



March 2010 – Vol. 8, No. 3

*CTS Research E-News brings you the latest research project milestones, published reports, and seminar coverage.***In this issue:****Announcements**

- ◆ [Topics announced for CTS Research Conference](#)

Policy & Planning

- ◆ [Investigators develop transportation solutions for sparsely populated areas](#)
- ◆ [Journal of Transport and Land Use published](#)

Intelligent Transportation Systems

- ◆ [A portable weigh station for rural roads](#)

Transit, Bicycling, and Walking

- ◆ [TCRP research publications available online](#)

Transportation Infrastructure

- ◆ [Seminar presents best practices for bridge deck sealants](#)

Upcoming Events

Announcements

Topics announced for CTS Research Conference

Speakers and topics have been announced for the [21st Annual CTS Transportation Research Conference](#). The event returns to its usual location at the [Saint Paul RiverCentre](#) April 27–28.

The conference is a forum for researchers and practitioners from Minnesota and the Upper Midwest to share their research findings in a variety of transportation-related areas. Concurrent sessions are focused in four categories that match the Center's research emphasis areas—Transportation Safety and Traffic Flow, Transportation Infrastructure, Transportation and the Economy, and Transportation Planning and the Environment—with a fifth category covering Education and Outreach issues.

The opening session—titled “How Do National Transportation Priorities Influence Local Decisions?”—will feature a keynote presentation by **Eric C. Peterson**, president of the [American High Speed Rail Alliance](#), and comments from a panel of local experts. The luncheon speaker will be Professor **Catherine Ross** of the [Georgia Institute of Technology](#), editor of the 2009 book *Megaregions: Planning for Global Competitiveness*.

For the first time, CTS will post [live Twitter updates](#) during the conference. The [program and registration information](#) have been mailed and are also posted online. For more information, contact the College of Continuing Education at 612-624-3708, cceconf5@umn.edu.

Policy & Planning

Investigators develop transportation solutions for sparsely populated areas



Large, remote, and sparsely populated, [Itasca County](#) has more than enough lakes and pine forests to qualify as quintessentially northern Minnesota. But the county's geographic and demographic characteristics present residents with significant transportation challenges, especially in the area of public transit. Senior citizens, low-income workers, rural residents, and students are among the groups facing the greatest difficulties in an area that is largely dependent on private automobiles for mobility.

With support from the [Blandin Foundation](#), a team of University of Minnesota researchers examined a range of potential measures for improving transportation and transit service in Itasca County. The research team was led by **Frank Douma**, assistant director of the [State and Local Policy Program](#) at the [Hubert H. Humphrey Institute of Public Affairs](#), along with Humphrey Institute assistant professor **Yingling Fan**, research fellow **Ferrol Robinson**, graduate students **Colin Cureton** and **Matt Schmit**, and CTS assistant director for education and outreach **Gina Baas**.

The research team sought to develop a complete picture of the county's transportation needs through background research—including demographic analysis and mapping the location of jobs and residential centers—and a series of focus groups, listening sessions, and individual interviews.

This research led to a finding that county residents are often unaware of the characteristics of available transit services and ride-share programs. Because residents lack knowledge about transit, the services are underutilized. In addition, the researchers found that so-called "last mile" factors inhibit transit use; where transit services exist, they do not anticipate the needs of users between their homes and the transit stops.

Automobiles, the researchers say, must be explicitly recognized as a component of an effective multimodal transportation system in Itasca County. The researchers concluded that improving transit alone will not meet all of the county's transportation needs; due to the geographic nature of the county, most residents rely on cars as their primary or exclusive means of travel, and this is likely to continue in the future.

In their report, the research team present several recommendations for improving transportation in Itasca County. These recommendations fall into several categories, including policy and administrative changes; educational and outreach opportunities; improvements to operations, maintenance, and services; and opportunities for cost sharing and savings.

Editor's note: "People's preferences for commuting in sparsely populated areas: The case of Sweden," by Kerstin Westin and Erika Sandow, published in the *Journal of Transport and Land Use* vol. 2 no. 3, explores similar issues of transport availability.

Itasca County Area Transportation Study (CTS 09-28) is available on the CTS Web site.

Journal of Transport and Land Use published

CTS is pleased to announce the publication of Vol. 2, issue 3 of the *Journal of Transport and Land Use*.

Special Issue: Networks and Commuting

Guest editorial: Networks, commuting and spatial structures: An introduction

Aura Reggiani, University of Bologna

The evolution of the commuting network in Germany: Spatial and connectivity patterns

Roberto Patuelli, University of Lugano, The Rimini Centre for Economic Analysis

Aura Reggiani, University of Bologna

Peter Nijkamp, VU University Amsterdam

Franz-Josef Bade, University of Dortmund

Modeling commuting systems through a complex network analysis: A study of the Italian islands of Sardinia and Sicily

Andrea De Montis, Università degli Studi di Sassari and Linkalab (Italy)

Alessandro Chessa, Università degli Studi di Cagliari and Linkalab (Italy)

Michele Campagna, Università degli Studi di Cagliari

Simone Caschili, Università degli Studi di Cagliari

Giancarlo Deplano, Università degli Studi di Cagliari

User inequity implications of road network vulnerability

Erik Jenelius, Royal Institute of Technology, Sweden

Perceptions of public transport travel time and their effect on choice-sets among car drivers

Nicolaas Jacob Arnold van Exel, Erasmus University Rotterdam

Piet Rietveld, Free University Amsterdam

People's preferences for commuting in sparsely populated areas: The case of Sweden

Kerstin Westin and Erika Sandow, Umeå University, Sweden

Commuting in Belgian metropolitan areas: The power of the Alonso-Muth model

Ann Verhetsel, University of Antwerp

Isabelle Thomas, University of Louvain

Marjan Beelen, University of Antwerp

The Journal of Transport and Land Use is an open-access, peer-reviewed online journal publishing original interdisciplinary papers on the interaction of transport and land use. Domains include: engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science, and complex systems.

Intelligent Transportation Systems

A portable weigh station for rural roads



Professor **Taek Mu Kwon** of the [University of Minnesota - Duluth electrical and computer engineering department](#) is developing a portable weigh-in-motion (WIM) system that will enable highway engineers to measure truck weights in areas far from highway weigh stations. The research is being sponsored by the [Minnesota Department of Transportation](#).

Editor's note: A longer version of this article appears in the [Spring 2010 ITS Institute Sensor](#) newsletter.

Highway engineers charged with maintaining rural roads have noted more heavy vehicles in recent years. The increase, according to researchers, is being driven by the rapid development of the biofuels industry and its need for large quantities of corn and soybeans.

The potential for increased heavy truck traffic to damage local roads concerns highway engineers in rural areas. Estimating road wear due to heavy trucks is difficult in rural areas, however, because constructing traditional weigh stations in these areas is unfeasible. WIM technology has the potential to monitor truck loads more economically. Kwon is designing a system that is portable and can be deployed where it is needed to monitor vehicle loads.

Traditionally, weigh stations staffed by trained personnel have been the primary tool for determining compliance with weight limits. After a vehicle has been stopped and weighed, weigh station staff determine whether its weight is within the limits prescribed for its classification and any applicable permits.

Constructing and maintaining weigh stations on low-volume rural roads, however, is not economically feasible. A portable WIM system gives engineers the flexibility to deploy monitoring equipment quickly and change locations as necessary, which makes monitoring vehicle weights in multiple locations cost-effective.

The heart of Kwon's WIM design is a pressure sensor consisting of a thin strip of piezoelectric material, which converts mechanical pressure into a measurable electrical signal.

To protect the piezoelectric beam, Kwon examined a variety of flexible materials for the weigh pad. Cementing together layers of neoprene fabric and ballistic nylon (a fabric used in bulletproof vests) to create a flexible pad proved problematic due to the difficulty of bonding the layers together without causing the pad to warp. He then turned to industrial reinforced-rubber conveyor belt material. A groove is carved into one layer of belt material to hold the piezoelectric beam, and a second layer is cemented over the top to fully enclose and protect the sensor.

A second obstacle was maintaining accuracy under tough real-world conditions. The signal processing system must be capable of measuring axle weights while isolating peripheral forces from the main load force. The impact of heavy wheels can cause anchored sensor pads to shift slightly, resulting in erroneous measurements. Temperature variations can also interfere with measurement.

Finally, to be deployable in remote areas that lack electrical service, the system must run entirely on battery power and be able to operate continuously for long periods. Because calculating vehicle weights from raw sensor data is computationally intensive, the data processor must be powerful but draw little electricity.

The system design includes a signal conditioning circuit to prepare raw analog signals from the sensor pad for digital processing. This critical circuit minimizes electrical impedance mismatch, removes noise in the signal caused by thermal fluctuations, and maps the raw charge signals onto linearly proportional voltage signals for digitization. The conditioning circuit will incorporate specially designed amplifiers tuned to the characteristics of the input signal, currently under development in Kwon's laboratory.

Field testing of the prototype WIM system is scheduled to take place during 2011 at the Minnesota Department of Transportation's MnROAD pavement testing facility, where vehicles of known weights can be operated on a variety of pavement types to conduct controlled verification of the system.

Transit, Bicycling, and Walking

TCRP research publications available online

The federal Transit Cooperative Research Program (TCRP), 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.

Recent TCRP publications include:

- ◆ [Legal Handbook for the New Starts Process](#) (TCRP Legal Research Digest 30)

Transportation Infrastructure

Seminar presents best practices for bridge deck sealants



Professor **Arturo Schultz** of the University of Minnesota [Department of Civil Engineering](#) presented research findings on the state of the art in bridge deck sealants and crack sealers at a [CTS Research Seminar](#) in conjunction with a meeting of the [CTS Transportation Infrastructure Council](#) February 17. A [webcast of the seminar](#) is available on the CTS Web site.

The research was carried out by graduate students **Karl Johnson** and **Jacob Reneson**, Schultz, and Professor **Catherine French**. Support for the research came from the Minnesota Department of Transportation and the Local Road Research Board. A [final report on the project](#) was published in 2009 and is available from the CTS Web site.

Penetration of chloride ions from road salt into bridge deck cracks is a significant cause of deterioration. When chloride reaches steel reinforcing bars within the concrete deck, the resulting rust leads to spalling and eventual deterioration. A variety of crack sealers and deck treatments are available to protect bridge decks and repair existing cracks. However, the number of options available makes it difficult to select the best treatment for a particular

situation.

Based on information collected from a literature review and survey, researchers determined the best sealant materials and recommended application practices for Minnesota and the Midwest. Their report includes a summary of the survey conducted by the Minnesota Department of Transportation (Mn/DOT) to determine the current selection criteria, materials, application practices, and findings from different states in United States and an assessment of selection criteria, materials, application practices, and performance.

"[Crack and Deck Sealant Performance](#)" is available for viewing on the CTS Research Seminars Web page.

Upcoming Events

April 20-21

[Symposium on Mileage-Based User Fees: Moving Forward](#), Minneapolis, MN

April 22

CSS National Dialog Workshop, 9:00 a.m. - 4:00 p.m., Continuing Education and Conference Center, Saint Paul, Minnesota

April 22

ITS Institute Seminar: The Nexus Between Accident Investigation and Transportation Safety Research, 3:30 - 4:30 p.m., 1130 Mechanical Engineering

April 27-28

2010 CTS Annual Transportation Research Conference, RiverCentre, St Paul MN

May 3-5

ITS America 20th Meeting and Exposition, Houston, TX