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 2006:
Contents

Chairman's Message

A happy and prosperous new year to all! Our first year of operation has been very productive. This newsletter reflects a great deal of interest and effort by the task groups that were appointed at the September meeting in Sedona. I thank you all for your dedication and hard work.

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. These folks have shown some real initiative and have laid a lot on the table for our consideration. A good part of the meeting agenda will be devoted to a discussion of their products.

Those of you who will be unable to attend the TRB meeting should also review the task group reports. Your email comments will be welcomed by all of the task group chairs as they refine their plans and products.

Our intent is to appoint a new editor for each issue of the newsletter. So, one topic of burning interest to me is the selection of an editor for the next issue. I would appreciate any volunteers for this task group. I hope to be able to announce the next editor at the Monday meeting. Otherwise, if you see me walking toward you, you might want to duck behind a pillar.

Thanks again for all of your help.

Task Group Reports

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

Annual Workshop Task Group

Submitted by John Halkias

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, January 22 from 1:30 to 5:00 PM in the Shoreham Empire Room, as Session 161 of the 2006 TRB Meeting. The theme will be "*Progress and Status of the Next Generation Simulation (NGSIM) Program.*" The workshop agenda is presented in the box below.

The task group has requested an agenda item at the annual meeting to discuss the nature and content of future workshops. All ideas for future topics will be welcome.

Simulation Workshop Agenda
"Progress and Status of the Next Generation Simulation (NGSIM) Program"

Sunday 1:30 -5:00 PM: Shoreham Empire Room
Session 161 of the 2006 TRB Meeting.

Overview: (Halkias/Colyar/Alexiadis – 15 min)

Data collection and Analysis:
- Cross-cutting look at vehicle trajectory data from different sites (Alexiadis – 20 min)
- Vehicle trajectory processing software - NG-VIDEO demonstration (20 min)
- Using NGSIM data to compare HCM with other capacity/speed measures (Ni/ Leonard - 20 min)

Algorithms:
- Results from the commercial validation of the first NGSIM algorithm – Freeway lane selection
  - AIMSUN (15 Min)
  - PARAMICS (15 Min)
  - VISSIM (15 Min)
- A new algorithm for cooperative/forced freeway merging (Toledo – 20 min)
- Research plan for a new NGSIM algorithm for Oversaturated freeway flow (Skabardonis – 20 min)

Next Steps in the NGSIM Program: (Halkias – 20 min)

Research Needs and Resources Task Group

Submitted by Mohammed Hadi

A draft mission statement and an action plan were developed for the Research Needs and Resources Task Group. The mission of the group is "to provide support to research in the area of surface transportation system simulation and to facilitate the use of the results from this research to advance the state-of-the-art and state-of-the-practice in transportation system simulation modeling." Specific objectives of the group activities are:

- Development of research problem statements for potential funding
- Collection and distribution of data to support traffic simulation research and development activities
- Facilitating the dissemination and sharing of research information

During the TRB 2006 annual meeting, the task group will meet to discuss and finalize the draft group mission and action plan. The meeting will identify the Research Needs and Resource Task Group initial undertakings and strategy for implementation of its mission statement. The group members will be assigned to specific tasks to accomplish the group objectives. Processes will be finalized to develop problem statements and submit the statements to potential funding agencies.

The group has collected existing research needs and problem statements from existing TRB committees, NCHRP sources, simulation meetings/workshops, and other sources. The following are activities that were performed to support this task:

- Contact the chairs of different TRB committees and/or simulation subcommittees to seek developed problem statements and/or identified list of research needs
- Review current and planned NCHRP projects, requests for proposals, and unfunded submitted statements
- Review the research needs identified in the last three traffic modeling workshops (Sedona, Sitges, Tucson).
- Review the research needs identified as part of the NGSIM program.

An initial list of research needs will be presented to the SimSub Committee at the 2006 TRB annual meeting. After the TRB meeting, the identified research needs will be consolidated and a short description will be developed for each. Then, the needs will be ranked to determine priority through a voting process of the SimSub members and the members of sponsoring committees.

Simulation Application Summaries Task Group

Submitted by Do Nam

The objective of this task group will be to compile and publish a comprehensive summary of significant applications of microscopic traffic simulation models to address real world problems.

TRB 2006 SimSub Meeting Agenda

Monday 7:30-9:30 PM: Marriott Maryland "A" Room

Introductions

Sponsor Committee Chair Remarks

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

Discussion of minutes from the mid year meeting in Sedona

Discussion of task group reports presented in the newsletter

- Annual Workshop (Brief synopsis and discussion of future topics)
- Newsletter (Critique and suggestions)
- Research Needs and Resources (Discussion of action plan and
- Simulation Application Summaries (Discussion of draft survey)
- Liaison and Outreach(Discussion on expansion of SimSub sponsorship

Review of the subcommittee purpose, scope and membership

New business

- Preferred time for future annual meetings
- Member directory
- New initiatives
- Mid-year meeting for 2006?

Adjourn

Progress report

Since our inception in September 2005, we have researched available technologies for collecting and publishing the simulation project summaries and have selected "PDF to XML" as the best technology for our purpose. The "PDF to XML" technology allows survey respondents to fill out and submit the survey using Acrobat Reader 7.0. The Acrobat Reader 7.0 is freely available at http://www.acrobat.com. Using the "PDF to XML" technology, we have developed a preliminary survey form available at the subcommittee website. We appreciate any comments on this survey form and plan to finalize it by March 2006. Our task group has total of 9 members.

Action Plan

Develop a preliminary survey form	2006 TRB
Finalize the survey form	2006 1Q
Begin survey	2006 2Q
Prepare survey report	2007 TRB

Liaison and Outreach Task Group

Submitted by Alex Skabardonis

This task group will monitor activities of other groups in the simulation community and will report to the subcommittee on the results of their efforts. Here are the liaison reports for this issue:

Highway Capacity & Quality of Service Committee (HCQS)—Simulation Subcommittee:

- The subcommittee is sponsoring a conference session titled "Relating the Highway Capacity Manual (HCM) to Traffic Simulation and Other Analytical Models", on Wednesday at 8 AM (Marriott Salon 2). The session focuses on comparisons of the HCM and simulation.
- The subcommittee will be looking to provide any needed support to the upcoming NCHRP 3-85 research project "Guidelines on the Use of Traffic Simulation and Other Models in Highway Capacity Analyses."
- The subcommittee has an ongoing activity to work with the other HCQS subcommittees to find opportunities to add references and discussions of simulation to the various chapters in the manual.

Freeway Operations Committee —Simulation Subcommittee:

A draft report on traffic analysis tools has been prepared for inclusion in a TRB Research Circular to be developed by the committee. The report describes the state-of-the-art and practice in simulation, identifies trends and gaps and includes a list of problem statements. The report and research problem statements will be discussed at the subcommittee meeting on Sunday 1/22/2006, 6:00 to 7:00 PM, Marriott Park Tower Suite 8226

Signal Systems Committee —Simulation Subcommittee:

Subcommittee meeting on Monday 1/23/2006, 11:00 AM to 12:00 PM, Marriott, Kennedy.

New Outreach Initiatives

SimSub has established by resolution that other TRB committees will be accepted as Sponsor Committees subject to two requirements:

1. A resolution of their full committee expressing the desire to become a sponsor of the Joint Simulation Subcommittee
2. Agreement of the Chairs of all of the existing sponsoring committees to accept the additional sponsorship

The Liaison and Outreach Task Force is now considering the question of whether and how we should be proactively soliciting additional TRB committee sponsorship. The task force has identified a few committees that could offer productive sponsorship and would welcome suggestions along this line. The task group has requested an agenda item for the SimSub meeting to discuss this issue.

Announcements and Calls for Papers

The task group has compiled some information on announcements of meetings and calls for papers that are presented in a separate section of this newsletter.

Newsletter Task Group

Submitted by Ken Courage

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.

This issue was produced as a prototype for things to come. There are several ways in which it can be improved and I am hoping for some constructive thoughts at our meeting. We need to formulate an editorial policy that addresses paper reviews, relationship with the private sector and other questions. We also need a larger task group and, as I mentioned in the Chairman's message, an editor for the next issue.

I welcome your comments on this issue, either at the meeting or by email.

Research News and Results

This section contains updates and results for research projects that involve simulation. Anyone may submit an item that describes a project in progress, one that has been recently completed or one that is about to start. Items for this section should be brief summaries. If you have more to say about a project, you might want to consider submitting an application note or a technical article. Application notes generally will describe innovative uses of simulation. Technical articles should describe research findings, simulation success stories, etc.

FHWA Update

FHWA is one of the major sponsors of research involving traffic analysis tools in general and simulation in particular. Here is list of some of their projects. We hope to have more in the next issue.

Traffic Analysis Tools Measures of Effectiveness

Submitted by Richard Dowling

Use of HCM and traffic simulation tools has become the standard approach for evaluating transportation design alternatives, operational performance, and ITS and traffic operations strategies. However, the HCM procedures and traffic simulation tools seldom result in identical performance measurements. Moreover, there are no guidelines on interpreting these performance measurements. This leaves decision makers and transportation professionals with the dilemma of identifying the true performance of the design alternatives and strategies.

The objectives of this work are to:

- Gain an understanding of the current use and interpretation, by transportation professionals, of some of the most commonly used measures of effectiveness (MOEs) generated by traffic simulation and analytical tools, such as HCM procedures
- Identify how field measurements are processed to estimate the MOEs used in conducting traffic analysis studies

- Provide guidance on how these MOEs are defined and calculated in the tools
- Develop an innovative approach to interpret these MOEs when conducting traffic analysis studies, and
- Demonstrate the validity of the approach through a case study of representative tools.

This work is being performed for FHWA by Dowling Associates, Inc. and is expected to be completed in Fall 2006.

NGSIM Update

The objective of the Next Generation Simulation (NGSIM) program is to develop a core of open behavioral algorithms in support of traffic simulation with a primary focus on microscopic modeling, including supporting documentation and state-of-the-art data sets that describe the interactions of multi-modal travelers, vehicles and highway systems, and interactions presented to them from traffic control devices, congestion and other features of the environment. These products are openly distributed and made freely available to the broad transportation community.

Data Sets

NGSIM collected three freeway data sets consisting of detailed vehicle trajectory data, wide-area detector data and supporting data needed for behavioral algorithm research. Vehicle trajectory data were collected from I-80 in Emeryville, CA at two different time frames 17 months apart, and at US 101 and Lankershim Blvd in Los Angeles, CA. Eight synchronized video cameras were used to record vehicle positions every 1/30th of a second.

The datasets also contain detailed CAD drawings of the freeway sections, GIS files of the detector data network, and ortho-rectified aerial photographs. The data are available for free at the NGSIM website or by request on DVD. The NGSIM team is currently processing an arterial data set for Lankershim Boulevard near the Universal City studios in Los Angeles, CA.

New Algorithms

NGSIM developed a freeway lane selection algorithm, consisting of a generalized lane changing model that explicitly incorporates target lane choice. The lane-changing process consists of two steps: choice of target lane and gap acceptance decisions. The target lane is the lane the driver perceives as most desirable, considering a wide range of factors and goals.

The algorithm was validated using the NGSIM data sets and currently is being validated in three major commercial simulation software. The algorithm is freely available via the NGSIM website.

Three new core algorithms are currently being developed and validated including: a) Cooperative freeway merge algorithm; b) Oversaturated freeway flow algorithm; and, c) Arterial lane selection algorithm.

Finally, NGSIM is using MITSIMLab to validate some of the algorithms developed under NGSIM. To facilitate verification of the algorithm validation effort MIT (a member of the NGSIM team) has made MITSIMLab available to the simulation community.

NGSIM Web Site

Please visit the NGSIM website at: http://ngsim.fhwa.dot.gov. You may join the NGSIM discussion forum by registering on the site. The following are available for download:

- Algorithm Prioritization Report
- Data Collection Plan Report
- Data Format Plan Report
- Verification and Validation Plan Report
- Three complete freeway data sets at I-80 in Emeryville, CA and at US 101 in Los Angeles, CA
- Freeway Lane Selection Algorithm
- Validation platform

Contact: John Halkias or James Colyar-

NCHRP Update

Several recent and ongoing NCHRP projects, including those that will start this year, involve simulation in one way or another. Specific projects and their simulation applications are summarized here.

Project 3-60: Capacity and Quality of Service of Interchange Ramp Terminals

Objective: Develop improved methods for capacity and quality-of-service analysis of interchange ramp terminals and nearby intersections and recommend a revised Chapter 26 of the Year 2000 Highway Capacity Manual that addresses a full range of interchange types.
Simulation Application: Simulation was applied to supplement field data collection.

Project 3-64: HCM Applications Guidebook

Objective: Develop a Highway Capacity Manual (HCM) Applications Guide that shows how to appropriately apply HCM methodologies to real-world problems and indicate when other methods may be more appropriate.
Simulation Application: One of the case studies illustrated the use of simulation to supplement HCM analysis

Project 3-66: Traffic Signal State Transition Logic Using Enhanced Sensor Information

Objective: Develop traffic signal state transition logic that innovatively employs sensor information. The logic will serve to improve the safety and mobility of vehicles, pedestrians, trains, and light rail transit.
Simulation Application: Simulation was used as a tool to evaluate concepts that could not easily be implemented in the field and to better quantify and evaluate concepts partially implemented in the field.

Project 3-75: Analysis of Freeway Weaving Sections

Objective: Develop improved methods for capacity and level-of-service analysis of freeway weaving sections, including a revised HCM Chapter 24. Assess the compatibility of the methods with those of other HCM freeway chapters.
Simulation Application: Simulation may be applied to supplement field data collection.

Project 3-76A: Highway Traffic Signal Warrants for Intersections near Highway-Rail Grade Crossings

Objective: Develop and recommend a new MUTCD traffic signal warrant for a highway-highway intersection near a highway-rail grade crossing.
Simulation Application: A model, calibrated and validated using video-based data collection, was used in the development of a proposed set of warrants that are now under review. A more detailed description of the process is presented in the *Application Notes* section of this issue.

Project 3-79 Measuring and Predicting the Performance of Automobile Traffic on Urban Streets

Objectives: Development of techniques to measure the performance of automobile traffic on urban streets for real-time applications and development of procedures to predict the performance of automobile traffic on urban streets that will provide a foundation for an update of the HCM.
Simulation Application: Simulation will be used to supplement field data for modeling an arterial street segment with various lengths, signal timings, semi-actuated/pretimed operation, volumes, etc. Field data for 6 segments will be used to calibrate the simulation model. The data generated from simulation will help to increase the range of parameters covered by the analysis procedures to be developed.

Project 3-81: Strategies for Integrated Operation of Freeway and Arterial Corridors

Objective: Develop a manual of recommended strategies for integrating the operation of a freeway and arterial corridor, including their benefits and methods of implementing them.
Simulation Application: The strategies will be evaluated using "appropriate analysis tools." Simulation is a potential tool for this purpose.

Project 3-82: Default Values for Capacity and Quality of Service Analyses

Objectives: Determine appropriate default values for inputs to Highway Capacity Manual analyses and develop a guide to select default values for various applications.
Simulation Application: The results of this project may be useful in setting calibration parameters for simulation models.

Project 3-85: Development of Guidelines for the Use of Simulation and Other Models in Highway Capacity Analyses

Objective: Enhance the guidance in the Highway Capacity Manual for selection and use of simulation and other models.
Simulation Application: Simulation will be used extensively to establish comparisons with HCM results for all facilities.

Project 3-87: Maximizing Freeway Throughput under Threat of Flow Breakdown

Objective: Develop procedures to select ramp-management strategies for a freeway section under the threat of flow breakdown.
Simulation Application: Simulation will be used as an analysis tool for evaluating different strategies.

Results of a Traffic Simulation Survey In Western U.S.A.

Submitted by Erik Ruehr
In the fall of 2003, a survey was conducted of ITE members who are employed by public agencies within ITE District 6 (the 13 western states). The survey was initiated by a task force of the ITE California Border Section, as part of a study of traffic simulation in the San Diego area. The logistics of the survey were handled by ITE headquarters staff, which created a internet-based survey site and sent out an email requesting a response to the survey. The email was sent to 1,235 ITE members and 117 responses were received, representing eleven of the thirteen states in District 6.

A summary of the results of the survey is shown below. It should be noted that some of the models are not considered to be simulation models. They were included to reflect the way that respondents answered the survey. The technical paper for which this survey was prepared is available at http://www.westernite.org/Sections/CalBorder/simulation.pdf

"Which of the following traffic simulation models does your agency accept for traffic studies done in your jurisdiction?"

90 (45%) Sim Traffic	48 (24%) CORSIM
37 (18%) VISSIM	11 (5%) Paramics
4 (2%) Integration	1 (<1%) TEAPAC
1 (<1%) FREQ	3 (1%) TRANSYT-7F
3 (1%) HCS	2 (1%) EMME/2
1 (<1%) HICap	1 (<1%) Traffix

"Which of the following traffic simulation models does your agency own?"

85 (57%) Sim Traffic	29 (20%) CORSIM
12 (8%) VISSIM	7 (5%) Paramics
3 (2%) Integration	1 (<1%) TEAPAC
3 (2%) FREQ	2 (1%) TRANSYT-7F
2 (1%) HCS	1 (<1%) EMME/2
1 (<1%) HICap	1 (<1%) HCM/Cinema
1 (<1%) SIDRA	

Announcements and Call for Papers:

This section contains announcements of meetings and calls for papers on subjects that involve traffic simulation.

Winter Simulation Conference

Submitted by Michael Hunter
The Winter Simulation Conference (WSC) is the premier international forum for disseminating recent advances in the field of system simulation. In addition to a technical program of unsurpassed scope and quality, WSC provides the central meeting place for simulation practitioners, researchers, and vendors working in all disciplines and in the industrial, governmental, military, and academic sectors.

WSC '06 features a comprehensive program ranging from introductory tutorials to state-of-the-art research and practice.

The conference includes student presentations, exhibits, training sessions by software vendors, business meetings for professional societies and software user groups, a general reception, and a spouses program.

Contributions to the technical program are solicited in the following general areas, although papers in all areas of discrete-event and continuous simulation will be considered: Tutorials, Analysis Methodology, Logistics, Transportation, Distribution, Manufacturing, Military Applications, Modeling Methodology, Case Studies, Homeland Security/Emergency Response, Simulation-Based Scheduling, Simulation Education, Virtual Reality and Simulation, Risk Analysis, Construction Engineering, Project Management, and Dynamic, Data Driven Application Simulations. All contributed paper submissions will be peer reviewed.

Accepted papers will be published in the CD-ROM versions of the conference proceedings, which will be copyrighted and widely disseminated. Paper submissions are due April 3, 2006. WSC 06 will be held in picturesque Monterey, California, USA at the beautiful Portola Plaza Hotel on December 3-6, 2006. Submission of a paper implies that an author will attend WSC '06 to present the paper.

Additional information about the WSC, the WSC 2006 call for papers and paper submission instructions, information, and forms and procedures are available on the WSC website, www.wintersim.org <http://www.wintersim.org. WSC '06 is sponsored by ACM/SIGSIM, ASA, IEEE/CS, IEEE/SMCS, IIE, INFORMS Simulation Society, NIST and SCS.

International Symposium of Transport Simulation 2006 (ISTS)

Lausanne, Switzerland, September 4th-6th, 2006

Following the success of the first International Symposium of Transport Simulation in Yokohama, Japan in 2002, Ecole Polytechnique Fédérale de Lausanne (EPFL) and Technical University of Catalonia (UPC), Spain will host the next symposium at Lausanne, Switzerland. This symposium will bring together leading engineers and scientists in the transport simulation field worldwide.

With advances in simulation modeling and applications in this past 5-10 years, many methodological issues arise. The theme of this symposium is *Methodological Issues in Transport Simulation*. This symposium will stress scientific challenges and issues raised by Intelligent Transportation System. The program will include invited presentations, submitted formal paper presentations and discussion sessions. The language of the symposium is English. We also plan to publish a book consisting of high quality papers selected by the reviewers after the symposium.

Topics of Interest for Submission

We invite papers that explore emerging research and development in the specific topic area but not limited to the following:

- Methodological issues in traffic simulation
- Advances in simulation modeling and applications
- Prediction of transport-land use for urban areas using microsimulation
- Data input for microsimulation: time sliced OD matrices

Important Dates

- Deadline for extended abstract submission (min 3 and max 5 pages): 1st March 2006
- Notification of acceptance of abstract: 30th April 2006
- Deadline of final version of accepted papers: 30th June 2006

Web Site: http://ists06.epfl.ch

First International Symposium on Freeway & Tollway Operations

Athens, Greece, June 4-7, 2006

Submitted by Panos Prevedouros

Organized by TRB Freeway Operations Committee (AHB20), the symposium will bring together freeway and tollway operators, practitioners and researchers specializing in freeway, HOV, and tollway operations. In doing so, the objectives of the Symposium are:

- To capture the state of the practice in freeway and tollway operations
- To identify innovative strategies and techniques to improve the proactive management and control of traffic
- To explore the potential benefits of using managed lane, tolling/pricing, and other strategies to improve traffic operations on congested freeways

Three parallel tracks are planned:

- Expressway/Motorway Management
- Tollway and Tolling Operations
- Operations and Control Centers

Submission and Selection of Papers and Presentations

Please submit paper abstracts or presentation notes via E-mail. Three types of sessions will be available in each of the three tracks.

- 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 up to 500 words for technical presentations and presentation titles (for panel sessions) with brief explanations are due by February 17. Subjects of presentations should fit in the themes of the planned sessions. Papers are selected through an abstract-based review process by TRB Committee AHB20. Papers and presentations will be included on a CD-ROM.

Important Dates

- February 17, 2006: Deadline for abstract submission
- March 15, 2006: Notification of abstract acceptance
- March 30, 2006: Deadline for early registration
- May 15, 2006: Deadline for paper or presentation submission with registration
- June 4, 2006: Symposium Proceedings on CD-ROM

Web Site: http://www.citycongress.com/1_ISFO

Fifth International Symposium on Highway Capacity and Quality of Service

Yokohama, Japan, July 25 to 29, 2006.

The 5th International Symposium on Highway Capacity and Quality of Service (5th ISHC) will be held at the Conference Center of Pacifico Yokohama, Japan from July 25 to 29, 2006. The symposium is sponsored by the Transportation Research Board (TRB), with the Mid-Year Meeting of Committee AHB40 being a major focus of the Symposium. The previous international symposia were held in Karlsruhe(1991), Sydney(1994), Copenhagen(1998) and Maui(2000).

This symposium will provide a significant opportunity for researchers, engineers, planners and other practitioners in the field of transportation to discuss current developments in highway and transportation capacity and quality of service. Technical papers accepted for presentation will be discussed by international experts. Proceedings of the symposium will be made available to all delegates. The official language for the symposium is English.

During the International Symposium, the TRB Committee on Highway Capacity and Quality of Service will meet to review recent research initiatives and activities. Discussion on recent progress in research for updating the Highway Capacity Manual will be one of the major topics of the Symposium.

Note: The paper submission and selection for this symposium has closed.

Web Site: http://www.itr.genv.nagoya-u.ac.jp

Industry News

This section contains newsworthy items that should be of interest to the simulation community. Anyone may submit such items. Please watch the SimSub web site for deadlines for the next issue. Since this is an official TRB activity, we have to avoid commercial messages but announcements of new products and versions would be appropriate, as well as company news on new personnel, representatives, etc. Please send text only, no logos, graphics or sales pitches. All items submitted will be subject to acceptance and modification by the newsletter editor.

TEXAS Model Available for Download

Submitted by Tom Rioux

The TEXAS Model for Intersection Traffic version 5.00 has been released and is available for free download from ftp://ftp.ce.utexas.edu/texas_model. Version 5.00 contains many enhancements and is available in source and executable form for Linux Intel and Windows Intel platforms. The source code is released under the GNU General Public License. Documentation for the TEXAS Model can be downloaded from ftp://ftp.ce.utexas.edu/texas_model_documentation.The University of Texas at Austin Center for Transportation Research Report Number DTFH61-03-C-00138 entitled "Enhancement of the TEXAS Model for Simulating Intersection Collisions, Driver Interaction with Messaging, and ITS Sensors - Final Report" by Thomas W. Rioux will be available at the documentation site when approved by FHWA.

TransModeler

Submitted by Howard Slavin

Caliper Corporation is pleased to announce the release of TransModeler, a new traffic simulation package with many innovative features. TransModeler is a high performance microscopic simulator that incorporates a powerful GIS for traffic and advanced driver behavior models. TransModeler dynamically assigns trips using historical or simulated travel times. Trips can be preplanned and also respond to unexpected traffic congestion. TransModeler also includes macroscopic and mesoscopic simulators and can perform hybrid simulation using different simulation methods for different parts of an area-wide network. TransModeler is easy to use and reduces the effort and cost of developing traffic simulation models. Data from CORSIM, Synchro, and TransCAD can be readily imported.

Contact: http://www.caliper.com/transmodeler/default.htm.

Dynameq

Submitted by Michael Mahut

Dynameq <http://www.inro.ca/dynameq> is a simulation package for equilibrium dynamic traffic assignment (DTA), specifically designed for the rigors of large, congested networks. Dynameq is revolutionary among DTA products because it is the first tool to combine microsimulation detail with the reliability of an equilibrium assignment. Dynameq users are engaged in projects in the USA, Canada, Europe, and Australia on networks ranging in size from 17 to 68 square miles and 829 to 2850 links. The completed projects have achieved exceptional calibration results with lean data requirements and modest labor. A recent example is a corridor study <http://www.inro.ca/en/pres_pap/international/ieug05/Dynameq-Notre-Dame.pdf> conducted by the City of Montréal and Transports Québec, which was coded and calibrated successfully in just 8 person-months. A trial version of the software is available at www.inro.ca/dynameq. Contact Michael Mahut

AIMSUN NG (v5.0)

Submitted by Ed Lieberman

AIMSUN NG (v5.0) is a new release of a robust tool where the user can specify traffic demand using entry volumes and turning movements, or origin-destination demand. It offers a variety of analysis tools in the form of statistics and time-series plots of system variables in real time. AIMSUN also provides the ability for the user to interact with the simulation model in real time. One of its strong points is that the user can customize the model to address project requirements.

AIMSUN is a Multiplatform application programmed for Windows, Mac and UNIX – based hardware. It is developed and maintained by Transport Simulation Systems (TSS), distributed and supported in the US by KLD Associates, Inc, (KLD). AIMSUN is well documented and has very good technical support. In addition to the help desks through TSS & KLD, there is a very active user group that provides support.

Some of the key features of new release include data integration, enhanced user friendly GUI, AIMSUN NG server, AIMSUN NG SDK, a next generation API and as set of transportation planning tools. For more information, contact: http://www.kldassociates.com/aimsun.html

Significant Simulation Events at TRB 2006
(M=Marriott, S=Shoreham)

SimSub Meeting, M Maryland A, Monday, 7:30 PM–9:30 PM

Simulation Workshop (Session 161) S Empire Sunday, 1:30 PM–5:00 PM

Sponsor Committee Simulation Subcommittee Meetings

- AHB20 M Park Tower 8226 Sun, 6:00 7:00 PM
- AHB25 M Kennedy Mon 11:00 Noon
- AHB40 M Salon 2 Sun 10:30AM-Noon

TRB Sessions

- 461: Traffic Flow Theory, Traffic Simulation, and Hybrid Models, M Cotillion North Tues, 10:15 AM-Noon
- 608: Relating HCM to Traffic Simulation and Other Analytical Models M Salon 2, Wed, 8:00–9:45 AM
- 640: Traffic Simulation Models: New Developments and Applications (Poster Session) M Washington Wed, 9:30 AM–Noon

Application Notes

This section contains brief descriptions of simulation applications that are more detailed than the research summaries, but do not constitute a full technical article.

Use of Simulation in Developing Signal Warrants

Submitted by Ed Lieberman

KLD Associates' microscopic simulation model – WATSim (**W**ide **A**rea **T**raffic **Sim**ulation) – was recently used in a research effort for the National Cooperative Highway Research Program (NCHRP Project 3-76A). The aim of the research project was to develop a set of traffic signal warrants to be applied at intersections located within 200 feet of an at-grade railroad-highway crossing.

The simulation model was applied to a representative four-legged intersection with one approach ("minor" street) crossed by railroad tracks. Traffic volumes, turn movements and traffic compositions along this minor street and along the cross street ("main" street) were varied over the range of conditions that would not trigger the existing traffic signal warrants. Traffic along this minor street, responding to the control at the intersection, forms queues that could extend over the railroad crossing. This control, in turn, consisted of "no control", YIELD, STOP, semi-actuated signal, and train-preempted signal. The model was calibrated and validated using video-based data collection.

Detectors (4 feet long) were placed side by side over the length of the minor street approach. The simulation model was modified to automate the specification of input streams to the model and to generate and archive a file of vehicle trajectory data over each detector, for each run. These files were subsequently read by a separate post processor simulation model which calculated the percentage of time that a vehicle was present within the Train Dynamic Envelope (TDE) representing the sixteen-foot effective width of the railroad crossing, when a train is approaching. This percentage of time served as a risk exposure metric for rail crossings located at various distances from the stop-bar.

These risk exposures were used to develop a set of signal warrant curves over the selected range of traffic volumes and compositions. Some 50,000 simulation runs were executed, each up to 24 hours of simulated time; the archived vehicle trajectory files required about 50 GB of storage. The resulting warrant curves, which are based on these exposure data and on fatal accident data, are under review. The Polytechnic University is the prime research agency, with Elena Prassas as P.I.

Technical Articles

We need more technical articles in future issues to give the newsletter some technical substance. The article in this issue has been included as a sample of what we're looking for.

We should probably establish a review process for articles submitted to future issues. Publication in the newsletter should not preclude submission elsewhere.

A Simple Example Demonstrating Some Systematic Differences between CORSIM and the HCM

Ken Courage, University of Florida

Introduction

The literature is full of studies that demonstrate that different traffic analysis tools produce different results. Most of the discrepancies are caused by systematic differences that are built into the MOE definitions and algorithmic treatment of various phenomena. When systematic differences exist, we expect the tools to produce consistently different results that can be predicted and explained.

Many of the traffic analysis tool comparisons presented in the literature have failed to address the systematic differences because they have attempted to deal with complex examples involving a combination of differences that have obscured each other. This paper presents a very simple example from which a great deal of information can be obtained, much of which is not generally known to users of traffic analysis tools.

Case Study Description

The example is based on the simplest possible configuration of a signalized intersection approach. A comparison of performance measures from two popular traffic analysis tools, the HCM and CORSIM, will be presented using a single lane approach carrying through traffic only. The signal timing is as follows:

- Cycle = 60 sec
- Green = 25 sec
- Yellow = 4 sec
- All Red = 1 sec

Both tools accept these inputs directly with the same definition. The demand volume is also accepted by both tools with the same definition.

Comparison of Capacity

The parameters that determine capacity are similar, but there is some divergence between the tools in their treatment:

Saturation Flow Rate: is specified directly in vphg for the HCM and as steady state headway (sec/veh) for CORSIM. The definitions are mutually compatible, but differences in resolution (1 vphg *vs.* 0.1 sec/veh) require that a common value be chosen to fit the resolution of both tools. We will choose 2000 vphg, which corresponds to 1.80 sec/veh.

Startup Lost Time (SLT): is defined for the HCM as the equivalent number of seconds taken away from the green time because of the longer headways of the first few vehicles. CORSIM defines this parameter as the delay incurred by the first vehicle to enter the intersection after the beginning of green. This creates a true systematic difference that must be investigated with multiple runs.

Effective Green Extension (EGE): is specified directly in the HCM as the number of seconds effectively added to the green time by drivers entering after the beginning of the change interval. This parameter is determined implicitly in CORSIM by the individual's decision to stop when the change interval is displayed. The response to the change interval should be a function of approach speed, but the HCM does not recognize speed as an input to this procedure. This phenomenon will also require a multiple-run investigation

At this point we must find a combination of capacity parameters that will yield the same capacity for both procedures. If the capacities are different, we would expect the estimated delays to be different, given the same volumes. However, if we can produce the same capacities, then we must look for systematic differences between the delay estimation procedures to explain any differences in the delays.

Using a saturation flow rate of 2000 veh/hr for the HCM and setting SLT=EGE, we calculate the capacity of the approach as 833 veh/hr. So, any difference in CORSIM's capacity is due to a difference in the net effect of (EGE – SLT). The CORSIM treatment of these two parameters must be investigated separately.

We will determine the capacity from CORSIM by setting the entry volume well above the estimated capacity and assuming that the capacity will determine the output volume. If we can constrain either of the capacity parameters to a known value, then we can isolate the effect of the other parameter. Since the SLT is a direct input, it should be easiest to constrain to a value very near zero.

CORSIM determines the EGE implicitly by deciding whether or not the first vehicle arriving at the intersection after the end of green will stop, based on the speed of the vehicle and the maximum deceleration that the driver will tolerate. There are two parameters that can be varied to determine the EGE. The first is the maximum allowable deceleration and the second is the free-flow speed on the approach. For simplicity, we will use the CORSIM default values for maximum deceleration.

Using a series of runs, the EGE was determined over the range of 10 to 55 mph free flow speed. The results as shown in Figure 1 confirm the hypothetical relationship at very low speeds but the FFS had very little effect at speeds above 25

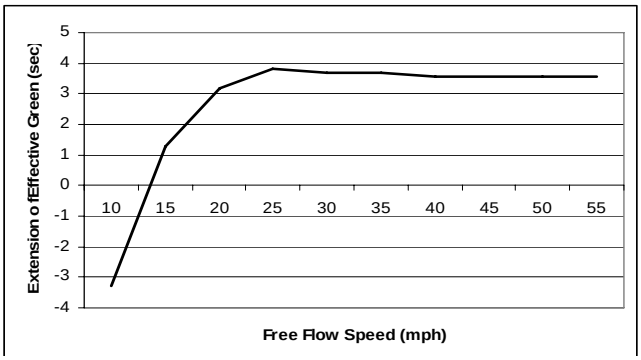

Figure 1. Effect of free flow speed on EGE

mph. Inspection of the animated graphics indicated that the actual approach speeds at the end of green never exceeded the 25 mph value when a queue was present throughout the entire green interval regardless of the FFS. So the conclusion here is that, as long as we set the FFS above 25 mph, the EGE will be more or less constant at about 3.6 seconds.

The next parameter to examine will be the startup lost time (SLT). Using the default maximum deceleration, and a 30 mph FFS, the SLT was varied in multiple runs over its full allowable range of 0 to 9 sec. The results, as shown in Figure 2 confirm the expectation that the SLT will have an approximately linear effect on the capacity of the intersection. Figure 2 also shows that the HCM and simulated capacities are equal with an SLT value of about 4.0

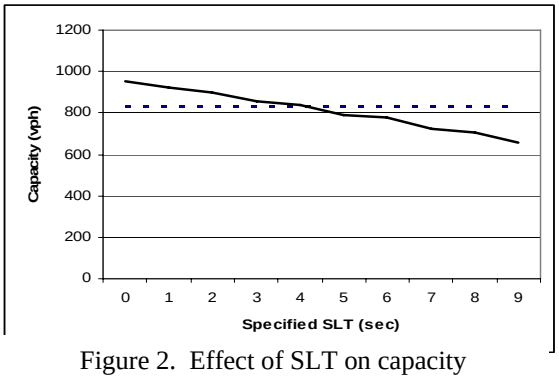

Figure 2. Effect of SLT on capacity

Comparison of Delay

Having now established the proper capacity calibration we want to compare the delay estimates from the HCM and CORSIM. The latest version of CORSIM produces an MOE called *control delay*, which attempts to follow the HCM definition, namely the extra travel time accrued on the approach because of the control device, in this case a traffic signal.

For an undersaturated case such as this, the HCM computes delay as a the sum of two delay components referred to as *uniform delay (d1)*, which is based on the assumption of completely uniform arrivals and *incremental delay (d2)*, which is the additional delay resulting from randomness and oversaturation. Simulation models typically combine these two components implicitly. So, to compare delay results it is necessary to separate the two components to pinpoint the location of systematic differences.

A very interesting and important comparison is seen in Figure 3, which shows the HCM uniform delay and control delay, as well as the simulated delay with the randomness removed from the arrivals for CORSIM by suppressing the controls that produce randomness. Removing the randomness produces essentially a deterministic simulation of uniform arrivals and departures. While such a simulation does not produce very useful results, the results tell us that the uniform simulation matches the uniform term of the HCM delay equation more or less exactly. This fact will be very useful when we compare the control delay estimation, because it means that all of the

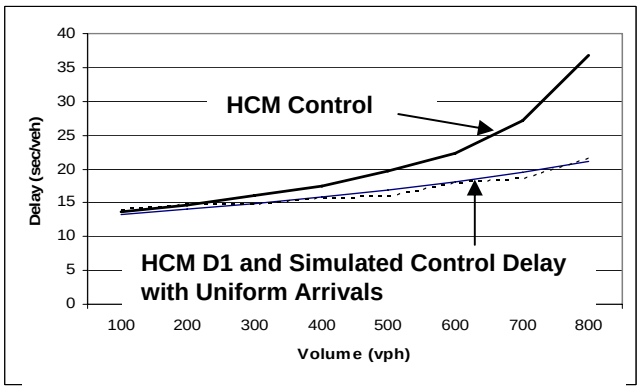

Figure 3. Comparison of uniform delay and deterministic simulation

difference between the control delay estimates must lie in the treatment of randomness.

A series of runs was made using the established capacity parameters and varying the approach volume from 300 to 1200 vph (v/c ratio from 0.34 to 1.37). A comparison of the resulting control delay is presented in Figure 4, which shows the characteristic shape of the two delay curves for a neutrally calibrated condition.

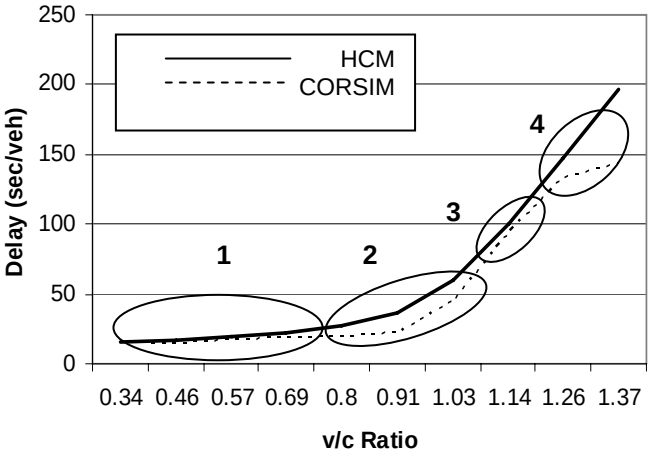

Figure 4. HCM – CORSIM control delay comparison

Four specific areas are identified in this figure, corresponding to different v/c ranges. A substantially different interpretation of the delay results applies to each of these areas:

Area 1 (< 0.75 v/c) In this range the HCM and simulation results agree very well because the effect of randomness in the arrival patterns is insignificant, so the method of dealing with random arrivals built into both tools produces essentially the same results in a neutrally calibrated situation.

Area 2 (0.75 to 1.1 v/c): In this range the simulated delay is lower than the HCM delay. This is an example of a real systematic difference that cannot be resolved easily. The cause of this difference lies in the treatment of random arrivals. The HCM uses a deterministic equation that assumes

a specific degree of randomness in the incremental term of the delay equation. For isolated intersections, the variance is assumed to be equal to the mean arrival rate.

CORSIM and other simulation tools treat randomness implicitly by generating entry vehicles from assumed distributions. The logical conclusion in this case is that CORSIM is not producing the same degree of randomness that is assumed by the HCM. The only way to obtain a neutral calibration here would be to reduce the value of the randomness coefficient, K, in the incremental term of the HCM delay equation.

Area 3 (1.1 to 1.25 v/c): This range is subject to frequent misinterpretation. It appears that the delay estimates have converged to better agreement, but this is only an illusion brought about by compensating differences. HCM and simulation delays cannot be compared directly above v/c=1.0 because of the differences in delay definition. The HCM estimates the delay to all vehicles that *arrive* during the analysis period. Simulation tools estimate the delay that *accrues* during the analysis period. The difference is that the delay to residual queues left at the end of the period is included in the HCM estimate. Simulation ignores this delay because it accrues in a subsequent period. The definition is the same when v/c <1.0 because there is no residual queue at the end of the period.

The HCM definition of delay in an oversaturated period is shown in Figure 5. The delay is represented as the area contained between the cumulative input and output lines. The incremental delay term of the HCM formulation covers all of the delay for both periods explicitly.

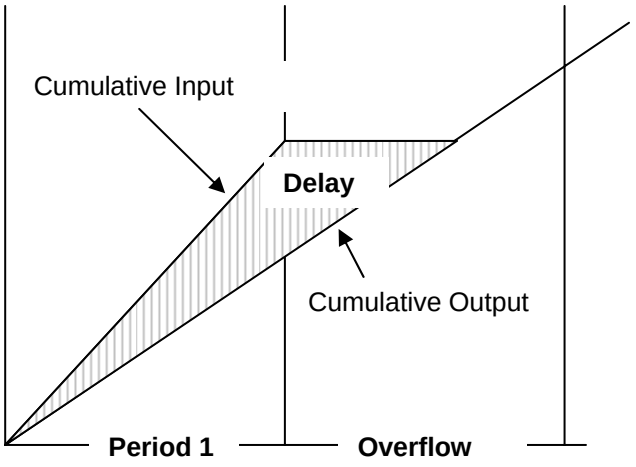

Figure 5. HCM delay definition

The CORSIM formulation shown in Figure 6 deals with one period at a time. So the CORSIM estimate of delay per vehicle is looking at a smaller number of vehicles that the HCM formulation because it ignores the residual queue.

To obtain a comparable estimate for simulation, it is necessary to add the total delay that accrues in both periods. The comparison shown in Table 1 illustrates this process. Note

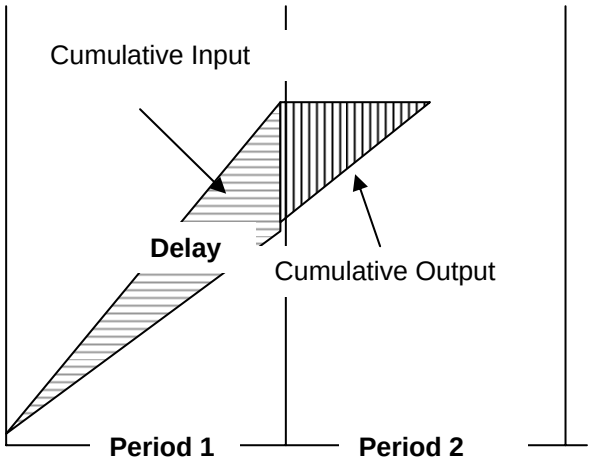

Figure 6. CORSIM delay definition

that the total delay for both simulation periods (418 veh-min) is identical with the HCM delay for the first period alone.

The close agreement shown here indicates that the two delay models are giving the same answer in this v/c range. The difference in the treatment of randomization pointed out in the previous range is much less important here because deterministic queuing considerations are now driving the delay model.

Table 1. Multi-period comparison of HCM and CORSIM results

	HCM Computations			Simulation		
Period	Sec/ veh	# Veh	Veh-Min	Sec/ veh	# Veh	Veh-Min
1	100.4	250.0	418.3	99.9	218.0	363.0
2	(Included in Period 1 overflow)			104.2	32.0	55.6
Total			418.3	.		418.5

Area 4 (v/c > 1.25): In this v/c range, the two delay estimates tend to diverge once more because much more of the simulation delay is shifted to the second period. Once again, multiple-period analysis will be required to reconcile any apparent differences between the two modeling approaches.

Closure

This paper has identified some systematic differences between the modeling approaches of the HCM and CORSIM using a simple example of a signalized intersection. It was demonstrated that, with careful calibration of capacity parameters, the approach capacity as seen by both tools could be equalized. Differences in the delay computations, while somewhat more complex, were able to be explained in terms of systematic differences in definitions and model formulation.

The analysis presented here sheds some light on the behavior of both of these popular traffic analysis tools and demonstrates that it is possible, with adequate knowledge and the right approach, to reconcile results which appear on the surface to be very different.