

CTS Catalyst

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Accelerating the pace of transportation innovation

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Sam Lamichhane, a MnDOT summer intern from Howard University, demonstrating pavement-testing technology with Bernard Izevbehai of MnDOT

Students gain experience through new internship program

When the summer began, Samrakshak Lamichhane wasn't certain what a typical work day might look like after graduation. But thanks to a new internship program, Lamichhane and three other undergraduates got a taste of real-world operations and gained insight for their future career paths.

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Catalyst



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Driver-assist technology improves bus driver performance

A driver-assist system (DAS) developed by the Intelligent Transportation Systems (ITS) Institute is improving bus operations and reducing driver stress on bus-only shoulders in the Twin Cities, according to an evaluation published by the Federal Transit Administration (FTA). The DAS has been in use on 10 Minnesota Valley Transit Authority (MVTA) buses operating in the Cedar Avenue bus rapid transit corridor since 2010 and is the first deployed system of its kind.

Driver-assist continued on page 7

Effects of transportation, land use on destination choice

In an effort to understand why consumers drive to certain places to do their shopping, researchers from the Department of Civil Engineering (CE) have completed a study examining the influence of land-use patterns and transportation networks on travel behavior.

The study, funded by the Intelligent Transportation Systems Institute and led by CE associate professor David Levinson, aimed to identify factors that make shopping destinations more or less attractive to consumers. It is one of



The study found that highly accessible destinations with a wide variety of available services are more appealing to shoppers.

the first empirical studies to use vehicle-based GPS travel data—from a group of more than 140 subjects in the Twin Cities—to analyze consumers' travel decisions and destination choices for home-based, nonwork shopping trips.

The study confirmed that higher accessibility and a greater diversity of services in the nearby walking zone make a destination more appealing. Destinations that are farther away or reached by more circuitous routes are less attractive.

The researchers also developed a web-based simulation tool—CLUSTER (Clustered Locations of Urban Services, Transport, and Economic Resources). The tool can be used to investigate how retail location choice and retail clustering is influenced by transportation cost, consumers' travel behavior, and suppliers' locations.

CLUSTER has already been used in an undergraduate course at the U of M, and feedback from students indicates that it's a useful tool for testing urban policy parameters and visualizing urban patterns. The researchers also suggest expanding the software for use as a regional forecasting model for transportation and land use.

Future work will use person-based GPS devices to collect travel data, ensuring that information on nonmotorized trips is also collected. The researchers also plan to examine the effect of trip tours—trips with multiple destinations and purposes—on individuals' destination choices.

CTS Fall Luncheon: Predictions for the transportation industry

Economic, political, social, and technological trends are changing the world—and the transportation industry—at an ever-quicken pace. Just think of some of the staples of daily life, such as smartphones and Facebook, that didn't even exist 10 years ago, let alone in 1987 when CTS was founded. What's next? Join us at the CTS Fall Luncheon on November 28 as we culminate the celebration of our 25th anniversary by looking at past innovations and anticipating the road ahead.

The speaker will be Frank A. Stasiowski, president and founder of PSMJ Resources and an advisor to the CEOs of many top design and construction firms in the U.S. and around the world. Stasiowski is best known as a futurist, predicting the

direction of design and construction worldwide.

In his presentation, Stasiowski will describe trends that could define the next decade and have a direct impact on transportation. One such trend—the retirement of the baby boomers—will have ramifications for the workforce and workplace conditions as well as for transportation and housing patterns.

Stasiowski will also address what research and actions are needed now to prepare for this future—such as

embracing new technological ideas, sharing intellectual capital, and building a knowledge network.

The key, Stasiowski says, is to adapt a culture of permanent change. Successful organizations in 2020 will be those that have best adapted to the changes coming—and only organizations that adopt a culture of permanent change will be able to do so.

For details and registration information, please go to cts.umn.edu/Events.

IN 2020

ALL BABY BOOMERS WILL BE OLDER THAN 55,
and their share of the workforce is expected to drop to about 25 percent—
half of what it is today.

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U of M lends expertise to central Minnesota sustainable development plan

University of Minnesota faculty, staff, and students are contributing their expertise to a federally funded plan to kick-start central Minnesota's economy and sustainable housing and transportation efforts.

Spearheaded by the U of M's Regional Sustainable Development Partnerships (RSDP) program and the Region Five Development Commission, the project—the Central Minnesota Sustainable Development Regional Plan, or “Resilient Region” plan—taps experts from throughout the University while relying on the guidance and input of more than 600 Minnesotans from five counties.

Urban and regional planning expert Carissa Schively Slotterback, an associate professor in the Humphrey School of Public Affairs, was chosen as kick-off speaker at the first Resilient Region consortium meeting last year. She recently completed a CTS-sponsored study of regional sustainability plans. Frank Douma, the associate director of the Humphrey School's State and Local Policy Program, spoke at last fall's Resilient Region Collage of Sustainability conference on economically smart and environmentally sound transit options.

Neil Linscheid and colleagues from U of M Extension Community Economics also participated in the conference and later brought data to a conversation around regional economic engines. Members from the U of M's Clean Energy Resource Teams assisted with civic engagement of the private sector. And Jean Coleman, the RSDP sustainability coordinator, served as project manager and coordinated the U's expertise.

Overall work from the University included data collection, county and city comprehensive planning dissection, scenario building, creation of a policy toolkit, and development of a unique housing location-allocation modeling tool.

“The success of this national rural model is testimony of the value that our land-grant institution can add to projects of this magnitude.”

— Cheryal Lee Hills

The two-year project was made possible by an \$825,000 grant from the U.S. Department of Housing and Urban Development (HUD). The plan could result in such things as more low-energy affordable housing, efficient transportation options, livable and healthy communities, opportunities for employment, and a resilient economy. A final plan will be presented to HUD, the U.S. Department of Transportation, and the Environmental Protection Agency in December 2012.

“Until now, the region has never had the resources to develop an integrated, long-term plan for sustainable development,” says Kathryn Draeger, RSDP statewide director. “This community-driven, University-assisted project jumpstarts those efforts to ensure planning is done in a big-picture way that will tangibly improve the lives of residents and visitors in this century and beyond.”

“The success of this national rural model is testimony of the value that our land-grant institution can add to projects of this magnitude,” adds Cheryal Lee Hills, executive director of the Region Five Development Commission and a member of the CTS Executive Committee. “If not for the outstanding contributions made by Kathy Draeger and many others from the U of M and other partners, we would never have achieved all that we have,” she says. “Their work has simply astounded our entire region. We look forward to future projects with the University.”

Prototype detects animals to reduce crashes

Crashes involving deer and other animals in the roadway cause significant property damage and lead to an average of 200 deaths per year in the United States. To reduce the number of animal-vehicle collisions, researchers from the University of Minnesota-Duluth (UMD) have developed a thermal imaging method to detect the presence of large animals near the roadside.

In a project funded by the Intelligent Transportation Systems Institute, Debao Zhou, assistant professor of mechanical and industrial engineering at UMD, led the development of a prototype system that includes thermal cameras, processors, and a motion control system. The system collects and analyzes thermal images to first detect and then track an animal by moving the camera up, down, left, or right. This tracking feature allows the system to indicate whether the animal is an immediate threat to the vehicle.

Future work will enhance the object identification component of the system, and then the prototype will be installed on roadsides for evaluation.

There are more than
35,000
DEER-VEHICLE COLLISIONS
each year in the U.S.



Practitioners learn about vehicle-based ITS technologies

at short course

One of the ways CTS helps put research into practice is to incorporate new findings into courses and training. An example of this was a short course offered in July by the Intelligent Transportation Systems (ITS) Institute, a part of CTS.

The new daylong course—ITS Technologies for Improving Highway Vehicle Safety and Crash Prevention—provided a detailed overview of the latest vehicle-based ITS technologies for improving highway safety and preventing crashes.

Practitioners learned how sensing and control technologies keep vehicles in their lanes, help avoid collisions, and prevent rollovers; how such technologies are being deployed; and what impact they will likely have on road safety and mobility. Attendees also used 3-D graphic simulations to experience the direct effects of these sensing and control technologies.

The course attracted 11 practitioners from the Minnesota Department of Transportation, the City of St. Paul, and several consulting firms.



Max Donath assists a practitioner with a 3-D graphic simulation.

The course was presented by two mechanical engineering professors: Max Donath and Rajesh Rajamani. Donath, the director of the ITS Institute, has led several national initiatives on road-vehicle safety systems, most recently on new approaches to reducing the high incidence of teen driver fatalities. Rajamani's active research interests include sensors, estimation, and control design for automotive and biomedical applications.

The course met the continuing education requirements for Professional Development Hour (PDH) units for engineers.

CTS promotes transportation careers at summer camp

CTS promoted transportation-related degrees and careers to about 50 high school students during the CSE Exploring Careers in Engineering and Physical Science Summer Camp, hosted by the University's College of Science and Engineering. The annual day camp is designed to introduce students to careers in science, engineering, and math.

The students toured two facilities: HumanFIRST, a human factors research laboratory that works to improve the understanding of driver behavior and support the design and evaluation of intelligent transportation systems, and the Minnesota Traffic Observatory, which tests and evaluates new transportation management and operational strategies and traveler information technologies.

Students also had time to play *Gridlock Buster*, an online educational game created by the ITS Institute. The game incorporates tools and ideas that traffic control engineers use in their everyday work to give players an idea of what it's like to manage traffic flow. Students also listened to a presentation about the dangers of distracted driving.

More about the labs and *Gridlock Buster* is at its.umn.edu.



High school students view the interactive planning table at the Minnesota Traffic Observatory.

CTS has issued a

CALL FOR PRESENTATIONS

for the 24th Annual CTS Transportation Research Conference, May 22–23, 2013, at the Saint Paul RiverCentre.

Deadline for abstracts: November 19

Details: cts.umn.edu/Events/Conference

Further information: Nicole Freese, 612-624-3708

CTS brings fun and transportation innovations to State Fair



- This 2009 Minnesota law requires all passengers in a motor vehicle to buckle up.
- Fines increase by this much in construction zones.
- This toy truck company started near Lake Minnetonka.

What do these three things have in common? They were all answers in another round of *Transportation Jeopardy!* at the CTS exhibit at the Minnesota State Fair.

Fairgoers tested their knowledge in categories such as governance and legislation, construction, and Minnesota trivia (see questions below). Three winners received transportation-related prizes—nifty skateboards.

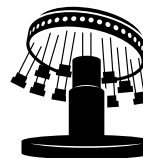
The CTS exhibit, in the U of M building on August 27 and 28, also included two online educational games: *Gridlock Buster* and *Distraction Dodger* (the latter highlights the dangers of distracted driving). Visit its.umn.edu to play the games yourself.

Photos and video clips of the fun are at cts.umn.edu/Events. The exhibit was also featured in several local news stories.



Questions:

- What is the primary seat belt law?
- What is doubled?
- What is Tonka Trucks?



In 2012
1,788,512
people attended the
State Fair.



Don Theisen (left), Washington County public works director, played the role of Alex Trebek in a game of Transportation Jeopardy! at the Minnesota State Fair.

DON'T FORGET:

THE CTS 25TH ANNIVERSARY SEMINAR AND RECEPTION WILL TAKE PLACE OCTOBER 11 ON THE MINNEAPOLIS CAMPUS.

Hani Mahmassani, director of the Northwestern University Transportation Center, will discuss an initiative called Reinventing the User Experience in Transportation in a free seminar from 3:30 to 4:30 p.m. CDT.

A one-hour reception will follow with hors d'oeuvres and refreshments.

Details and registration: cts.umn.edu/Events.



READ CATALYST ONLINE

for links to research reports and other resources.

RESEARCH SEMINARS

CTS will host four research seminars this fall, beginning in October. The seminars will highlight research on the impacts of transitways, innovative parking pricing, culvert design, and more. Details are available on

cts.umn.edu/Events.

Students from page 1

The eight-week Summer Transportation Internship Program was developed in partnership by CTS, the Intelligent Transportation Systems (ITS) Institute, Howard University, and the Minnesota Department of Transportation (MnDOT). Its purpose was to provide an opportunity for students to gain professional experience and skills that will complement their academic pursuits.

Through the program, the students gained practical knowledge about MnDOT, learned about its operations, and worked on transportation-focused projects.

Out of 34 applicants, four students were selected:

- Lamichhane, majoring in structural and transportation engineering at Howard University, was placed with the Office of Materials.
- Chelsey Palmateer, majoring in civil engineering at the U of M, was placed with the Metro District's Office of Planning, Program Management, and Transit.
- Autumn McDowell, majoring in urban studies at the U of M, was placed in the Office of Statewide Multimodal Planning.
- Yusuf Abdi, majoring in electrical engineering at the U of M, was placed in the Office of Electronic Communications.

"The internship involved a lot of learning experience and exposure to the real-world environment," Lamichhane says. "I have learned that on-the-job learning, with college education as a background, is the way to success."



Chelsey Palmateer interned with MnDOT's Metro District Office.

During his internship, Lamichhane worked with Bernard Izevbekhai, MnDOT research operations engineer, at the MnROAD pavement research facility. They submitted a paper about their work—"2011 Low-Volume Road Construction Cell 28 Stabilized Partial Depth Reclamation Construction Quality Assurance Testing"—to the Transportation Research Board, and Lamichhane presented the paper in August to MnDOT staff.

"Sam's enthusiasm for learning and communication were just some of the talents shared during his very productive, yet much too brief, internship," says John Siekmeier, Lamichhane's supervisor/mentor.

Palmateer says she thoroughly enjoyed the opportunity that the internship provided. "I was

able to finally get an idea of how I could expect to apply my degree," she says. "I was able to observe and participate in a number of meetings as well as work on a few projects. Basically, I learned a lot about the vast amount of work and planning that goes into maintaining and improving the transportation network. I gained insight into the workings of MnDOT, and now I know where I want to end up when I graduate."

Palmateer's supervisor/mentor echoes the positive experience. "This was a great two-way opportunity," says Brian Isaacson. "We got the energy and insights of a talented young engineer, and she got some great exposure to planning and programming for a variety of highway and transit efforts."

NEW RESEARCH REPORTS

Recently published reports on transportation-related research at the University of Minnesota explore:

INTELLIGENT LANE CONTROL SIGNALS

and driver behavior
(MnDOT 2012-22)

NEIGHBORHOOD AND SOCIAL INFLUENCES

of transit corridors
(CTS 12-19)

SENSORS AND TRAFFIC DATA FOR

weigh-in-motion systems
(CTS 12-26)

Research reports are available at cts.umn.edu/Publications/ResearchReports.

Driver-assist from page 1

The DAS uses high-accuracy GPS and vehicle-mounted sensors to monitor a bus's position on the roadway. It provides feedback to the driver through a head-up display (HUD), vibrating seat, and actuated steering if it detects the bus drifting out of the bus-only shoulder lane.

The FTA evaluation measured the performance of the DAS in six areas, including efficiency/productivity, rider satisfaction, and driver satisfaction. It was conducted by researchers at the National Bus Rapid Transit Institute at the University of South Florida.

Overall results indicate that drivers stayed in the shoulder lanes 10 percent longer and drove 3 miles per hour faster while the DAS was active, indicating an increase in driver confidence. Side-to-side movement in the shoulder was reduced by 5.5 inches.

For bus passengers, the DAS was a positive but invisible presence. More than 80 percent of riders rated the ride quality in the shoulder highly, and more than 95 percent were satisfied with travel time reliability. Most people, however, were not aware that the DAS had been installed on the buses.

"The fact that passengers didn't really notice the system is in fact a good result," says MVTA transit planning manager Mike Abegg, a leader of the Cedar Avenue project. "The system should function in the background for passengers, with the results only felt in that their trip is faster and more reliable."

Results from drivers were also positive, with 32 percent reporting greater confidence while driving in the shoulder with the DAS. More than 60 percent of drivers said the DAS made driving in the shoulder safer and less stressful. The most popular feature of the system was the vibrating seat, while the HUD received mixed feedback. Many drivers found it distracting, while others reported that it was especially helpful during snowstorms and at night.

The installation of the system was funded by the FTA through the U.S. Department of Transportation's Urban Partnership Agreement with match from the Twin Cities Metropolitan Council. The ITS Institute's Intelligent Vehicles Laboratory and HumanFIRST Program collaborated with the MVTA and Schmitt and Sons Transportation on the installation.

"I'm pleased that the evaluation documented a measurable improvement in driver performance," Abegg says. "The fact that bus operators had a positive reaction overall is also encouraging for the adoption not only of this specific technology, but the wide spectrum of connected-vehicle technologies that are on the near horizon."



The driver-assist system was designed to help drivers safely navigate bus-only shoulder lanes.

The Twin Cities area has

296

MILES OF BUS-ONLY SHOULDERS,
more than any other metro area in the U.S.

TOWARD ZERO DEATHS CONFERENCE

OCTOBER 22-23

MINNESOTATZD.ORG

Registration is open for the 2012 Minnesota Toward Zero Deaths (TZD) annual conference in Bloomington, Minnesota.

The conference is offered by the Minnesota TZD Program and the Minnesota Departments of Public Safety, Transportation, and Health and is hosted by CTS.

EVENTS CALENDAR

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SEPTEMBER 2012

DRIVER-ASSIST SYSTEM

developed at the U
IS IMPROVING OPERATIONS
on bus-only shoulders in the Twin Cities.

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Researchers created a
**SIMULATION
TOOL TO INVESTIGATE**

how shoppers' travel behavior
affects retail clustering.

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A federally funded plan to kick-start
CENTRAL MINNESOTA'S

ECONOMY

and sustainable housing and transportation
efforts is tapping U of M experts.

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