

CTS Catalyst

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Accelerating the pace of transportation innovation

BICYCLE COMMUTING

page 2

CROSS-COUNTY COMMUTERS

page 3

SMART SIGNAL

page 4

CTS AT THE FAIR

page 5

CTS BLOG

page 5

RESEARCH CONFERENCE: CALL FOR ABSTRACTS

page 6



Interns Sharon Wong and Joseph Casanova working in the field at the MnROAD pavement research facility

Internship program continues its success in second year

Participants in the 2013 Summer Transportation Internship Program gained valuable experience in the transportation industry and received a behind-the-scenes glimpse of what it takes for the Minnesota Department of Transportation (MnDOT) to keep Minnesota moving.

This year, six students participated in 10-week internships at a variety of MnDOT offices. The program was offered in partnership by CTS, Howard University, and MnDOT.

Internship continued on page 6

Congestion-reduction measures on I-35W:

How well do they work?

In an effort to combat congestion in our country's urban areas, the United States Department of Transportation launched the Urban Partnership Agreement (UPA) program in 2007. The program infused nearly \$900 million into transportation-related projects in four cities nationwide, including the Twin Cities metropolitan area. Minnesota's projects—which include the installation of MnPASS dynamic toll lanes and variable message signs—focused on improving traffic flow in the I-35W corridor between Minneapolis and the city's southern suburbs.

To understand the effectiveness of the traffic operations measures implemented under the UPA,

Congestion continued on page 7



Exploring the effects of the built environment on bicycle commuting

Over the past few years, the City of Minneapolis has doubled its miles of on-street bikeways, and many cyclists are using these and other bicycle facilities to ride their bikes to work. In fact, 3.7 percent of workers in Minneapolis frequently commute by bicycle.

To determine exactly how bicycle infrastructure and the built environment affect people's decisions to bike to work, researchers from the Humphrey School of Public Affairs and the Department of Civil Engineering surveyed residents in three Minneapolis corridors. Graduate student Jessica Schoner reviewed the study and its findings at the 24th Annual CTS Transportation Research Conference in May.

The researchers measured residents' participation in and frequency of commuting by bicycle while controlling for demographics, residential preferences, and travel attitudes. According to Schoner, the resulting information could be used to assist policymakers and planners in making strategic infrastructure development decisions.

Overall results showed that 25 percent of survey respondents—which included residents in the Nicollet, Bloomington, and Hiawatha corridors—commute by bike. About one-fifth of these bicycle commuters said they bike to work four or five times per week.

Findings also indicated that those living near a bike lane are more likely to commute by bicycle, but the presence of bike lanes was not correlated with how frequently residents chose to bike to work. However, after controlling for whether individuals choose to bike at all, factors such as biking accessibility to jobs were associated with the frequency of bicycle commuting, Schoner said.

"Looking at participation in and frequency of bicycle commuting jointly



About 25 percent of survey respondents in this study reported commuting by bicycle.

gives us better insight about what factors influence people to make more trips by bike versus factors that attract people to bike-friendly neighborhoods because they already prefer bicycling," Schoner said.

Other findings showed that individuals with access to free parking at their workplace or those with longer commute distances were less likely to commute by bike.

"The ultimate goal is to use the study's findings to help us deploy bike infrastructure in a way that provides the greatest number of opportunities for people to choose to bike," Schoner said. "For example, bike lanes are probably attracting people who like biking to live near them, so we should build new bike lanes in areas with good job accessibility...in order to magnify their impacts."

In the future, Schoner hopes to investigate the link between free



Minneapolis has
**92 MILES
OF ON-STREET
BIKEWAYS AND
85 MILES
OF OFF-STREET
BIKEWAYS.**

workplace parking and bicycle commuting in greater detail. She also believes the methodology used in this study could be tested on non-work bicycling trips, as well as for other modes such as walking and transit.

Investigating cross-county workforce flows in Minnesota

Changes in transportation costs, population growth, and the outward spread of cities and suburbs have contributed to an increase in the geographic size of local labor markets in Minnesota. This means that many workers, both within and outside of the St. Paul–Minneapolis metropolitan area, currently work in a different county from where they live.

In an effort to better understand these cross-county links, a team of researchers from the U's Department of Applied Economics examined Minnesota's workforce flows—the number of workers who live in one county and work in another. Led by Associate Professor Elizabeth Davis, the researchers examined the size of these workforce flows from each Minnesota county. They also compared the flows of different earnings groups from each county to examine the effects of income on cross-county commuting patterns.

The study's goal was to create a framework for understanding broader regional commuting connections within Minnesota, which could be used to inform more effective transportation planning, economic development, and housing decisions. Study funding was provided by the Center for Urban and Regional Affairs (CURA).

Although cross-county workforce flows varied by worker earnings and county type (e.g., metropolitan area, rural), they were significant across the state. In fact, overall results of the study indicated that half of all Minnesota workers were outcommuters—individuals employed outside their home county—in 2008.

Other key findings:

- Workers in the high-earnings category were more likely to be outcommuters than workers with lower earnings.

- Metropolitan area counties (associated with an urban core area of 50,000 people or more) had higher rates of outcommuting than other Minnesota counties, but even rural counties had large numbers of outcommuters.
- In counties outside a major metropolitan area, workers outcommuted to a wider variety of destination counties to reach their workplace, especially workers in the low-earnings category.
- For each county, the top five outcommuting destination counties were typically similar, but not identical, across earnings categories.

Based on these results, the researchers suggest that focusing only on the largest commuting flows can obscure the complexity of actual commuting patterns as well as the interdependence of rural and urban areas in Minnesota.

The study's findings also have implications for Minnesota's transportation network: information about significant workforce flows between counties could be helpful for setting transportation infrastructure development priorities.

Adapted from a report published in the spring 2013 issue of the CURA Reporter.

50 PERCENT
OF MINNESOTA WORKERS
are employed outside of their
home county.



New SMART Signal installation helps MnDOT monitor timing plans

Researchers from the U of M recently developed a new version of software for the SMART Signal system, and deployments at more than 50 intersections managed by the Minnesota Department of Transportation (MnDOT) are already under way.

SMART Signal (Systematic Monitoring of Arterial Road and Traffic Signals) automatically collects and processes data from traffic signal controllers at multiple intersections. It then creates performance measures, including information on the times and locations congestion occurs on a roadway. The system was originally developed by civil engineering associate professor Henry Liu to improve traffic management on urban arterial streets.

With the new software, also developed by Liu and his research team, SMART Signal can directly retrieve traffic data from signal controllers without any additional hardware instrumentation—reducing both the time and cost associated with implementation.

The new software has been incorporated into the iMonitor system currently offered by Smart Signal Technologies Inc., a startup company launched in 2011 to commercialize the SMART Signal system.

Recently, MnDOT had the iMonitor system installed at several intersections on Trunk Highway (TH) 10 and TH 65. According to metro traffic engineer Steve Misgen, MnDOT plans to equip additional intersections on TH 61 sometime this fall, for a total of more than 50 new intersection implementations.

The new installations are allowing MnDOT to monitor existing signal timing plans and evaluate their performance by providing data on queue length, level of service, travel time, speed, volume, and delay, Misgen says. In addition, several of the new installations support MnDOT's signal timing consultant, Alliant Engineering, in its collection and



analysis of traffic data.

"Presently, our plan is to retime the signals in a corridor every three years, but this technology will help us determine whether that's really needed. For example, we might just need to retime the a.m. peak period, or maybe it can be done every four of five years instead," Misgen says.

In addition to these ongoing implementations, MnDOT also continues to support research related to the SMART Signal system. In the latest MnDOT-funded study, Liu and his team investigated how SMART Signal could be used as part of an integrated corridor management (ICM) system.

The proposed ICM system would use the performance measures generated by the SMART Signal system to diagnose incidents on signalized arterials and propose new signal control strategies that could be deployed in real time to mitigate traffic congestion.

The system also aims to reduce overall network congestion by using the available capacity of parallel routes—for example, by rerouting traffic from a freeway to a parallel signalized arterial during times of peak traffic congestion or when a crash occurs. In this case,

SMART SIGNAL TECHNOLOGY

is currently installed at more than

100

INTERSECTIONS

in Minnesota and California.

SMART Signal could help identify and predict the effects of rerouting travelers to the arterial and then automatically adjust signal timing to compensate for the increased traffic.

The study tested the proposed ICM system using a traffic simulation model based on the I-394 and TH 55 corridor in Minneapolis. Results showed that the system significantly reduces network congestion—the average delay and number of stops per vehicle was reduced and average vehicle speed increased.

"The ICM control system developed in this project has a very promising future for real field implementation," Liu says. "We look forward to testing the field performance of the proposed approach in future projects."

CTS showcases transportation attractions at the State Fair

CTS featured online educational games, U of M roundabout research, and several rounds of *Transportation Jeopardy!* at the 2013 Great Minnesota Get-Together on August 23.

Visitors to the CTS exhibit, located in the U of M building, managed traffic flow and battled the hazards of distracted driving in the online games *Gridlock Buster* and *Distraction Dodger*. They also checked out video highlights of a U of M research project on roundabouts.

In the afternoon, fairgoers competed for signed Gopher sports memorabilia in six rounds of *Transportation Jeopardy!* on the U of M stage. CTS challenged participants with several new categories this year, including Need for Speed, Color Me Signed, Transportation in Song, and Transportation at the Movies.



Fairgoers played *Transportation Jeopardy!*, emceed by Mike Marti of SRF Consulting Group (top right), and educational online games at the CTS booth.



THE FIRST AIRPLANE FLIGHT IN MINNESOTA HISTORY

took place at the State Fair in 1910.

CTS launches blog

CTS is pleased to announce a new blog—*CTS Conversations*—that will highlight the full spectrum of transportation research, education, and outreach at the University. Supplementing *Catalyst*, the blog will share timely updates on research publications, events, and training from CTS and its programs.

Also, the blog will feature topical questions to spark conversation and interaction with our readers. Check out the current question:

“WHAT JOBS OR INTERNSHIPS HELPED YOU GET STARTED IN YOUR CAREER?”

Join the conversation at <http://blog.lib.umn.edu/cts/blog>.



Internship from page 1

The program was designed to provide students with the opportunity to gain professional experience and skills that will complement their academic pursuits. For this year's participants, that included working on research teams, using complex testing equipment, creating project reports, and giving professional presentations.

The following students from the U of M Twin Cities (UMTC), U of M Duluth (UMD), and Howard University participated in the 2013 program:

- Joseph Casanova, a civil engineering major at UMTC, was placed in the Office of Materials.
- Kelly Charbonneau, a psychology major at UMTC, was placed in the Office of Human Resources, Workforce Development Department.
- Alain Moll, a civil engineering major at UMD, was placed in the Office of Environmental Stewardship.
- Allison Morrow, a psychology major at UMTC, was placed in the Office of Human Resources, Organizational Development Department.
- Paula Rolim, a civil engineering major at Howard University, was placed in the Metro District's Office of Operations and Maintenance, Bridge Inspection Unit.
- ManShean (Sharon) Wong, a civil engineering major at UMTC, was placed in the Office of Materials.

Highlights reported by the students included working with and learning from MnDOT staff, seeing research put into practice, and getting hands-on experience.

"This internship was a great stepping stone for me to be more prepared to face the world as an engineer in the future," said Sharon Wong, who worked with Bernard Izevbekhai, MnDOT research operations engineer. Wong and her fellow intern Joseph Casanova participated in

test cell construction instrumentation and monitoring at the MnROAD pavement research facility.

Izevbekhai, Wong's supervisor, agreed that the internship program helps students prepare to join the workforce. "It creates an opportunity for interns to experience engineering practice in the real world of competing priorities and approaching deadlines. It's a friendly environment for classroom-acquired skills to be refreshed, rekindled, or developed," he said.

Kelly Charbonneau, who worked in the Office of Human Resources, also had a positive experience with the program.

"The internship gave me insight into various aspects of human resources, and I now better understand my options in this career," Charbonneau said. "I also learned how much work it takes from many, many people in various careers to keep our state moving."

Charbonneau's supervisor, Carol Hennekens, echoed these remarks. "This internship provided Kelly with a 'taste' of MnDOT. She learned that it takes a variety of people with many talents to make MnDOT run, and a person with her background and degree (psychology) can make a big contribution."



Paula Rolim, a Brazil native attending Howard University as an exchange student, spent most of her time inspecting bridges around the metro area.

CTS HAS ISSUED A CALL FOR PRESENTATIONS

for the 25th Annual CTS Transportation Research Conference, May 21–22, 2014, at the Saint Paul RiverCentre.

DEADLINE FOR ABSTRACTS: NOVEMBER 12

Details: cts.umn.edu/Events/Conference

Further information: Nicole Freese, 612-624-3708

Congestion from page 1

University of Minnesota researchers examined three separate but related areas: the effects of a new variable speed limit (VSL) system, the impact of severe weather conditions on road safety, and the behavior and traffic impacts of bus rapid transit (BRT) operations. Their work was funded by the Intelligent Transportation Systems Institute, a part of CTS.

The U of M research team began by assessing the effectiveness of variable speed limit signs along the I-35W corridor designed to display advisory speed limits during periods of congestion. They found that drivers don't typically comply with the advisory speed limit, but they do take it into consideration. "Drivers may use the advisory speed limit to gauge downstream congestion and prepare themselves for encountering upcoming shockwaves," says Minnesota Traffic Observatory (MTO) director John Hourdos, the principal investigator. The congested conditions observed after the VSL system went into operation contained less severe shockwaves, he adds, representing a smoother and possibly safer traffic flow.

Project co-investigator Seraphin Abou investigated the impacts of inclement weather on road safety, focusing on the new priced dynamic shoulder lane (PDSL). Traditionally, shoulder lanes are used for emergency stops as well as for rainwater storage during heavy storms. The Minnesota Department of Transportation, as part of the UPA, opened the shoulder lane to traffic during specific times of the day. A portion of the road, however, lies in a low area that can flood during heavy rains. "Weather conditions have a significant impact on traffic safety, traffic demand, and traffic

flow," says Abou, an assistant professor in the Department of Mechanical and Industrial Engineering at the U of M Duluth. "The risk assessment tool we designed can be combined with intelligent transportation systems, risk communication, and operation control to predict causal mechanisms of weather-related crashes along the corridor."

Finally, the research team examined the effect buses have on congestion along the I-35W corridor. "One of the biggest advantages of the I-35W BRT corridor is the fact that buses can use the MnPASS lane, guaranteeing uncongested traffic conditions," Hourdos says. However, some stations are located in the median while others are located on the right side of the highway—meaning bus drivers must cross several freeway lanes to reach both stations.

By examining the buses' movements and congestion impacts, researchers made several key findings. First, bus drivers underutilize the MnPASS lane, making lane changes as soon as possible after leaving the station located in the median. They also found that the bus lane changes do generate visible disturbances during moderate and heavy congestion; however, these disturbances do not seem to contribute to the breakdown of traffic flow. Finally, the researchers estimate that the underutilization of the MnPASS lane and the several lane changes needed to move between stations cause a combined delay of 12 to 19 minutes each day for all buses traveling between two stations. "There is currently discussion about moving the right-lane stations to the median, and we hope this research can help policymakers in their deliberations," Hourdos says.



Buses leaving the 46th Street station in the median need to cross lanes to reach the next station located on the right side of the freeway.

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A publication of the Center for Transportation Studies
University of Minnesota

SEPTEMBER 2013

Researchers study the effectiveness of

ANTI-CONGESTION MEASURES.

page 1

Study explores links between

BICYCLE INFRASTRUCTURE AND BIKE COMMUTING

in Minneapolis.

page 2

New

SMART SIGNAL

installation helps MnDOT

MONITOR SIGNAL TIMING PLANS.

page 4



The summer internship program continues its success in second year.

page 1