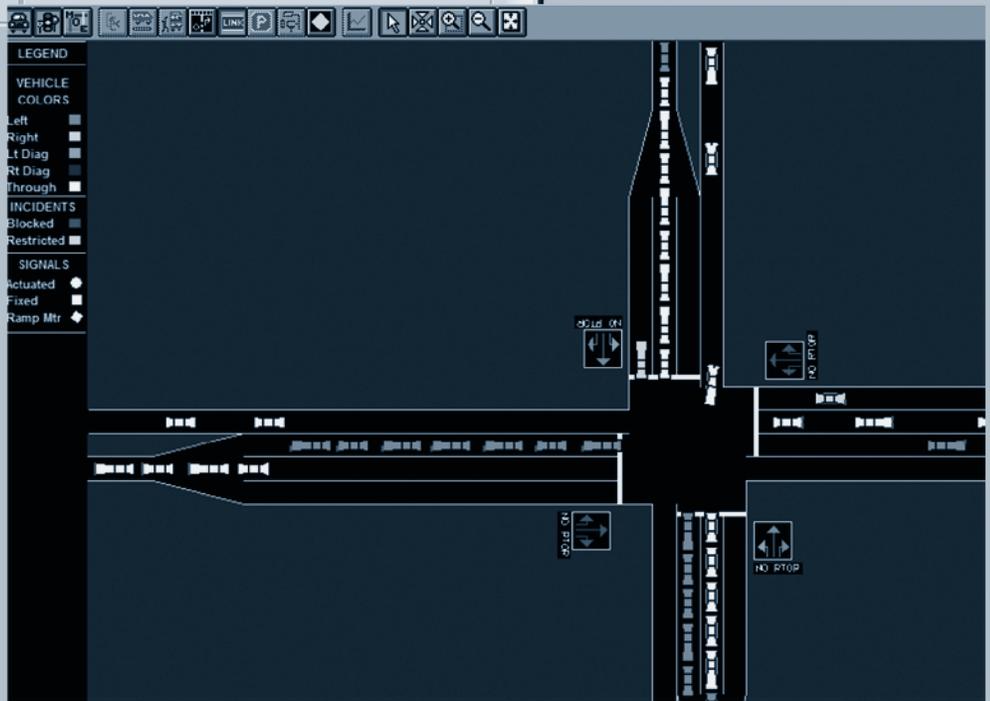
HCS+



Available in:

- Signals
- Unsignal
- Freeways
- Weaving
- Ramps

* Requires TSIS/CORSIM



"You mean that's all I have to do?"

Calendar

NEED Training?

- Highway Capacity Analysis (HCS+)
- TRANSYT-7F Release 10
- CORSIM (TSIS 5.1) for Beginners
- QuickZone
- Traffic Engineering Fundamentals
- Site Impact Analysis
- Access Management

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<http://mctrans.ce.ufl.edu/training/>

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Training

Signal Capacity Analysis Seminar McTrans 1-800- 226-1013 ext. 229	Mar 9, 2006 Mar 16, 2006	Atlanta, GA Seattle, WA
Highway Capacity Analysis Seminar McTrans 1-800-226-1013 ext. 229	TBA	TBA
Traffic Network Study (TRANSYT-7F) Seminar McTrans 1-800- 226-1013 ext. 229	TBA	TBA
CORSIM Simulation for Beginners McTrans 1-800-226-1013 ext. 229	TBA	TBA
“Designing Optimized Traffic Signals and Systems Using Visual TEAPAC, PASSER, TRANSYT and CORSIM” Strong Concepts 847-564-0386	Jan 11-13, 2006 Mar 13-15, 2006	Las Vegas, NV Orlando, FL
FHWA Traffic Noise Model (TNM) 2.5 Training Course Bowly & Associates 615-771-3006, ext. 222	Feb 26-Mar 3, 2006	Franklin, TN

Conferences

TRB Annual Meeting TRB 202-334-3472	Jan 22-26, 2006	Washington, DC
ITE Technical Conference ITE 202-289-0222	Mar 19-21, 2006	San Antonio, TX
ITE Annual Meeting ITE 202-289-0222	Aug 6-9, 2006	Milwaukee, WI

<http://mctrans.ce.ufl.edu/training/> for up-to-date training information