The National Academies of
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TRB
TRANSPORTATION RESEARCH BOARD

Workshop on Traffic Simulation and Connected and Automated Vehicle (CAV) Modeling

A Virtual Meeting

November 16-18, 2020

All times are in Pacific Standard Time – California PST 7:00 a.m. *and*
Eastern Standard Time – Washington, DC EST 10:00 a.m.

Description

Transportation system simulation is widely used to support the business processes of transportation agencies including those related to planning, design, operation, management, and safety of increasingly complex multi-modal transportation systems. The advent of connected, automated, shared, and electric (CASE) vehicles provide challenges to be addressed with simulation. This virtual workshop will bring together researchers, vendors, and users of transportation system simulation to identify persistent challenges, discuss solution approaches, present recent research findings, and identify future research needs related to traffic simulation modeling. The discussions will focus on the history, status, and future of traffic simulation, plus modeling of CAVs. The workshop includes invited panels, sessions based on a call for papers/posters, and breakout sessions.

Preliminary Agenda

As of 11/12/2020 and Subject to Change

DAY 1 – MONDAY, NOVEMBER 16, 2020

7:00 am – 8:30 am PST **----------** **10:00 am – 11:30 am EST**	**Introduction and first panel: Traffic Simulation – Past, Present, and Future** Welcoming Remarks and Introduction to the Workshop • Workshop Introduction, Mohammed Hadi • History of Simulation Workshops, Pitu Mirchandani • History and Vision of Simulation Research, John Halkias • Simulating AVs as Safety Agents in a Human-driven Fleet, Jane Lappin • FHWA Research on Emerging Technology Modeling, Gene McHale • DOE's Energy Efficient Mobility Systems: SMART Mobility Modeling & Simulation, David Anderson • European State and Direction of Simulation Modeling, Peter Vortisch

9:00 am – 10:30 am PST **----------** **12:00 pm – 1:30 pm EST**	**Elements in Emerging Vehicle Analysis, Modeling, and Simulation** ***Moderator: Loren Bloomberg*** 3967: Beyond the Transportation System Simulation Manual – What is Next?, George List 3960: Enabled Analysis, Modeling, and Simulation (AMS) for Cooperative Automated Vehicle (CAV) Applications, Monty Abbas 3971: Understanding future impacts of CAVs through the Mobility Energy Productivity (MEP) lens, Stanley Young 3951: Evaluating Benefits of Connected and Automated Vehicle (CAV) Technologies to Prepare for Future Deployment, Zhitong Huang 3314: Trajectory-Level Data Collection Efforts to Improve Traffic Model Development, Rachel James **Simulating Alternative Mobility Options** ***Moderator: Peter Vortisch*** 3817: Solving large-scale TNC vehicle scheduling problems with an "analytical simulation-based" optimization, Taylor Li 3863: Micro-Simulation to Model and Evaluate TNC Activity, Curb Management, and Pedestrian Infrastructure in a Busy Multi-Modal Environment, Sai Sirandas 3949: Validating POLARIS Ride-hail Simulation through Back-casting in Chicago, Joshua Auld 3964: Simulation Approach to Planning and Evaluating Autonomous Vehicle Ride Hailing in a Geo-Fenced Area, Karina Meneses 3934: The Distributional Effects of Household Vehicle Automation on Mobility, Zachary Needell
11:00 pm – 12:45 pm PST **----------** **2:00 pm – 3:45 pm EST**	**Interactive Session: National and State Guidance –Lessons Learned and Gap Identification** ***Moderator: Sanhita Lahiri*** Perspective from State agency based on what influenced the State to develop guidance for traffic analysis. The challenges and the lessons learned, and the needs and opportunities in the development of traffic analysis guidance. The session also addresses how can national guidance/standards help. **Panelists:** Sanhita Lahiri, Virginia Department of Transportation Raj Ponnaluri, Florida Department of Transportation Douglas Norval, Oregon Department of Transportation Vicki Haskell, Wisconsin Department of Transportation John Halkias, Federal Highway Administration James Sturrock, Federal Highway Administration **Session Format:** 10-15 minute presentations on DOT and FHWA guidance, focusing on above topics, followed by Roundtable discussions
1:00 pm-2:30 pm PST **----------** **4:00 pm-5:30 pm EST**	**SimCap Overview** This **Sim**ulation & **Cap**acity Analysis User(s) Group (SimCap) quarterly meeting will review the latest activities of the public agency and consultant members, discuss strategies for expanding and improving SimCap, and provide technical discussions and presentations. SimCap consists of a volunteer network of professionals working across geographic and organizational boundaries to share information, experiences, and to disseminate, promote, and develop guidance and best practices in the application of traffic simulation and capacity analysis tools, methods, and related practice areas.

DAY 2 – TUESDAY, NOVEMBER 17, 2020

7:00 am –8:30 am PST **----------** **10:00 am – 11:30 am EST**	**Workshop Emerging Concepts in Calibration and Validation of Traffic Simulation Models** ***Moderator: David Hale*** This workshop will address emerging concepts in traffic simulation calibration such as vehicle trajectory-based calibration, calibration for future conditions, sensitivity of driver behavior to traffic density, consistency among resolutions, libraries of parameters, plus calibration of simulation models for cooperative automated vehicles (CAVs). Attendees will discuss simulation modeling calibration approaches such as pseudo-trajectory calibration, repositories for calibrated models, k-fold or n-fold validation, and real-world CAV data collection efforts**.** • 3780: Advanced Calibration of Vehicle Trajectories for Microsimulation, David Hale • Region-Wide Calibration of Bottleneck Capacity and Demand-Capacity Functions in a CAV Simulation Framework, Xuesong Zhou • Calibration Framework for Simulation Tools to Manage Uncertain Future Conditions, Hani Mahmassani • How to calibrate a car-following model? A Pareto efficient calibration setting and its implication on research transparency and reproducibility, Vincenzo Punzo • A two-level probabilistic approach for validation of stochastic traffic simulations: impact of drivers' heterogeneity models, Marcello Montanino
9:00 am – 10:30 am PST **----------** **12:00 pm – 1:30 pm EST**	**Cooperative Driving Automation and Associated Applications, Part 1** ***Moderator: Kaan Ozbay*** 3909: SCoPTO: Signalized corridor management with vehicle trajectory prediction and optimization under mixed-autonomy traffic environment, Jiaqi Ma 3944: Simulation of Mixed CAV Traffic with Cooperative Lane Changes, XiaopengLi 3972: May I join you? A Cooperative Vehicle Platooning to Minimize the Disturbance from Joining a Platoon, Alireza Talebpour 3970: Capacity Paradox of Connected Automated Vehicles in Mixed Traffic, Soomin Woo 3980: Freeway Cooperative Merge Control via Cooperative Multi-agent Deep Reinforcement Learning, Jiaqi Ma **Infrastructure Support Simulation** ***Moderator: Mike Hunter*** 3952: Can GNSS support platooning in mixed traffic?, M N Sharath 3977: Impact of Sensing Range on the Performance of Real-Time Traffic Signal Control, Chris Day 3914: The effects of vehicle-to-infrastructure communication reliability on performance of signalized intersection control, Toledo Tomer 3945: Simulation of Connected and Automated Vehicles (Cav) Mobility Data Sharing Using Blockchain, Junaid Ahmed Khan

11:00 am – 12:45 pm PST **----------** **2:00 pm – 3:45 pm EST**	**Breakout Sessions** *Breakout Rooms* • **Emerging Vehicle Technology** *Moderator: James Sturrock* • **Researching Solutions to Gaps that are Facing Simulation Modeling** *Moderator: John Shaw* • **Multi-Modal and Mixed Traffic Models** *Moderator: Peter Vortisch* • **Simulation to Support Performance-Based Decisions** *Moderator: Loren Bloomberg*
1:00 pm – 2:30 pm PST **----------** **4:00 pm – 5:30 pm EST**	**Advancement in Modeling Emerging Technologies – Technology Presentations** ***Moderator: George List*** • Multimodal optimization of roadspace, Jochen Lohmiller, PTV • Holistic Approach For Simulation And Modelling Of C-ITS Services, Tamara Djukic and Jordi Casas, AIMSUN • Simulating Impacts of Connected and Autonomous Vehicles Under Supply Uncertainties: An Experimental Design Approach, Daniel Morgan, Caliper Corporation • Advances in Large Scale Traffic Simulation and Dynamic Traffic Assignment, Michael Mahut, INRO

DAY 3 – WEDNESDAY, NOVEMBER 18, 2020

7:00 am –8:30 am PST **----------** **10:00 am – 11:30 am EST**	**Multi-Resolution and Agent-Based Modeling** ***Moderator: Randy Johnson*** 3901: Twenty Hours of Insight from the World's Foremost Experts on Multiresolution Modeling, David Hale 3939: Multi-Resolution Modeling of Active Transportation and Demand Management Strategies, Joe Blasi 3941: Modeling and Impact Assessment Framework for Autonomous Vehicles in Multi-resolution Simulation Models, Athina Tympakianaki 3968: Hybrid and Distributed Macroscopic Traffic Simulation with Open Traffic Models, Gabriel Gomes 3938: Efficient Agent-Based Model of Network Trip Flow with General Demand Patterns, Irene Martínez **Cooperative Driving Automation and Associated Applications, Part 2** ***Moderator: Rachel James*** 3772: Longitudinal Dynamics in Traffic Microsimulation, Shirin Noei 3929: Evaluation of CAV Platooning on Uninterrupted Freeway Merge Bottleneck Capacity Using VISSIM, Soheil Sajadi 3975: Impact of Commercially Available Automated Vehicles on Signalized Intersections, Md. Ashraful Imran 3926: Capacity Impacts of Adaptive Cruise Control Vehicles At Bottlenecks, Raphael Stern 3911: Application of Dynamic Lane Assignment to Combined Flexible Lane Assignment and Reservation-based Intersection Control, Farzaneh Azadi 3910: Development of a Framework for CAV Modeling in Simulation and Application, Kevin Johns

9:00 am – 10:30 am PST **----------** **12:00 PM – 1:30 PM EST**	**Effects of CV-Based Applications on Performance** ***Moderator: Meenakshy Vasudevan*** 3930: Evaluation of the Operational Effects of Autonomous and Connected Vehicles through Microsimulation, Pruthvi Manjunatha 3950: Modeling Speed Adaptation of Connected Drivers with Infrastructure-to-Vehicle (I2V) Variable Speed Advisory, Hao Liu 3913: A Hardware-in-the-Loop Simulation System for Assessing Intersections with Cooperative Traffic Signal Control and Connected Automated Vehicles, Hao Liu 3220: Benefits of Connected Vehicle Signalized Left-Turn Assist: Simulation-Based Study, Mahmoud Arafat 3976: Mobility Implications of CAV Lane Reservation in Mixed Traffic Environment, M. Shoaib Samandar **Multimodal Modeling** ***Moderator: Joshua Auld*** 3917: ASPIRES: Airport Shuttle Planning and Improved Routing Event-driven Simulation, Qichao Wang 3919: Development of Guidelines for Implementation of Freight and Transit Signal Priorities in Urban Corridors, Evangelos Kaisar 3925: An HPC-enabled Simulation Framework for Designing and Evaluating Curbside Traffic Management Policies at Dallas/Fort Worth Airport, Juliette Ugirumurera 3932: Usage of Microscopic Traffic Simulation to Quantify Traffic Impact of Autonomous Maintenance Technology, Qing Tang
11:00 am – 1:00 pm PST **----------** **2:00 pm – 4:00 pm EST**	***Moderators: Mohammad Hadi and Sanhita Lahiri*** Briefings by Breakout Session Moderators and Discussion of the Findings Traffic Simulation Committee Next Steps and Closing Remarks