

Annual Report 2011

TRANSPORTATION RESEARCH BOARD
JOINT TRAFFIC SIMULATION
SUBCOMMITTEE



Chairman's Message

George List

This past year has been a busy one for the subcommittee. We added two new sponsoring committees – AHB55 (Work Zone Traffic Control) – partly as a result of our emerging focus on safety-related simulation – and ADC20 (Transportation and Air Quality) because of our emphasis on air pollution. We also added new task forces – one focused on agent-based simulation and another focused on safety-related simulation.

For the second year we held a mid-year meeting – this time on July 19, 2011 in conjunction with the Traffic Flow Theory Committee meeting in Berkeley, CA which was held just prior to the 19th International Symposium on Transportation and Traffic Theory. We spent most of the time talking about safety-related simulation which has proved to be the focus of this year's traffic simulation workshop.

The joint simulation subcommittee continues to play a valuable role within TRB. As you may know, it serves as a forum where people interested in traffic simulation can meet, share recent developments, and explore new ideas related to the theory, implementation, and use of traffic simulation. On May 11, 2011 – because of the efforts of the Calibration, Validation, and Verification task group – we hosted at TRB-sponsored webinar entitled “Microscopic Traffic Simulation Models – Why and How to Calibrate Them?” It was well attended. We also initiated a partnership with the ITE Simulation and Capacity User Group to spread the word about simulation models and their use and to learn more about the ways in which practitioners use simulation models and the challenges they face.

Please join the group and participate in our activities. You will find the workshop on Sunday afternoon to be particularly valuable – with a number of researchers talking about what they are doing to advance the ability of simulation models to address safety-related issues.

Sponsor Committees

- AHB45: TRAFFIC FLOW THEORY
- AHB40: HIGHWAY CAPACITY AND QUALITY OF SERVICE
- AHB20: FREEWAY OPERATIONS
- AHB25: TRAFFIC SIGNAL SYSTEMS
- ADB30: TRANSPORTATION NETWORK MODELING
- AHB55: WORK ZONE TRAFFIC CONTROL
- ADC20: TRANSPORTATION AND AIR QUALITY

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SimSub Web Site

Alex Stevanovic, Webmaster

<http://sites.google.com/site/trbcommitteeahb45>

Organization and Activities

Motivation

The decision to create a joint subcommittee was motivated by the recognition that simulation is a problem solving tool and not an institution. A few TRB committees found it hard to ignore their overlapping interest in simulation and decided that the joint subcommittee structure was the best way to address these interests. They all agreed that forming a separate simulation committee was not a good idea.

SimSub addresses the simulation community as a whole. For example, one of our task groups organizes a Sunday afternoon simulation workshop annually at TRB. Workshops generally address a topic of broad interest to developers and users of simulation tools. We also publish a periodic newsletter with information of interest to the simulation community.

Membership:

The subcommittee membership has no numerical limitations but all subcommittee members must be active members of an appointed task group. The list of current task groups appears in the box at the right. Subcommittee members are encouraged to focus their efforts on a single task group. Those who are interested in the work of the subcommittee but are not task group members will be designated as friends of SimSub.

Expansion of Committee Sponsorship

Recognizing that the interest in traffic simulation extends beyond the boundaries of our existing committee sponsors, we have established a formal but simple

procedure for expanding committee sponsorship. There are two requirements for any committee that seeks to become a sponsor:

1. A resolution from the full committee expressing the desire for sponsorship
2. Acceptance by the chairs of all of the existing sponsoring committees

By TRB rules, Subcommittee sponsorship applies only to standing TRB committees (i.e., not subcommittees).

Role of Sponsor Committees

The chair of each sponsor committee appoints one member as a SimSub liaison. The role of the liaison member is as follows:

- Report to SimSub on the current interests and activities of their committee, including suggestions for new SimSub task groups and activities that would have cross cutting components with other sponsor committees.
- Report to their committees on the current activities of SimSub, including task group progress, reports, research problem statements and proposals for new task groups.

Each sponsor committee may nominate papers to be considered for awards by the subcommittee. Normally, these papers will have been submitted to the committee for presentation and/or publication at the annual TRB meeting. Both lectern and poster session papers are eligible. The award categories are identified in the Awards Task Group description. Committees may also make nominations for the Lifetime/Pioneer Achievement Award.

We fit into the TRB structure as Subcommittee AHB45-1 of the Traffic Flow Theory Committee. We support, instead of competing with, the sponsor committee activities. We don't sponsor paper sessions for that reason

Current Task Groups

- Annual Workshop
- Research Needs and Resources
- Awards:
- Calibration, Validation and Verification
- Liaison and Outreach
- Safety Modeling and Simulation
- Agent-based Simulation

SimSub Annual Report Team

Editor: Ken Courage

Associate Editor:
(To be Appointed)

Simulation Activities Coordinator:
(To be Appointed)

Research Reporting Coordinator:
(To be Appointed)

Industry News Coordinator
(To be Appointed)

Annual Meeting January 24, 2011

The SimSub annual meeting took place on Monday evening of the TRB 2011 meeting. The following topics were included on the agenda

- Introductions
- Sponsoring Committee Chair Remarks
- Annual Workshop Report (Brief synopsis and discussion of future topics)
- Research Needs and Resources Task Group Report
- Calibration, Verification and Validation Task Group Report
- Liaison and Outreach Task Group Report
- Mesoscopic Task Group Report
- FHWA Update



- 2011 Midyear activities
- New Task Group(s)
- The use of traffic simulation in the assessment of road safety: Topics in this discussion included how is safety influenced by control and design, could simulation be utilized to measure surrogates, can simulation be used to predict safety It was highlighted that an advanced driver model may be needed; questions were raised about

whether existing models are sufficient.

It was suggested to create a safety analysis task force. A list was to be generated of potential task group members. Brian Park is to lead the task group. The potential for a jointly sponsored panel session on this issue was discussed. This will be explored with road safety committee.

Sunday Workshop

The Annual Workshop Task Group undertakes the development and presentation of the Simulation Workshop on the Sunday afternoon of each TRB Meeting. Workshops generally address a topic of broad interest to the simulation Community. The annual workshop draws a large attendance and has been the most visible product of the subcommittee.

The 2011 workshop focused on “Simulation Modeling and Analysis of Effect of Operational Improvements on Greenhouse Gas Emissions: Integrating U.S. EPA MOVES Model and Other Power-Based Emission Models with Simulation Models.” The agenda included eight presentations and a panel discussion.

The 2012 workshop will focus on “The Use of Simulation to Assess Safety Performance.” The workshop agenda is presented in the 2012 TRB meeting preview on Page 23.



New Task Group Formation

New task groups are our most important means of expanding the SimSub activities and interests and attracting new members and TRB committee sponsorship. Anyone can propose a new task group and the person proposing the task group generally becomes the chair of that group.

Proposals for new task groups should be submitted to the subcommittee chair. Each proposal should contain a discussion of the following items:

1. Why is this topic important?
2. What are the unmet needs and how will they be addressed?
3. What is the specific product to be developed by the proposed group?

4. Who are the proposed members? A task group must have at least three members to ensure a broad perspective.

In keeping with TRB goals, each task group should have one young member who will serve as the co-chair.

Individuals wishing to explore the formation of a task group may request time on the agenda of a subcommittee meeting. They may also submit a prospectus for publication in the newsletter to assess the interest among subcommittee members and friends. The SimSub chair may appoint a task group at any time, subject to ratification at a subcommittee meeting.

Sample Prospectus: Coordination of Input to Wikipedia Article on Traffic Simulation

Why is this topic important?

Wikipedia has become a significant and readily accessible source of knowledge on a variety of subjects. It has recently developed a “Traffic Simulation” page that provides information on the nature and application of simulation, the software products that perform simulation and the relationship between simulation and the HCM. These are all topics of vital concern to SimSub. Our members have both the interest and the capability to enhance the accuracy and relevance of the information posted on this site.

What are the unmet needs and how will they be addressed?

There is minimal control over the evolutionary development of Wikipedia sites. Anyone can post their own material. The existing material is essentially accurate, but it is nowhere near complete, especially in terms of

reference citations and its organization is in need of improvement. Some links simply go to product developer’s websites. Others have notes from Wikipedia indicating the need for improvement. SimSub, through its sponsor committee members, has unique access to broad expert consensus on this subject. We can perform an important service to the transportation engineering profession by enhancing the material posted on this site. A task group should be formed to review, revise and expand the posted material.

What is the specific product to be developed by the proposed group?

The product will be an ongoing enhancement of the Wikipedia “Traffic Simulation” Internet site. New material will be developed for posting. Existing material posted by others will be edited to improve its accuracy, organization and relevance.

Who are the proposed members?

Unknown at this time. We are seeking volunteers for this important task.

New task groups are our most important means of expanding the SimSub activities and interests.

Current Wikipedia Article Structure

Theory

- Traffic models
- Systems Planning

Applications in Transportation Engineering

- Roadway/ Ground Transportation
- Rail Transportation
- Maritime and Air Transportation
- Other

Software Programs

- Macroscopic
- Mesoscopic
- Microscopic
- Hybrid

Microsimulation

Comparing simulation results with the US Highway Capacity Manual

Sponsor Committee Profile

AHB45: Traffic Flow Theory and Characteristics

<http://www.tft.pdx.edu/>



Chair
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ing
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Scope and Mission:

The TRB Committee on Traffic Flow Theory and Characteristics (TFTC) serves as an unbiased focal point for promoting the development and improvement of sound theoretical, experimental and applied foundations of traffic flow phenomena; validation, dissemination and application of traffic flow theories in the planning, design and operation of multimodal transportation systems; and the study of traffic flow characteristics and the application of this knowledge in the planning, design, operation and maintenance of surface transportation systems.

Principal Committee Activities

The 2012 TRB Annual Meeting is coming up—search the interactive program for “AHB45” and you will find that we are sponsoring or co-sponsoring: 5 podium sessions, 4 poster sessions, two Sunday Workshops, one committee meeting, one subcommittee meeting, and one doctoral student session. Our committee received 175 papers this year, a 77% increase over last year.

2012 TFT Midyear Meeting Abstracts now being accepted until January 15, 2012! We will hold a joint meeting with the Committee on Highway Capacity and Quality of Service in beautiful Fort Lauderdale, FL, June 19-22, 2012. Visit our website for more information: www.tft.pdx.edu.

ISTTT 20: The 20th International Symposium on Transportation and Traffic Theory will be held at the Grand Hotel Huis ter Duin in Noordwijk, the Netherlands, from July 17-19, 2013. The Symposium will be organized by the Delft University of Technology. Extended abstracts are now being accepted until January 15, 2012: <http://www.isttt.net/isttt20/call-for-papers/>.

ISTTT19: The 19th International Symposium on Transportation and Traffic Theory was held July 18 - 20, 2011 in Oakland, California. Our committee held a short ancillary summer meeting.



SimSub Liaison
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Web Site: Our website contains a repository of historic traffic flow theory related documents including committee sponsored monographs. Take a look: <http://www.tft.pdx.edu/docs.htm>.

Simulation-related Activities

This committee is the designated parent committee for SimSub and is pleased to co-sponsor the annual Sunday Workshop on Simulation at the TRB Annual Meeting. Plans are being made now for the 2013 workshop – contact George List if you have ideas for the 2013 workshop.

We have launched our Greenshields Prize best paper award (http://www.tft.pdx.edu/greenshields_prize.htm) and have selected the inaugural winner! Congratulations to Ji-Won Kim and Hani Mahmasani on their winning paper: “Correlated Parameters in Driving Behavior Models: Car-Following Example and Implications For Traffic Microsimulation.”

More Committee News

Please join our Friends email list—we are always looking for volunteers for reviewing papers, staffing subcommittees and launching new initiatives: <http://www.tft.pdx.edu/friends.htm>

Follow us on Facebook at: www.facebook.com/AHB45

Join the Traffic Flow Webinars Google Group: <http://groups.google.com/group/traffic-flow-webinars>

“The Traffic Flow Theory and Characteristics Committee is proud to join with six other TRB committees to advocate for the sound development and application of traffic simulation modeling tools, through our Joint Subcommittee on Traffic Simulation (SimSub). This includes calibration, validation, interpretation and application procedures for traffic models and related tools, as well as guidelines and identification of misuse.”

The TFT Committee is pleased to partner with the Georgia Institute of Technology to offer webinars of papers presented at the TRB Annual Meeting. You can find 25 archived webinars at <http://www.webinars.jltraffic.com/video-archives>

Sponsor Committee Profile

AHB40: Highway Capacity and Quality of Service

<http://www.ahb40.org>



Chair

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SimSub Liaison

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Scope and Mission:

This committee is concerned with relationships among those physical and non-physical factors which are found to affect capacity, traffic flow, comfort, convenience, and safety; measurement techniques for obtaining data for these factors; and acceptable standards of service in terms of measurable characteristics.

Principal Committee Activities

AHB40 acts as the primary overseer for research and enhancement of the Highway Capacity Manual (HCM.) The HCM documents procedures and guidelines for the measurement, analysis, and interpretation of data quantifying highway capacity and quality of service.

Joint Meeting of the Transportation Research Board Highway Capacity and Quality of Service (AHB40) and Traffic Flow Theory and Characteristics (AHB45) Committees Fort Lauderdale, FL June 20-23 2012.

Simulation-related Activities

AHB40 maintains an active Subcommittee with the main objective to develop HCM guidance on the application of traffic simulation tools. Three Chapters of the new HCM2010 include materials on simulation and applications in capacity and level of service analyses. The Subcommittee has twelve members and over 90 friends.

Final HCM2010 materials on simulation (chapters 6, 7, 24):

The discussion focused on how to get feedback from the user community. It is important to get feedback from each of the methodology chapters, regarding how they address simulation. We need ask specific questions that give the users a context and focus on what we need to know. The following ways were suggested to get feedback from the user community: a) an article in the ITE journal about these chapters, b) presentations at ITE section meetings, c) presentation on developers' user group meetings, d) committee website.

“The Highway Capacity Committee relies on simulation tools for the development of some of its methods, and thus it is very important for us to work closely with developers and users of these tools.”

AHB40: Highway Capacity and Quality of Service Simulation Subcommittee Activities



Subcommittee Meeting: January 2011

The subcommittee meeting took place on Saturday January 22, 2011, at the Marriott-Wardman Park hotel. It was very well attended (more than 60 participants).

ANNUAL MEETING, IN JANUARY

The main topics addressed at the Subcommittee meeting included:

Information on FHWA related activities:

Simulation investigations at the three Integrated Corridor management (ICM) sites (Minneapolis, Dallas, San Diego) have been completed. Final reports will be available soon. Additional studies and results on Active Traffic and Demand Management (ATDM) will be available. Demand impacts will be a focal point of efforts in ATDM.

Research Problem Statements

The following research areas got the highest priority from the attendees. It was emphasized throughout the discussion that close coordination should be sought with the Research Subcommittee and the related subcommittees for each topic.

Rural highway facilities: There is a need for improved simulation model, but requires extensive empirical data that are not readily available. Focus should be on algorithms, that can be used by software developers.

Roundabout validation: guidance for modeling or calibrating and validating human behavior models, research jointly with the traffic flow theory committee. May be use the data resulting from the previous NCHRP project used to create the current HCM procedure.

ATDM modeling in HCM: the biggest problem is the lack of emulators for ATDM control methodologies. One example is representing the ability of traffic responsive metering plans to demand changes. The same is true for speed harmonization and other responsive techniques. We need to be able to model system responses to certain conditions.

Consistency between capacity estimates

Integration of planning in simulation models: It is better to wait on the findings from the ICM modeling efforts to determine what are the key research needs.

Interaction between facility types:

One example of a problem is the queuing at signalized intersections on interchanges.

MIDYEAR MEETING 2011

There was no Subcommittee meeting in the mid year Committee meeting which was held in Stockholm, Sweden.

The subcommittee website is
<http://sites.kittelson.com/hcqs-sim>

Sponsor Committee Profile

AHB20: Freeway Operations

<http://www.trb-freewayops.org>

Photo
Not available

Chair

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Scope and Mission:

The mission of the Committee is to provide leadership and serve as the TRB focal point in promoting, implementing, operating and maintaining traffic management systems and strategies including Intelligent Transportation Systems, to enhance the efficiency, safety and environmental conditions on freeways and in freeway corridors.

Principal Committee Activities

The Committee's activities specifically include promoting research in traffic management and the application of promising results to operational systems; and fostering the cooperation, coordination, and information dissemination, between individuals and groups active in freeway traffic management and advanced technologies.

The committee has a major interest in freeway and corridor simulation with an emphasis on real world simulation applications. In 2004, the committee approved the formation of the AHB20(2) subcommittee on Freeway Operation Simulation and the subcommittee has been active since that time.

Simulation-related Activities

The scope of AHB20(2) is to serve as a link between freeway, corridor and urban simulation model developers on one hand, and promoters, users and researchers of simulation on the other hand with a focus on challenges and best practices in real world simulation applications.



SimSub Liaison

Dr. Panos D. Prevedouros
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A major objective of the subcommittee is to monitor and present state-of-the-art developments in

- Simulation model improvements and new entrants
- Simulation of ITS
- Simulation of tolling and pricing schemes
- Simulation as part of a real time traffic control operation
- Trends in usage of simulation models
- Trends in scope and methodologies of simulation models

HB20(2) has a roster of about 70 friends, meets regularly at TRB's annual and midyear committee meetings, participates in research statements, research circular chapter preparation, and organizes sessions in AHB20-sponsored conferences.

“Simulation is a vital tool for assessing operational improvements to freeways and freeway corridors. As budgets shrink for capacity expansion, extracting the maximum throughput from existing facilities becomes paramount. Traffic systems simulation is an essential decision making assistant in sifting through alternative improvements.”

Subcommittee meeting, January 2011



Sponsor Committee Profile

AHB25: Traffic Signal Systems

<http://www.signalsystems.org>



Scope and Mission:

This committee is concerned with provision of the safe and efficient movement of people and goods on surface streets through the use of traffic management systems. The scope includes system design, implementation, operations, and maintenance; development of traffic operations centers; development of traffic management strategies; integration and operational evaluation of surface street systems with freeway, traveler information, and transit systems; and incorporation of surface street systems into Intelligent Transportation Systems (ITS).

Simulation-related Activities

The Simulation Subcommittee was established in 2005, and hosted its first subcommittee meeting in Las Vegas in July, 2005. Since then, the subcommittee has hosted both regular meetings twice a year (i.e., one at the summer meeting and the other at the TRB annual meeting).

The main objective of the subcommittee activities is to identify and share the best practices and state of the arts simulation modeling methods and techniques relevant to traffic signal control and operations. Throughout the years, the subcommittee had discussions on the following areas – hardware in the loop simulation, software in the loop simulation, connected vehicle technology (previously known as IntelliDrive or vehicle infrastructure integration), simulation model calibration and validation best practices, wireless communications simulators, etc.

At the most recent meeting, the subcommittee had the following presentations:

Daniel Morgan, Caliper Corporation, made two presentations: The first was application-oriented and involves the use of TransModeler as a database for signal timings for wide areas, even regions spanning multiple cities, in support of wide-area microscopic traffic simulation. The second presentation involved the development of an API for signal systems simulation in TransModeler.

Byungkyu “Brian” Park, University of Virginia gave a presentation on “Benefits of IntelliDrive-based Cooperative Traffic Signal Control at Traffic Signalized Arterial.” This study investigated energy and emission impacts of the connected vehicles through life cycle assessment.

This study suggested that, despite the additional manufacturing needs associated with implementing a cooperative vehicle-infrastructure transportation system, it could reduce about 30% of carbon dioxide emissions to implement a cooperative system opposed to the current vehicle-infrastructure system in place. This presentation can be seen on YouTube at <http://www.youtube.com/watch?v=7PAFrifUGkI>.

Chair

Dr. K. Larry Head
Department Head
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SimSub Liaison

Dr. Byungkyu (Brian)
Park
Associate Professor, Civil
Engineering
University of Virginia

The Traffic Signal Systems simulation subcommittee will continue to support and participate in the joint simulation subcommittee activities. The TSSC is interested in presenting the simulation related best practices and operations of traffic signal system for the transportation systems operations and management. These include issues related to simulation model calibration and validation, the use of hardware and/or software in the loop simulation, and connected vehicle technology. In particular, the subcommittee is interested in presenting wireless communications simulators and their calibration/validation issues into connected vehicle technology applications.

Subcommittee meeting, January 2011



Sponsor Committee Profile

AHB55: Work Zone Traffic Control

<http://sites.google.com/site/trbcommitteeahb55>



Chair

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SimSub Liaison

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Scope and Mission

This committee is concerned with optimizing traffic flow and with minimizing hazards to work crews and road users, including pedestrians, in a cost-effective manner during maintenance, construction, and utility operations on streets and highways. These concerns include improved methods, procedures, materials, equipment, devices, and systems applicable to traffic control in work zones. They extend to the planning, design, installation, operation, maintenance, and removal of such traffic control zones.

Principal Committee Activities

In addition to the review and sponsorship of presentation and publication of papers submitted to TRB on the topic of work zone traffic control, the committee regularly organizes and sponsors conference sessions during the annual meeting on topics of high interest to the committee and to the profession.

The committee does not typically hold a mid-year meeting, but does look for opportunities to jointly meet with other committees during their mid-year meetings when a topic of mutual interest can be identified. The committee also works with the National Work Zone Safety Information Clearinghouse to identify webinar topics and secure presenters to perform those webinars. The committee holds a best-paper competition each year of the papers it receives, the winner of which is recognized the following meeting and the paper is forwarded for further award consideration by TRB.

Simulation-related Activities

Members and friends of the Work Zone Traffic Control committee have been using traffic simulation for work zone analyses for many years. However, since the committee is a relative newcomer to SimSub, traffic simulation committee activities to

date have been limited to the review and sponsorship of papers on the topic at each year's TRB annual meeting. The committee hopes to change that in future years through participation in SimSub.

It should be noted that the FHWA Work Zone Safety and Mobility rule (23 CFR 630 Subpart J) has increased the prominence and importance of simulation as a means of properly planning for traffic impacts caused by all types of roadwork activities. This has translated to an increase in research on various work zone traffic simulation issues (methods of calibration and validation, appropriate representation of various work zone operational strategies, computation of effects of work zones on nearby routes, etc.), and methods of resolving those issues. It is hoped that the committee's involvement in SimSub will further promote high-quality research in this area.

In 2012, the committee is sponsoring one podium session and one poster session of papers that include several pertaining to traffic simulation evaluations:

- *Session 404, Work Zone Analysis Tools (Poster)*
- *Session 461, Evaluating and Managing Work Zone Impacts*

Both sessions will occur in the Marriott.

The formal co-sponsorship of SimSub by the Work Zone Traffic Control Committee offers new opportunities for us to elevate the visibility of the many challenges pertaining to work zone simulation. We look forward to finding new ways to collaborate with members of other co-sponsoring committees in improving the state-of-the-art and state-of-the-practice in this area.

Sponsor Committee Profile

ADB30: Transportation Network Modeling

<http://www.nextrans.org/ADB30>



Chair
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Scope and Mission:

The committee will promote research and information exchange in transportation network modeling, an interdisciplinary field spanning Computer Science, Logistics, Mathematics, Operations Research, Telecommunications, and Transportation Science. The committee will also focus on: the understanding and modeling of the technological and behavioral factors affecting the performance of transportation systems; modeling the interactions between the infrastructure and transportation networks; and the development and use of models to evaluate the quantity and quality of transportation facilities and services. The committee will serve as a focus for the development, adaptation, and implementation of quantitative and computer-based methodologies for the above purposes. The committee will cut across traditional modal boundaries, seeking unifying conceptual and methodological frameworks, yet highlighting modal differences. As such, it will foster effective and rapid sharing of information and experiences among researchers, practitioners, regulators and decision makers.

Principal Committee Activities

The most important activity of the committee is to review and select high-quality papers for presentation at the annual conferences of TRB and publication in the Transportation Research Record. Not only the ADB30 committee has been recognized as one of the most selective committees of TRB for scientific excellence,



SimSub Liaison
Dr. Henry X. Liu
Assistant Professor
University of Minnesota
sota

the committee has also been commended by TRB for reviewing more than 150 papers annually in the last two years. The committee has also taken a leading role for organizing the seminar on Doctoral Student Research in Transportation Modeling at the annual TRB conferences.

Simulation-related Activities

The committee has developed a dynamic traffic assignment (DTA) primer that is officially published by TRB in June 2011. The DTA primer can be downloaded from our website: <http://onlinepubs.trb.org/onlinepubs/circulars/ec153.pdf>. The main goals of this document is not to set the standard for DTA, but to present and depict the concept of DTA as defined by literature, to discuss general modeling issues and to present, with respect to adoption of DTA, decision-making considerations for both novice and experienced transportation modeling practitioners.

The committee has a special interest in all aspects of simulation techniques because simulation is arguably the most important modeling tool for transportation networks. Our committee is proud to be one of the sponsoring committees for SimSub, which serves as a focal point for simulation modeling and application activities at TRB.

Sponsor Committee Profile

ADC20: Transportation and Air Quality

<http://trbairquality.org/>



Chair

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SimSub Liaison

Dr. Yi-Chang Chiu
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Scope and Mission:

To examine the full range of relationships between transportation and air quality including regulatory and policy considerations, modeling practices, health effects, new technologies and transportation management strategies.

Principal Committee Activities

Among its many activities, the ADC20 identifies, stimulates and disseminates important research related to transportation and air quality. Our scope is to examine the full range of relationships between transportation and air quality including regulatory and policy considerations, modeling practices, health effects, new technologies and transportation management strategies

- Provides for a mutual exchange of information among committee and task force members
- Identifies research needs
- Stimulates needed research
- Advises on research priorities and procedures
- Evaluates and interprets research findings
- Reviews papers for presentation at TRB meetings and for publication
- Encourages the adoption of appropriate research findings into practice
- Arranges special programs, conferences, and workshops

Simulation-related Activities

On Sunday January 22, 2012, ADC20 is hosting a one-day workshop on integrated transportation and air quality modeling with application to PM hot-spot analysis. In particular, the workshop will focus on the model evaluation and validation and data issues. In transportation conformity analyses, travel activities as input to emission

and air dispersion models are commonly obtained from regional travel demand models and/or traffic simulation models. It is this community's particular interest in understanding how transportation models produce the travel activities necessary for the air quality models, how those model outputs should be validated and evaluated, and what are the data needs. In response to such demand and the recent U.S. EPA's PM hotspot conformity regulation, this workshop will convene both practitioners and researchers to share experience in developing integrated transportation and air quality modeling tools especially in application to PM hotspot analyses.

For more information about the ADC20 activities and news, please visit <http://trbairquality.org/>

It is part of the scope and mission of ADC20 in modeling and analysis of transportation system planning and operations related to air quality impact. The committee has recognized that simulation of traffic movement has become increasingly important as a tool for the analysis of transportation system operations. Therefore it is the committee's interest in becoming a co-sponsor of SimSub and building the bridge between the two.

Task Group Reports

Research Needs and Resources (Mohammed Hadi)

Since the formation of SimSub, the Task Group has produced a number of products including the identification and ranking of traffic simulation research challenges and producing a

white paper that addresses the need for a data repository to support traffic simulation research and development.

The most recent product is a technical paper on Microscopic Simulation Model Support of Emission Estimation, presented on Page 30.

This task group provides 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.

Calibration, Validation and Verification (Ray Benekohal)

Webinar

CVV offered a webinar on Microscopic Traffic Simulation Models – Why and How to Calibrate Them? The webinar was offered on May 11, 2011, from 2:00 p.m.-3:30 p.m. EDT. It explored ways to properly calibrate and validate traffic simulation models. The participants had to register at least 24 hours prior to the start of the webinar, and there was a fee for non-TRB Sponsor employees. Professional Development Hour (PDH) certificate for one hour was given to the individuals thru TRB.

There were two excellent presenters (Alex Stevanovic and Brian Park) and the session was moderated by John Shaw. We had 120 sites sign in with an estimated 373 people watching the session. Of the attendees that responded to our post-webinar evaluation, 88 responded that they were satisfied or very satisfied with the session.

Participants asked a lot of questions about calibration. In spite of going overtime, more time was needed to answer all the questions. In the future we may offer two webinars or a longer one.

Session in ITS-WC

Sponsored a Session “User’s Perspectives on Calibration and Validation of Traffic Simulation Models” (AM05) in ITS-World Congress in Orlando FL on October 17, 2011. These papers were

presented in the session:

- “User's Perspective on Calibration of a Microscopic Traffic Simulation Model” - Brian Park, University of Virginia
- “Calibration of Arterial Traffic Conditions in VISSIM” - Aleksandar Stevanovic, Florida Atlantic University
- “Calibration of Simulation Models for Incident Conditions” - Mohammed Hadi, Florida International University
- “Using Field Data to Calibrate Car-Following Models” - Lily Eleftheriadou, University of Florida

Synthesis Topics:

CVV members prepared and submitted two problem statements to NCHRP Synthesis. The titles of the proposed studies are:

- Calibration and Validation of Microsimulation Models among DOTs, Ray Benekohal
- State of Practice in Calibration and Validation of Traffic Micro Simulation Models, Alex Stevanovic

Future Activities

CVV will meet on Monday night immediately after SimSub meeting end (around 9:30). Major topics will be

- Presentation on MULTITUDE activities related to CVV during TRB 2012
- White paper on CVV
- Another Webinar

The objective of this task group is to enhance the understanding of the role of and effects of calibration, verification and validation in simulation.

Liaison and Outreach

Ken Courage

This Annual Report is the principal product of the Liaison and Outreach Task Group. I hope you like the new and more contemporary format. I appreciate the support of all who contributed to the content.

The future of this document will be discussed at the Annual SimSub Meeting. The size and scope is too large to be a job for a single editor. We need an Editorial Team. The proposed structure for such a team is shown here. Each member of the team would be responsible for collecting specific information and staying abreast of developments in their own area. With the right team, I am confident that we can produce a publication that will grow in quality and value each year..

Other task group activities included an update to the “organization and activities” document presented on Page 2, and the addition of two new sponsor committees: AHB55 (Work Zone Traffic Control) and ADC20 (Transportation and Air Quality).

Awards

Ed Lieberman

The task group is now evaluating candidates for the 2011 awards to be presented at the 2012 annual SimSub Meeting.

The task group recognizes that simulation models are ubiquitous within the analytical tools used by transportation professionals. This is a “good thing” that reflects the value and importance of the discipline. This wide usage also implies the need to develop guidelines for establishing the boundaries of SimSub and for these

Proposed Annual Report Team

Editor:

- Overall responsibility for layout and content
- Collects technical articles
- Obtains reports and summaries from all SimSub task groups.

Associate Editor

- Prepares to be the next editor
- Proofreading
- TRB Annual meeting preview
- Obtains reports and summaries of all sponsor committee activities related to simulation.

Simulation Activities Coordinator

- Monitors past and future conferences involving simulation.
- Collects announcements, calls for papers and conference summaries
- Monitors simulation related activities of other professional groups

Research Reporting Coordinator

- Summarizes ongoing research projects sponsored by government agencies and universities
- Summarizes current research publications involving simulation

Industry News Coordinator

- Collects and summarizes news items of interest to the simulation community from simulation tool developers.

awards. For example, do simulation-based DTA, path-choice and signal-timing optimization models, qualify? Does an innovative integration/new application of an existing simulation model qualify? These, and other similar questions can be difficult to evaluate.

The task group will therefore propose some award guidelines for consideration by the subcommittee at the annual meeting.

The scope of the Liaison and Outreach Task Group includes maintenance of a document describing SimSub organization and activities, publication of a periodic newsletter and pursuing additional TRB Committee sponsorship.

The Awards Task Group has developed two awards that may be presented annually:

The Lifetime/Pioneer Achievement Award, to be presented to an individual who has made a continuing contribution to the traffic simulation field over his/her full career.

The best paper award for simulation, chosen from the papers submitted to the sponsor committees. Separate awards are presented for model development and application.



Safety Modeling and Simulation (Doug Gettman)

During the TRB annual meeting in January 2011, there was extensive discussion of how simulation models can be modified and used to allow the prediction of the safety performance of a modeled system. While there have been many studies of linkages of safety performance using simulation models, the amount of research and number of papers has significantly increased in the last 10 years. In 2001, FHWA initiated a study and subsequently developed freely-available software tools for extracting surrogate measures from common microscopic simulation models. The free software can be accessed here: <http://www.itssiemens.com/research/ssam/>. Estimation of the potential for crashes and reductions in crashes due to the implementation of alternatives using simulation has expanded extensively since then.

It was concluded in January 2011 that there is need to form a task force of SimSub to explore this topic further. The Safety Modeling and Simula-

tion Task Force was formed and is currently chaired by Douglas Gettman of Kimley-Horn & Associates. A discussion has started regarding a number of activities related to the task force scope.

In September 2011, the 3rd annual road safety & simulation conference was hosted by Purdue University in Indianapolis, IN, USA. **Over 50 professionals attended the conference and 30 papers focused on simulation modeling of safety were presented.**

From this successful conference, the 2012 Simulation Workshop at TRB will be focused on modeling of safety with simulation models. Eight dynamic speakers will present a variety of issues related to simulation and safety at the workshop. A further brainstorming session on Task Force products and activities will be held in conjunction with the SimSub committee meeting at TRB. If you are interested in joining the task force, please email: doug.gettman@kimley-horn.com.

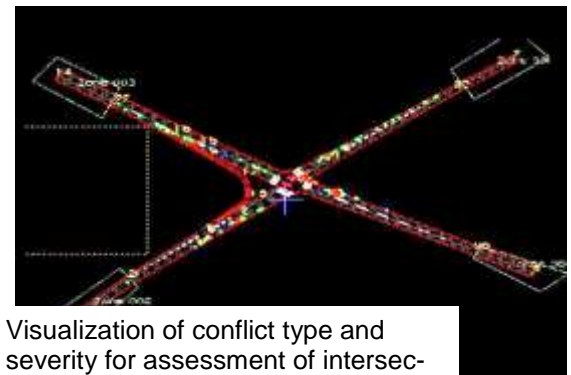
Mission: To provide a clearinghouse for research and development topics related to the modeling of traffic safety with simulation systems.

Scope: To generate research problem statements; coordinate workshops and synthesis of state-of-the-practice.

Surrogate Safety Assessment Model (SSAM) Enhancements

Submitted by Joe Bared

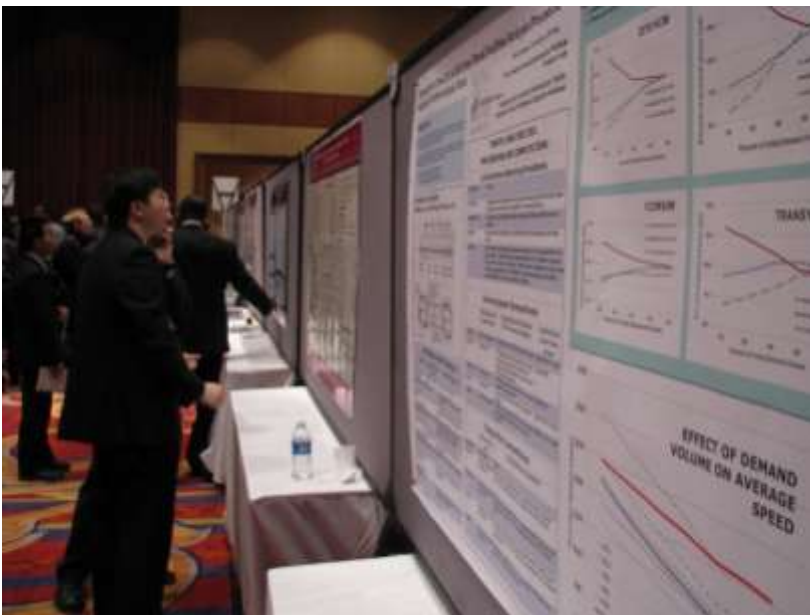
- Correct grade separation problem to eliminate erroneous crashes due to missing vertical coordinates.
 - Reduce computer running time.
 - Explore and generate other surrogate measures of safety besides frequencies of conflicts to assess severities.
 - Improve targeted data extraction, statistical output, presentation, and visualization.
 - Develop case problems to show how to best use SSAM.
- Conduct additional validations using crash data, especially for freeways and interchanges.



Visualization of conflict type and severity for assessment of intersection safety performance



TRB 2011 Annual Meeting Photos



Developer Exhibits

Poster Sessions

Simulation Related Events in 2011

The Simulation and Capacity Analysis User Group (SimCap) is an international user group organized as part of the Traffic Engineering Council of the Institute of Transportation Engineers (ITE). Many local ITE sections and groups are organized throughout the United States. SimCap develops and shares guidance and best practices in the application of various simulation and capacity analysis methodologies and tools.

Here is a summary of the group's most significant activities in 2011:

April 5: ITE Traffic Engineering Council and SimCap hosted a "What is SimCap?" Kickoff meeting at the ITE Technical Conference in April 2011. This meeting began with an introduction to SimCap and continued as an open forum answering questions about initial objectives, soliciting input on future topics and defining early action items. It was pointed out that there are a wide range of opportunities for those who want to participate,

April 21: SimCap Lunch n Learn - Delaware Signal Timing Enhancement Partnership, University of Delaware ITS Lab.

August 15: ITE Annual Meeting, St. Louis, MO. The program included a formal presentation on SimCap and Integrated Modeling.

September 19: A SimCap Session was held during the MASITE annual meeting in Cape May, NJ. Presentations included:

- HCM 2000 vs 2010: Case Study
- Roundabouts v' Signals: US 222 Corridor Intersection Improvements Project
- Use of VISSIM in Modeling City

Traffic Operations (A Case Study)

September 21: SimCap & Younger Member Dinner Meeting at the University of Maryland. Presentations included:

- Transportation Master Plan of the recent Baltimore Grand Prix.
- Center for Advanced Transportation Technology Laboratory (CATT Lab) Tour and Presentation
- I-270 HOV Effectiveness Study Using CORSIM.

October 12: NCSITE SimCap and Signal System Users Groups Joint Meeting. Presentations included:

- Smoking up the Mountains with Diverging Diamond Interchanges, SimTraffic, and VIS-SIM
- Dynamic 3D Modeling
- I-26 Connector Data Collection for Calibration
- Atlanta Radial Freeways Strategic Plan – Traffic Simulation Modeling
- School Carpool Lane Modeling and Simulation: Objectives, Approaches, and Initial Findings

December 7: Penn State Transportation Engineering and Safety Conference. The program included a SimCap session with the following presentations:

- Use of VISSIM in Modeling Curbside Activity at Bradley International Airport
- Simulation of Bus Operational Enhancements along West Chester
- The 2010 HCM Multi-Modal Level of Service (MMLOS)



What is SimCap?

SimCap (Simulation and Capacity Analysis) is a volunteer group established to develop and share guidance and best practices in the application of simulation and capacity analysis methodologies and tools.

SimCap provides a resource for transportation professionals, both government agency and private consultants, to advance the state of the practice. Using several communication tools such as web-based forums, regional workshops, and user group meetings, we anticipate transportation professionals and software users will be able to share experiences, provide lessons learned, ask questions and work together toward that common goal.

Future Simulation Events

Call for Papers:

Advanced Computational Methods for Traffic Modeling and Network Monitoring

The International Journal of Computer-Aided Civil and Infrastructure Engineering is planning to publish a special issue on advanced computational methods for traffic modeling and network monitoring.

For more information, please contact one of the Guest Editors:

Ludovic Leclercq,
leclercq@entpe.fr

Edward Chung,
edward.chung@qut.edu.au

Hesham Rakha,
hrakha@vtti.vt.edu



Call for Extended Abstracts:

This joint meeting will be a significant opportunity for transportation researchers and practitioners to interact and identify research findings that would benefit the existing highway capacity analysis procedures; to formulate goals for updating the United States Highway Capacity Manual; and to identify research needs related to traffic flow and highway capacity analysis.

Authors are invited to submit extended abstracts of papers for presentation at the meeting. The papers should focus on research and/or research applications in the areas of traffic flow theory, data, and characteristics as they relate to estimating highway capacity and quality of service. It is anticipated that the presentations will provide insights into the connections of recent traffic flow theory and characteristics research to highway capacity and quality of service analysis. The followings are examples of topics of particular interest:

- Methodological advancements in traffic flow fundamentals that relate to HCM models
- Calibration/validation of HCM methods
- Methods for measuring or estimating HCM-defined performance measures
- The use of additional performance measures that can supplement HCM measures

- Procedures and tools for evaluating advanced technologies and active traffic management strategies
- Analysis of congested/breakdown conditions as related to capacity
- Stochastic Capacity Variation and Travel Time Reliability
- Interactions between different transportation modes/vehicle types as related to highway capacity
- Influence of variations in driver behaviors in different countries/regions on capacity

An extended abstract of no more than 1000 words should be submitted by December 1st, 2011. The submission should include the presentation title, name and affiliation of author(s), with e-mail addresses. of the author(s). The abstract should be sufficiently detailed and should indicate the objectives, methodology, results, and important conclusions of the work to be reported. It is expected that the authors will be able to submit their papers through a web site starting September 1st, 2011.

Papers will be selected for presentation through a peer review process by the TRB's AHB40 and AHB45 Committees.

Joint Meeting of the Transportation Research Board Highway Capacity and Quality of Service (AHB40) and Traffic Flow Theory and Characteristics (AHB45) Committees Fort Lauderdale, FL, June 19-22 2012

Future Simulation Events

AlaSim International, organized by the Alabama Modeling and Simulation Council, is a series of annual exhibitions and conferences designed to showcase the breadth and depth of simulation activity in Alabama and to collect, document, display and discuss the current state of simulation technology throughout the world. The first of the series will be held on May 1-3, 2012 in Huntsville, AL.

AlaSim includes a variety of formats for attendees and participants to see, be seen, hear, be heard, teach, and learn about the science and technology of simulation, in recent years recognized as the third pillar of the scientific method, with theory and experiment.

- Exhibitors showing their simulation products and capabilities
- Project and program papers or briefings about simulation work planned and in-progress
- Simulation papers of high academic quality that survive rigorous review
- Panel discussions, opportunities for open discussion with simulation subject experts
- Workshops that will provide some knowledge product at the end of the session
- Tutorials, providing introductory and advanced training in current simulation technology
- Students, displaying educational projects in a poster session
- Sponsors supporting AlaSim in various ways, all appreciated and recognized

**AlaSim
International,
May 1-3, 2012 in
Huntsville, AL.**

Web Site <http://www.alabamamscouncil.org/AlaSimHsv/>

TRB Joint Simulation Subcommittee AHB45(1)

Welcome

Any opinions, findings, or conclusions expressed on this website are those of the authors and do not necessarily reflect the views of the Transportation Research Board or the National Academies.

SimSub

TRB JOINT SIMULATION SUBCOMMITTEE - SimSub, sponsored by:

- AHB45: [Traffic Flow Theory & Characteristics](#)
- ADB30: [Transportation Network Modeling](#)
- AHB20: [Freeway Operations](#)
- AHB25: [Traffic Signal Systems](#)
- AHB40: [Highway Capacity and Quality of Service](#)
- AHB55: [Work Zone Traffic Control](#)
- ADC20: [Transportation and Air Quality](#)

Find information about Committee Chairs and Liaisons [here](#)

News

Check out the SimSub Website

[http://sites.google.com/site/trbcommitteeahb45.](http://sites.google.com/site/trbcommitteeahb45)

Alex Stevanovic is our Webmaster

Future Simulation Events

The 20th International Symposium on Transportation and Traffic Theory (ISTTT), organized by Delft University of Technology will be held at the Grand Hotel Huis ter Duin, Noordwijk, The Netherlands from July 17 to July 19, 2013.

The ISTTT series is the premier gathering for the world's leading transportation and traffic theorists, and for those who are interested in contributing to or gaining a deeper understanding of the field.

The symposium covers all scientific aspects of transportation and traffic, spanning all modes of transport, including freight, air, and maritime modes, as well as private and public transport.

Sample topics welcomed by the symposium include but are not limited to:

- Traffic flow theories and their implications
- Traffic management and control
- Dynamics of transport phenomena, especially when coupled with observation
- Intelligent Transport Systems
- Travel behavior processes and demand modeling
- Vehicular interactions in mixed-mode traffic Congestion pricing and other policies
- Scheduled modes (public transport, air networks): system planning, service design and operations)
- Pedestrian and crowd modeling

- Transport safety
- Network modeling and dynamics Routing and scheduling in transportation systems
- Freight transport modeling, logistics, and supply chains
- Terminal design and operation
- Transportation policy

As in past symposia, paper review will be a two-stage process. An extended abstract (around 1000 words) can be submitted electronically to the organizers through the website www.isttt20.org between August 15, 2011 and January 15, 2012 for the first-round review.

Since for the ISTTT series the principal criterion is the scientific contribution of the work, we emphasize that the extended abstracts need to provide sufficient (theoretical, mathematical or empirical) evidence to allow the reviewers to assess this contribution. Please note that the official language for the ISTTT is (UK) English.

Accepted papers will be published both in the symposium book (Elsevier Procedia series) and in Special Issues of the Transportation Research series.

Given the high standards of the ISTTT series, only 36 papers will be selected for podium presentation and publications in the conference proceedings. In addition, around 24 papers will be selected for a poster presentation. These papers will be made available via the symposium website only.



The 20th International Symposium on Transportation and Traffic Theory (ISTTT) will be held at the Grand Hotel Huis ter Duin, Noordwijk, The Netherlands from July 17 to July 19, 2013.

Web Site: <http://www.isttt.net/isttt20/>

Use, Calibration and Validation of Traffic Simulation Models in Practice: Results of a Web based Survey

Submitted by Mark Brackstone

The MULTITUDE project (Methods and tools for supporting the Use caLi-bration and validaTION of Traffic simU-lation models, www.multitude-project.eu), being undertaken in Europe, has produced a paper covering the results of their web based survey on Cali-bration and Validation, which will be presented in session 807 on the Thurs-day of the TRB Annual Meeting. The project is attempting to focus and drive forward the issue of 'model validity' and thereby calibration and validation meth-ods and their usage in simulation, and, as part of this, an assessment of the state-of-the-practice has been performed, ex-aminating among other things how models are applied, what procedures are used for calibration and what guidelines are followed. The basis for this state-of-the-practice assessment, was a web based survey which ran in the latter quarter of 2010.

The survey examined three topics in-cluding:

- Level of awareness and comprehen-sion of respondents about the model/software they used in their last appli-cation/assignment (did they correctly understand how it worked?)
- How respondents used their models, including how (and if) calibration and validation was performed, char-acteristics of the last model applica-tion and motivations which govern model choice (this includes general information on the application type, on the impact assessed, on the type of project and on the type of client).

- More technical aspects regarding descriptions of the simulation sce-narios, the number of replications/runs performed and the outputs typi-cally used.

Although many of the finding are not necessarily surprising, the survey does, perhaps for the first time, enable us to take a snapshot of the traffic simulation 'sector', both in terms of how models are typically being used, but also if 'scientific' approaches are being appro-priately and widely implemented (eg. 'warm up period', which only 76% of users were found to be using, and mod-elling guidelines, which were found to be used only 45% of the time).

Whilst it is true that the importance of understanding these issues are a matter of perspective (what is viewed as ade-quate by industrial standards is unlikely to be viewed similarly by the more strin-gent standards sought by academics), most would agree that these issues are both important, and need to be better understood, especially as increasing numbers of simulation projects are now pushing the boundaries of computation in the use of exceptionally large net-works and/or testing real-time applica-tions.

MULTITUDE hopes that the provision of this information may assist the traffic simulation community as a whole in lev-ering increased support for development of guidelines in the coming years, in-deed the project is intending to perform a series of stakeholder meetings in 2012 in an attempt to discover what issues are of most concern to both industry and government, and how academia can as-sist in 'filling in the blanks.'

This paper reports on the results of a web based survey conducted as part of the MULTITUDE project).

The project, being performed in Europe, is attempt-ing to focus and drive forward the issue of 'model va-lidity' and thereby calibration and vali-dation methods and their usage in simu-lation

Recent Research Results

Traffic Simulation Runs: How Many Needed?

Jonathan D. Wiegand and C. Y. David Yang

Public Roads, Vol. 74, No 4
January, February 2011

<http://www.fhwa.dot.gov/publications/publicroads/11janfeb/05.cfm>

The examples provided in this case study show the effects of carrying out too few simulation runs on reducing variability in the results. Similarly, when applying future increases in annual traffic demand, the impacts of a poorly calibrated model might skew the results exponentially based upon the level of increased demand. State DOT and local agencies usually use calibration acceptance targets such as error tolerance and confidence intervals to ensure that an acceptable level of calibration is achieved.

The FHWA research utilized a calibrated model of six freeway links on I-694 and I-35W in the northern Minneapolis/St. Paul, MN, metropolitan area. For each of the six freeway links, the researchers carried out six independent run sets (5, 10, 15, 20, 25, and 30). To ensure that there was no correlation between individual runs and each run set, each run was different and independent of all other runs and run sets. This independence ensures that the full variability between runs is captured and provides examples of the progressions toward stabilized runs.

The study indicated that many of the numerical and graphical representations of the run sets revealed recognizable improvements to the results between 5 and 10 runs. But overall evidence from this particular case study indicated that at least 10 to 15 simula-

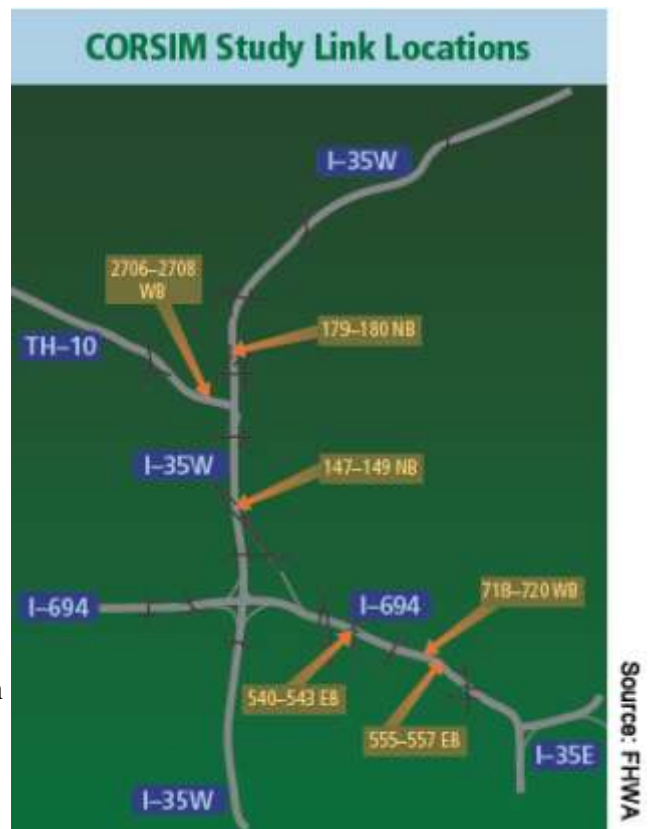
tion runs were needed to stabilize the results. It is important to note that the number of simulation runs necessary to attain stabilized results varies from one project to the next. Further, stabilized results do not necessarily mean that they meet the predetermined levels of confidence in reflecting real-world traffic conditions. A statistical analysis is necessary to validate the model results for project approval.

After the researchers achieved a stabilized run set, minimal benefit was obtained from additional runs. In addition, the researchers found that the most significant variability between runs occurred at the onset of congested conditions (that is, peak hours), because the beginning of queue development varied in intensity and initiation time.

Of the six scenarios, the two that contained readily apparent nuances for comparison were the northbound segments 147-149 on I-35W and westbound segments 718-720 on I-694.



FHWA conducted a CORSIM case study to examine the validity of computer models for generating results that are reliable enough to make transportation investment decisions.



2012 TRB Sunday Workshop on Simulation Use of Simulation to Assess Safety Performance

A Profiling Based Approach to Safety
Surrogate Data Collection

Lakshmi Peesapati
Michael Hunter

Calibration of Micro-Simulation Models
to Account for Safety and Operation
Factors for Traffic Conflict Risk Analysis

Hong Yang
Kaan Ozbay

A Practical Approach to Modeling
Crash Occurrence with Micro-
simulation

Andrew P. Tarko

Surrogate Safety Assessment Module
(SSAM) and its Use

Steve Shelby

Simulating Crashes and Creating
SSAM Files with TEXAS

Tom Rioux

Stochastic Acceleration Choice and
Changes in Model Parameters linked to
Road Geometric Features

Samer Hamdar

Simulating Crashes for Evaluating Net-
work-level Impact of Safety Enhance-
ment Strategies: A Fast Dynamic Traf-
fic Assignment Approach

Xuesong Zhou

TRB 2012 SimSub Meeting Agenda Monday, 7:30-9:30PM Marriott, Washington B5

- Introductions - George List
- Sponsoring Committee Chair Remarks - attending sponsoring chairs or reps
- Annual Workshop Report (Brief synopsis, future topics) - Doug Gettman
- MULTITUDE project (Methods and tools for supporting the Use calibration and validation of Traffic simulation models) - Mark Brackstone
- Research Needs and Resources Task Group - Mohammad Hadi
- Calibration, Verification and Validation Task Group - Ray Benekohal
- Liaison and Outreach Task Group – Ken Courage
- Mesoscopic Task Group – Yi-Chang Chiu
- Safety Simulation Task Group – Doug Gettman
- Agent-Based Simulation Task Group – Monty Abbas
- FHWA Update
- 2011 Midyear activities
- New Task Group(s)
- Other Items
- Closing

Here is a summary of the simulation-related activities at the 2012 TRB annual meeting. The material is organized by sponsor committee. All committee events, including simulation subcommittee meetings, lectern sessions and poster sessions are covered.

A separate table at the end summarizes the sessions with simulation content that have been organized by TRB committees that are not currently SimSub Sponsors. There might be some mutual interests worth exploring with these committees.

SimSub Activities

	Meeting: Traffic Simulation Models Joint Subcommittee of AHB45, AHB40, AHB25, AHB20, ADB30, AHB55, ADC20	M	Jan 23	7:30PM
161	Sunday Workshop: Use of Simulation to Assess Safety Performance	M	Jan 22	1:30PM

AHB45: Traffic Flow Theory

403	Research in Traffic Flow Theory and Characteristics, Part 1 (Part 2, Session 433; Part 3, Session 434; Part 4, Session 493)	M	Jan 23	4:15PM
433	Research in Traffic Flow Theory and Characteristics, Part 2 (Part 1, Session 403; Part 3, Session 434; Part 4, Session 493)	M	Jan 23	7:30PM
434	Research in Traffic Flow Theory and Characteristics, Part 3 (Part 1, Session 403; Part 2, Session 433; Part 4, Session 493)	M	Jan 23	7:30PM
493	Research in Traffic Flow Theory and Characteristics, Part 4 (Part 1, Session 403; Part 2, Session 433; Part 4, Session 493)	M	Jan 24	8:30AM
718	Car Following and Driver Behavior	M	Jan 25	10:15AM
800	Modeling Pedestrians and Motorized Traffic	M	Jan 26	8:00AM
807	Traffic Oscillations and Simulation	M	Jan 26	10:15AM

AHB40: Highway Capacity and Quality of Service

	Traffic Simulation Applications Subcommittee, AHB40(1.2)	M	Jan 22	11:00AM
533	Highway Capacity for Interrupted Facilities	M	Jan 24	10:45AM
534	Highway Capacity for Uninterrupted Facilities	M	Jan 24	10:45AM

AHB25: Traffic Signal Systems

	Simulation of Traffic Signal Systems Subcommittee, AHB25(3)	M	Jan 23	8:00AM
145	Integrated Corridor Management	M	Jan 22	9:00AM
213	Traffic Signal Control Using Active Management and Connected Vehicles	M	Jan 23	8:00AM
489	Design and Assessment of Traffic Signal Priority for Transit	M	Jan 24	8:30AM
490	Fundamentals of Traffic Signal Control	M	Jan 24	8:30AM
491	Performance and Evaluation of Traffic Signal Systems	M	Jan 24	8:30AM
535	Optimizing Signal Timing	M	Jan 24	10:45AM
504	Emerging Issues in Managed-Lane Operations	M	Jan 24	10:15AM

ADB30: Transportation Network Modeling

149	Doctoral Student Research in Transportation Modeling	H	Jan 22	1:00PM
453	Traffic Assignment and Network Equilibrium Models	H	Jan 23	7:30PM
774	Advances in Transportation Network Modeling	H	Jan 25	2:45PM
796	Route Choice and Congestion Pricing in Networks	H	Jan 25	4:30PM
809	New Directions and Applications Using Network Modeling	H	Jan 26	10:15AM

AHB20: Freeway Operations

	Freeway Simulation Subcommittee, AHB20(2)	M	Jan 22	5:00PM
341	Active Freeway Traffic Management and Freeway Operations	M	Jan 23	2:00PM
341	Active Freeway Traffic Management and Freeway Operations	M	Jan 23	2:00PM

ADC20: Transportation and Air Quality

141	Integrated Transportation and Air Quality Modeling: Model Implementation, Data issues, and Application to PM Hotspot Analysis	H	Jan 22	9:00AM
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AHB55: Work Zone Traffic Control

404	Work Zone Analysis Tools	M	Jan 23	4:15PM
461	Evaluating and Managing Work Zone Traffic Impacts	M	Jan 24	8:00AM

Sessions with Simulation Content Sponsored by Other Committees

485	ABE90	Taming the Automobile and Enabling Low-Carbon Cities in Developing Countries	H	Jan 24	8:00AM
119	ABJ70	Agent-Based Modeling and Simulation	H	Jan 22	9:00AM
212	AH010	Traffic Operations in Adverse Weather	M	Jan 23	8:00AM
262	AH010	Weather Impacts on Surface Transportation	M	Jan 23	10:15AM
463	AHB60	Highway-Rail Grade Crossing Safety: Methods to Quantify Risk and Prioritize Improvements	M	Jan 24	8:00AM
706	ANB10(4)	Emergency Evacuation Research Developments	M	Jan 25	8:30AM
431	ANB75T	Research All About Roundabouts	M	Jan 23	7:30PM
650	ANF10	Modeling and Pedestrian Behavior	M	Jan 24	7:30PM

CURRENT MODELING ENHANCEMENTS TO CORSIM

University of Florida
Transportation Research
Center
and
McTrans

The CORSIM microsimulation software program is a powerful tool for use in analyzing traffic operations for a given set of traffic, roadway, and control conditions. It has been used extensively throughout the U.S. for the last twenty years. However, CORSIM currently lacks the ability to model several roadway and/or vehicle features that are currently, and will continue to be, of great interest to transportation analysts. Four specific areas are currently the subject of CORSIM modeling enhancements, as described here.

Simulating High Occupancy/Toll Lane Operations

Congestion pricing has been advocated by economists and transportation researchers as an efficient way to mitigate traffic congestion. A prevalent form of congestion pricing in the U.S. is high occupancy/toll (HOT) lanes. Since the first HOT lane was implemented in 1995 on State Route 91 in Orange County, Calif., the concept is becoming popular and widely accepted by many transportation authorities. The managed-lane operator must ensure a superior level of service on HOT lanes in order to attract motorists to pay and use them. To achieve this, ideally tolls should vary in response to real-time changes in traffic conditions.

Microscopic simulation has been used to design and evaluate effective pricing schemes or operation strategies of managed lanes. As a trustworthy traffic simulation tool, CORSIM has a very limited capability of simulating dynamic tolling strategies and the drivers' lane choice behaviors in the presence of tolls. This research aims to enhance CORSIM and develop a CORSIM-based simulation platform to evaluate the impacts of a variety of pricing strategies on freeway traffic operations.

Two sets of modules are developed. The first one consists of a variety of pricing strategies including the one implemented on I-95 Express in Miami, a reactive dynamic pricing algorithm and a time-of-day pricing scheme. More precisely, the I-95 Express dynamic pricing algorithm adjusts the toll every fifteen minutes based on the actual traffic conditions, including the current traffic density, the difference in density between the previous and the current time intervals, the toll amount in the previous time interval. In the reactive pricing algorithm, the toll amount at the current time interval depends on the toll at the previous time interval, the current density and the desired density.

Finally, in the case of the time of day pricing scheme, the toll is not determined based on real-time data (density, travel

time, etc.) but it is predetermined by the CORSIM user. This scheme is useful for freeway facilities that have similar traffic patterns during, for example, weekdays. The second module mimics drivers' lane choice behaviors in the presence of tolls. More specifically, if a vehicle is allowed to enter the HOT lanes by paying, it needs to make a decision of whether to pay and use the HOT lanes or continue its trip on the general-purpose lanes. In the developed lane-choice model, the lane-choice decision depends on the toll amount, the travel time savings and the traveler's value of time.

Simulation experiments are being conducted using the network of I-95 Express in Miami to evaluate and compare the impacts of different pricing strategies on this managed lane system.

Implementing Two-Lane Highway Modeling

Access to rural areas transitioning into more developed areas is usually by two-lane highways, which may also include occasional traffic signals. In order to manage the growth and resulting traffic demands in these areas, it is essential that transportation planners and engineers have tools by which they can analyze these situations. However, no analysis tool exists for analyzing two-lane highway facilities with occasional intersections.

The objective of this project was to implement two-lane highway modeling into the CORSIM simulation program and also provide for the capability to model the combination of two-lane highway segments and signalized intersections.

The most distinguishing feature of traffic operations on two-lane highways is passing in the oncoming lane (when passing lanes are not present); thus, the development of a passing model is the most important aspect of two-lane highway simulation. The developed passing model includes components for determining a driver's desire to pass, centerline striping, and passing sight distance.

Current Modeling Enhancements to CORSIM (Cont)

The modeling logic also handles the passing of multiple vehicles at one time and safely aborting a passing maneuver when necessary. Passing lanes are also accommodated by identifying impeding vehicles and calculating a willingness to move over.

Preliminary testing results produced by the developed two-lane highway modeling logic are reasonably consistent with expected traffic flow theory and field observations discussed in the literature.

Implementing Toll Plaza Modeling

In the U.S. there currently exists a financial crisis for the funding of necessary roadway maintenance and expansion. It has thus become necessary to find other means to fund transportation based projects. One potential solution that is gaining momentum is roadway tolling. To cost-effectively analyze, plan, and design tolling operations, both conventional and open-road tolling, simulation is an essential tool.

Simulation software programs allow transportation analysts a means to analyze and visualize their proposed roadway designs under expected traffic conditions. This allows transportation analysts an opportunity to develop the appropriate toll network design before construction begins. This can save federal, state, and local agencies millions of dollars in expenses to correct or alter already started/completed projects. Unfortunately, few of these simulation programs are capable of properly simulating traditional toll plazas.

CORSIM, one of the most widely utilized simulation programs in the U.S., does not currently allow for direct simulation of toll plaza facilities. This project resulted in the implementation of direct toll plaza modeling into CORSIM. This was accomplished

through the development of new algorithms and modeling features.

To accommodate toll plaza simulation, a new lane selection algorithm was developed exclusively for toll plazas. This algorithm takes into account a vehicle's payment type, the payment types accepted by each toll booth, the queuing at each toll booth, and the number of lane changes needed to reach each toll lane. In addition to the new lane selection algorithm, new inputs, such as average service time and payment type distribution, and outputs, such as toll booth delay and throughput, were included in CORSIM.

Using Microsimulation to Evaluate the Effects of Advanced Vehicle Technologies on Congestion

Advanced Driver Assistance Systems (ADAS) are electronic devices installed in vehicles to assist drivers in tasks such as lane changing, merging and speed control by providing warnings or even taking control of the vehicle. These systems have shown promise in the improvement of road safety.

An important question is whether the use of these systems would also result in traffic improvements and congestion mitigation. Some papers already show positive effects of one particular system (Adaptive Cruise Control), but the integration of these systems' impact and the use of such systems by different drivers have not been evaluated yet.

This research uses CORSIM to evaluate the impact of Adaptive Cruise Control (ACC) and Lane Change Assist (LCA) in traffic operations and congestion occurrence. The research evaluates traffic operational impacts based on various market penetration levels for each of these technologies separately and in combination.

The selected algorithms were implemented and tested in a CORSIM network. Three flow scenarios were

tested to evaluate the impacts of the technologies under various demands: The "average demand" scenario had freeway entry volumes ranging from 1400 to 1800 veh/hr/lane, and arterial entry volumes ranging from 300 to 400 veh/hr/lane. The "heavy demand" scenario had freeway entry volumes from 1900 to 2200 veh/hr/lane, and arterial entry volumes from 400 to 500 veh/hr/lane. The "congested" scenario had freeway entry volumes from 2200 to 2500 veh/hr/lane, and arterial entry volumes from 550 to 650 veh/hr/lane. All scenarios used only passenger cars.

Preliminary results show that the ACC has significant potential to increase average travel speeds in a network, and its impact is larger for the heavy demand and congested scenarios. The impacts of LCA on traffic operations are mostly positive, but relatively minor.

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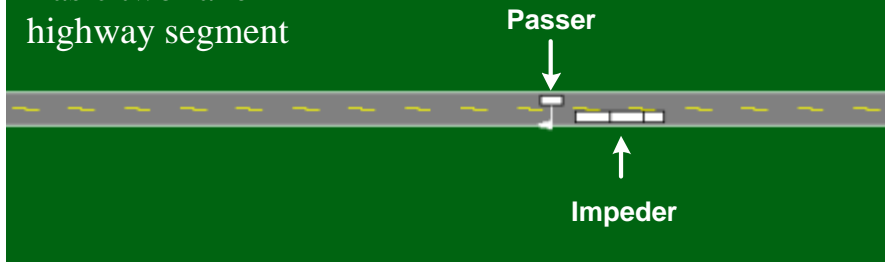
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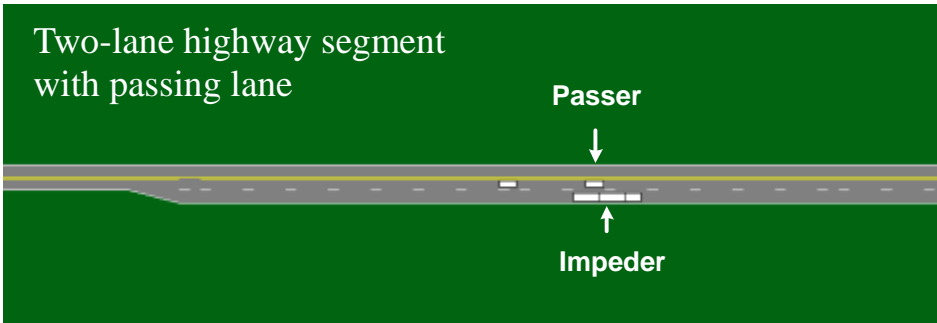
Technical Articles

Current Modeling Enhancements to CORSIM (Cont)

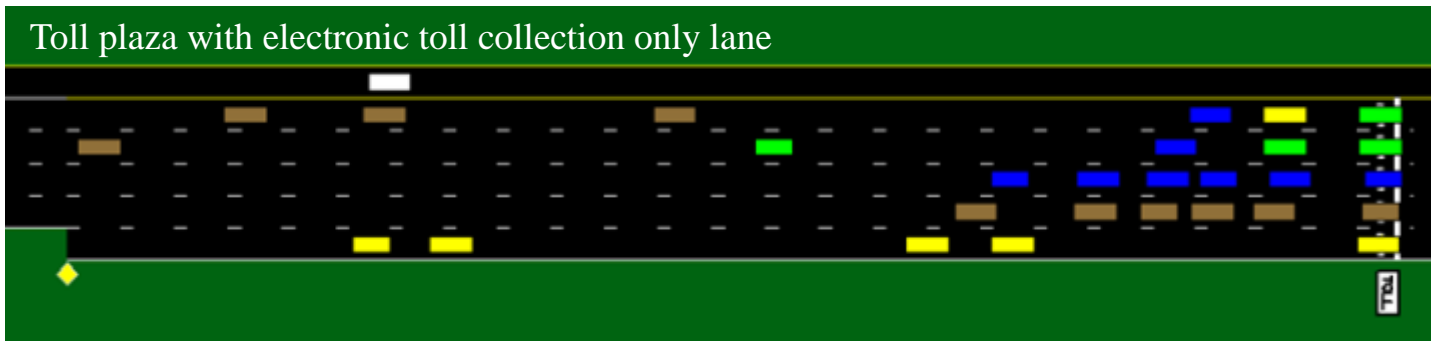
Basic two-lane highway segment



Two-lane highway segment with passing lane



Toll plaza with electronic toll collection only lane



TRAFVU legend showing information for vehicle toll payment type and payment types accepted at toll booths.

LEGEND	
VEHICLE COLORS	
Left	■
Right	■
Lt Diag	■
Rt Diag	■
Through	■
TOLL PAYMENTS	
ACM	■
Manual	■
Ticket	■
ETC	■
INCIDENTS	
Blocked	■
Restricted	■
SIGNALS	
Actuated	●
Fixed	■
Ramp Mtr	◆
TOLL COLLECTION	
ACM	■
Manual	■
Ticket	■
ETC	■
All	■



Microscopic Simulation Model Support of Emission Estimation

A product of the Research Needs and Resources Task Group

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There has been an increasing interest in using microscopic simulation to support modal emission models since vehicle trajectories from microscopic simulation allows the estimation of the variations in driving cycles, as required by these emission models.

This paper summarizes a review of existing issues related to these applications. The review was conducted by the Research Needs and Resources Task Group of the Transportation Research Board (TRB) Joint Simulation Subcommittee (SimSub).

An important component of assessing the performance of existing transportation systems and improvement alternatives is the evaluation of the associated emission and fuel consumption levels.

In the United States, most planning agencies have estimated these levels using models such as the Environmental Protection Agency (EPA) Mobile model and the California CARB model. The emission rates in these models were developed based on fixed driving cycle data. Lookup tables are produced to estimate the emission rate per vehicle-miles traveled (VMT) for each pollutant by vehicle type, facility type, and speed bin. The rates are corrected to account for the temperature and humidity of the region. The VMT are then estimated using methods such as demand forecasting models and the total emissions are calculated for each pollutant by multiplying the rates by the VMT for each category.

The simplified calculation of emission using VMT-based models, as described above, is based on average link speeds without regards to the impacts of variations in acceleration/deceleration and idling time. Although the average speed is an important factor influencing emissions, instantaneous speed fluctuation and acceleration/deceleration have a great influence on emission. For the same average speed, significantly different fuel consumption and emission levels may be expected. This is important to differentiate between the impacts of transient and smooth driving on emission. Modal emission models have

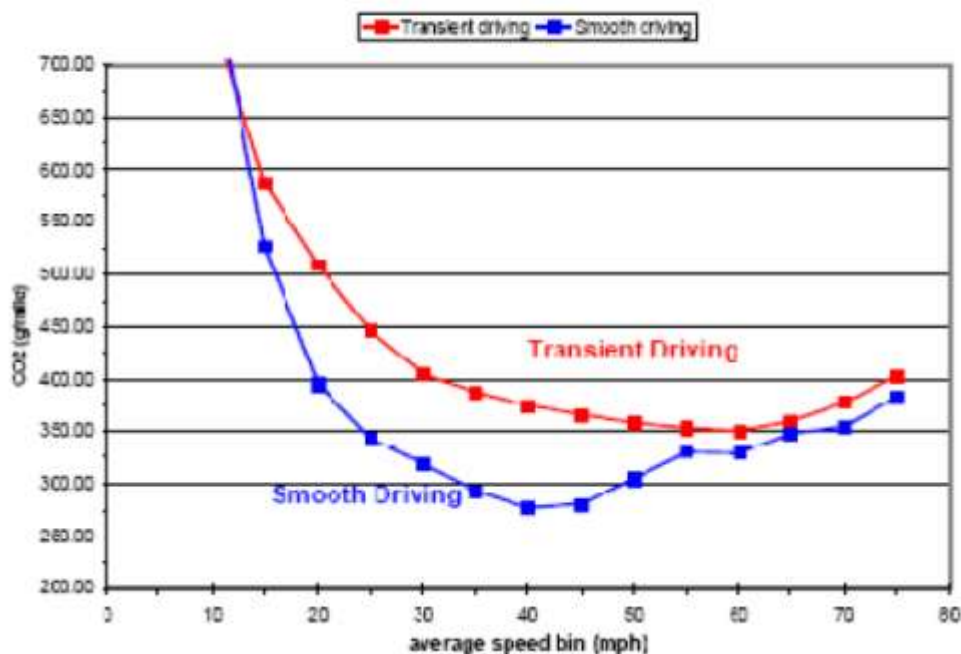
been developed in recent years to account for these differences in driving cycles. However, these models require data that are not available from the real-world and/or are expensive to collect.

There has been an increasing interest in using microscopic simulation to support modal emission models since vehicle trajectories from microscopic simulation allows the estimation of the variations in driving cycles, as required by these emission models. The recent release of the EPA MOVE model has increased the level of interest even further. However, there are a number of research issues that need to be addressed to improve the applications of simulation to emission modeling. This paper summarizes a review of existing issues related to these applications.

Emission Modeling in Existing Micro-Simulation Tools

The integration of emission estimation with microscopic simulation models is not new and all leading microscopic simulation tools have built-in or post-processing emission estimation models. Below is a summary of emission models implemented in existing simulation tools:

CORSIM emission model determines fuel consumption and emission rates as functions of vehicle performance index, vehicle speed, and acceleration. The emission model is based on work done in Oak Ridge National Laboratory in the early 1980s.



Difference between Smooth Driving and Transient Driving Emission Based on a Previous Study

The emission and fuel consumption models in **SimTraffic** are based on macroscopic relationships rather than based on individual vehicle instantaneous movements, as is done in other tools. The independent variables in these relationships are the average speed, total travel, total delay, and number of stops.

VISSIM uses speed, acceleration data, and vehicle type to estimate fuel consumption and emission. Initially, a two second simulation time step was used in the model. However, this time step was not sufficient to provide good estimates of emission. Newer versions of **VISSIM** allow the user to change the time step to 0.1 sec, which improved the estimation of emission. **VISSIM** emission estimation has been based on rates developed in 1994. However, it now also sup-

ports an interface to the **VERSIT** emission model developed in Europe.

At each time step, **AIMSUN** uses the vehicle driving mode to estimate the emissions from each vehicle, considering the vehicle type and fuel type. The implemented model was based on the model used in the **DRACULA** simulation/assignment tool developed in the United Kingdom. However, as with **VISSIM**, **AIMSUN** now also supports an interface to the **VERSIT** emission model.

S-Paramics uses a post-processor to estimate instantaneous emission based on the microscopic simulation model output. The post-processor assigns an engine type to each vehicle after the simulation with the engine specified by its

size, fuel type, and euro class emission level. A default fleet distribution is also included, which may be modified as necessary

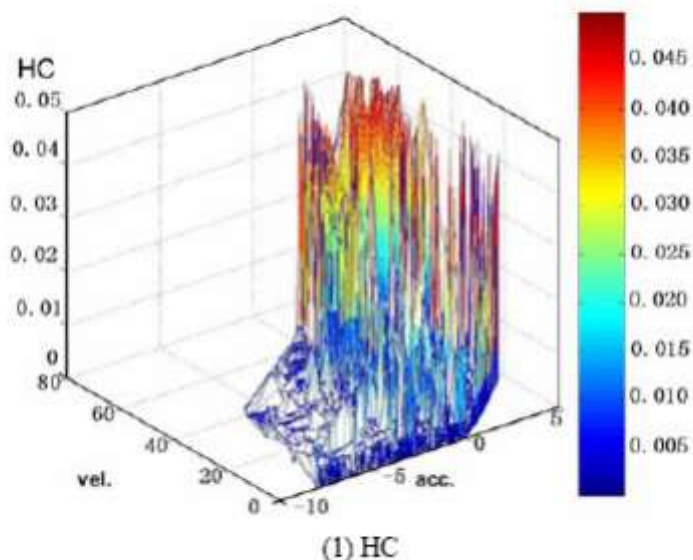
The **TEXAS** Model for Intersection Traffic utilizes the **EMPRO** Model originally developed by the University of Texas at Austin in 1983 using EPA data. This model calculates the emission based on the speed and acceleration of every vehicle for every time step using a trajectory data file. For trucks, it calculates the emission based on speed considering the gear and the revolutions per minute (RPM) of the engine to determine the emission rates.

The above review indicates that existing simulation tools utilize emission models developed in the U.S. in the 1980s based on limited amounts of data or in Europe, which limit their accuracy for emission estimation at least in the United States. Additional issues related to the use of micro-simulation for emission estimation are discussed later in this paper.

Modal Emission Models

There have been significant improvements in modal emission models that utilize emission rates that account for vehicle acceleration, deceleration, idling, and cruising modes. These models present a fundamental shift from VMT-based estimation models that are based on aggregate driving-cycle to models which can predict emission over any driving pattern. As such, these models are able to differentiate between transient and smooth driving behavior when estimating emission and can be used to estimate the impacts of advanced strategies and technologies on driving behaviors. However, as stated earlier these models require significantly more data than what is required by VMT-based models.

There has been interest in utilizing microscopic simulation models to provide the data required by modal emission models. Two previous research projects have integrated the INTEGRATION and TRANSIM simulation/assignment tools with the VT-Micro emission model. Other research projects have integrated the Comprehensive Modal Emission Model (CMEM) developed by Uni-

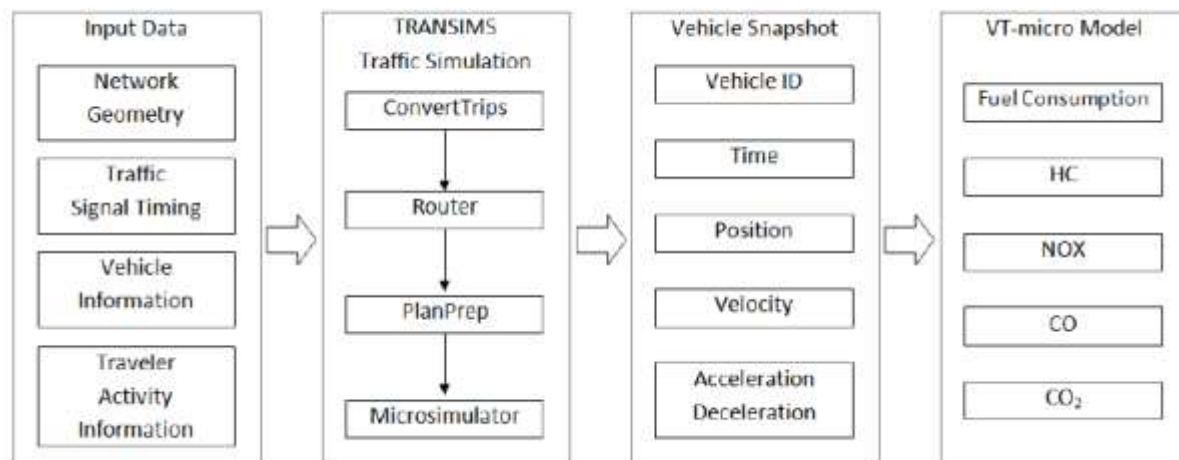


Relationship between Instantaneous Speed, Acceleration and Emission based on a Previous Study

versity of California (UC) Riverside in 2000 with VISSIM and Paramics. As stated above, in Europe, both VISSIM and AIMSUN have been integrated with the VERSIT model. VERSIT is an advanced model that considers driving activities for few seconds in the past to assess emission. It has been stated that this consideration improves the emission estimation, particularly considering the features of modern vehicle engines.

However, at least one study found that existing simulation models may not capture important elements of the variations in driver behaviors and that the randomness in driver behaviors is not sufficiently modeled for accurate estimation of emission. This needs to be further investigated as discussed later in this paper.

The latest advancement in emission modeling is the release of the EPA MOVE modal emission model. MOVE allows the estimation of emission at different levels of details, depending on the scope of the analysis and the availability of information. Emission rates of a pollutant are categorized into “bins” that are defined as a function of average speed and Vehicle Specific Power (VSP) by vehicle type and fleet composition. The VSP is an indicator of the vehicle operating mode (function of speed, acceleration, and grade). In this way, the operating mode can be explicitly accounted for in the estimation by calculating the average emission of a given driving process as the product of the time spent in each bin and the bin emission rate summed over all bins.



Integration of TRANSIMS with a Modal Emission Model in a Previous Study

The rates and parameters of the MOVE model were based on a large amount of data collected during the model development. These rates and parameters can be customized to different regions and countries as needed.

MOVE supports three levels of analysis:

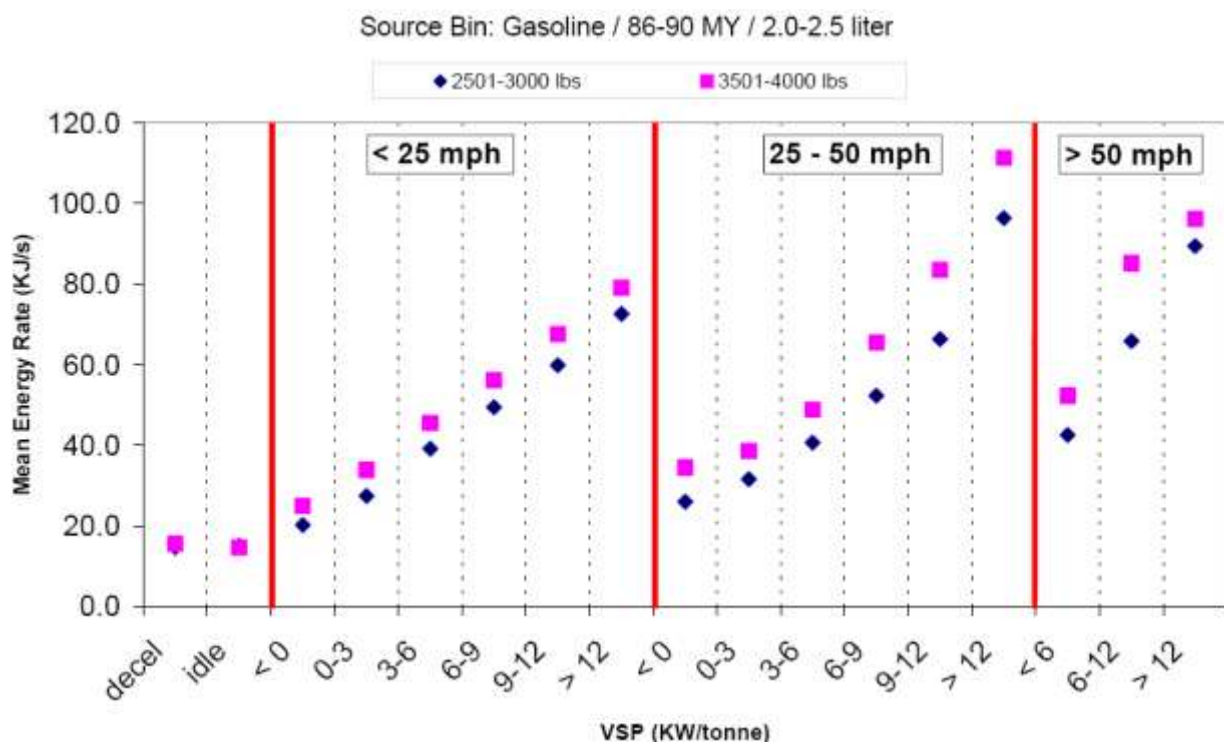
- Macroscopic analysis that uses annual average daily traffic (AADT) data and fleet information from traffic monitoring system or demand forecasting models
- Mesoscopic analysis that uses link-based volume and speed by hour for each roadway link by facility type. The analysis also uses the number of trips at origins to estimate the start-up emission
- Microscopic analysis that allows the consideration of the impacts of the different modes of driving (acceleration, deceleration, idling, and cruising). Microscopic analyses require the estimation of the proportion of driving in each mode (bin), vehicle trajectories, or the use of default driving cycles.

Microscopic analysis is obviously the appropriate type of analysis for project level assessment, particularly when assessing the impacts of high congestion and advanced technologies/strategies. If the default values are not used, microscopic simulation models become strong candidates for estimating the proportion of driving in each mode and/or vehicle trajectories since obtaining this data from the field is difficult and expensive.

Research Issues

As indicated above combining the trajectory outputs of microscopic simulation and microscopic level MOVE emission analysis has the potential of providing a powerful environment for emission estimation. However, there are a number of research issues that need to be considered as summarized as follows:

- Applications like the estimation of emission/fuel consumption and safety based on vehicle trajectories from microscopic simulation models require further examination of the quality of the trajectory data produced by these models. Although the accuracy of microscopic simulation results may be sufficient for the assessment of mobility measures, they may not be sufficiently accurate for emission and safety measure estimation. The validation of the accuracy of these trajectories should be done for freeways and arterial streets, different vehicle types, different driver aggressiveness, and different congestion levels including breakdown conditions. The validation should also consider the degree of randomness of the acceleration and deceleration, which was found to be an issue with these trajectories in the past.



Emission Rate by Bin in MOVE

- Real-world vehicle driving cycle datasets under different conditions are needed to calibrate and validate simulation model trajectories. This will allow the assessment of the ability of car following and lane changing models to produce reasonable trajectories. In addition, it will allow the assessment of the impacts of factors such as the impacts of geometry and control on lead vehicle trajectories.
- There is a need to investigate the best method to integrate emission modeling with macroscopic and mesoscopic models for different types of analyses considering the limitations and constraints in modal emission models like MOVE.
- Further guidelines are needed to address the impacts of cold start, which contributes significantly to the emission.
- An investigation is needed of the importance in the variation of different driving cycles under different conditions for different regions and the need to recalibrate these parameters for different regions.
- An investigation is needed of the impacts of the level of aggregation of trajectory data on the accuracy of the estimation.
- There is a need to investigate the degree of correspondence between vehicle types and performance in simulation and real-world vehicles in different regions and how does this effect emission modeling.
- There may be lessons learned from the European experience with the VERSIT model that can be of benefit when integrating modal emission models like MOVE with simulation models.
- Several traffic simulation models have been modified to produce a trajectory data file for the Surrogate Safety Assessment Measures application during FHWA Contract Number DTFH61-03-C-00129. If this file format is to be used for emissions, it would have to be modified to add the vehicle type and possibly other vehicle data required by the MOVE model.