Annual Report 2017

TRANSPORTATION RESEARCH BOARD
JOINT TRAFFIC SIMULATION
SUBCOMMITTEE

AHB45 (1)

SimSub

Mohammed Hadi (left) presents a certificate to George List (right) at the 2016 TRB Annual Meeting

Chairman's Message

SimSub Chair
Dr. Mohammed Hadi
Florida International University

Dear SimSub members,

It is with great pleasure that I write this message as we complete eleven years since the establishment of SimSub in 2005. Through the years, our subcommittee has brought us together to exchange ideas and to volunteer on activities that advance simulation modeling research and applications. I want to thank all the volunteers that have supported the activities of SimSub and I look forward to working with you this coming year on new activities. We will discuss potential activities of SimSub task groups in the annual meeting.

My sincere thanks to David Hale for preparing this newsletter. The time that he has devoted to this activity in recent years is greatly appreciated. A number of conferences and meetings focused on simulation topics are occurring this coming year. Many of them are listed in the newsletter.

This past year has seen the continuation of the effort that started last year in establishing the foundation of the Transportation System Simulation Manual. This effort is expected to be an important focus of our simulation modeling community in the coming years and I am sure we will hear more about it at the TRB. In particular, I want to bring your attention to a workshop organized by our subcommittee, as part of the 2017 TRB annual meeting. The workshop title is "Emerging Needs for Improving Simulation Models in The Immediate, Intermediate and Long-Term Horizons." Thanks to John Halkias, Jim Sturrock, and Samer Hamdar for their help in organizing the workshop. You can find more details about the workshop and other related TRB annual meeting activities in this newsletter.

A group of SimSub members are coordinating with the ITE SimCap committee on activities to support connecting simulation modeling research and practice. We will discuss the plans for this effort in the annual meeting.

This is an exciting period to be a simulation modeler, as we witness the increasing need for advanced methods, models, and tools to assess transportation system performance and the impacts of emerging technologies and strategies. We look forward to your continuing involvement and support; and to seeing you at the annual meeting

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

Contents

SimSub Web Site
Alex Stevanovic, Webmaster **http://sites.google.com/site/trbcommitteeahb45**

2017 Upcoming Events

ITE 2017 Annual Meeting and Exhibit - Institute of Transportation Engineers

07/30/2017 - 08/02/2017

Toronto, Ontario (Canada)

Join your peers the ITE 2017 Annual Meeting and Exhibit. The conference is designed to share knowledge, expertise and ideas on multifaceted approaches to addressing transportation issues and to exploring emerging trends in the industry. The meeting content will include sessions in a mix of presentation and training formats focused on state-of-the practice, advancement of the profession, and emerging issues designed to benefit transportation professionals in the public and private sectors. Transportation engineering students are encouraged to attend. Additionally, networking events provide opportunities to connect with one another outside of the classroom.

2017 Upcoming Events

ANT-2017 - Modeling and Simulation in Transportation Sciences

The 8th International Conference on Ambient Systems, Networks and Technologies (ANT-2017)

Track on Modeling and Simulation in Transportation Science

http://cs-conferences.acadiau.ca/ant-17/

Madeira, Portugal (16-19 May 2017)

ANT-2017 is a leading international conference for researchers and industry practitioners to share their new ideas, original research results and practical development experiences from all Ambient Systems, Networks and Technologies related areas.

ANT-2017 will be held in conjunction with the International Conference on Sustainable Energy Information Technology [SEIT]).

ANT 2017 will be held in Madeira, Portugal (16-19 May 2017).

Transportation Research Institute (IMOB)
Hasselt University
Wetenschapspark 5 bus 6
B-3590 Diepenbeek, Belgium

2017 Upcoming Events

The 8th International Conference on Ambient Systems, Networks and Technologies (ANT-2017)

The 6th International Workshop on Agent-based Mobility, Traffic and Transportation Models, Methodologies and Applications (ABMTRANS'17)

http://cs-conferences.acadiau.ca/ant-17/workshop_approved *http://www.abmtrans.eu/*

in conjunction with ANT-2017 conference | Madeira, Portugal (16-19 May 2017)

ABMTRANS 2017 provides an international forum on the latest technologies and research in the field of traffic and transportation modeling using an agent-based approach.

ABMTRANS 2017 will be held in Madeira, Portugal (16-19 May 2017) in conjunction with The 8th International Conference on Ambient Systems, Networks and Technologies (ANT-2017).

Transportation Research Institute (IMOB)
Hasselt University
Wetenschapspark 5 bus 6
B-3590 Diepenbeek, Belgium

ELSEVIER

universiteit hasselt | imob
TRANSPORTATION RESEARCH INSTITUTE

2017 Upcoming Events

ROAD SAFETY & SIMULATION
INTERNATIONAL CONFERENCE 2017
RSS2017

RSS2017—ROAD SAFETY & SIMULATION INTERNATIONAL CONFERENCE

The Road Safety and Simulation Conference was established in Rome in 2007. It provides a platform for researchers and professionals from various disciplines to share their expertise and present their innovative research results in the field of road safety and simulation. The RSS2017 conference will be hosted by Delft University of Technology (TU Delft) and organized in co-operation with the Dutch Institute for Road Safety Research (SWOV).

Conference Special Theme

The conference theme focuses on advancing the safety of all road users with special attention for vulnerable road users. Especially, in the upcoming era of advanced technologies and vehicle automation new safety challenges have emerged. The road infrastructure design plays a critical role in accommodating these challenges.

For more information: info@RSS2017.org; www.RSS2017.org

2017 Upcoming Events

ROAD SAFETY & SIMULATION INTERNATIONAL CONFERENCE 2017
RSS2017

Conference Topics

- Vulnerable road users' safety
- Automated vehicles and safety
- Virtual environments and augmented reality
- Roadway design: research and projects
- Emerging technologies
- Surrogate measures of safety
- Human factors and behavioral models
- Safety modeling
- Crash causality
- Naturalistic studies
- Hazard perception
- Big data for safety analysis
- Stress and fatigue
- Microsimulation for safety and operations
- Bicycles and pedestrians simulators
- Distraction and inattention
- Simulation for evaluation of driving fitness
- Simulation for driver education and training

Proceedings

All conference papers will be included in the conference proceedings, to be distributed on a USB stick to all conference attendants. Following the conference, there will be several special issues of high-level journals, such as Accident Analysis & Prevention, Transportation Research Part F: Traffic Psychology and Behavior, and Advances in Transportation Studies – an International Journal.

Keynote Speakers

We are honored to welcome Linda Ng Boyle (Professor, University of Washington) and Anna Nilsson-Ehle (Director, SAFER - Vehicle and Traffic Safety Centre) as keynote speakers at RSS 2017.

For more information: info@RSS2017.org; www.RSS2017.org

RSS2017 Local Organizing Committee

We look forward to welcoming you at RSS2017, on behalf of the organizing committee:

• Haneen Farah – Scientific Program Chair (TU Delft)
• Marjan Hagenzieker – Scientific Program Co-Chair (TU Delft & SWOV)
• Tom Brijs - Scientific Program Co-Chair (Universiteit Hasselt)
• Adam Pel – General Chair (TU Delft)
• Winnie Daamen – General Co-Chair (TU Delft)
• Bernat Goñi Ros – Workshops & Technical Tours (TU Delft)
• Silvia Varotto - Workshops (TU Delft)
• Paul van Gent - Technical Tours (TU Delft)
• Nicole Fontein - Conference Organisation (TU Delft)
• Jeroen van der Gun - Website (TU Delft)
• Simon Goede - Finances (TU Delft) RSS Permanent Steering Committee
• Andrea Benedetto (Roma Tre University, Italy
• Elias Choueiri (WSO, USA)
• Stéphane Espié (IFSTTAR, France)
• Essam Radwan (University of Central Florida, USA)
• Nikiforos Stamatiadis (University of Kentucky, USA)
• Åse Svensson (Lund University, Sweden)
• Andrew Tarko (Purdue University, USA)

2017 Upcoming Events

ROAD SAFETY & SIMULATION INTERNATIONAL CONFERENCE 2017
RSS2017

Venue RSS2017 - Grand Hotel Amrâth Kurhaus

The Grand Hotel Amrâth Kurhaus will be the venue for RSS2017. Enjoy a classical Grand Hotel experience in a historical ambience at the Beach; the perfect combination of classical hospitality with modern tradition at Grand Hotel Amrâth Kurhaus The Hague. Our basic principles are to obtain the highest level of service and guest satisfaction by constantly monitoring our personal service, quality and cleanliness as well as exceeding our guests' expectations by. The Hague offers a selection of 253 elegant accommodations.

Gevers Deynootplein 30
2586 CK The Hague
The Netherlands
Email: info@amrathkurhaus.com
Phone: +31(0)70 416 2636

2017 Upcoming Events

FAU FLORIDA ATLANTIC UNIVERSITY
LABORATORY FOR ADAPTIVE TRAFFIC OPERATIONS & MANAGEMENT
in the College of Engineering & Computer Science

5-day Training on Adaptive Traffic Control Systems - March 6-10, 2017; Boca Raton, FL

The training offers some hand-on experiences with adaptive traffic control systems in microsimulation environment.

Our next training will be somewhat modified compared to the previous one. Based on some of your suggestions we will add a day on system engineering process for the ATCS procurements. Also, instead of focusing briefly on many ATCS simulation hands-on exercises we will focus only on few but the simulation exercise will be more detailed.

FAU LABORATORY FOR ADAPTIVE TRAFFIC OPERATIONS & MANAGEMENT PRESENTS

5-day TRAINING ON

ADAPTIVE TRAFFIC CONTROL SYSTEMS

BOCA RATON, FLORIDA
MARCH 6-10, 2017

PURPOSE

Adaptive Traffic Control Systems (ATCSs) are slowly, but surely, replacing traditional coordinated actuated signal systems. Yet, only few training opportunities about existing ATCSs are available for the general public. Potential ATCS users struggle to find information about several aspects of ATCS deployments - anywhere from selecting the right corridor/network for a successful ATCS installation, through the process of selecting a right technology, to better understanding of the fundamental principles of the existing systems. This comprehensive 5-day training is intended to cover all of these issues and give attendees an opportunity to gain additional knowledge about ATCSs, from an unbiased perspective.

TARGETED AUDIENCE

- Public agency decision makers, traffic operation center's staff, and traffic signal practitioners interested in deployment, selection, and utilization of ATCSs.
- Private consultants interested in prioritization of the corridors for ATCS deployment, selection of the technologies, and ATCS features and capabilities.
- Researchers and scholars interested in ATCS's frameworks and their fundamental concepts.

ABOUT INSTRUCTOR

Source: http://www.wptv.com/news/region-s-palm-beach-county/boca-raton/smart-traffic-signals-aim-to-give-you-green-light-on-pbc-roads

Aleksandar Stevanovic, PhD, PE
Associate Professor - Civil, Environmental & Geomatics Engineering @ FAU. Director - Laboratory for Adaptive Traffic Operations & Management (LATOM).
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Phone: (801) 671-2868

Dr. Stevanovic's is the author of the NCHRP Synthesis on "Adaptive Traffic Control Systems: Domestic and Foreign State of Practice". He has authored numerous journal papers and reports on ATCS and traffic signal systems. He is the member of TRB AHB25 Committee on Traffic Signal Systems and he has presented on the ATCS topics at a dozen of ITE, TRB, ASCE, and ITS conferences and webinars. He has been involved with multiple field evaluations of ATCSs and has had hands-on experiences with multiple ATCSs.

TRAINING CONTENT

DAY 1
- Definition, history, and overview of various commercially available ATCSs
- Brief description of various ATCS technologies
- Detailed coverage of fundamental principles of 3-4 major ATCS technologies

DAYS 2-3
- Infrastructural and institutional requirements
- Network prioritization for successful deployment of ATCS technologies
- Criteria and process for technology selection
- System Engineering process for ATCS

DAYS 4-5
- Detailed hands-on exercises on simulated corridors (3-4 major ATCS technologies)

Each training day will be closed with a short quiz to test acquired knowledge. Full-description of the training program will follow soon…

REGISTRATION & COSTS

Further details about registration will follow soon. Training capacity is very limited (about 20 trainees) and it will be handled on the first-come-first-served basis. Interested parties are strongly encouraged to reserve their seats by contacting the organizers asap at astevano@fau.edu.

Estimated training fees (per person) vary from $500 for one day to $1,500 for the duration of the entire training. Discounts will be available for the staff of the local (FL) public agencies (~25%) and university students (~50%). The fees will cover training material, food & refreshments, parking, and certificates of completion.

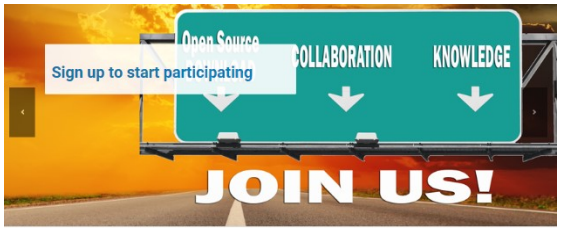
Simulation Resources

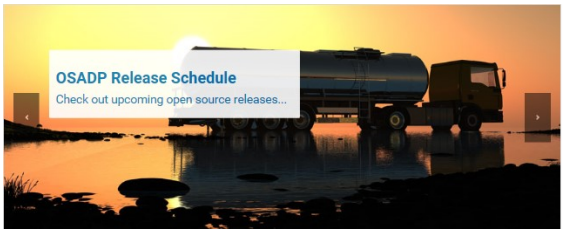
Open Source Application Development Portal (OSADP)

The Open Source Application Development Portal (OSADP) is a web-based portal that provides access to and supports the collaboration, development, and use of open-source ITS-related applications. The OSADP has added a number of new ITS-related applications that are available free to the public.

The U.S. Department of Transportation's Intelligent Transportation Systems Joint Program Office (ITS JPO) funds the OSADP to help facilitate the advancement of research, development, planning, testing, and deployment of connected vehicle and traveler-related applications and ITS. The OSADP features source code, software, applications, and resources (e.g., documentation, licenses, data) to support the use or further development of these ITS-related applications.

Public agencies, service providers, researchers, application developers, and others are invited to visit the OSADP at http://itsforge.net.





Simulation Awards & Workshops

AHB 45 Newsletter
Transportation Research Board

TRB Traffic Flow Theory Committee (AHB45) Newsletter Article on SimSub Awards

Volume 4, Issue 3, March 2016

The Transportation Research Board (TRB) Joint Simulation Subcommittee (SimSub—AHB45(1)), of which our AHB45 Committee is a sponsor, presented two awards at its TRB 2016 annual meeting.

A lifetime achievement award was presented to Haris Koutsopoulos of Northeastern University. Haris Koutsopoulos' first significant contribution to the field was the development, together with Qi Yang, of the microscopic traffic simulation model MITSIMLab. This was one of the first attempts in developing modern traffic simulation models that incorporate all of state-of-the-art driving behavior models, flexibility to incorporate t ravel demand in the form of origin -destination matrices and rout e choices, and traffic control and management measures and logic. Publications from this research are among the most cited in the field and have influenced it tremendously.

Later, Prof. Koutsopoulos led, together with Prof. Moshe Ben -Akiva, the development of DynaMIT, a dynamic traffic assignment model. Within this project, Prof. Koutsopoulos was responsible for the mesoscopic traffic simulation model embedded in the system that is used for traffic estimation and real time prediction. Over the years, Prof. Kousopoulos and his students developed several other more specialized traffic simulation models, including MEZZO, SimMETRO and busMezzo. He has also published extensively on important questions related to the application of traffic simulation models, such as methods and algorithms for the calibration and validation and OD estimation, both off-line and on-line, of microscopic traffic simulation models and DTA systems, rout e choice and driving behavior models and simulation-based evaluations of ITS, transit and rail operations.

A best paper award was presented to Dr. Peter Wagner and Dr. Ronald Nippold from DLR, Germany for their paper "The structure of the parameter space of car-following models". The paper shows that fitting car-following models to different forms of the same data (speed, spacing) leads to different optimal sets of parameters. The authors propose an exploration approach to identify the Pareto front of optimal sets. They further show how their approach can be used to identify the most influential parameters in a model and compare between competing car-following models.

The awards committee included Professors Jorge Laval, George List, Kaan Ozbay, and Tomer Toledo.

2017 Transportation Research Board Meeting—AHB45 Workshops

The Transportation Research Board (TRB) Committee on Traffic Flow Theory and Characteristics (AHB45) is inviting you to attend two workshops it is sponsoring at the 2017 Annual Meeting that will be held on January 8-12, 2017, Washington, DC, USA. Both workshops are led/organized by the Joint Simulation Subcommittee (AHB45(1)) and/or the Subcommittee on Traffic Flow Modeling for Connected and Automated Vehicles (AHB45(3)):

1– The first workshop will be held on Sunday the 8th of January, 2017, between 9:00 AM and 12:00 PM. It is titled: —Emerging Needs for Improving Simulation Models in The Immediate, Intermediate and Long-Term Horizons.

2– The second workshop will be held on Thursday the 12th of January, 2017, between 8:30 AM and 11:30 AM. It is titled: —Active Transportation Operation and Demand Management in Connected/Automated Traffic Systems: Data Collection and Analytics, Modeling and Control.

Emerging Needs for Improving Simulation Models in the Immediate, Intermediate, and Long-Term Horizons

Sunday 9:00 AM– 12:00 PM
Convention Center, 103A
Workshop 134

Sponsored by:
Standing Committee on Traffic Flow Theory and Characteristics (AHB45)
Standing Committee on Transportation Network Modeling (ADB30)
Task Force on System Simulation (AHB80T)

Capturing the Impact of Exogenous Factors on Freeway Performance in the Connected Driving Environment: From Data Analysis to Exploratory Modeling

Samer Hamdar, George Washington University

Non-uniform interactions between individual drivers and errors in the driving decision making processes have been previously identified as major contributors to unsafe and unstable traffic conditions. "Connected and Automatous Vehicle" (CAV) technologies have been proposed to eliminate driver behavior errors and heterogeneity leading to "smoother" traffic flows with limited disturbances. Motivated by the prominence of such CAV technologies, this presentation starts but showcasing the non-uniform impact of surrounding driving conditions on roadway performance. Such impact has been quantified using detector data, driving simulator data and instrumented vehicle data gathered/mined by the GWU research team. The team has incorporated its findings into different simulation methods for further analysis. The results show the validity of these methods with an increase in roadway capacity and an improvement in traffic stability as the Market Penetration Rate (MPR) and the CAV "level of control" increase.

Modeling Driver Input and Vehicle Dynamics: A Naturalistic Empirical Approach to Modeling Car-following Behavior

Hesham Rakha, Virginia Polytechnic Institute and State University

The common approach in car-following modeling is to model the human-in-the-loop (driver) and vehicle as a single entity. The talk highlights the need and benefits of separating these two entities using empirical naturalistic data. The talk highlights this approach for emerging connected a automated vehicle modeling applications, enhancing existing car-following models and modeling of vehicle energy/fuel consumption and emissions.

SimSmartMobility - a Simulation Framework to Evaluate the Effects of Cooperative and Connected ITS

Hans Van Lint, Delft University of Technology

Whereas the focus of industry and public bodies has largely been on (pilot) implementations of C-ITS and VA technologies, one of the biggest puzzles of a successful transition to connected, cooperative and ultimately automated car-mobility relates to understanding the complex new interactions that will take place between intelligent vehicles and drivers without this intelligence. In this talk I will outline the ideas behind SimSmartMobility (SSM), a collaboration between TU Delft, TNO, and the Dutch ministry of Transport and The Environment. In SSM the open-source simulation environment OpenTrafficSim provides a simulation model designed to study those interactions, but also other simulation tools (VISSIM, Aimsun, etc) can be connected to the SSM environment. I will discuss the underlying ideas and show results with the first prototype developed in the fall of 2016.

Network Level Modeling and Applications of CAV Technologies with Focus on the Level 2 (Long Term Needs) Automation

Hani Mahmassani, Northwestern University

An assessment of the current microscopic/ macroscopic simulation models used to evaluate the impact of Connected and Automated Vehicles (CAVs) technologies on the transportation network is desired. In this presentation, the gaps and the findings associated with these models are presented. Such materials will motivate the future direction of research to be adopted by the AHB45 Committee in order to improve these models (the more long-term needs - Level 2 Automation and beyond). It should ne noted that such models should be developed without focusing necessarily on the current link level applications/examples as the network CAV level applications are of interest especially when dealing with network wide connectivity.

Validation of Simulation Models Using Vehicle Trajectories

Vassili Alexiadis, Cambridge Systematics, Inc.

Analysis, Modeling and Simulation (AMS) tools are often used in transportation planning decision-making, and increasingly in a real-time operational environment. More accurate AMS tools are needed for better, more effective transportation funding investment and real-time operational decisions. This presentation provides an update on this FHWA project to enable AMS tools to be validated and calibrated based on detailed vehicle trajectory-level data, which will improve the accuracy of AMS tools. The objectives of the project are to: a) Compile existing and collect new vehicle trajectory level datasets; b) Develop a documented process/ methodology for enabling trajectory level AMS tool validation; c) Develop a computational engine that allows the process/methodology to be demonstrated; and, d) Demonstrate the validation process.

Testing and Evaluation of Connected Automation Applications

Taylor Lochrane, Federal Highway Administration (FHWA)

(no abstract provided)

Use of Simulation for Highway Capacity Manual Purposes

Tuesday 3:45 PM- 5:30 PM
Convention Center, Hall E
Poster | Practice Ready Paper

Sponsored by:
Standing Committee on Highway Capacity and Quality of Service (AHB40)

Operational Criteria for Spanish Two-Lane Highways. Passing and Alignment considerations

Ana Moreno, Technical University of Munich

The effect of highway bendiness on traffic performance is not directly addressed on the current HCM analysis procedure for two-lane highways. Given the relationship between operating speed and horizontal alignment, highway bendiness could potentially affect speeds and platooning; and, it may be risky to use design speed in estimating free-flow speeds at segments with high bendiness. Moreover, HCM considers the effect of passing restrictions through the percentage of no-passing zones; which can lead to quite unrealistic results. The objective of this research is to evaluate the effect of passing restrictions and highway alignment variations on two-lane highway operation and incorporate it in the analysis methodology, if significant. The influence of horizontal and vertical alignment on their traffic operation was studied on 19 uniform segments from Spanish two-lane highways using TWOPAS. Alignment was classified following the German procedure: curvature change rate (CCR) and class of gradient. Passing restrictions were studied on straight segments. Percentage of no-passing zones and aver-

age passing zone length were considered. The results indicate that solely geometry was not enough to characterize traffic operation on the most linear alignments, and passing restrictions should be also included. These results can be applied to evaluate traffic efficiency on two-lane highways, in replacement of the HCM.

Data Analytics and Pattern Recognition Methods for Work Zone Simulator Studies

Samareh Moradpour, Missouri University of Science and Technology (MUST)
Suzanna Long, MUST
Ruwen Qin, MUST
Dincer Konur, MUST
Ming Leu, MUST

This research presents a driving simulator based study to evaluate a driver's response to alternate work zone sign configurations. This study has compared the Manual on Uniform Traffic Control Devices (MUTCD) configurations against Missouri Department of Transportation (MoDOT) alternate configurations. Study participants within target populations, chosen to represent a range of Missouri drivers, have attempted four work zone scenarios as part of a driving simulator experience. The test scenarios simulated both right and left work zone lane closures with both the CLM and MoDOT alternatives. Drivers' merging patterns were measured against demographic characteristics of test populations. Statistical data analysis was used to investigate the effectiveness of the alternate configurations employed under different scenarios. The results of this simulation study were compared to the results from a previous MoDOT field study. Pattern recognition and data analytics suggest a correlation between age and gender with the location of merging for the simulated scenarios. . Based on results it is observed that the drivers merge earlier with the MoDOT alternative sign than they do with the MUTCD sign. This suggests that MoDOT alternative sign is safer. Also, this observation is in line with the observations of Field study.

Queue Clearance Rate Method for Estimating Passenger Car Equivalents at Signalized Intersection

Mithun Mohan, Indian Institute of Technology, Roorkee
Satish Chandra, CSIR-Central Road Research Institute New Delhi

This study explores the use of queue clearance rate method for estimating passenger car equivalents (PCE) at signalized intersections. PCE is estimated based on the assumption that the rate at which a queue of vehicles clears the intersection is a function of its composition. Results of this method is compared with some of the popular techniques for PCE estimation. A four-legged intersection was simulated in VISSIM software and different techniques were used to convert the traffic mix into a uniform one. Parameters of VISSIM were modified to closely reflect the traffic behaviour under heterogeneous traffic conditions. All approaches of the intersection were loaded to saturated conditions and accuracy of estimated PCEs were established by comparing converted flow (PCE/h) with the capacity of an all-car traffic stream. Method based on saturation flow delivered the best result, but its use was limited to traffic composed only of two types of vehicles. Results of regression and optimization techniques were almost same and the converted flow was close to the capacity of all-car stream. However, accuracy of these methods largely relied on the correct value of saturation flow. Determination of exact saturation flow is quite difficult under heterogeneous conditions and when popular saturation flow models were used, these two methods performed poorly. On the contrary, queue clearance rate method is independent of saturation flow and delivered reasonable estimates of PCE throughout the simulation runs, with the difference between converted flow and capacity falling consistently within 10%.

Development of Capacity Model for Urban Arterials using VISSIM

Ashish Dhamaniya, S.V. National Institute of Technology-Gujarat
Satish Chandra, CSIR-Central Road Research Institute New Delhi

Traffic is heterogeneous in all countries in the world including US but the degree of heterogeneity is different in developing and developed countries. The Highway capacity manual (HCM 2010) of US has defined two categories of vehicles visually car and heavy vehicles. However, in the car category there are many models like hatchback, sedan, SUV and XUV are plying on the road whereas in the heavy vehicle category, bus, two and three axle trucks are there on the roads. The operating and physical characteristics of these vehicles are different and they affect the speed flow characteristics of the stream at different flow levels thus consequently affect the capacity of the roadway. The present paper demonstrates the effect of traffic mix on capacity of urban arterial roads and proposes a mathematical model to determine capacity of six-lane divided urban arterial at different composition of various categories of vehicles present in the traffic stream. Microscopic simulation software VISSIM is used to develop the model. Speed flow characteristics of various categories of vehicles are studied in the field and are used to calibrate and validate the software for Indian traffic conditions. Traffic data collected in field are used to derive capacity of the road in terms of equivalent passenger car unit (PCU) per hour. The capacity of six-lane road as achieved from the field data is 6300 PCU/hr for one direction of traffic flow. This capacity value was further achieved through simulation run for 'all car' conditions using calibrated VISSIM software. The program was run for small car and one of the remaining four categories of vehicles at different compositions in the traffic stream. Regression equations were developed for each set of simulation run for all four categories of vehicle with standard car. These equations are then combined to get the equation of capacity mix. Further, a stream equivalency factor (SEF) is introduced that can be used to convert heterogeneous traffic stream into homogeneous equivalent without actually using the passenger car units (PCU) values. The proportion of each category of vehicle in the traffic mix and total vehicle volume in veh/hr is taken as independent variable in developing SEF model. Two models have been proposed in the study. The capacity model may be used for quick estimation of volume to capacity (v/c) ratio which is the surrogate measures of level of service (LOS) on the roadway and at the same time capacity of a roadway can be determined in pcu/hr using SEF model without actually using the PCU factors. Similar models may develop for US conditions when variety of vehicles is present in the traffic mix.

Optimizing/Modelling Toll Way Operation Using Micro Simulation: Case Study Sanand Toll Plaza, Ahmedabad, Gujrat, India

Manraj Bains, Transaxiom
Shriniwas Arkatkar, Sardar Vallabhbhai National Institute of Technology, Surat
KS Anbumani, L & T
Siva Subramaniam, L & T

This study aims at developing a model for optimizing toll plaza operations in terms of operation cost and level of service for users of microsimulation. A well calibrated and validated model is developed in VISSIM and several scenarios are simulated to test their efficacy for improving toll plaza operations. Data collected includes classified entry traffic volume at toll plaza, service times for different payment categories, percentage of lane utilization and travel time while crossing the toll plaza. For modelling lane selection for vehicles VISSIM Component Object Model (COM) Application Programming Interface (API) is used which enables dynamic route choice. From the results it is observed that the simulation model accurately represents the current operations at the toll plaza. Scenarios such as implementing a number plate recognition technology to increase the present service time and segregating lanes for different vehicle types to improve the level of service are evaluated using the simulation model.

Level of Service Criteria on Indian Multilane Highways based on Platoon Characteristics

Sudipa Chatterjee, Indian Institute of Engineering Science and Technology, Shibpur
Debashish Roy, Indian Institute of Engineering Science and Technology
Sandip Chakraborty, Indian Institute of Engineering Science and Technology, Shibpur
Sudip Kumar Roy, Indian Institute of Engineering Science and Technology, Shibpur

Increasing traffic flow demand has forced transport planners to increase the number of lanes of highways to provide good maneuvering facilities to the road users. As a result, several highways in India have been widened for capacity augmentation and quality improvement. Thus it has become essential to evaluate the operating condition of Multilane highway facilities. Level of service (LOS) is a qualitative term describing the operational condition of a transportation facility. In order to evaluate the operating condition under a facility we need some quantitative measure for defining the level of service. The quantitative basis is referred as measure of effectiveness (MOE) for that facility. The LOS concept devised by US-HCM (TRB, 2010) has got limitation for direct implementation in heterogeneous traffic system prevailing in India. A well defined LOS criterion for heterogeneous traffic conditions is essential for Indian traffic perspective. An attempt has been made in the study to evaluate level of service considering the platoon parameters observed on Indian Multi-Lane Highways as MOE. For the proposed study, total six Multilane highway sections have been considered across the country. A critical headway of 5 seconds is adopted for evaluation of different platoon characteristics such as follower rate, follower density, percentage follower and platoon rate. Threshold values are proposed for the different LOS based on follower density which is found to be the most suitable parameter for mixed traffic conditions using k-means clustering technique.

Estimating the Capacity Impacts of Urban Street Incidents

Aidin Massahi, Florida International University (FIU)
Mohammed Hadi, FIU
Maria Adriana Cutillo, FIU
Yan Xiao, FIU

Incident impacts on capacity is the most critical parameter to estimate the influence of incidents on network performance. The Highway Capacity Manual (HCM 2010) provides estimates of the drops in capacity due to incidents, as a function of the number of the blocked lanes and the total number of lanes of the freeway section. However, there is limited information regarding the impacts of incidents on the capacity of urban streets. This study investigates the capacity impacts of the interaction between the drop in capacity below demands at midblock urban street segment location and upstream and downstream signalized intersection operations. A model was developed to estimate the drop in capacity at the incident location as a function of the number of blocked lanes, distance from downstream intersection, and g/c ratio of the downstream signal. A second model was developed to estimate the reduction in the upstream intersection capacity due to the drop in capacity at midblock incident location as estimated by the first model. The second model estimates the drop in capacity of the upstream links feeding the incident locations as a function of incident duration time, V/C ratio at the incident location, and distance from an upstream signalized intersection. The models were developed based on data generated utilizing a microscopic simulation model that was calibrated by comparison to parameters suggested in the HCM 2010 for incident and no-incident conditions and by comparison with field measurements.

Simulation of Roundabouts to Advance Implementation

Tuesday 3:45 PM- 5:30 PM
Convention Center, 103A
Lectern | Practice Ready Paper

Craig Parks, Boone County, Indiana, presiding

Sponsored by:
Standing Committee on Roundabouts (ANB75)

Modeling and Analysis of Multimodal Modern Roundabouts

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This paper analyzes and compares the operational, safety and emission performance of multi-lane multi -modal roundabout as compared to the signalized intersections using VISSIM and VISWALK micro-simulation models. By simulating pedestrian/cyclists movement and capturing the interaction with motorized vehicles, this research models the delay, travel time and network efficiency experienced by all modes. Safety surrogate measures has also been estimated to analyze interaction/conflict between pedestrian/bicycle and vehicle flow. The results of the analysis shows that roundabout outperformed the signal controlled intersection in terms of improved travel time, reduced delay, higher average speed, less number of stops and less waiting time. The emission analysis results show that roundabouts can be considered a sustainable design option in terms of less vehicular emission as it creates a smooth flow of traffic by eliminating stop and go condition compared to the signalized counterpart. The extensive safety analyses using surrogate measures justifies the use of multi-use pathways around roundabouts as it creates a safer design option for active modes. Thus this paper which incorporates operational, safety and environmental improvement measures for a multi-lane roundabout considering mixed modes provides an objective comparison with other types of intersection control design.

Effect of Calibration Process in Comparison of Simulated and Observed Rear-end Conflicts at Roundabouts

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A methodology for calibrating and validating VISSIM simulation model is presented that allows to replicate the observed vehicles conflicts. A case study roundabout has been selected to test the usefulness of a combined approach of VISSIM simulation package and the Surrogate Safety Assessment Model (SSAM) for providing reliable estimates of traffic conflicts. Safety performance has been assessed from the field by video-recording vehicle interactions at the roundabout, and then expressed in terms of Time To Collision (TTC) values. The proposed calibration procedure has been performed by a multistage methodology involving microscopic drivers' car following behavior parameters to enhance the correlation between observed and simulated queue lengths at the roundabout's entries. The calibration procedure is based on a statistical screening of inputs leading to a linear expression relating significant parameters to the queue length. The best estimates of the model's parameters have been determined using a Genetic Algorithm technique. The spatial distribution of the rear-end conflicts and the TTC values determined by SSAM have been finally compared with the observed ones to analyze the capability of the model of replicating rear-end conflicts. The results suggest to that this calibration procedure impacts positively on the estimate of the safety performance measures obtained through the simulation processes. Notwithstanding the good results in the evaluation of the model's accuracy, the

simulation seems to fail in reproducing the traffic phenomena linked to unusual driving behavior, and therefore it is not able to replicate forced drivers' maneuvers that can lead to a conflict situation.

Operational Evaluation of Two-Lane Roundabouts at Freeway Ramp Terminals

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In the US, roundabouts have been recently constructed to replace signalized intersections at freeway ramp terminals as a safety treatment. In practice, this is need of guidelines specifying conditions under which the roundabouts or signalized intersections are more appropriate when assisting practitioners in deciding which alternative to choose. Particularly, there lacks research of a comprehensive operational comparison between roundabout and signalized interchanges. This research, through a strictly calibrated microscopic simulation platform, analyzes and models the control delays at double-lane roundabout and signalized interchanges. Both roundabout and signalized interchanges were modeled in a VISSIM simulation platform. Capacity at each roundabout entrance was calibrated and validated separately for passenger cars and heavy vehicles as both vehicle types have different critical and follow-up headways. The design of the simulation experiments covered 2880 different scenarios for roundabout and signalized interchanges with varying ramp and arterial volumes, ramp spacing, and heavy vehicle percentages. Based on the simulation results, control delays and level of service (LOS) of the off ramp and arterial approaches of roundabout and signalized diamond interchanges were modeled and compared. Ultimately, guidelines for selection between double-lane roundabout and signalized interchanges were developed and presented in the form of look-up tables. These tables provide an easy-to-use tool for practitioners to determine the appropriate double-lane interchange to install under specific combination of traffic demand, heavy vehicle percentage, and ramp spacing conditions.

Comparison of Driver Navigation at Turbo Roundabouts and Modern Two-Lane Roundabouts: A Simulation Study

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Roundabouts can be a solution to safety concerns present at other types of intersections. Recently in the United States, there has been an increase in conversion of problematic intersections to roundabouts to improve their safety. However, it is difficult to make these roundabouts, especially multilane roundabouts, safe to all ranges of users. It is usually difficult for drivers to navigate a newly-built or a new type of roundabout. Roundabout features such as pavement markings and signage play an important role in driver navigational performance. This research was an effort to evaluate new roundabout design and existing roundabout safety and operational features such as signs and pavement markings. The focus was on how such features influence performance of drivers, specifically at multilane roundabouts. We evaluated two-lane roundabouts and rotor turbo roundabouts. A driving simulator was employed to test various simulation scenarios in a virtual world. The results indicate that lane keeping and speeding are still problems at multilane roundabouts. The rotor turbo roundabout outperforms the two-lane roundabout in enabling correct lane choice and navigation speed control by drivers. Furthermore, it was found that roundabout signs and pavement markings used in the United States can be adopted for turbo roundabouts.

Joint Traffic Simulation Subcommittee

Transportation Research Board Annual Meeting
Monday, January 11, 2016, 7:30-9:30PM
Marriott Marquis, Marquis Ballroom Salon 10 (M2)

Introductions - George List
Sponsoring Committee Chair Remarks - attending chairs or liaisons
Task Group Reports
- Annual Workshop (brief synopsis) – John Halkias
- Research Needs and Resources Task Group - Mohammad Hadi
- Calibration, Verification and Validation Task Group - Ray Benekohal
- Awards – Tomer Toledo
- Liaison & Outreach (transit, bike) – Rob Bertini
- SimSub Annual Report – David Hale
- Mesoscopic Task Group – Yi-Chang Chiu
- Agent-Based Simulation Task Group – Monty Abbas
- SimCap Liaison – Randy Johnson

ATDM-DMA Analysis, Modeling, and Simulation (AMS) Testbed Project – James Colyar
Presentations
- Transportation System Simulation Task Force – Rob Bertini
- SUMO - David Hale
- ETFOMM – Li Zhang
- FHWA Bottleneck Project – David Hale
- ARPA-E program, TRANSNET– Ismail Zohdy

Leadership Transition – George List / Mohammed Hadi
Other Business
Closing