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Accelerating the pace of transportation innovation

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Transportation and quality of life: a citizen perspective

Quality of life is a commonly used term, but what does it mean to the average Minnesota citizen? What factors do Minnesotans identify as important to their quality of life, and how does transportation fit in? The Minnesota Department of Transportation (MnDOT) has partnered with researchers from the University of Minnesota's Tourism Center in an effort to find out.

In a statewide study, researchers used focus groups and surveys to identify the major categories that contribute to quality of life in Minnesota, including transportation. The research

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Smartphone research aims to help visually impaired pedestrians

Crossing a street isn't risk-free for any pedestrian, but it's especially challenging for the blind or visually impaired.

Chen-Fu Liao, senior systems engineer in the U's Minnesota Traffic Observatory, led a research team that developed a prototype Mobile Accessible Pedestrian Signal (MAPS) system using a smartphone, GPS, and other technologies to help people with limited or no eyesight cross signalized intersections safely.

Smartphone continued on page 7

Celebrating 25 years of CTS—and U of M homecoming

In 1987 the nation's best-selling car was the Ford Escort, the average price of a gallon of gas was under a dollar—and CTS was established.

Help us commemorate our 25th anniversary and take a look at the future of transportation at a special seminar and reception on October 11 in Walter Library on the Minneapolis east bank campus.

The seminar, from 3:30 to 4:30 p.m. CDT, will feature Professor Hani Mahmassani of Northwestern University (see article below).

A one-hour reception will follow with hors d'oeuvres and refreshments. We'll have other fun facts on hand from 1987...and we hope you'll bring a few of your own to share with other guests.

Our celebration falls during the U of M's homecoming week, which will culminate when the Northwestern Wildcats come north to battle the Gophers on October 13. Plan to join us for this seminar and share in the campus spirit—and, at least for Professor Mahmassani's seminar, give a warm Gopher welcome to a Wildcat.



THE 1987 GOPHER FOOTBALL TEAM

was coached by John Gutekunst and finished 6th in the Big 10.

The 25th anniversary reception and seminar are both free but registration is encouraged. Details and registration information are online at cts.umn.edu/Events.

25th anniversary seminar: rethinking the transportation experience

In an age of anytime, anywhere access to virtual destinations, our everyday experience with physical mobility continues to deteriorate. From crumbling infrastructure to congestion to crowded planes and transit vehicles, the quality of the user experience is falling across the spectrum of transportation systems and services.

Yet in many other realms of personal consumption, says Professor Hani Mahmassani, new technologies and devices continue to please and delight consumers. Through clever design and a keen focus on the user experience, personal communication devices have become virtual hubs for social interaction and instant connectivity.

Mahmassani, the director of the Northwestern University Transportation Center, is currently leading an initiative called Reinventing the User Experience in Transportation. He will share highlights from the work and

what it could mean for the future of transportation at a special CTS seminar on October 11.

Reinventing the user experience, Mahmassani says, might call for rethinking the very definition of the output of a transportation system or the nature of the service provided by a transportation company. This means rethinking the total experience—



How can personal communication devices improve the user experience in transportation? Find out at the October 11 seminar.

from origin to final destination—recognizing that travel is part of a more elaborate activity pattern and exploiting the contribution of personal communication and information devices and technologies in that process.

The free seminar will be held in 402 Walter Library on the Minneapolis east bank campus from 3:30 to 4:30 p.m. CDT. It will be broadcast live on the web and be available for later viewing.



TELL US WHAT YOU THINK

We welcome your feedback and ideas. Please share at cts.umn.edu/Catalyst.

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Robotic roadway message painter could improve safety

To improve safety and increase efficiency in roadway painting operations, researchers at the University of Minnesota Duluth (UMD) have developed a robotic roadway message painter prototype. The device can automatically paint words and symbols on a road surface while an operator controls the system from a safe distance.

Ryan Rosandich, associate professor of mechanical and industrial engineering at UMD, led the development of the prototype. The device can automatically paint words like STOP, SLOW, and TURN, various combinations of straight and turn arrows, and symbols for handicapped parking, bike lanes, and railroad crossings. The system's operator can easily select and monitor the painting operation from a laptop computer.

Currently, maintenance workers use stencils and paint rollers to manually apply messages and symbols to the roadway. The robotic device could help workers complete painting operations more safely, quickly, and efficiently—requiring fewer workers and less time spent on the road. It could also improve the flexibility of painting



The robotic prototype can automatically paint words, arrows, and symbols on roadway surfaces.

operations, according to Rosandich, because the system could ultimately be programmed to paint anything.

And although initial benefits will be limited to roadway painting, similar robotics technology could be used for automated crack filling and pothole repair operations in the future, Rosandich says in the project's final report.

The development of the prototype

was sponsored by the Intelligent Transportation Systems Institute at CTS through the Northland Advanced Transportation Systems Research Laboratories at UMD.

The next phase of research, funded by the Minnesota Department of Transportation, is focused on developing and field-testing a similar robotic painter that could be mounted on a vehicle.

New technique aims to extend bridge life, save dollars

A large number of U.S. bridges are reaching the end of their lives and are subjected to heavier traffic than originally intended, but replacing them costs serious money. As a result, affordable solutions to safely extend bridge life are urgently needed.

In a study sponsored by CTS, researchers modeled a response modification technique in which a device is added to aging bridge components under repeated heavy loads. The technique could change how a bridge responds to a specific load—helping it disperse weight from a heavy vehicle, for example.

To test this technique, the researchers—led by Professor Arturo Schultz and Assistant Professor Steven

Wojtkiewicz of the Department of Civil Engineering—used an existing computer model of an in-service Minnesota bridge. They found the response modification technique would effectively reduce stress on vulnerable bridge connections. As a result, the stress ranges were reduced by 39 percent, which could lead to a bridge life extension of up to 61 years. In a follow-up study, researchers discovered using multiple modification devices could extend bridge life even further—by as much as 81 years.

Overall, their results indicate that, combined with bridge health monitoring and advanced sensors, the device has the potential to extend bridge life by decades at a fraction of

the cost of bridge replacement.

Additional research is needed to investigate optimal placement of the device and the best methods for attaching the device to the bridge.



**READ
CATALYST
ONLINE**

for links to research reports and other resources.

CrashHelp pilot under way in central Minnesota

In partnership with the Central Minnesota Regional Trauma Advisory Committee (CENTRAC), researchers at the Center for Excellence in Rural Safety (CERS) and Claremont Graduate University are conducting a pilot study of CrashHelp in central Minnesota this summer.

The study is funded by the Minnesota Departments of Transportation and Health as part of the Minnesota Toward Zero Deaths program.

CrashHelp is a smartphone-based system that allows emergency responders to collect multimedia data about crash victims on-scene and send it directly into emergency rooms. The information gives hospitals advance notification of crash severity and helps them best prepare for a patient's arrival.

CERS research director Tom Horan and Claremont research associate Ben Schooley developed the CrashHelp system and are leading the Minnesota study, which began in July. This is the second CrashHelp pilot, following a successful study in the Boise, Idaho, area in 2011.

Results from the Boise study, which included more than 800 incident transmittals, indicate that CrashHelp allowed for the efficient collection of usable information. Seeing the information being used in hospitals spurred medics to make more use of the system, and hospital personnel said it helped them prepare for the arrival of patients—especially for victims coming from farther away.

As part of the Minnesota study, the CrashHelp system has been adapted to meet the specific needs of rural EMS and emergency practitioners. The enhanced system has been implemented at the Cuyuna Regional Medical Center (CRMC) and its ambulance service provider in Crosby, Minnesota.

The goal of the pilots is a system ready to deploy in rural regions throughout the country.

**ON AVERAGE, IT TAKES
53 MINUTES
FOR VICTIMS TO REACH
A HOSPITAL AFTER A
RURAL CRASH.**



Online gravel road training: students from Alaska to Botswana

CTS's first online distance-learning course has been open for registration for only a few months, but it's already a hit with students from Alaska to Botswana.

The course—Gravel Road Maintenance and Design—is designed for supervisors, operators, and township officials responsible for maintaining

gravel roads, as well as anyone interested in gravel road maintenance.

The course provides a high-quality training option at a low cost. Students can access the training anytime, anywhere. All that's needed is access to a web-enabled computer and an e-mail address.

Eight students have already completed the course and 22 are

currently enrolled, half from outside Minnesota.

The course was developed by the Minnesota Local Technical Assistance Program, a part of CTS, in partnership with Minnesota's Local Road Research Board.

To learn more, go to the Minnesota LTAP website: mnltp.umn.edu.



There are approximately
**1.4 MILLION
MILES OF UNPAVED
ROADS**

in the United States—about 35 percent of the total.

In memoriam: Herbert Mohring, congestion pricing pioneer



Herbert Mohring

Herbert Mohring, a transportation economist who taught at the University of Minnesota from 1961–1994, died June 4. He is known for his pioneering work in the economics of public transportation and congestion pricing.

In the 1990s, Mohring served on a steering committee for the Minnesota Department of Transportation, and his thinking contributed to the opening of the I-394 MnPASS pay lane in 2005.

“Herb’s early work on congestion pricing in the 1960s helped lay the theoretical groundwork for congestion pricing,” says Lee Munnich, director of the State and Local Policy Program at the Humphrey School of Public Affairs.

Mohring is perhaps best known for identifying a significant positive feedback property of transit systems, now known as the Mohring Effect. In a 1972 paper, Mohring showed that increasing the frequency of transit service (and thereby reducing wait times) leads to an increase in demand as more potential riders choose transit; this growth in ridership drives further increases in service as the transit operator responds



to the availability of more paying riders. The Mohring Effect influenced the development of transit requirements included in the Americans with Disabilities Act.

Mohring’s research also helped influence policymakers from Singapore to London. The fourth International Transport Economics Conference, held in Minneapolis in 2009, featured a special tribute in honor of Mohring. An international journal, *Economics of Transportation*, plans to devote an entire upcoming issue to honoring him.

Award-winning bike center is blueprint for other campuses

The University of Minnesota Bike Center and Parking and Transportation Services (PTS) were recognized in June with an Award of Excellence from the International Parking Institute for the Bike Center and its new RFID (radio-frequency identification) commuter validation program.

The University Bike Center includes things that make bike commuting practical, such as professional and do-it-yourself repair stations, card-accessed 24-hour bike parking, restrooms/showers, and a clothing locker.

As a first-in-the-nation program of this magnitude, the university’s RFID

program has the opportunity to break new ground in the promotion and encouragement of bicycle commuting. The program consists of small tags affixed to registered users’ bicycles. RFID receivers installed at strategic locations around campus read and wirelessly transmit the tag information to a server accessible to users and the institution. This system solves the longstanding problem of bicycle commute trip validation and enables employers to offer incentives to bicyclists.

“This program can serve as a blueprint for campuses around the nation,” says Bob Baker, PTS executive director.



368 PEOPLE

died on Minnesota roads in 2011. This represents a fourth consecutive annual drop in road fatalities and the lowest death count on record since 1944.

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 provides a forum for sharing information on best practices in engineering, enforcement, education, and emergency medical/health services and for identifying new approaches to reducing the number of traffic fatalities and life-changing injuries on Minnesota roads.

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

Quality of life from page 1

team was led by Ingrid Schneider, Tourism Center director. Karla Rains, director of customer relations at MnDOT, provided transportation-related guidance.

The study identified 11 main categories that Minnesotans find important for their quality of life, including education, employment, recreation, health, and transportation. And although transportation was ranked ninth in terms of overall importance, participants said it was often a factor in their experience of other categories.

“Transportation is described as the piece that makes everything else on the list happen,” Rains said. “It gets [citizens] to work, health care appointments, and recreation opportunities.”

The research team also asked participants to identify specific services within transportation that contribute to or detract from their quality of life. Results were organized into seven transportation categories: access, design, environment, maintenance, mobility, safety, and transparency (in planning and communications).

Although all seven areas were identified as important, maintenance was considered nearly twice as valuable as any other category. Within maintenance, keeping the road surface smooth—including snow and ice removal—was ranked as MnDOT’s most important activity.

The researchers also asked participants about the categories they would like to see MnDOT emphasize in future planning initiatives. Citizens



MnDOT has used the study results to support **MINNESOTA GO,** a 50-year visioning process aimed at aligning transportation with Minnesota’s economy, natural environment, and quality of life.

identified maintenance, access, and safety as the most important for both short- and long-term efforts.

Using the results of the study, MnDOT has begun implementing a planning process that uses transportation as a gathering point to address the multiple needs of a community.

“We’ve already begun holding consumer-centric planning meetings with stakeholders and other state agencies at the corridor-planning level,” Rains said. The meetings aim to expand the discussion beyond transportation investment to consider the benefits of other quality-of-life, economic, and environmental objectives.

MnDOT is also using the quality-of-

life study results to review and revise its current performance measures, which will be used to guide future planning and investment decisions.

“Our goal is to ensure we’re measuring ourselves against those services that predict satisfaction and contribute to quality of life for Minnesotans,” Rains said.

FINDINGS INDICATE THAT 8 OUT OF 10 MINNESOTANS ARE SATISFIED with MnDOT services.

NEW RESEARCH REPORTS

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

COLLISION DETECTION

for enhanced vehicle and occupant safety (CTS 12-07)

AUTOMATED SPEED ENFORCEMENT

and deployment issues (CTS 12-23)

IMPROVED CAMBER PREDICTION

for bridge construction (MnDOT 2012-16)

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

Smartphone from page 1

For their work, funded by the Intelligent Transportation Systems Institute (a part of CTS), the researchers interviewed 10 blind and low-vision people to better understand what types of information they use at intersection crossings and to identify what could help them. "I think the whole system and the whole concept is so beautiful," says Ken Rodgers, president of the American Council for the Blind of Minnesota. "It just works well."

Blind or visually impaired pedestrians face a number of challenges, such as difficulty locating the edge of the street or crosswalk and interpreting signal and traffic patterns. Current crossing systems, which use audio warnings, have shortcomings for municipalities, including the cost of equipment and maintenance. And because there is no standard location for push-button signals, visually impaired pedestrians must deviate from their preferred travel paths to request a crossing signal, which can make navigating the intersection more difficult.

The U's system goes above and beyond existing crosswalk aids. While standing at an intersection, the user can point a smartphone in the direction he or she wants to cross and call up information about the intersection and the signal phase by tapping the unit's touchscreen once. Tapping twice confirms the desired crossing direction and sends a request for a crossing signal to the traffic signal controller. The user gets feedback from the text-to-speech interface.

Because it's an app, it's easy and inexpensive for users. And MAPS puts the assistive technology directly in the hand of the user, avoiding many of the drawbacks associated with conventional infrastructure-based systems while offering greater flexibility and ease of use. A video explaining MAPS is online.

The prototype has been field-tested at intersections in Minneapolis and Golden Valley, Minnesota. Work continues to refine the accuracy, resolution, and usability of the system.

In addition, the researchers will soon begin a new project funded by the Minnesota Department of Transportation. This project aims to enhance the system to help the visually impaired travel safely around work zones.



The research team worked with potential users of the app, such as Robert Zimmerman (above), to understand their needs.



25.2 MILLION
AMERICANS

18 and older have significant vision loss.

More than
3.4 MILLION
AMERICANS

age 40 and older are legally blind or visually impaired.



EVERY
7 MINUTES

someone in the U.S. becomes blind or visually impaired.

EVENTS
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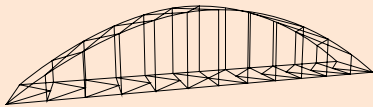
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A prototype
SMARTPHONE APP
 helps the
BLIND AND VISUALLY IMPAIRED
 cross intersections.
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A technique refined at the U of M could
EXTEND BRIDGE LIFE
AND SAVE DOLLARS.
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To improve safety and efficiency,
 U of M researchers invented a
ROBOTIC
ROADWAY PAINTER.
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