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CTS Research E-News brings you the latest research project milestones, published reports, and seminar coverage.

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Upcoming Events**Policy & Planning****Technology's impacts on transportation**

The Sustainable Technologies Applied Research (STAR) initiative released a milestone report titled *Places and Networks: New Hierarchies in Access and Activity* highlighting findings from three years of interdisciplinary research. The goal of the six-year project is to better understand how rapid advances in communication networking are affecting Minnesota's transportation system, land use, and economic development.

The STAR initiative is a project of the [Intelligent Transportation Systems \(ITS\) Institute](#) (housed within CTS), and includes researchers from the Hubert H. Humphrey Institute of Public Affairs and several other University of Minnesota departments.

Areas covered in the report include:

- Technology's influence on the development of urban areas
- Effects of new information technologies on household travel decisions
- How rural emergency response systems are adapting to the growth of wireless communications
- Rural industry clusters' use of information technology
- Network dynamics governing the growth of transportation networks

Project leader **Lee Munnich** of the Humphrey Institute says that the STAR initiative reflects the University's commitment to "real world" research that informs future policy decisions. Commenting on the project, Congressman **James Oberstar** (D-Minn.) agreed that STAR will help policymakers "sift through the complex issues of transportation and technology, and make these systems work for all citizens."

In the next three years, the STAR researchers will continue their various projects and look forward to publishing detailed findings as well as conducting outreach and education efforts to disseminate the results of their research. The current report, along with other project information, is available at www.hhh.umn.edu/centers/slp/projects/star21.

Benefit-cost analysis tool for highway projects

Estimating the economic effects of highway projects on vehicle owners could get easier thanks to a new tool developed for [Mn/DOT](#) by two University of Minnesota researchers.

Gary Barnes and **Peter Langworthy** of the [Humphrey Institute of Public Affairs](#) looked at several variable factors influencing vehicle use costs, including fuel consumption, maintenance, tires and repairs, and some depreciation. In contrast to information from other sources, such as consumer guides, the new methodology factors out fixed costs such as insurance and finance that remain the same no matter how much the vehicle is driven.

The project was prompted by Mn/DOT's experience using other cost-estimation methods. The agency found that existing tools were difficult to apply to real-world situations, and that dated information could not readily be updated to reflect current vehicles and conditions.

Barnes and Langworthy developed estimation methods for both private vehicles (automobiles, pickup trucks, SUVs, and vans) and large commercial vehicles. The cost estimates can be adjusted to take into account varying pavement conditions and stop-start driving.

The result of this analysis is a spreadsheet tool that reflects Minnesota conditions. The spreadsheet allows users to edit cost parameters in order to compare the impacts of alternative project scenarios, or estimate complex projects where different construction phases have different impacts on drivers.

The Per-Mile Costs of Operating Automobiles and Trucks (Mn/DOT 2003-19) is available at www.lrrb.gen.mn.us/pdf/200319.pdf.

Intelligent Transportation Systems

New technique for monitoring traffic in difficult environments



Researchers at the [Intelligent Transportation Systems Institute](#) are currently developing new techniques to allow video-based monitoring of traffic flow on freeway entrance ramps. This technique could improve the ability of traffic engineers to manage these critical road segments.

The new work, by **Nikolaos Papanikolopoulos** and **Osama Masoud** of the [Department of Computer Science and Engineering](#), extends their earlier research on image processing algorithms for video-based traffic monitoring.

Although video-based monitoring systems offer advantages including ease of installation and flexible configuration, they have traditionally had problems monitoring individual vehicles in stop-and-go conditions and areas where the detector's view of a vehicle is often blocked by other vehicles.

In their work's latest phase, the researchers modified their approach to vehicle tracking, changing from an algorithm that tracks "blobs" of similar pixels to one that focuses on measuring optical flow characteristics of the video image. This approach does away with the blob-tracking algorithm's need to separate foreground objects from the background and from each other.

Considering the relative strengths and weaknesses of blob-tracking and optical-flow algorithms, the researchers hypothesize that a future system incorporating elements of both methods could be the key to accurate video monitoring of entrance ramps and other difficult traffic environments.

Sensor-based Ramp Monitoring (Mn/DOT 2003-34) is available at www.lrrb.gen.mn.us/pdf/200334.pdf.

Transportation Infrastructure

Impacts of truck weight on bridge service life



A bridge that lasts forever? That would be nice. In the real world, replacing bridges as they inevitably wear out is an expensive and disruptive part of managing the transportation system—one that engineers would prefer to minimize.

With this in mind, a research team led by **Robert Dexter** and **Catherine French** from the [Department of Civil Engineering](#) recently undertook an evaluation of several Minnesota bridges aimed at understanding which bridges in the state would be most affected by relaxing truck load restrictions. The researchers' findings have implications for bridges across the country that employ similar designs and materials.

The structures evaluated included steel-girder bridges and bridges built with prestressed concrete I-girders. Both bridge decks and supporting girders were tested. The testing methodology attempted to understand the effects of increases in maximum legal gross vehicle weight (GVW) as well as permit loads and per-axle load limits.

Initial field testing employed strain gages to measure the bridges' response to trucks of known weights. Back in the lab, the field data were used to calibrate finite-element models of each bridge. Using these models, the researchers performed parametric studies to investigate the effects of various load factors on the bridges' decks and girders.

Based on their field data and modeling, the researchers were able to make specific recommendations about weight limits on the bridges under evaluation. Further, they were able to generalize their findings to make recommendations about which types of bridges are likely to suffer decreased service life due to increased vehicle weights.

Effects of Increasing Truck Weight on Steel and Prestressed Bridges (Mn/DOT 2003-16) is available at www.lrrb.gen.mn.us/pdf/200316.pdf.

Transit & Alternative Modes

Conference explores community-based transportation

On October 1, CTS hosted the second "Conference on Community-Based Transportation," an event that brought together participants from regional human service agencies, government, private industry, and the University of Minnesota to discuss issues related to community-based transportation (CBT) and to share ideas for improving CBT options.

In opening remarks, CTS director **Robert Johns** defined CBT as transportation that is provided by means other than mainline buses or private vehicles, for people who cannot drive or do not have access to vehicles. He said that an increased awareness of CBT issues stemming from the first conference led to, among other things, a partnership between [Hennepin County](#) and the [University of Minnesota](#) to conduct a multifaceted CBT-related research project.

Gary Erickson, assistant county administrator for Hennepin County Public Works, explained that Hennepin County has a particular stake in CBT

because it funds many social service programs, for which total transportation-related costs exceed \$10 million. But CBT issues are by no means limited to Hennepin County, he said; they are regionwide.

"The time has never been better to get together to solve these problems, especially considering the current budget crisis we are all in," he said. "We have to do more with less."

In her keynote presentation, delivered via teleconference, **Dianne McSwain**, special assistant to the director for the Office of Intergovernmental Relations, U.S. Department of Health and Human Services, noted that health and human services providers encounter significant challenges in getting their clients into service sites, yet these challenges often fail to make it into the policymaking arena.

Following McSwain, **Lee Munnich** and **Gary Barnes**, researchers with the Hubert H. Humphrey Institute of Public Affairs' State and Local Policy Program, gave a presentation on the opportunities and challenges for CBT in Minnesota.

A panel session on CBT-related policy issues moderated by **David Johnson** of Metropolitan Health Plan featured **Louis Moore**, director of community relations for U.S Rep. **Martin Sabo**, **Connie Kozlak**, manager of transportation systems planning for the Metropolitan Council, and **John Kowalczyk**, a policy consultant with the Medical Assistance and Medical Transportation division of the Department of Human Services.

The conference also included concurrent sessions on brokerage systems, policy needs, leveraging existing systems, and measuring outcomes of CBT programs.

A complete conference summary is available online at www.cts.umn.edu/publications. Expanded coverage of this event will appear in the January 2004 *CTS Report*, www.cts.umn.edu/news/.

University research incorporated in light-rail project

Research at the University of Minnesota helped lay the foundation for underground construction on the Hiawatha Light Rail line, former faculty member **Chuck Nelson** said at a light-rail seminar this fall.

The conference, "An Insider's View of Light Rail," drew more than 60 people to the Department of Civil Engineering on October 10.

Speakers included Hennepin County commissioner **Peter McLaughlin**; **Vicki Barron**, the deputy design/build project manager for the Hiawatha Project Office; **Rex Brejnik**, deputy project manager on the project for Parsons Transportation Group; and Nelson, a senior consultant for CNA Consulting Engineers.

Light-rail proposals have a long history in the Twin Cities. In the early 1970s, Nelson and a group of University of Minnesota professors studied routes for low-cost rail tunnels in the Twin Cities. Their study, with funding from the National Science Foundation and the federal government, looked at the region's unique geology, and included construction of a cavern under what is now the Washington Avenue ramp to demonstrate the feasibility of using large-scale underground spaces. Many of their developments covering both geotechnical engineering and underground station geometrics have been incorporated into the rail line's underground tunnels, especially at the airport, where the line will connect with a transit hub under the current parking garages.

The Regional Transit Board, through the CTS research program, also funded research in the 1990s by **Ray Sterling** and **John Carmody** (then of Civil Engineering) into underground station design issues for LRT in the Twin Cities geology.

Brejnik and Barron discussed the rail line's design process and the challenges of managing fast-track construction on a highly visible project. McLaughlin, a longtime light-rail proponent, said the impact of the project goes beyond its transit advantages. When the main line, which runs through south Minneapolis to the airport, opens this spring, it will also boost development along the entire Hiawatha corridor, he said.

The first segment of the line, from the airport to downtown Minneapolis, will open on April 3, 2004. The remainder of the line, south to the Mall of America, is scheduled to open in December 2004.

National Transit News

TCRP research publications available online

The federal Transit Cooperative Research Program, administered by the Transportation Research Board, provides practical transit research to address technical and operational issues. TCRP emphasizes putting research results into the hands of organizations and individuals that can use them to solve problems. TCRP publications may be viewed at www4.trb.org/trb/crp.nsf.

Here are recent TCRP publications, with associated reference information from the TRB Web site:

- ◆ [*Resource Requirements for Demand-Responsive Transportation Services*](#) (TCRP Research Report 98)
- ◆ [*Emerging New Paradigms -- A Guide to Fundamental Change in Local Public Transportation Organizations*](#) (TCRP Research Report 97)
- ◆ [*Determining Training for New Technologies: A Decision Game and Facilitation Guide*](#) (TCRP Research Report 96)

Journal of Public Transportation

The *Journal of Public Transportation*, Volume 6, No. 4, 2003, published by the National Center for Transit Research at the University of South Florida, includes these articles, available at www.nctr.usf.edu:

- ◆ The Importance Customers Place on Specific Service Elements of Bus Rapid Transit
- ◆ Bus Transit and Land Use: Illuminating the Interaction
- ◆ Evaluating the Urban Commute Experience: A Time Perception Approach
- ◆ A Review of Approaches for Assessing Multimodal Quality of Service

Safety

Putting limits on the speed-versus-safety debate

A new study may help put limits on the debate about the role speed plays in car crashes. Although it may seem obvious that driving slower is safer, there is a lack of consensus in the public and policy arena about the connection between the speed one chooses to drive and the risk of being involved in a crash. The issue is further muddled by several recent studies that suggest only a weak connection between driving speed and crash risk.

Associate professor **Gary A. Davis** of the University's [Civil Engineering Department](#) is hoping his research will help clarify the issue and inject some facts into the debate.

According to Davis, problems with previous research on the subject have produced misleading results.

For example, one commonly used research approach looks for associations between a road's average speed or speed variance and its crash rate, without looking at the speeds of vehicles actually involved in crashes. Unless carefully done, this approach can produce classic statistical misinterpretations, such as the ecological fallacy and Simpson's paradox. On the other hand, crash reconstruction techniques do attempt to look at the speeds of vehicles involved in crashes, but haven't accounted for inevitable measurement errors when estimating the speeds of vehicles. These errors in speed measurement can give rise to inaccuracies in statistical results.

Rather than study broadly aggregated data, Davis and graduate students **Sujay Davuluri** and **Jianping Pei** are focusing on how speed affects crash risk at the individual level. To avoid the measurement-error pitfalls of previous research, the team developed a method for quantifying the uncertainty in estimates made from crash reconstructions, and incorporated this into a "case-control" study of vehicle speed and crash risk. Rather than use a straightforward case-control approach, the heterogeneity in the crashes they had to work with required them to develop new methods for extracting information from very small samples, Davis says.

Davis says he doesn't expect the research results to dictate policy; instead, he hopes to inform the ongoing debate about the role of speed in determining crash risk. Aside from influencing what speed limits should be, the findings could potentially help law enforcement and traffic engineering agencies decide how much emphasis to put on speed limits and their enforcement.

An expanded article on this topic appeared in the [Fall 2003 issue](#) of the ITS Institute *Sensor*. Additional research project information is available at www.its.umn.edu/research/projects/2001032.html.

Upcoming Events

Visit the CTS web site www.cts.umn.edu for more comprehensive event information.

February 18, 2004

CTS Winter Luncheon, "A National Perspective on Current Highway Safety Issues," Radisson Metrodome Hotel, Minneapolis. Contact Shirley Mueffelman, 612-624-4754, smueffel@cce.umn.edu. View [details](#).

February 19, 2004

Minnesota Pavement Conference, Earle Brown Center, St. Paul. Contact Teresa Washington, 612-624-3745, twashing@cce.umn.edu. View [more information](#).

March 3, 2004

Transportation Career Expo, Coffman Union, Minneapolis. Contact Mindy Carlson, 612-625-1813, carlson@cts.umn.edu. View [details](#).

May 4-5, 2004

15th Annual CTS Transportation Research Conference, RiverCentre, St. Paul. To learn more, please visit www.cts.umn.edu/events/rescon. You may also call Shirley Mueffelman at 612-624-4754 for more information.
