Program Progress Performance Report
for the
New England University Transportation Center
Massachusetts Institute of Technology

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REPORTING CATEGORIES

1. Accomplishments

1A. Research Projects

Major goals as stated in New England UTC Prospectus

Research Goal

- To conduct research in technology applications and systems integration with related work in policy, planning and human factors that improve transportation safety as well as further our understanding and realization of livable communities to support mobility across the lifespan.

- To support peer-reviewed investigations that address safety and livability by exploring and furthering research, policy, and practice in the application of ubiquitous intelligence, use of big data, and improved human performance

Following is the list of the 37 research projects under this grant, and their current status:

Project No.	PI	Project Title	Status
MITR25-1	Abou-Zeid Ben-Akiva	Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones	active
MITR25-2	Caplice Caballero	High-Resolution Urban Freight Modeling in Cambridge, MA	completed
MITR25-3	Coughlin	Assessing Navigability and Livability of Public Transportation Systems	active
MITR25-4	Ellis Lavalliere	Transportation Workforce Health and Wellbeing	completed
MITR25-5	D'Ambrosio	Understanding the Adoption of and Education about New Auto Technologies among Older Adults	completed
MITR25-6	Frazzoli	Modeling the Impact of One-Way Car Sharing: An integrated data- and optimization-driven approach	completed

MITR25-7	Goentzel	Stochastic Analysis of Logistics Capacity in Disaster Response Networks	active
MITR25-8	Gonzalez	Coupled Mobility Networks: A Data Driven Approach	completed
MITR25-9	Isaacson	Out and About in New England: Maintaining Active Life styles in Later Life	completed
MITR25-10	Lee	Effectiveness of Various Information Channels on User Training and Learning in Automobiles	completed
MITR25-11	Osorio	Optimal Road Traffic Operations for an Increasingly Autonomous and Connected Vehicle Fleet	completed
MITR25-12	Pentland Shmueli	Incentivizing Safer Driving Using Peer-Pressure	active
MITR25-13	Reimer Dobres	Assessing the Effect of Typography on In-Vehicle Glance-Like Reading Across the Lifespan	active
MITR25-14	Salvucci Murga	MALL Transit and Wider Economic Benefit Assessment	completed
MITR25-15	Sussman	Hub Stations As Catalysts for Regional Growth: The Case of New York Penn Station	active
MITR25-16	Trancik	From Trip Data to the Energy Requirements of Personal Vehicle Travel	active
MITR25-17	Zegras Pereira	Scenario Discovery for Resilient Urban Systems (or, The Future is "Big Data")	completed
MITR25-18	Zhao	Humanizing Travel: How E-hail Apps Transform Stakeholder Relationships in Taxi Services	active

HVDR25-19	Glaeser	Transportation Stimulus Spending and Long Term Unemployment	completed
HVDR25-20	Gomez-Ibanez Fagan	The Experience with Managed Toll Lanes	active
HVDR25-21	Howitt	Recreating Livable Communities after Catastrophe: Managing the Recovery from Japan's Earthquake, Tsunami, and Nuclear Disaster of 2011	active
HVDR25-22	Mayne	The Politics of Transport Policy in the Greater Copenhagen Region, Part 2	active
HVDR25-23	Shoag	The Local Effects of the American Recovery and Reinvestment Act on Economic Activity and Traffic Safety	completed
UMAR25-24	Christofa Knodler	Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands	active
UMAR25-25	Fisher Knodler Zafian	Evaluating the Effect of Google Glass on Driver Distraction	active
UMAR25-26	Gao	Routing Policy Choice Models in Stochastic Time-Dependent Networks: The Stockholm Case Study	active
UMAR25-27	Gonzales	Route Choice in Congested Grid Networks	active
UMAR25-28	Knodler Fisher	A Driving Simulator Evaluation of Driver Distraction and Traffic Control Device Comprehension for At-Grade Railroad Crossings	active
UMAR25-29	Krishnamurty	An Innovative Design to Retrofit Seatbelts in Motorcoaches	active
UMAR25-30	Ni Wang	Supplementary Vehicle Positioning to Connected Vehicles	active
UCNR25-31	Atkinson-Palombo Garrick	A Multi-Scalar Model to Identify the Causes of Decreased Vehicle Miles Traveled (VMT) in the United States	completed

UCNR25-32	Garrick Atkinson-Palombo	Factors Contributing to the Decrease in Traffic Fatality Rates for Young People in America	completed
UCNR25-33	Ivan Ravishanker Townsend	Social Network Effects on Attitudes about Pedestrian Street Crossing Behavior	active
UCNR25-34	Konduri Dalal	Exploration of Human Psychological Factors Underlying Mobile Phone Usage Behaviors while Driving	active
UCNR25-35	Lownes	Clustering Algorithms for Transit Network Design	active
UMER25-36	Garder	Deficient Bridges and Safety Information	completed
UMER25-37	Rubin Garder	Automated Vehicles: Economic Incentives for Environmental Benefits and Safety	active

Accomplishments under the New England UTC's research goal

Project MITR25-11
Optimal Road Traffic Operations for an Increasingly Autonomous and Connected Vehicle Fleet
The goal of this project is to develop decision-making tools that enhance our understanding of the intricate relationship between vehicle autonomy, traffic operations and congestion externalities. A detailed traffic simulation tool was used to investigate the relationship between vehicle autonomy, travel demand attributes (e.g., driver behavior), and network supply (e.g., prevailing traffic management strategies). The project carried out the following tasks. We have formulated, designed and prototyped, offline and online, calibration algorithms, such as to fit the input parameters of the new generation simulators that simulate both autonomous and/or connected vehicles. We then also formulated and implemented simulation-based optimization algorithms to address traffic management problems with mixed (i.e., autonomous and manually driven) traffic.

Project MITR25-12
Incentivizing Safer Driving Using Peer-Pressure project
We finished our field study for improving driving behavior and analyzed the results. During the field-study we used our dedicated platform and compared two incentive schemes. We were able to reduce the number of aggressive driving alerts in 25% on average. Surprisingly, the social incentive yielded a moderate improvement of 15% on average, while the individual incentive yielded an astonishing improvement close to 35% on average. Interestingly, one of the byproduct of improving driving behavior is reduction in fuel consumption—we show that this saving alone returns 60% of the monetary incentive spent, suggesting that our approach can be implemented in a sustainable way in real-world scenarios.

Project MITR25-16

From Trip Data to the Energy Requirements of Personal Vehicle Travel

We have continued developing and applying TripEnergy—a model of personal vehicle energy consumption across the U.S. that is faithful to vehicle performance, individual driving patterns, and nationwide travel trends. We have also extended the energy model to allow it to estimate aggregate electricity demand from a fleet of electric vehicles, under different weather conditions, for different locations throughout the US, and given different charging behavior and access. This allows us to study in more depth potential pitfalls to electrification of the personal vehicle fleet arising from limited electricity generation and charging infrastructure, as well as potential policy solutions to allow electric vehicles to better utilize existing electricity infrastructure. Furthermore, we have finalized our vehicle database that is based on public sources and now contains almost 20,000 vehicle models and trims that were offered in the U.S. between 2000 and 2017. Based on this database, we have updated and substantially expanded the selection of models available at our online tool, carboncounter.com.

Project UMAR25-24
Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands

We presented the preliminary results of the microsimulation, field, and driving simulator experiments at the 5th International Conference on Roundabouts, which took place on May 8-10, 2017, in Green Bay, Wisconsin. We also prepared a paper on the microsimulation analysis for a variety of pedestrian and vehicle demand levels and submitted it for presentation to the Transportation Research Board 97th Annual Meeting (January 7-11, 2018) and publication to the Transportation Research Record: Journal of the Transportation Research Board. Furthermore, we finalized the design of the driving simulator experiments, ran 24 participants, and started analyzing the results. The results so far agree with the microsimulation ones that higher levels of conflicting traffic and pedestrian demand increase emissions. Additional data analysis by turning movement and location of pedestrian (i.e., exit vs entry leg) is still in progress.

Project UMAR25-25
Evaluating the Effect of Google Glass on Driver Distraction

The research team conducted two simulator studies: Does the Presentation of Traffic Sign Information on Head-Mounted Displays Improve Latent Hazard Anticipation? The first experiment, now completed and presented, determined whether warnings of an impending latent hazard, delivered on Google Glass, could improve both young and middle-aged drivers' latent hazard anticipation ability. The ability to identify latent hazards is associated with decreases in crash risk. The results showed that the latent hazard anticipation performance of young drivers was significantly improved with warnings given through Google Glass. The performance of middle aged drivers was not significantly affected by the warnings. It was concluded that head mounted displays such as Google Glass may offer a promising platform for delivering traffic warnings to help young drivers better detect hazards on the road. A second experiment, still in progress, further explores the potential beneficial effects of heads-up displays on transportation safety, and the impacts of alerts delivered through heads-up displays on hazard anticipation by older drivers at intersections. In this second driving simulator experiment, older drivers are being recruited and assigned to one of two groups: a control group that receives no alerts when approaching the intersections, or an experimental group that receives both auditory) and visual alerts when approaching the same intersections as the control group.

Project UMAR25-28
A Driving Simulator Evaluation of Driver Distraction and Traffic Control Device Comprehension for At-Grade Railroad Crossings

A first-of-its-kind rail simulation model has been fully constructed in a virtual driving environment. The precisely constructed scenarios carefully sequence the movement and placement of virtual objects in the presence of railroad crossings to test driver attention, visual detection and the effect of

distraction. The second and last experiment in this project is currently underway. Forty-six participants have been recruited for this simulator experiment. The second experiment evaluates the dynamic envelope pavement markings previously evaluated by the Florida Department of Transportation as a supplemental treatment to non-gated at-grade crossings. Participants assigned to the experimental group were asked to undertake a secondary task during the drive, in the form of a mock cellphone conversation or an in-vehicle task where the participant was asked to change the radio station. Eye tracker data as well as driver performance data are being collected for each participant and the preliminary analysis is currently underway.

Project UCNR25-35
Clustering Algorithms for Transit Network Design
The research team is using genetic algorithm (GA) to solve large instances of transit network design problems. Equity-based objective functions have been implemented into trial networks utilizing a new crossover paradigm within the GA. Solutions have been validated against existing designs and the performance of the algorithm suggests larger-scale implementations are feasible.

Project UMER25-36
Deficient Bridges and Safety Information
We have analyzed fatal crashes occurring in 2016 on, at, or under bridges. It can be concluded that the US in 2016 had at least 258 fatal crashes that were not suicides or planned homicides, killing 314 people on or under bridges. There were 244 car/truck occupants, 35 MC riders, 4 bicyclists and 31 pedestrians killed. Overall, 81 of the fatal crashes happened under the bridge (with piers etc.) and 174 on top of bridges. In 84 of the 174 fatal crashes on bridges, the bridge was traversing water and in the remaining 90 cases, the bridge was passing over other highways, railroads or similar facilities. Structural failures prior to the 'accident' did not contribute to any fatalities on bridges in 2016. Debris falling from a bridge as a result of a crash took one person's life.

Project UMER25-37
Automated Vehicles: Economic Incentives for Environmental Benefits and Safety
We have completed our analysis from a New England based mail survey, administered in a two-round modified Dillman method between January and March of 2017, with a response rate of 20%. We chose to set our work in the New England region, in order to capture perspectives from both rural and urban area citizens, as well as perceptions from drivers who experience varied seasonal driving conditions. We offer three implications from our work that may inform the implementation of transportation infrastructure changes to come. First, our findings suggest the importance of identifying an individual's existing technology attitudes, and personal characteristics, in understanding their AV adoption decision. Second, our work suggests important implications for how AVs are introduced to the public. Finally, our respondents state that they will change their use of in-vehicle time given different levels of automation. At higher levels of automation, we find a stated willingness of 'drivers' to engage in four new in-car behaviors: sleeping, watching movies/TV, using virtual reality (VR) and driving intoxicated/using drugs. This change in behavior is likely to lead to change in the use of private automobiles since vehicle travel time is one of largest costs associated with travel. This may well lead to changes in urban and suburban land use patterns as drivers re-evaluate the costs and benefits of travel.

How the New England UTC's research results have been disseminated

Project MITR25-4
Transportation Workforce Health and Wellbeing
Based on Lavallière and Handrigan's presentation (2014), a manuscript is in its final editing phase for submission in a scientific journal. The review conducted for CARSP 2017 is now formatted for a

grant submission at the IRSST for conducting an intervention on health and safety aimed at older drivers. Results extracted from the Gallup-Healthways Well-Being Index survey to quantify and analyze well-being metrics amongst different industries and ages are being prepared for publication in a scientific journal.

Project MITR25-12
Incentivizing Safer Driving Using Peer-Pressure project
The research team has presented the project in the NetSci-X 2017 conference (International School and Conference on Network Science, Tel-Aviv Israel, January 15-18 2017). Our research paper was also accepted to the IMWUT journal, and is going to be presented in the prestigious Ubicomp 2018 conference (2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing, Singapore, October 8-12 2018).

Project MITR25-16
From Trip Data to the Energy Requirements of Personal Vehicle Travel
This work has produced three academic papers in the past 6 months, one of which has been accepted into the Transportation Research Record: Journal of the Transportation Research Board, and two of which is currently in the final stages for preparation for submission. Another paper on electricity demand from BEVs is in preparation and expected to be submitted before the next reporting deadline. This work has also resulted in a presentation at the 2017 International Society for Industrial Ecology (ISIE) conference in Chicago in June 2017, and three presentations that have been accepted for the 2018 Transportation Research Board Annual Meeting in January.

Project UMAR25-27
Route Choice in Congested Grid Networks
A paper was published in Economics of Transportation that makes a theoretical contribution to the literature about modeling equilibrium route choices of populations of travelers with diverse sensitivity to travel time variability. This publication documents fundamental modeling contributions that can be applied to other types of traveler decisions. Another paper was published in the International Journal of Transportation Science and Technology that proposes a structure for an advanced traveler information system that recognizes the variations in preferences across different individuals. This project also documents the results of a survey that shows that there are many characteristics of routes that people consider when making travel decisions, and the relative weight of these characteristics in the decision-making process varies from person to person.

Project UMAR25-29
An Innovative Design to Retrofit Seatbelts in Motorcoaches
A conference paper was published and presented at an SAE International symposium in Pune, India in 2017. 3D printed miniature samples were produced to demonstrate the product at the event. A coauthor presented the solution there to CIRT, a leading organization for implementing an accreditation system for Bus Body Builders in India. In response to our recent presentation, NHTSA began a promotion for seatbelt use on motorcoaches found at https://twitter.com/NHTSAgov/status/808370846746152960. Information about the filed patent application for this retrofit solution is available at http://tto-umass-amherst.technologypublisher.com/tech?title=_Seatbelt_System_for_Buses_%E2%80%93_Retrofit_or_New. A provisional patent application was filed in this period to capture the latest product innovations. Presentations of the latest design were given under NDA to potential early adopters in industry at American Seating and DATTCO.

Project UCNR25-35
Clustering Algorithms for Transit Network Design
The research team took part in the UConn 2016 National Summer Transportation Institute held on

UConn campus in June 2016, funded by the Federal Highway Administration. Eighteen high-school students from across Connecticut participated in a week-long residential program in Storrs, CT learning about transportation careers and seeing results from several ongoing research efforts, including this research project.

Plans during the next reporting period to accomplish the New England UTC's research goal

No change on our major goals contained within our approved Application.

1B. Education Projects

Education & Workforce Goal

- To introduce transportation to all levels of education: K-12, undergraduate, graduate and continuing education.

- To place graduates into transportation fields.

- To provide current and developing methods, tools and insights to today's transporttation workforce to support their capacity to build, operate and manage a safe and efficient transportation system.

Following is the list of the 2 education projects under this grant, and their current status:

Project No.	PI	Project Title	Status
HVDE25-38	Howitt	Teaching Case Study on Korea Ferry Disaster of April 2014	completed
HVDE25-39	Davis Altshuler	Transforming Urban Transport: a Set of Case Studies	active

Accomplishments under the New England UTC's education goal

Project HVDE25-39
Transforming Urban Transport: a Set of Case Studies
This project seeks to advance our knowledge of how, when, and where political leadership has been critical to the successful implementation of path-breaking transportation policies. The project has done so through the case study research of 8 democratically governed cities around the world: Los Angeles, Mexico City, New York City, Paris, San Francisco, Seoul, Stockholm, and Vienna. A book manuscript entitled, "Transforming Urban Transport—The Role of Political Leadership," was accepted for publication and is currently being edited by Oxford University Press. It contains the eight case studies and introductory and concluding chapters.

1C. Technology Transfer Projects

Technology Transfer Goal

- To increase the awareness and level of information concerning transportation issues facing New England.

- To further our well-established technology transfer and outreach activities.

- To engage the public and private transportation sectors throughout the New England Region and the nation.

Following is the list of the 2 technology transfer projects under this grant, and their current status:

Project No.	PI	Project Title	Status
MITT25-43	Coughlin	MIT Centralized Technology Transfer Initiatives	active
UMAT25-44	Collura	UMass Centralized Technology Transfer Initiatives	active

Accomplishments under the New England UTC's technology transfer goal

Project UMAT25-44
UMass Centralized Technology Transfer Initiatives
The focus of this initiative is on workforce development and technology transfer:

During the Fall semester 2017 the University of Massachusetts/Amherst again offered a course in transportation aviation, "Air Transportation Systems".

In April we participated in the 2017 William W. Boyer Lecture in Transportation Engineering, where a representative from the Massachusetts Department of Transportation (Mass DOT) spoke on "Transportation Innovation in the Commonwealth". This event included: a Research Showcase at which the students displayed posters of their research; a table staffed by MassDOT Human Resources personnel to discuss opportunities at MassDOT; and concluded with an Emerging Professionals Group Networking meeting. Among the 100 participants were UMass faculty, staff and students.

In May, UMass students attended the 2017 ITE Northeastern District meeting in New Jersey.

In September, we participated in the MassDOT 2017 Moving Together Conference, which attracted over 800 participants. UMass/Amherst faculty, staff and students were instrumental in organizing the conference for MassDOT.

Also of note, students/faculty/staff participated in 6 UMass/Amherst Transportation

Engineering Program seminars: Managing Risks to Infrastructure with Real-Time Monitoring of Performance; T.F. Green Airport Improvement Program: Environmental Review, Design & Construction; Assessment and Prioritization to Addressing Ecological and Transportation Vulnerabilities Associated with Road-Stream Crossings; High Speed Rail: The Interaction of Technology and Policy; Developing a Sensing-Base and Spatially-Enabled Methodology for Intelligent Roadway Asset Management and Decision Making; and UMassAir – A Research and Educational Collaborative.

2. Products

Journal publications

Amirgholy, M., Golshani, N., Schneider, C., Gonzales, E.J., Gao, O. (2017). An advanced traveler navigation system adapted to route choice preferences of the individual users. International Journal of Transportation Science and Technology. (In Press)

Amirgholy, M., Gonzales, E.J. (2017). Efficient frontier of route choice for modelling the equilibrium under travel time variability with heterogeneous traveler preferences. Economics of Transportation. (In Press)

Bertolaccini, K. and N. Lownes (2017) Developing and Solving an Equitable Transit Network Design Model with a Genetic Algorithm Solution Approach, *Proceedings of the 96th Annual Meeting of the Transportation Research Board*, Paper # 17-06547.

Khalighi, F., Hajiseyedjavadi, F., Christofa, E., and Knodler, M. 2018. Emission Impact of Motorized Vehicles and Pedestrians at Roundabouts, Submitted to the Transportation Research Record: Journal of the Transportation Research Board. [Under Review]

Lawrence, W., Townsend, R. M., Ivan, J., Ravishanker, N., Mamun, S., Caraballo, F., & Zhang, Y. "The Rhetorical Process of Justification in Pedestrian Safety Deliberations." Submitted to Communication Quarterly.

Miotti, M., Needell, Z.A., Trancik, J.E. Quantifying reductions in personal vehicle energy consumption due to driving style changes *(in preparation)*.

Needell, Z. A., and Trancik, J. E., (2017). Efficiently simulating personal vehicle energy consumption in mesoscopic transport models. Transportation Research Record: Journal of the Transportation Research Board (In Review).

Tang, Y. and Gao, S. (2017). An Exploratory Study of Instance-based Learning for Route Choice with Random Travel Times. Journal of Choice Modeling 24: 22-35.

Wei, W., Needell, Z.A., Ramakrishnan, S., Trancik, J.E. Potential for increasing electric vehicle adoption through charging infrastructure expansion *(in preparation)*.

Y. Cohen and E. Shmueli: "Money Drives: Can Monetary Incentives based on Real-Time Monitoring Improve Driving Behavior?". Accepted to Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies.

Books, dissertations, or one-time publication

Bertolaccini, K. L. (2015). Designing Transit Networks for Equity and Accessibility, Doctoral Dissertation,
http://digitalcommons.uconn.edu/cgi/viewcontent.cgi?article=7214&context=dissertations.

Caraballo, Franklin, "Identifying Association Between Pedestrian Safety Interventions and Street

Crossing Behavior Considering Demographics and Traffic Context", M.S. Thesis, University of Connecticut, Civil Engineering, May 2016.

Other publications, conference papers and presentations

Emerging Technologies (EmTech) Caribbean Conference. *KEYNOTE TALK: Designing and operating the on-demand, shared, autonomous and connected transportation systems of the future* Emerging Technologies (EmTech) Caribbean Conference, April 27, 2017, Santo Domingo, Dominican Republic.

Fulbright Colombia Conference on Sustainable Urban Mobility> *KEYNOTE TALK: The design and the management of sustainable urban mobility systems in the big-data era.* Fulbright Colombia Conference on Sustainable Urban Mobility, September 14, 2017, Cartagena, Colombia.

Guevara, C. A., Tang, Y. and Gao, S. The Initial Condition Problem with Complete History Dependency in Learning Models for Travel Choices. The 22nd International Symposium on Transportation and Traffic Theory. Evanston, IL. July 24-26, 2017.

Khalighi, F., Hajiseyedjavadi, F., Christofa, E., and Knodler, M. 2016. Emission Impact of Pedestrians at Roundabouts. 5th International Conference on Roundabouts, 5-7 May, Green Bay, WI.

Khalighi, F., Hajiseyedjavadi, F., Christofa, E., and Knodler, M. 2018. Emission Impact of Motorized Vehicles and Pedestrians at Roundabouts, Submitted to the Transportation Research Board 97th Annual Meeting, Paper No. 18-06324. [Under Review]

Lownes, N.E. and K. Bertolaccini (2016) Transit Planning Web Application Development Using GTFS, *Innovations in Public Transportation Planning and Modeling Utilizing General Transit Feed Specification (GTFS) Webinar*, The National Academies, TRB, May 12, 2016. http://www.trb.org/ElectronicSessions/Blurbs/174385.aspx

Miotti, M., Needell, Z.A., Trancik, J.E. Quantifying reductions in personal vehicle energy consumption due to driving style changes. Accepted for presentation at Transportation Research Board Annual Meeting 2018.

Miotti, M., Trancik, J.E (2017). Evaluating the emissions and costs of light-duty vehicles. International Society for Industrial Ecology (ISIE) 2017 Conference, Chicago IL.

MIT CEE and Parsons Infrastructure, Smart Cities, Transportation Workshop. *Large-scale urban transportation optimization* MIT CEE and Parsons Infrastructure, Smart Cities, Transportation Workshop, March 8, 2017, Cambridge MA, USA

Needell, Z. A., and Trancik, J. E. Efficiently simulating personal vehicle energy consumption in mesoscopic transport models. Accepted for presentation at Transportation Research Board Annual Meeting 2018.

Wei, W., Needell, Z.A., Ramakrishnan, S., Trancik, J.E. (2017, Oct.). Potential for increasing electric vehicle adoption through charging infrastructure expansion. Poster session presented at the MIT Energy Night, Cambridge, MA.

Wei, W., Needell, Z.A., Ramakrishnan, S., Trancik, J.E. Potential for increasing electric vehicle adoption through charging infrastructure expansion. Accepted for presentation at Transportation Research Board Annual Meeting 2018.

Eddy, D., Patil, S., Krishnamurty, S., Grosse, I. et al., "Design and Evaluation of an Affordable Seatbelt Retrofit for Motor Coach Occupant Safety," SAE Technical Paper 2017-26-0018, 2017, DOI: 10.4271/2017-26-0018.

"Response to NHTSA on March 2016 Report to Congress on: (Lap/Shoulder Belts) Retrofit Assessment for Existing Motorcoaches", submitted to NHTSA

Lavallière, M., & Handrigan, G. A. (2014). Merging two paths safely: aging and obesity. Presented at the 24th Canadian Multidisciplinary Road Safety Conference, Vancouver, B.C.

Lavallière, M. (2014). Aging and Obesity behind the wheel: when risk factors collide. Presented at the HFES 2014 Annual meeting as a part of the panel "Aging, Obesity and Beyond: Implications for Healthy Work Environment", Chicago, IL.

Lavallière, M. (2014). Survey on the Multigenerational Workforce. Presented at the Energy Technology Workshop Ensuring Energy Delivery, Cambridge (MA).

Lavallière, M. (2017, June 18-21). A literature review on bus drivers' health and safety: a conceptual model. Presented at the Canadian Association of Road Safety Professionals, Toronto, Canada.

Websites or other Internet sites

http://www.carboncounter.com

Media

Nothing to report

Technologies or techniques

Project UCNR25-35
Clustering Algorithms for Transit Network Design
The research team uses a novel form of Genetic Algorithm (GA) to solve instances of the transit network design problem. The GA uses new initial solution generation, crossover and mutation functions to address complexities introduced by the use of equity as an objective as opposed to cost minimization.

Inventions, patent applications, and licenses

Project UMAR25-29
An Innovative Design to Retrofit Seatbelts in Motorcoaches
Toward the goals of advancing user performance with a focus on safety and economically competitive, yet livable communities, the project focused on the technology transfer of the invention

that resulted from this research for potential implementation in the bus industry. Work in the past six months focused on technology transfer of the intellectual property developed by this research. The team filed a provisional patent application to protect innovations developed since the original patent application. A coauthor and presenter of the 2017 SAE conference paper is working with Central Institute of Road Transport (CIRT) in Pune, India to gain acceptance for seatbelt retrofits that are needed on an even greater scale in India. Toward that end, simulation was done to verify that occupant protection in head on frontal collisions exceeds requirements in India. Domestically, the team initiated an NDA and a field testing agreement with American Seating in Michigan. The overall field test was planned and discussed with American Seating. American Seating found a willing participant to fill a bus with the first run of the product that will first be tested.

A US patent for "Retrofit Seat Belt System" was filed as patent application PCT/US/1532218 in May of 2015 and is published as WO2015179784 A1 in January 2016.
UMA 17-040 provisional patent application Ref. No.: 42740-38PROV, "Retrofit Seatbelt System".

Other products

Project UMAR25-24
Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands
We have an AIMSUN microsimulation model of the roundabout at N. Pleasant and Governors Dr. at the UMass campus in Amherst, MA. The model has been calibrated so far with volumes obtained through video cameras. Additional calibration is in progress that will use trajectory data collected at the same roundabout using the INTERSECTOR motion and presence radar sensor. In addition, we have developed driving simulator scenarios with roundabouts and have programmed the appearance of pedestrians at crosswalks when vehicles are approaching those roundabouts. We also have eye tracking and trajectory data from 24 subjects that participated in the driving simulator experiments.

Project UCNR25-35
Clustering Algorithms for Transit Network Design
A GTFS extraction tool and transit system analysis package has been developed and will be made available through the t-HUB website.

3. Participants & Other Collaborating Organizations

Organizations that have been involved as partners

Charles and Anne Schewe, Sara's Wish Foundation (SWF), Amherst, MA
Dave McLaughlin the American Seating Corporation
Dr. Chandra K. Thorbole, Director at Thorbole Simulation Technologies.
John Cieplik, General Manager of the Coach Builders Facility at Peter Pan Bus Lines
Tel-Aviv University, Israel
Tivity provided access to the Gallup Healthways Well-Being Index data and financial support.
Tsinghua University, China
University of Hartford, West Hartford, CT
University of Queensland, Brisbane, Australia

Nothing to report

4. Impact

The impact on the development of the principal disciplines of the program

Project MITR25-11
Optimal Road Traffic Operations for an Increasingly Autonomous and Connected Vehicle Fleet
We have developed tools for transportation agencies, and more broadly transportation stakeholders, to inform the design and the operations of future mobility systems where both autonomous and conventional vehicles will co-exist and interact. We formulated, designed and prototyped, offline and online, calibration algorithms, such as to fit the input parameters of the new generation simulators that simulate both autonomous and/or connected vehicles. We then also formulated and implemented simulation-based optimization algorithms to address traffic management problems with mixed (i.e., autonomous and manually driven) traffic.

Project MITR25-16
From Trip Data to the Energy Requirements of Personal Vehicle Travel
The project addresses a still open question in transportation and climate policy about the suitability of different vehicle powertrain technologies for widespread adoption and emissions reduction, especially given that the success of these various technologies depends on both their abilities to successfully meet divers travel needs of households across the U.S. and their performance under that use. In doing so, it allows for a better understanding of the pathway towards greater electrification of personal vehicle transportation, achievable policy and technology levers that might ease that transition, and potential unintended consequences that might arise along the way. It also addresses important methodological questions concerning the prediction of vehicle energy requirements under significant uncertainty and information limitations, a contribution that will be useful to many modeling and simulation efforts that produce energy estimates.

Project UMAR25-24
Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands
The development of the roundabout scenarios in the driving simulator are a great asset for the program since they facilitate continuation of research on driver behavior, operations, safety, and emissions at roundabouts.

Project UMAR25-29
An Innovative Design to Retrofit Seatbelts in Motorcoaches
The key players and stakeholders in the motor coach industry are now informed about this technology and well aware that an economical and safe solution now exists that did not exist before. Furthermore, early adopters in the industry are now making efforts to implement the technology.

Project UCNR25-35
Clustering Algorithms for Transit Network Design
The research team has made advances in transit network design modeling and solution methods, most significantly with respect to the inclusion of equity as a priority in reconfiguring transit networks.

This work has enhanced the ability of public transportation systems researchers to consider aspects such as equity in service provision as well as allowed them to leverage the increasing amount of data and test beds openly available to researchers.

The impact on other disciplines
Nothing to report

The impact on the development of transportation workforce development

Project MITR25-4
Transportation Workforce Health and Wellbeing
The research team is continuing to collaborate with Canadian colleagues to evaluate if there are any differences between the transportation workforces in the United States and Canadian industries. This would give us increased confidence in our US based work and would give us insights into the nature of interventions in these workforces.

Project UMAR25-25
Evaluating the Effect of Google Glass on Driver Distraction
The second experiment is providing graduate PhD and Masters students the experience and skills of developing and pilot testing scenarios on an advanced driving simulator, of designing and running an experiment involving older drivers, of collection of eye, vehicle and driver behavior, and of analyzing the data results. The statistical analysis of the results, and the process of developing a human subject research protocol and getting it approved by an Institutional Review Board. Driving simulation, eye tracking and head mounted displays are increasingly playing a role in transportation and this project gives students the research tools that they will need in the future.

Project UCNR25-35
Clustering Algorithms for Transit Network Design
This project has allowed a PhD student multiple opportunities for research, teaching and presenting her findings at scholarly venues over the course of the project. Additionally, the results have informed the material of existing courses at UConn (CE 5735) that address elements of the transit network design problem. Lastly, the findings were shared with high school students (in a very condensed manner) as part of the 2016 UConn National Summer Transportation Institute, funded by FHWA.

The impact on physical, institutional, and information resources at your university or other partner institutions

Project UMAR25-24
Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands
We have an AIMSUN microsimulation model of the roundabout at N. Pleasant and Governors Dr. at the UMass campus in Amherst, MA. In addition, we have developed driving simulator scenarios with roundabouts and have programmed the appearance of pedestrians at crosswalks when vehicles are approaching those roundabouts. We also have eye tracking and trajectory data from 24 subjects that participated in the driving simulator experiments. All these resources can become available to other researchers within the NEUTC.

Project UMAR25-25
Evaluating the Effect of Google Glass on Driver Distraction
This project helped provide evidence to support the recent upgrading of the lab's driving simulator infrastructure. The updated driving simulator includes a number of improvements including greater in-vehicle display capabilities with a new in-vehicle display channel, increasing the simulator's field of view from 150 degrees to over 300 degrees, and new visual channels for side mirrors and a rear mirror. These improvements both help to create greater realism in the simulator and allow the studying of research questions including regarding informational displays and alerts such as heads-up displays for drivers which can be better studied on the upgraded simulator.

The impact on technology transfer

Nothing to report

The impact on society beyond science and technology

Project MITR25-11
Optimal Road Traffic Operations for an Increasingly Autonomous and Connected Vehicle Fleet
As transportation systems become increasingly connected and autonomous, there is a pressing need to develop methods that enable transportation agencies, and more broadly, transportation stakeholders, to inform the design and operations of the new transportation systems. This work contributes to fill this gap by both exploring the impact of autonomous vehicles on the performance of transportation systems (e.g., congestion), and by designing novel calibration algorithms suitable for transportation systems with mixed vehicle fleet (both autonomous and conventional).

Project UMAR25-29
An Innovative Design to Retrofit Seatbelts in Motorcoaches
The project could have some impact on influencing public policy regarding transportation safety. Awareness and engagement throughout the motor coach industry should lead to other innovations to further improve public safety. Last November for example, National Highway Traffic Safety Administration (NHTSA) changed their position regarding seatbelts on school buses by an announcement that they now recommend 3-point seatbelts on all school buses and other buses. Such heightened awareness is expected to accelerate the demand for seatbelts over time. The bus industry now knows that a solution exists to retrofit seatbelts onto motorcoaches. Discussions and presentations have been done with numerous key players and stakeholders at this stage. A marketing presentation was delivered to the Ad Council to address the issue of low passenger use of seatbelts on buses. An increase in passenger demand is expected to increase the potential market for the bus industry and accelerate the availability of seatbelts. Awareness of a solution by NHTSA and the National Safety Council are expected to support that momentum. This is especially apt to the driver of parents' demand for safety and protection of their children...

5. CHANGES/PROBLEMS

Project MITR25-7
Stochastic Analysis of Logistics Capacity in Disaster Response Networks
The research team had difficulty identifying a student with relevant experience to work on the originally proposed project: Fusing Structured and Unstructured Transportation Data for Decision-Making in Crisis. Upon consultation with the New England UTC administration, we revised the project to build on a related research line in which we had begun promising connections with federal and state emergency management agencies. In October 2017, we are interviewing potential candidates for a postdoctoral associate to work on this project.

Additional information regarding Products and Impacts

Nothing to report

Outputs

Project MITR25-12
Incentivizing Safer Driving Using Peer-Pressure project
We developed a platform that allows us to monitor the driving behavior of drivers, to provide them feedback about their driving behavior, and to employ different incentive schemes. The platform was used in our field study (that took place between August 1 and September 30, 2016), during which we were able to improve driving behavior in 25% on average. We presented the work at NetSci-X 2017 conference, a journal paper was accepted to IMWUT journal and will be presented in the prestigious Ubicomp 2018 conference.

Outcomes

Nothing to report.

Impacts

Project MITR25-12
Incentivizing Safer Driving Using Peer-Pressure project
In a preliminary analysis of the field study's results, we found that the use of incentives managed to reduce the number of aggressive driving alerts in roughly 25%. Although we anticipated that harnessing the natural mechanism of social pressure will amplify drivers' willingness to avoid risky driving patterns, using the same or lower monetary incentives, this hypothesis turned to be wrong – while the social incentive yielded an improvement of 15% on average, the individual incentive yielded an improvement close to 35% on average.