The “Aware Car” of the Future—Enhancing Driver Wellness

New England Center researchers are exploring the development of integrated “aware cars” that can help vehicle drivers lower stress, increase focus and perform at higher levels through a multi-path approach to wellness.

According to a new white paper by Joseph Coughlin, Bryan Reimer and Bruce Mehler, a wellness inspired vehicle will be able to proactively improve vehicle driver performance. The AwareCar would detect driver state (fatigue or stress), display that information to the driver to improve the driver’s situational awareness in relation to road conditions and their own ‘normal’ driving behaviors; and finally offer in-vehicle systems to increase driver alertness.

Please see The “Aware Car” of Future, pg. 6

TECHNOLOGY TRANSFER

Young Inventors Aim to Stop Texting While Driving

Who better than a team of teens to tackle the dangers of texting while driving? The Inventioneers, a team of students from Londonberry, NH, has created a prototype device that may reduce the use of distracting technologies at the wheel.

"We feel texting and driving is the new driving under the influence; that is why we are calling it driving under the influence of texting," said 14-year-old Tristan "TJ" Evarts, a senior member of the Inventioneer team. "Our machine offers immediate reinforcement not to do it."

The device uses the same sort of technology that reminds drivers to fasten seatbelts.

Please see School Kids Create Simple Device to Stop Teen Drivers’ Texting, pg. 5
From the Director

Easy as it is to become fully engrossed in the many research projects happening at the New England Center, we continue to emphasize outreach to the public, the government and educational programs. In turn, we gain perspective on the needs and interests of people with regards to transportation. This allows our research to remain relevant and drives us to consider how our innovations improve upon current transportation awareness, practices and systems.

In the past six months we have demonstrated this outreach with a series of agenda-setting activities. New England Center Member, University of Massachusetts, Amherst hosted the annual meeting of the Council of University Transportation Centers, which represents over 70 university-based transportation research and education programs. A new book by Harvard’s Arnold Howitt and Herman B. Leonard was published, “Managing Crises,” which lays out invaluable information for transportation leaders to consider in better preparing for major disasters. Also sponsored by the New England Center, a free publication was produced by the MIT AgeLab, The Hartford Advance 50 Team and the American Occupational Therapy Association to serve as a guide to driving evaluations for older adults. And the New England Center reached out to a group of young New Hampshire students who invented a device that may improve teen driving safety.

I hope readers find our work compelling and relevant. We urge readers to contact researchers directly with ideas, opportunities to translate research into transportation reality and other feedback so that a healthy transfer of knowledge may continue keeping our region and nation safely on the move.

Joseph F. Coughlin
Center Director & Policy Committee Chair, MIT

NEWS AND EVENTS

UMASS Hosts Annual CUTC Meeting

The University of Massachusetts, Amherst, part of the New England Center consortium, played host to the annual meeting of the Council of University Transportation Centers (CUTC), which included the CUTUC Executive Committee and general membership meetings. CUTC’s membership represents over 70 of the nation’s leading university-based transportation research and education programs.

For a full listing and details of presentations, visit the Research and Innovative Technology Administration’s University Transportation Centers web site at http://utc.dot.gov.
RESEARCH PROJECT HIGHLIGHTS

Simulators May Revolutionize Older Driver Retraining

As our society ages and the number of older drivers surges, older driver retraining is getting increased scrutiny. Most often these programs, like the AARP’s 55ALIVE, promote safe driving through a classroom curriculum emphasizing awareness of traffic hazards, how to anticipate the actions of other drivers and a general overview of traffic rules and signalization.

Martin Lavallière, a Ph.D. candidate at Quebec’s Université Laval and a Visiting Student at The New England Center at MIT is showing that classroom training may not go far enough. Since driving combines mental and physical processes, general driving information or ‘watch how to do it’ procedures are not sufficient to change driving behaviors. For example, if inadequate eye-head coordination before making a left turn leads to driving error—a common cause of accidents—corrective feedback for this specific action and practice are needed. A subject must experience specific driving contexts highlighting driving deficits in order to engage the necessary mental and physical processes that can lead to more secure driving.

Plus, when drivers are actually shown their own performance they engage the necessary cognitive processes for modifying their driving strategies. Providing classroom-only information does not appear to be sufficient to allow drivers to fully appreciate the nature of their driving errors. Simulator training combined with tools providing driving specific-feedback could be an important method to modify driving.

While on-road training is still considered the best choice, Lavallière reports that driving simulators may offer safer alternative where drivers can physically practice driving strategies that mimic those used on-road. Specific simulator training coupled with video-based feedback can modify on-road behaviors of elderly drivers more effectively and safely than classroom training alone.

EDUCATION AND WORKFORCE DEVELOPMENT

New England Center Names Student of the Year

A lifelong student of transportation systems, Travis Dunn has applied his formal education in civil and transportation engineering to a variety of research and professional pursuits. His areas of interest include infrastructure system management, technology deployment, and strategy development.

Travis was recently named the New England Center’s student of the Year. As a PhD candidate at MIT, his research focuses on the design and evaluation of alternative frameworks for surface transportation policy and investment decision-making in the country of Portugal. In addition, he has assisted in the teaching of several undergraduate and graduate courses in transportation systems.

Prior to pursuing a doctoral degree, Mr. Dunn worked as a consultant providing technical and policy support to a variety of transportation clients in the areas of asset management, technology evaluation, and road pricing.

The choices Mr. Dunn has made in spending two years with Booz, Allen and Hamilton and his international experience both serve to broaden the perspective he brings to bear on strategic transportation issues and contributed to the basis for his selection as Region One’s awardee.
Reaching Transportation Leaders, New England Center & Kennedy School Create Case Studies

Learning from Hurricane Floyd

A New England Center-funded case study on one of the largest evacuations in U.S. history—the evacuation of 2.5 million people in the state of Florida, where officials sought to protect them from a hurricane that ultimately did not strike the state—is among the cases in “Managing Crises”, a new book focusing on government responses to unfolding disasters. Published by CQ Press in 2009, the book was co-authored and co-edited by Arnold Howitt and Herman "Dutch" Leonard. It uses the UTC-funded teaching case, along with such topics as the flawed responses to Hurricane Katrina, to help students and practitioners see how responders can more adeptly navigate between technical or operations needs and political considerations.

The Hurricane Floyd case primarily focuses on the significant difference between the level of evacuation officials believed they had ordered and the far larger evacuation that actually occurred. The exodus of twice as many people as officials had asked to leave led to massive traffic jams. Had the hurricane’s path changed only slightly, thousands would have been stuck on the highways, at the mercy of potentially deadly high winds. The case raises several big questions: How could officials have explained the situation in such a way to avoid the near panic which ensued? And, more importantly, can we organize a truly orderly mass evacuation from population centers in the face of a terror threat or attack? If so, how should such evacuations be planned for and carried out?

Howitt served on the New England Center’s Policy Committee and is Executive Director of the Ash Institute for Democratic Governance and Innovation at Harvard’s Kennedy School of Government.

See articles relevant to Howitt’s work at www.hks.harvard.edu/taubmancenter/emergencyprep/articles.htm.

New England Center & The Hartford Imagine the Future

Release Consumer Guide to Driving Evaluations

In an event sponsored in part by the New England Center, MIT’s AgeLab, AARP and The Hartford, participants came together to look at the future. Shaping Life Tomorrow: A Conversation on the Future of Aging, Business and Innovation was a forum for business leaders, advocates, practitioners and researchers in the domains of transportation, social media, housing and health to discuss some of the challenges and opportunities that an aging population presents to business and to government. This event marks a 10 year relationship between the MIT AgeLab and The Hartford Advance 50 Team that focuses on research to improve the quality of life of older adults and their families. A free new publication, Your Road Ahead: A Guide to Comprehensive Driving Evaluations, based on research with the MIT AgeLab, The Hartford Advance 50 Team, and the American Occupational Therapy Association was released at the event. The publication is available through The Hartford at http://aarp. thehartford.com/Direct-Safety.

Videos of the symposium will be available at utc.mit.edu in 2010.

Older Driver Decision Making Becomes Hot Topic

After the Shaping Life Tomorrow forum, the partnership between The Hartford, MIT AgeLab and the New England Center continued to make headlines. In December, The Wall Street Journal picked up the theme of helping older Americans make informed decisions about limiting their driving, suggesting that holiday get togethers can be a great opportunity to observe a loved one’s driving first hand and to talk with other relatives to build consensus.

"Driving is about more than transportation. It’s a symbol of independence and freedom. But having frank family conversations about driver safety early on—well before it becomes a problem—can reinforce safe practices and open a communications channel without the strain of asking a parent to curtail or stop driving," said Lisa D’Ambrosio, Ph.D., research scientist at the New England Center and MIT’s AgeLab.

Although car accidents involving older drivers often call attention to the issue of older adults and driving safety, statistics indicate that most older adults are relatively safe drivers. They represent 15 percent of licensed drivers, but only 8 percent of crashes. The Journal noted that it is important to keep in mind that medical conditions, medication usage and reduced physical function can affect safety.


NEWS AND EVENTS
RESEARCH

Reliability IDEA Program Announces Research Funding for Projects that “Challenge Conventional Thinking”

Under the Strategic Highway Research Program (SHRP 2), the Reliability IDEA program is seeking proposals for improving the dependability of travel times and providing information to travelers and other highway system users when dealing with unexpected delays. UTC researchers are encouraged to apply.

The goal of SHRP 2 Reliability is to improve travel time reliability through incident reduction, improved incident management, quicker incident response and mitigation of the impact of traffic incidents.

IDEA programs differ from traditional research programs in two ways: IDEA projects are initiated by researchers rather than by a request for proposals, and funding can support initial testing of unproven concepts. The funding through the IDEA program is meant to capture the “unexpected concept that challenges conventional thinking.”

The next application deadline is September 1, 2010. For more information, go to http://www.trb.org/IDEAProgram/IDEAReliability.aspx.

SCHOOL KIDS CREATE SIMPLE DEVICE TO STOP TEEN DRIVERS’ TEXTING, FROM PAGE 1

The “SMARTWheel” slips over the steering wheel, with pressure sensors that measure where a driver’s hands are located. If the hands move close enough to one another so that the thumbs could cover a mini keyboard, a loud alarm sounds. Removing one hand to adjust the radio or signal a turn is allowed, thanks to a three-second delay. The alarm sounds only if the car is moving, meaning drivers can have a sip of coffee or bite of a burger at a stoplight, Evarts said.

“The wheel helps correct a variety of bad driving habits, not just texting,” Evarts added.

The patent-pending SMARTwheel, short for Safe Motorist Alert Restricting Texting, fits in well with the work being done by the New England Center. Katii Gullick, a student at the MIT AgeLab worked with the students and said she was impressed.

“The product they have created is well thought out and actually works,” said Gullick. “It is exciting for me to see such young kids not only thinking about important issues in our technology driven society, but also designing effective ways to remedy them.”

The Inventioneers were invited to MIT to conduct a pilot study of the technology in action on the AgeLab’s driving simulator, Miss Daisy, as part of the New England Center’s commitment to K-12 outreach.

Team members said that in a perfect world, the SMARTwheel would become standard in all vehicles. But a retail option that gives parents a choice to install one on a new driver’s car is a more likely possibility. Another hope is to partner with an auto insurance provider and get teens a discount for using the wheel, or for signing a non-texting pledge.

"The wheel helps correct a variety of bad driving habits, not just texting"
Traffic safety has been traditionally addressed through individual improvements to the car by manufacturers, improvements to the driver through education and enforcement and improvements to the infrastructure by government. While each of these approaches is important, they are incomplete without creatively exploiting the overlapping and interactive nature of the role of the vehicle, driver and driving environment in accident prevention and mitigation.

In the paper, the concept is discussed in the context of the ongoing research, testing and validation of the MIT AwareCar platform.

The paper is available for download on the New England Center’s website at http://utc.mit.edu.
In a study sponsored in part by the Ford Motor Company, New England Center researchers are working to see if it’s possible to produce vehicles smart enough to measure a driver’s emotional state and react accordingly.

Onboard sensors could determine when the driver of a car or truck is tense or uncomfortable and start massaging a driver’s back or automatically alter the cabin air temperature to fend off drowsiness.

Joseph Coughlin, one of the leads on the research, says we have and know how to use the technology.

"Just think," he says "about how people respond to the little avatar fitness instructors on the Wii Fit. Those games sense your balance and fitness levels and then tell you what you have to do. Could vehicles do the same thing?"

For instance, if you are zoning out but don’t notice it, the vehicle could sense, through how tightly you’re gripping the wheel or other onboard sensors, that your eye movement is remaining fixed for too long. Theoretically, Coughlin says, the back of your seat could automatically massage you. Or the interior lighting might change color enough to make you more alert. Even aromatherapy might be employed to alter drivers’ moods.

"And then of course there’s the entire entertainment system that could be exploited. We’re talking about personalizing the driving experience, on an extremely individual basis, to keep the driver as stress free as possible," he says.

But not, Coughlin quickly adds, so stress-free you nod off. "Some stress is good," he says.

Ford’s manager of active safety research Jeff Rupp, says the goal is "creating the most comfortable driving environment possible so that our driver is always relaxed, calm and able to perform at peak performance."

The rolling lab at the heart of the study will be a fully loaded Lincoln MKS, complete with blind-spot-information system, adaptive cruise control, collision warning with brake support and voice-activated navigation. Additional onboard gear will monitor the driver’s reactions to various stress-inducing situations using biometrics such as heart rate, skin conductivity and eye movement.

New England Center scientists will figure out ways to use those measurements to alter the driving experience to keep the driver in peak health and alertness.

Games such as the Wii Fit sense your balance and fitness levels and then tell you what you have to do. Could vehicles do the same thing?
About the New England University Transportation Center

The New England University Transportation Center employs research and innovative technology to improve transportation system management. Its research and technology transfer serve as groundwork for progressive safety measures and for increasing the efficiency of the nation's roads and mass transit systems.

The center's research investigates how changes in the age distribution of the nation's population and changes in technology, infrastructure, global climate, economics and politics affect transportation systems. The New England Center will use this research to educate future transportation professionals and leaders responsible for tackling transportation challenges of today and tomorrow.

In addition to these education goals, the New England Center has a mission to influence the transportation agenda and develop and disseminate new methodology and tactics for strategic change. The New England Center is part of the national UTC program. Massachusetts Institute of Technology is the lead university in the consortium, which also includes Harvard University, and the state universities of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

The New England Center will use this research to educate future transportation professionals and leaders responsible for tackling transportation challenges of today and tomorrow.

About MIT's Center for Transportation and Logistics

MIT's Center for Transportation and Logistics is part of the Engineering Systems Division in the School of Engineering. The center is widely recognized as an international leader in the field of transportation and logistics.

The CTL facilitates a basic understanding of transportation systems planning, operations and management, and the center makes significant contributions to logistics modeling and supply-chain management for shippers, to technology and policy analysis for government, and to management, planning and operations for trucking, railroad, air and ocean carriers.

In addition to administering the Master of Engineering in Logistics program, the center helps coordinate the extensive transportation and logistics research conducted throughout MIT. At any given time, research initiatives typically number more than 100 and range from modest projects involving a single faculty member and a few students to large-scale international programs involving scores of people and a full-time research staff.

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