Sponsor Committees:
AHB45: Traffic Flow Theory
AHB40: Highway Capacity and Quality of Service
AHB20: Freeway Operations
AHB25: Traffic Signal Systems

TRB Joint Traffic Simulation Subcommittee

SimSub

AHB45(1)

Newsletter

January 2008

Please visit our web site at:
http://www.tft.pdx.edu/simsub.htm

January 2008: Contents

- Chairman's Message
- TRB 2008 SimSub Meeting Agenda
- Task group Reports
- Simulation-Related Activities of the Sponsor Committees
- Research News and Results
- Announcements and Calls for Papers
- Industry Update
- Technical Articles

Chairman's Message

This is the first issue of our newsletter that is smaller than the previous issue, primarily due to lack of technical articles. I hope that this trend does not continue. Still, we have had another productive year, although we need to discuss ways that we can maintain the interest and participation of our membership.

We had the opportunity for a brief mid-year meeting last year at the HCQS Committee mid year meeting in Charlotte. I hope that we will be able to do the same in 2008.

For those of you attending the TRB meeting next week, please note the items of interest to the traffic simulation community presented in boxes throughout this issue of the newsletter. Please look over the task group reports in preparation for our Monday night subcommittee meeting. A good part of the meeting agenda will be devoted to a discussion of their products.

We also want to provide some time on the agenda this year for discussion of the resurrection of our liaison and outreach activities. We will welcome George List as the new chair of the task group. Some new initiatives that we will discuss include the possible formation of new task groups for simulation applications for safety and for a consistent set of summary descriptions for existing simulation tools.

Thanks to all who have contributed to our productivity and to this newsletter.

TRB 2008 SimSub Meeting Agenda

Monday 7:30-9:30 PM: Marriott Wilson B/C

Introductions

Sponsor Committee Chair Remarks

Discussion of task group reports presented in the newsletter

- Annual Workshop (Brief synopsis and discussion of future topics)
- Newsletter
- Research Needs and Resources
- Simulation Application Summaries
- Liaison and Outreach
- Awards

NGSIM Update

FHWA Update

Review of the subcommittee purpose, scope and membership

Old Business

- Mesoscopic Simulation Task Group

New business

- Possible task group on simulation applications for safety
- Possible task group on simulation tool summary descriptions.
- Other New initiatives
- Mid-year meeting for 2008?

Task Group Reports

Here are the reports submitted by each of the task groups:

Annual Workshop Task Group

Submitted by John Halkias, FHWA

This task group is responsible for the organization and presentation of an annual workshop on traffic simulation, historically held on the Sunday afternoon of the TRB annual meeting.

The Workshop on Simulation will be held on Sunday from 1:30 to 5:00 PM in the Shoreham Palladian , as Session 160 of the 2008 TRB Meeting. The theme will be "*Simulation Modeling and Analysis for Traffic Evacuation*."

There is substantial interest in traffic evacuation in the analysis and simulation community. Many agencies have been using simulation modeling to prepare traffic evacuation plans for a wide range of scenarios. However, there are many technical challenges for an analyst in conducting such an analysis. The purpose of this workshop will be to highlight best practices, lessons learned, innovative applications, and recent research regarding this topic.

Workshop 160: Simulation Modeling and Analysis for Traffic Evacuation
Sunday, 1:30 PM - 5:00 PM, Shoreham Palladian

Overview on Modeling Traffic Evacuations and Introduction, John A. Halkias

Evacuation Management Operations Modeling Assessment, Matthew Hardy

Scales of Modeling Evacuation: Toward a Real-Time Framework Essam Radwan and Vinayak V. Dixit

History, Outcomes, and Future of Evacuation Traffic Simulation in Louisiana, Brian Wolshon

Using Dynasmart-P for Evacuation Modeling in Central Texas, Yi-Chang Chiu, University of Arizona

Strategies and Lessons Learned from Major Network Disruptions: Case of San Francisco Bay Area, Alexander Skabardonis

I-40 Lane Reversal Traffic Analysis: Use of Microsimulation for Plan Evaluation, Billy M. Williams,

Simulation-Based Evacuation Planning Framework Applied to the City of Boston Ramachandran Balakrishna

Arterial Signal Timing for Evacuation in Washington, D.C., Area, Elise Miller-Hooks

Closing Discussion and Questions

Research Needs and Resources Task Group

Submitted by Mohammed Hadi, hadim@fiu.edu

One of the important objectives of SimSub is the development of research problem statements for potential funding. In one of the earlier activities, the SimSub Research Needs and Resources Task Group developed a matrix of simulation research needs based on a survey of the traffic simulation community. The needs were ranked according to scores given by 40 respondents to the survey. The final rankings were presented in the January 2007 issue of the newsletter.

To take this effort to the next level, the Research Needs and Resources Task Group issued a request for volunteers to write research problem statements for the problems that were highly ranked according to the results of the survey mentioned above. Each written statement is to include a short description, research objectives, and a brief write-up of the research tasks. Unfortunately, only few responses were received from volunteers to write the statements. We are hoping to have at least a couple of these statements ready by the time of the TRB annual meeting.

During the SimSub meeting in January 2008, we will ask the SimSub members and friends to help in writing the statements and discuss the best approaches to ensure that these statements are funded.

Simulation Application Summaries Task Group

Submitted by Do Nam, T-Concepts Corp.

This Task Group is responsible for compiling and publishing a comprehensive summary of significant applications of microscopic traffic simulation models. We have finalized a survey form and posted on the SimSub subcommittee website.

One of our goals in 2007 was to collect successful microsimulation application stories as many as possible. A comprehensive survey form had been distributed through TRB technical committees as well as outside organizations such as ITE. However, as of December 2007, there were only 9 responses: 6 from USA and 3 from Europe. Our group is currently working on alternative strategies and those will be shared at the annual meeting.

Liaison and Outreach Task Group

After a period of inactivity, this task group will be reconstituted. George List has agreed to serve as its chair. We appreciate George's willingness to lead this important activity. Please be prepared to give George your ideas for resurrecting our liaison and outreach efforts at the meeting. One topic that will be discussed is the expansion of TRB Committee sponsorship.

Newsletter Task Group

Submitted by Ken Courage, kcourage@ufl.edu

This task group will post a newsletter to its web site in advance of each meeting to inform members and others of items of interest to the simulation community. This issue of the newsletter constitutes the task group report.

We welcome your comments on this issue and ideas for future issues, either at the meeting or by email.

Awards Task Group

Submitte by Tom Rioux, rioux@mail.utexas.edu

A Life-Time/Pioneer Achievement Award has been created by the Awards Task Group. The following guidelines will be used:

(1) Significant traffic simulation contribution 20 or more years ago
(2) Continued traffic simulation contributions,
(3) Can be nominated by anyone,
(4) Nomination letter and short resume are needed,
(5) Must be re-nominated to be considered again
(6) Do not have to give an award each year.

The award will be presented at the TRB Annual Meeting.   Edward Lieberman was presented with the first award in January of 2007.

Simulation-Related Activities of the Sponsor Committees

Highway Capacity & Quality of Service Committee AHB40

The Committee will meet in the Marriott Lincoln 2 Room Monday, 8:00-Noon.

The Simulation Applications Subcommittee will meet in Marriott Park Tower Suite 8216 Sunday, 10:30 AM–Noon. The subcommittee objective is "To develop HCM guidance on the application of traffic simulation tools."

HCQS Committee Resolutions Governing The Guidance On The Use Of Alternative Traffic Analysis Tools For Highway Capacity Analyses

The HCQS Committee adopted the following resolutions at its mid-year meeting:

1. The Highway Capacity Manual should include guidance to developers of traffic simulation models and other traffic analysis tools to promote consistent and accurate reporting of measures of effectiveness for highway capacity analysis. This guidance should include a set of minimum criteria that all traffic analysis tools would be encouraged to achieve.

2. To promote consistency among traffic simulation models and other traffic analysis tools, the Highway Capacity Manual should include a recommended list of common measures of

Highway Capacity and Quality of Service Traffic Simulation Applications Subcommittee
Sunday 10:30 AM to Noon
Marriott, Park Tower, Room 8216

Introductions, membership/roster circulation

Review meeting objectives and finalize agenda

Discussion Items

1. Review of 2007 Midyear Meeting Discussions (Charlotte)
2. Approved Motions on MOEs (approved by HCQS Committee)
3. FHWA Activities (Zammit)
4. NCHRP 3-85 Activities (Courage)
5. Coordination with SimSub
6. Feedback from NCHRP 3-92 Workshops
7. Brainstorming Activity: "What should be our focus areas?   What are our overlaps/coordination opportunities with other groups?   How can we guide the full committee?"
8. 2008 Mid-Year Activity Planning

Other TRB 2008 Simulation Activities of Interest

1. Traffic Simulation Workshop (Session 160) concurrent with other HCQS activities) – Sunday 1:30 to 5 PM (Palladian Room, Omni-Shoreham). "Simulation Modeling and Analysis for Traffic Evacuation"
2. Joint Subcommittee on Traffic Simulation (AHB 45(1)) – Marriott Wilson B/C, Monday 7:30 – 9:30 PM

Input for Full Committee Meeting

effectiveness (MOE's). These MOE's should be based on vehicle trajectories. The HCM should recommend that all traffic analysis tools include the functionality to provide those measures of effectiveness as outputs. For the purpose of this motion, vehicle trajectories shall be defined as documented in the report, Definition, Interpretation, and Calculation of Traffic Analysis Tools Measures of Effectiveness prepared by the Federal Highway Administration dated January 2007.

3. The Highway Capacity Manual should discourage the use of HCM level of service threshold tables based on measures of effectiveness reported by other traffic analysis tools that are inconsistent with HCM definitions.

4. The Highway Capacity Manual should include guidance that the measures of effectiveness produced by traffic simulation models and other traffic analysis tools are considered to be incomplete, unless they also include clear documentation of the assumptions used to handle and report vehicle queues.

5. The Highway Capacity Manual should include a discussion of the randomness inherent in the results of stochastic traffic simulation models and recommendations for dealing with this aspect of traffic simulation.

Freeway Operations Committee AHB20

The Committee will meet in the Marriott Washington B1 Room Tuesday, 8:00 AM-Noon and 7:30-930 PM .

The Simulation Subcommittee will meet in the Marriott Taylor Room on Sunday,6-7 PM.

Freeway Operations Committee
Simulation Subcommittee
Sunday, 6:00 to 7:00 PM
Marriott Taylor

Brief introductions

5-minute briefings
(1) Rural Freeway Work Zone Simulation Software Evaluations, Li Zhang
(2) Integrating Planning and Microsimulation for HOV Forecasting on Toronto Highways Rob Pringle,
(3) DSP Modeling of Day-to-Day Departure Time and Route Adjustment Processes under Variable Value Pricing,Yi-Chang Chiu
(4) Using VISSIM to Analyze the Effect of Lane Balance, Michael Trueblood,
(5) A Traffic Simulation Framework for the Greater Toronto Area Freeway Network: Concept and Challenges,Yiannis Stogios, and Goran Nicolic
(6) Simulation Approach for Analyzing Managed Lanes Operations on SR 52 in San Diego, John El Khoury and Loren Bloomberg

Compendium of software titles and features:

Group report of progress

Discussion of theme for session in TRB 2009 meeting

Compendium of software titles.

A working group has been established within the Freeway Simulation Subcommittee to develop a concise compendium of software titles and features likely limited to a couple of pages per simulator. More interested parties may join the work group of Srinivas Yanamanamanda , Li Zhang , Lin Zhang and Panos Prevedouros to assist in this endeavor.

TRB Traffic Signal Systems Committee
Simulation Subcommittee Meeting
Monday 11AM – Noon
Marriott – Park Tower Suite 8228

TRB website for the subcommittee meeting:
http://www.trb.org/am/ip/assembly_detail.asp?id=11689&e=187

Introduction

Short Presentations – about 10 minute each
1. ATACid – CID/TS2 Tester for VISSIM, Dynasim, and CORSIM, Shawn Birst
2. Simulation Guidance, Barbara Arens and Reid Jonathan
3. Realism in H.I.L modeling, Pete Sykes

Traffic Simulation Modeling Archives

Enhanced Podcast on the VII/CICAS Summer Workshop

Subcommittee Tasks and Volunteers

Traffic Signal Systems Committee AHB25

- The Committee will meet in the Marriott Washington B1, Room, Monday, 1:30 PM to 5:00 PM
- The Simulation Subcommittee will meet on Monday, 11:00 AM to 12:00 Noon in the Marriott Park Tower Suite 8228

Traffic Flow Theory Committee AHB45

- The Committee will meet on Tuesday 1:30 to 5:00 PM in Marriott Wilson B & C
- The Committee: will sponsor Session 646: Advances in Traffic Flow Theory and Applications in Marriott Salon 3, Wednesday, 9:30 AM–12:00 Noon
- The Committee: will sponsor Session 647: Applications of Traffic Simulation Techniques in Marriott Salon 3, Wednesday, 9:30 AM–12:00 Noon

Research News and Results

A seven part summary describing the features and computational attributes of a traffic simulation tool was developed under NCHRP Project 3-85. The entire summary is attached to the end of this newsletter to support discussion on the possibility of forming a new "Simulation Tool Summaries" task group at the SimSub meeting on Monday

Announcements and Calls for Papers

PTV Vision User Group Meeting

PTV America's Annual PTV Vision User Group meeting will be held Thursday and Friday, May 15-16, 2008, at the Hilton Garden Inn in Philadelphia, PA. The PTV Vision user group event features presentations by PTV Vision software users and PTV staff, and includes sessions on new developments and software applications. Over 75 participants attended last year from academia, public agencies, and consultants throughout North America.

Call for papers: send a one-page or less abstract of your related PTV Vision project or research to usersgroup@ptvamerica.com before March 15, 2008. The winning abstract will receive an all expense paid trip and recognition at the meeting. More information at: http://www.ptvamerica.com/usergroup.html

SpringSim'08

The 2008 Spring Simulation Multi conference (SpringSim'08) sponsored by The Society for Modeling and Simulation International (SCS) in cooperation with the Association for Computing Machinery (ACM) Special Interest Group on Simulation (SIGSIM) is scheduled for April 14-17, 2008, in Ottawa, Canada. Original, high-quality technical papers are solicited for review, possible presentation and subsequent publication in the conference proceedings. All accepted papers will also be published in the ACM Digital Library. The Call for Papers is available at http://www.scs.org/springsim .

2nd ISFO.

The Second International Symposium on Freeway and Tollway Operations will take place at the Hyatt Regency Waikiki in Honolulu, Hawaii between June 21 and 24, 2009. In addition to the Freeway Operations Committee (AHB20), the meeting is sponsored by the Committee on Highway Capacity and Quality of Service (AHB40) and the HOV Committee (AHB35). Several sessions for presentations on traffic simulation are planned.

Three types of sessions will be available. Technical sessions in which three to four 15 to 20 minute presentations will be given. Panel sessions in which three to four 10 to 15 minute presentations will be given, followed by discussions among the panelists and the audience. Roundtable sessions in which four or five discussants will respond to questions from a moderator and the audience. Abstracts of 200-400 words for technical presentations, and presentation titles with brief explanations for panel sessions are due on October 30, 2008. Papers and presentations will be included on a CD-ROM.

The 2nd ISFO will also have a student paper competition. The competition requires a paper of up to 5,000 words with exhibits counting for 250 words each, and on a subject relevant to the Symposium. The top three entries win a $2,000 travel award to attend the 2nd ISFO. Contact: Panos Prevedouros, pdp@hawaii.edu

Industry News

VISSIM 5.0

http://www.ptv-vision.com/cgi-bin/traffic/traf_vissim.pl

PTV is pleased to announce the latest release of VISSIM; the North American release will occur in February/March. VISSIM 5.0 provides a new protocol for sharing information within the PTV Vision® Suite of VISUM and VISSIM. The travel demand model, VISUM, can now reflect network changes from VISSIM in addition to communicating demand and path information as with previous versions. This is a big step in connecting a link/connector structure with the simplified node/link. Other important features include a new ring-barrier controller (RBC), enhanced and expanded COM library interface, and improved dialogs and performance.

The new RBC controller, which replaces VISSIM's existing NEMA controller, is a fully functional, industry standard controller (software-in-the-loop). The RBC is loaded with functionality such as railroad/emergency preemption, transit signal priority, multiple rings/barriers, 16 vehicle phases, 16 overlaps, 8 coordination patterns, and several other operations (permissive modes, offset references, max green modes, transitions, etc.). In addition, VISSIM 5.0 and associated VISSIM 3D Modeler now supports Google Sketchup file formats and an improved 3D Studio export. Customers with active maintenance will receive the update automatically

Econolite ASC/3® SIL

PTV America and Econolite have teamed together to provide the first software-in-the-loop (SIL) controller available to Econolite and PTV Vision® clients. This new product is fully integrated into VISSIM, allowing for a seamless transition of the ASC/3® database from the hardware into the VISSIM interface. It also complies with NEMA TS2 and NTCIP requirements.

In the past, users of PTV simulation software were only able to run an ASC/3 controller during traffic simulation by having the simulation software drive an actual hardware controller through a process called HIL (hardware-in-the-loop). The ASC/3 SIL feature allows a VISSIM user to circumvent the issue of configuring a physical ASC/3 controller to run during the simulation. Econolite's advanced technology permits the ASC/3 SIL to simulate multiple virtual controllers under VISSIM without the cost and complexity of physical controllers and controller-interface devices. In addition, the ASC/3 SIL can also run in a mode that is faster than real-time, something not previously feasible with HIL simulation, facilitating simpler and less time consuming simulation runs.

The ASC/3 SIL controller offers additional functionality to the VISSIM user by allowing for a 16-vehicle and -pedestrian phase, 16-vehicle and -pedestrian overlaps, 8 configurable concurrent groups in 4 timing rings, and 4 timing plans. Further, the ASC/3 SIL provides logic processing functionality allowing the user to add up to 99 user-defined logic statements for custom, advanced operations. The latest firmware version also includes transit signal priority.

The ASC/3 SIL is available as an add-on for VISSIM 4.2 or later versions. Contact Kiel Ova at kova@ptvamerica.com

Caliper Corporation

Caliper Corporation announces the 2008 release of TransModeler 2.0. Ongoing research combines the topographical accuracy of 3-dimensional GIS with high resolution microsimulation to facilitate better visualization of traffic dynamics. The new version includes transit signal priority, improved toll and managed lane modeling, and updated behavior models for simulating on-street parking. Advancements in analytic and simulation-based dynamic traffic assignment methodologies have also been made.

McTrans

Build 507 of CORSIM, created in October 2007, can now be downloaded and used within TSIS 6.0.

TSIS Next, a new prototype user-interface for CORSIM, can now be downloaded and used in conjunction with TSIS 6.0. TSIS Next contains the same type of functionality that can be seen in the TShell, TRAFED, and TextEditor component programs.

TSIS Next requires the Microsoft .NET Framework 2.0 to be installed on the computer. If not already installed on your computer, you can access the Microsoft .NET Framework from the Microsoft Windows Update site

Technical Articles

Anyone can submit a technical article for the newsletter. The only requirement is that the content be non commercial and of interest to the traffic simulation community. There is a limit of three pages (in this format) per article. It has been our practice to focus the mid-year issue on a single topic and to keep the January issue open for all topics

Assessing Intersection Safety with Simulation

Submitted by Steve Shelby, Siemens ITS
steve.shelby@siemens.com

Editor's Note: This article was submitted to provide background information for discussion of a possible subcommittee initiative to form a new task group on the use of simulation for safety assessments.

The vehicle dynamics of a simulated traffic facility—an intersection, interchange, or roundabout—can be analyzed in a detailed manner to assess the safety of the intersection. This is the hypothesis behind the recently concluded FHWA project: Surrogate Safety Assessment Model (SSAM) and Validation. This effort was lead by Siemens ITS, building on conceptual work in a preceding project: Surrogate Safety Measures from Traffic Simulation Models. Siemens worked with the corresponding vendors of four simulation—VISSIM, AIMSUN, TEXAS and Paramics—to author an open specification, universal vehicle trajectory file format, which can now be exported by all four simulations. Algorithms to process vehicle trajectories were encoded in a prototype application referred to as SSAM (acronym defined previously). The SSAM software analyzes vehicle-to-vehicle intersections to identify traffic conflicts (i.e., near-miss events), then calculates various surrogate safety measures for these events (time-to-collision and post-encroachment time), and also classifies the event as a crossing conflict, lane-change conflict, or rear-end conflict. Validation studies were conducted to assess SSAM results with regard to the relatively safety of 10 intersection-design pairs (e.g., an intersection with and without an exclusive right-turn bay). In addition, conflict data from 83 simulated intersections were compared to actual crash histories of the same intersection. Preliminary results have revealed some compelling possibilities.

This article is intended only to provide preliminary information. The final report is in the process of final publication editing and should be available soon from FHWA. The SSAM software and user manual will also be available free of charge for all interested parties to download (please contact FHWA Office of Safety RD&T: Joe Bared). In addition, a Technical Brief will be published shortly by FHWA, providing a more detailed executive summary of the capabilities of SSAM.

The Myth of Random Arrivals

Submitted by Ken Courage

There is a common misconception among analysts that deterministic and simulation tools treat random arrivals in a similar manner. This myth is rooted in the principle of operations research that states:

> *"Vehicles generated from a negative exponential headway distribution will produce a Poisson distribution of arrivals."*

Most simulation tools have at least an option to generate vehicular headways with a negative exponential distribution. The incremental term of the HCM delay equation is based on the assumption of an arrival distribution in which the mean equals the variance. This is a distinguishing characteristic of the Poisson distribution. Therefore, the analytical and simulation treatments are assumed to be equivalent and the expectation is that, at least for the very simple situations, simulation results ought to match the HCM results for the same input data.

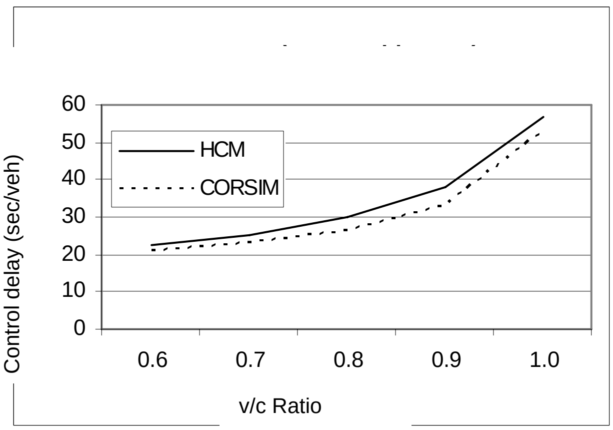

Figure 1: Effect of v/c ratio on delay

In the first SimSub Newsletter (January 2006) I reported on a comparison of the analysis of a very simple signalized intersection, using the HCM and simulation. The intersection involved pretimed control of single lane, one-way approaches. Most of the differences were small and reconcilable. The only exception was the fact that simulation (CORSIM) produced lower delay estimates than the HCM at higher v/c ratios up to 1.0. After exhausting all other explanations, it was concluded that the discrepancy had to be due to differences in the way that the two modeling methods dealt with random arrivals in the traffic stream. A typical plot of delay *vs.* v/c ratio is shown in Figure 1. This phenomenon bears further investigation.

NCHRP Project 3-85 is developing guidance for the use of alternative traffic analysis tools for highway capacity analyses. Explanation of the treatment of basic traffic phenomena among various traffic analysis tools is an important part of this guidance. The effect of random arrivals has been investigated further as a part of that project.

Effect of the Cycle Length on Random Arrivals

Random arrivals increase HCM estimates of delay because more vehicles arrive on some cycles than others. The fact that they arrive with different spacing is of more or less negligible concern. Therefore, as the cycle length increases, negative exponential headway arrivals should produce less variability in the number of arrivals per cycle, which is the basis of the analytical delay estimation process. In other words, if all of the cycles have

Cycle	Green Times	
	EB & WB	NB
30	15	5
60	30	20
90	45	35
120	60	50
150	75	65
180	90	80

Yellow times = 5 sec
All red times = 1 sec
Link length = 2000 ft.
Speed = 30 mph
Sat flow rate = 1800 vphgpl
g/C ratio = 0.50
Capacity = 900 vph,
Volume= 855 vph
v/c Ratio = 0.95

Figure 2: Input data summary

roughly the same number of arrivals then fact that the arrivals are randomly spaced throughout the cycle is of no concern. Let's test out this hypothesis with another example.

Intersection Configuration for Cycle Variation

The objective of this next experiment is to compare the HCM and CORSIM control delay estimates using a carefully designed example in which all parameters except the cycle length are held constant. The basic intersection for this investigation still has two one-way streets carrying through traffic only. The analysis covers a 15 minute period. For simulation purposes, each link is considered to be 2000 ft in length.

The green times will be varied over the range of cycle lengths to produce a constant g/C ratio of 0.50. Traffic volumes will be held constant to produce a 95% v/c ratio. Thus, the only parameter affecting the computations will be the cycle length. Within each cycle length, the timing will be varied to maintain constant v/c and g/C ratios. A summary of all of the data is given in Figure 2. The values were chosen to give convenient "round numbers" for the computations. The saturation flow rate is considered to be the measured rate to avoid the complications involved with the HCM adjustments.

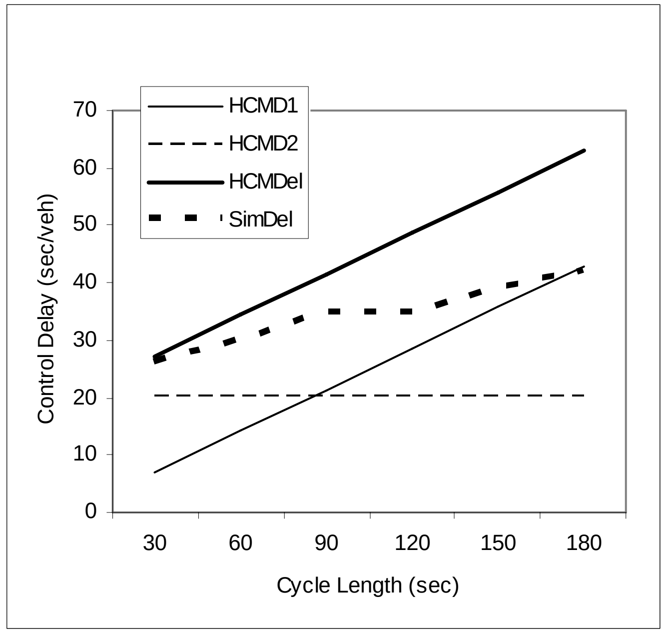

Figure 3: Effect of cycle length on delay components

Results

The results are presented in Figure 3, which shows the various components of delay for the HCM and simulation as a function of the cycle length. The delay components are affected by the cycle length as follows:

- The HCM uniform delay (HCMD1) shows a linear increase with the cycle length, as expected from the uniform delay equation.
- The HCM incremental delay (HCMD2) is constant with respect to cycle length because the v/c ratio and all other determinants of incremental delay are held constant by the nature of the input data. Cycle length is not an explicit input to the incremental delay equation.
- The total HCM delay (HCMDel) is the sum of the uniform and incremental delay components and is therefore linear.
- The simulated delay (SimDel) shows close agreement with the HCM total delay (uniform + incremental) for short cycles and progresses towards the uniform delay value at longer cycles.

The last item above represents a very interesting finding and one that is not generally understood by many analysts. It demonstrates clearly that the HCM takes an entirely different view of random arrivals than simulation. It also confirms the hypotheses that the effect of randomly generated traffic in simulation diminishes as the cycle length increases, eventually becoming negligible.

So who is right and who is wrong?

The analyst is wrong unless the effect of random arrivals is clearly understood. The important point is that random headways between generated vehicles do not create a significant variance in the number of arrivals per cycle on long cycles. If there are no other forces at work to create some variability in arrivals from cycle to cycle, then the simulation results are probably more credible. If, on the other hand, there is empirical evidence of variability in the number of arrivals per cycle, then the simulation is missing something and the HCM procedure probably provides a better answer.

Inter-cycle demand variability is a site-specific phenomenon that that can only be established by field data. Reconciling the differences between HCM and simulation estimates is therefore very difficult. The ability to handle random inter-cycle variability is not built into most simulation tools. On the other hand, if demand can be assumed constant over an analysis period it might be possible to develop a correction factor based on cycle length to reconcile the delay estimates produced by the two modeling concepts.

Traffic Analysis Tool Summary Description

The following pages describe the features and computational attributes of a simulation based traffic analysis tool developed by NCHRP Project 3-85. This material is provided to support discussion on the possible formation of a new task group.

PART 1: SUMMARY OF OUTPUTS

Measure P = Provided by Program U = User can derive from other outputs 1, 2, 3 etc: Refer to Part 6 explanatory note Blank if not applicable	**Surface Arterials and Networks** Movement Level	**Surface Arterials and Networks** Link or Approach Level	**Surface Arterials and Networks** System Level	**Freeways** Lane Level	**Freeways** Link Level	**Freeways** System Level
Throughput (vehicles per period)						
Vehicle miles traveled (VMT)						
Travel time						
Average speed						
Running speed for moving vehicles						
Total Delay						
Queue delay						
Stopped delay						
Control delay						
Level of service						
Number or percent of stops						
Capacity, v/c ratio						
Phase failures						
Denied entry						
Average density						
Density for moving vehicles						
Max queue						
Average queue						
Percentile queue						
Queue related to storage						

Microscopic Outputs by Time Increment

( ) Vehicle trajectory in time and space
( ) Signal status over time

____

____

____

____

____

Mesoscopic Outputs Averaged Temporally and/or Spatially

( ) Flow profiles
( ) Speed and/or density profiles
( ) Speed and/or density contours
( ) Time-space diagrams
( ) Platoon Progression Diagrams

____

____

____

Performance Measure Output Formats		
( ) Text file	**( )** Comma-delimited	**( )** XML
( ) Direct to Printer	**( )** Direct to spreadsheet	**( )** Bitmapped Graphics
( ) Compressed for postprocessing	**( )** Direct to database	**( )**

Part 2: MODEL STRUCTURE AND FEATURES

Modeling Level
( ) Microscopic
( ) Mesoscopic
( ) Macroscopic
( ) Hybrid
Scan Resolution (time slice) ________________

Travel Modes Modeled Explicitly
( ) Vehicles: # of classes ______________________
( ) Buses
( ) Carpools
( ) Light rail
( ) Pedestrians
( ) Bicycles
( ) HOV Lanes
( ) HOV Priority entry

____

Roundabout Modeling Characteristics
( ) Link-node based
( ) Intersection based
Max entry lanes ____ Max Circulatory Lanes ___

( ) Priority reversal?

Special features for roundabout modeling

____

____

____

Turning Movement Specification at Nodes
( ) Absolute volume
( ) Proportion of approach volume
( ) Determined from OD analysis

____

Aggregation of Measures over the Analysis Interval
( ) Based on entering vehicles
( ) Based on exiting vehicles
( ) Based on full trips (enter and exit)

____

Travel Time for Denied Entry Vehicles is:
( ) Added to the subject link
( ) Added to the upstream link
( ) Ignored

Ramp Metering Features

( ) Pretimed
( ) Responsive to demand and capacity

____

____

Traffic Control Features
( ) Pretimed
( ) Traffic-actuated

# of phases_________

# of rings ___________

( ) Coordination
( ) Preemption
( ) Hardware in the loop extensions available

PART 3: MODELING METHODOLOGY AND PARAMETERS

Stop, Delay and Queue Computation Parameters

Link delay reference speed _______________________

Control delay reference speed _____________________

Threshold speed for queue entry___________________

Threshold speed for queue exit____________________

Threshold speed for beginning of stop_______________

Threshold speed for end of stop____________________

Threshold spacing for queued state_________________

Threshold acceleration for queued state ______________

Minimum no. of vehicles for queued state_____________

Assumed vehicle length in queue___________________

Queue Truncated to link length

( ) Yes

( ) No, it continues to upstream link

Special features for stop, delay and queue computations

____

____

____

Generic Description of Driver Behavior Modeling

Car following ___________________________________

____

____

____

Lane changing __________________________________

____

____

____

Permitted Left Turn Modeling
Model name or category: Gap acceptance with critical gap

based on driver type

( ) Static critical gap
( ) Dynamic critical gap
( ) Max waiting time override?
Parameters affecting critical gap

____

Stop Control Modeling
Model name or category Gap acceptance with critical gap

based on driver type

( ) Static critical gap
( ) Dynamic critical gap
( ) Extended critical gap for divided roadways
( ) Dual stage critical gap for divided roadways
( ) Max waiting time override?
Parameters affecting critical gap

____

Merge Area Modeling
Model name or category ___________________________

____

( ) Static critical gap
( ) Dynamic critical gap
( ) Cooperative merging features?
( ) Max waiting time override?
Parameters affecting critical gap

____

Distribution(s) for Generating Vehicles
( ) Uniform
( ) Negative exponential
( ) Normal
( ) Minimum generation Headway?

____

____

Support for Multiple Runs with Different Random Seeds

( ) Script or batch mode to execute multiple runs
( ) Capability to produce measures representing the average of all runs

____

Treatment of vehicles unable to attain the correct lane or position for their intended maneuver

____

____

____

____

Green Time Utilization Modeling
Startup:
( ) Startup lost time applied to first vehicle only
( ) Startup lost time distributed over n vehicles
( ) Includes jumpers for permitted left turns?

Ending:
( ) Extends effective green by a specified amount
( ) Applies a probability of stopping model
( ) Includes fixed # of sneakers for permitted left turns
( ) Applies a more complex sneaker model.

Special modeling features for green time utilization

____

____

____

Dynamic Traffic Assignment (DTA)
( ) DTA Available
DTA Algorithms Applied ___________________________

____

____

____

____

____

( ) Warming-up Period
( ) Feedback Period
( ) Multiple User Class Assignment
( ) Turn Penalty

____

____

____

PART 4: TREATMENT OF PARAMETERS AFFECTING SURFACE STREET MODELING		
Parameter	**Treatment**	**Process**
Facility Class		
PHF		
Grade		
Lane width		
Street width		
Parking		
Bus stops		
Fleet composition		
Pedestrian volume		
Pedestrian walking speed		
Bike Volume		
"Jumpers"		
"Sneakers"		
Free flow speed		
Desired speed		
Initial queue		
Arrival type		
Signal offset		
Critical gap		
Follow up time		
Median Properties		
Approach flare		

Parameter Treatment Categories:

- *Explicit:* The parameter is entered and used in the modeling process
- *Embedded:* A constant value is embedded in the process
- *Derived:* The parameter is derived from other parameters
- *Calibration*: The parameter is not used explicitly but it may be represented implicitly by calibration of other parameters
- *List*: List of parameters recognized by the associated algorithm
- *N/A*: The parameter is not recognized

PART 5: TREATMENT OF PARAMETERS AFFECTING FREEWAY AND RAMP MODELING		
Parameter	**Treatment**	**Process**
Terrain		
Lane width		
Lateral clearance		
Weaving segment type		
Friction Coefficient		
Presence of upstream and downstream ramps		
Fleet composition		
Free flow speed		
Desired speed		
Incident parameters		
Car Following Parameters		
Lane Changing Parameters		
DTA Link Cost Parameters		

Parameter Treatment Categories:

- *Explicit:* The parameter is entered and used in the modeling process
- *Embedded:* A constant value is embedded in the process
- *Derived:* The parameter is derived from other parameters
- *Calibration*: The parameter is not used explicitly but it may be represented implicitly by calibration of other parameters
- *List*: List of parameters recognized by the associated algorithm
- *N/A*: The parameter is not recognized

PART 6: EXPLANATORY NOTES

If any information that you wanted to provide in Parts 1-5 would not fit in the available space, please enter a number in that space and place an explanatory note with the corresponding number here.

PART 7: DEVELOPER'S DESCRIPTION

This page is available for your own descriptive and promotional material. It will be a part of the summary that is posted on the web site. You may include any material you wish. Please observe the one page limit.