

CTS Catalyst

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Accelerating the pace of transportation innovation

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New version of Cyclopath makes bike routing available statewide

Bicyclists across Minnesota can now plan their rides using Cyclopath, an online bicycle map and trip planner developed at the University of Minnesota.

Originally launched in 2008 to serve the seven-county Twin Cities metro area, Cyclopath now includes the complete Minnesota Department of Transportation (MnDOT) road and state trail network. A simpler version of Cyclopath is also now available as an Android app.

The statewide expansion project was sponsored by MnDOT, which also provided the U of M

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Identifying truck bottlenecks will help shape Minnesota's freight investment

Delays in freight shipments caused by highway bottlenecks can harm a region's economy and productivity. It's no surprise, then, that freight mobility is a key concern for many major metropolitan areas—and the Minneapolis–St. Paul metro area is no exception. For example, forecasts show that I-94 between the Twin Cities and Chicago will carry nearly 20,000 heavy commercial trucks per day by 2020.

To improve freight management planning and guide infrastructure decision making, planners at the Minnesota Department of Transportation (MnDOT) realized that they needed performance

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Study finds two types of MnPASS lanes equally safe

In a study evaluating the safety and mobility of Minnesota's MnPASS lanes, researchers at the U of M's Minnesota Traffic Observatory (MTO) found that facilities on I-35W and I-394 are performing equally well in spite of their different designs.

On I-394, MnPASS uses a restricted access design. Most of the MnPASS lane is separated from the general purpose lane by a double white line, and there are only specific points where a dashed line allows drivers to enter or exit. In the open design on I-35W, drivers have many more opportunities to enter the MnPASS lane, with a double white line preventing access only in limited locations.

The study, sponsored by the Minnesota Department of Transportation (MnDOT), was conducted in response to objections about the use of open access systems like the one on 35W. Critics say that by allowing more access points, open systems can cause more congestion and increase the risk of crashes.

"When the MnPASS lane and the general purpose lane are moving at the same speed, it's relatively easy to change lanes," explains John Hourdos, MTO director and the study's lead investigator. "But when the general purpose lane is congested, jumping from 10 mph in the general purpose lane to the MnPASS lane that's traveling at 55 mph or more can be risky—you need a huge gap. This is what open access critics don't like."

To evaluate the two designs, the researchers collected video data and examined lane changes in areas where drivers are allowed to access MnPASS lanes on both 394 and 35W. The team then identified and analyzed shockwaves—areas of suddenly stopping or slowing traffic—to help them measure mobility and safety.

How often shockwaves occurred was correlated to mobility, since shockwaves disrupt the good service and high speeds drivers expect in MnPASS lanes. Shockwave length was used to evaluate safety—the more vehicles that have to unexpectedly slow down or stop, the higher the likelihood of a crash.

Results indicate that shockwave activity is similar between the two systems. In fact, shockwave length was slightly longer on 394 than on 35W.



"What we found is that each system works well on its respective freeway," Hourdos says. "On 394, the MnPASS access 'gates' attract more lane changes, but it works because 90 percent of the demand comes from three distinct interchanges. Open access on 35W gives better service to that freeway because demand is more spread out and interchanges are more frequent."

"It's valuable for us to know that both restricted and open access for MnPASS performs well," says Brian Kary, freeway operations engineer at MnDOT's Regional Transportation Management Center. "MnDOT will use these results to inform the design of future MnPASS corridors."

To help MnDOT plan for changing needs on existing MnPASS corridors, the research team also created a tool that can predict how increasing traffic levels could affect shockwave activity. For example, if an increase in traffic is expected to cause disruptions, the tool can help determine where double white lines should be installed to maintain service and performance.

More than
25,000
people have
**MNPASS
TRANSPONDERS.**

Technology shows promise in reducing rural intersection collisions

While Minnesota has made much progress in reducing traffic fatalities, rural stop-controlled intersections remain an ongoing challenge. The Minnesota Department of Transportation (MnDOT) launched the Rural Intersection Conflict Warning System (RICWS) deployment project in 2012 to work toward reducing crashes at such intersections.

The three-year, Design-Build Indefinite Delivery/Indefinite Quantity (ID/IQ) project will deploy intersection conflict warning systems at up to 50 rural stop-controlled intersections statewide.

University of Minnesota researchers

recently completed an evaluation of the first installation. Led by Arvind Menon, a research fellow in the Department of Mechanical Engineering, researchers used technology developed in previous U of M research (see sidebar) to monitor the RICWS and demonstrate its accuracy and reliability.

“Design-Build ID/IQ allows for innovation in system equipment, fast-tracked design and construction, and the ability to expand the project as more resources become available,” says Terry Ward, MnDOT RICWS project manager. “With these benefits, MnDOT needed to know that the systems will be reliable for Minnesota drivers.”

Intersection conflict warning systems (ICWS) give drivers on both the major and minor road a dynamic warning of approaching vehicles. A variety of types of ICWS have been developed and tested in many states. Early results from these tests show a 30 percent reduction in total crashes and greater reductions for fatal and serious injury crashes.

The researchers evaluated the system selected for MnDOT’s RICWS for 34 days at the intersection of Trunk Highway 7 and Carver County CSAH 33. They installed a portable intersection surveillance system (ISS) developed in earlier studies and collected data from the RICWS and the ISS. They then validated data collected from the RICWS against data recorded by the ISS to determine the accuracy and reliability of the RICWS.

The researchers determined that the RICWS had a sign activation rate of 99.98 percent (or 1 vehicle per 5,000 vehicles), meeting the 99.95 percent rate specified by MnDOT. The research team also validated sign activations using video captured at the site and recorded a sample of times for valid activations and valid periods when the sign was inactive.

“The 99.98 percent activation reliability is great news,” says Ken Hansen, RICWS deputy project manager with MnDOT. “By using dual vehicle detection, we are able to give the traveling public confidence in RICWS systems. With the reliability information, MnDOT plans to start new projects to install more RICWS across the state.”

Minnesota’s leadership role

Minnesota is a leader in the research, development, and deployment of intersection conflict warning systems. MnDOT led a Federal Highway Administration pooled-fund program that established an approach for more consistent deployment and further evaluation of ICWS. The U of M and MnDOT also partnered in the Cooperative Intersection Collision Avoidance Systems-Stop Sign Assist (CICAS-SSA) research. This work, sponsored by MnDOT and the USDOT, developed and tested a system that warns drivers of unsafe gaps at rural, high-speed stop-controlled intersections. More about CICAS-SSA is online at its.umn.edu/Research.



Photo courtesy MnDOT

In 2013,
387
PEOPLE WERE KILLED
on Minnesota roads;
68
of those were killed at
STOP-CONTROLLED INTERSECTIONS.

(Source: Minnesota Motor Vehicle 2013 Crash Facts, Department of Public Service)

Study examines link between road networks and economic development

Researchers studying the relationship between the growth of road networks and regional development at the county level in Minnesota found a weakening connection between the two.

“The influence of road networks on employment isn’t as large as it used to be,” according to Michael Iacono, a research fellow with the Department of Civil, Environmental, and Geo-Engineering (CEGE). Iacono and David Levinson, the RP Braun/CTS Chair in Transportation, authored a paper with their findings earlier this year titled “Mutual Causation in Highway Construction and Economic Development.” Iacono also shared their findings during a presentation at the CTS annual research conference in May.

The researchers measured regional development by examining changes in data about population and employment. They used 20 years of road data from the Minnesota Department of Transportation (1988–2007) and employment data from Minnesota counties for the same period.

Part of the reason for the lack of connection between roads and development simply may be the maturity of the road network. In other words, existing roads facilitate most economic activity. “We’ve made most of the biggest, most productive investments already,” Iacono explained.

The researchers interpreted the findings as evidence of a weakening influence statewide of road networks (and transportation more generally) on the location of economic development. However, it’s possible that other location factors such as human capital levels, tax rates, and natural amenities have become just as, if not more, important than transportation network considerations.

“One of the implications of the findings,” Iacono said, “is that highway projects ought to be evaluated according to the benefits they provide to users, rather than hoped-for impacts on local employment or land development.”

Iacono added that since, from a statewide perspective, most of the major investments in road networks have been made, further changes to road networks likely won’t lead to significant changes in where people live and work. But he cautioned that these findings are too broad to be applied to specific development projects.

The study did find, however, mutual causality between population changes and the growth of local networks. Specifically, it found that the growth of the highway network tends to follow changes in population, and this result was statistically significant. Population growth also followed highway growth (they were positively correlated), but the result was not statistically significant.

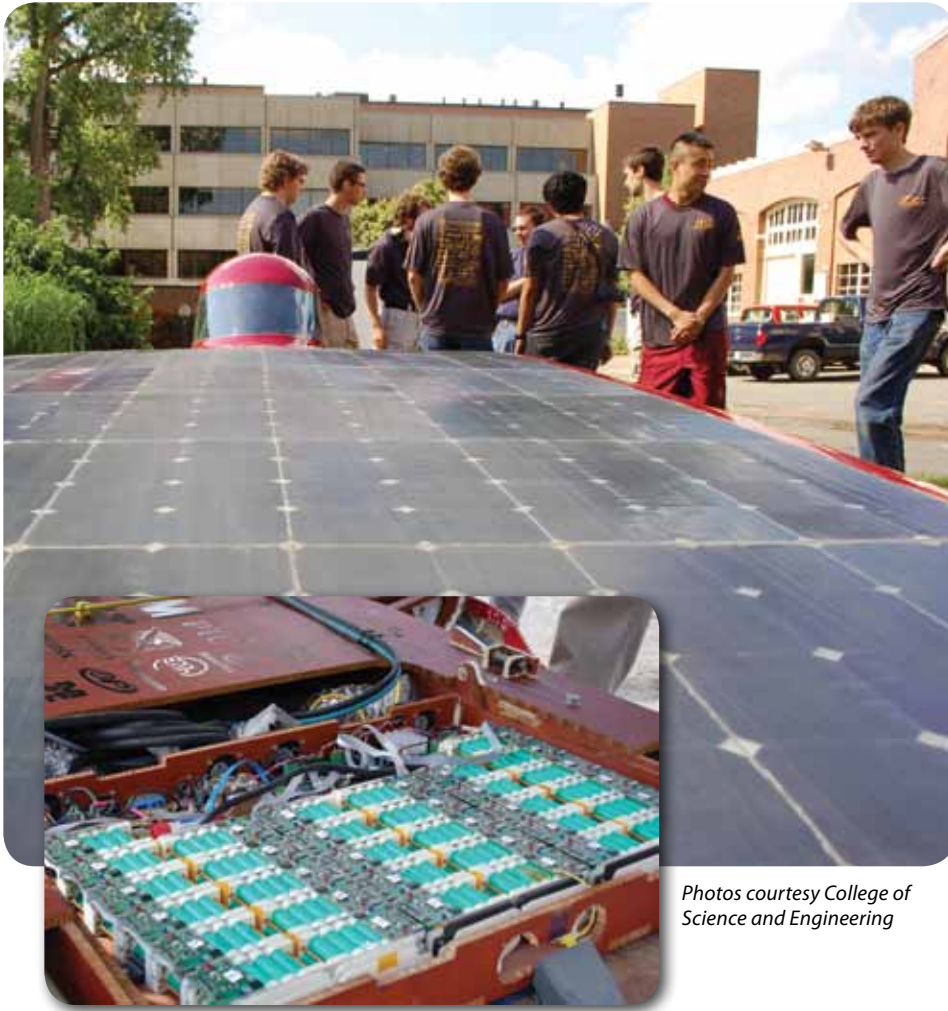
“Recent state highway and multimodal long-range plans align well with the research results, recognizing the importance of preserving existing high-value critical connections in a state of good repair,” says John L. Wilson, economic policy analyst with MnDOT’s Office of Transportation System Management. “Current funding constraints should limit system capacity expansion to cases with evident benefits to the traveling public in the form of travel time savings, reduced operating costs, and improved safety.”

The study stems from a previous research effort for MnDOT.



National solar car race **crosses finish line at U of M**

This year's American Solar Challenge, a 1,700-mile cross-country race, ended on the University of Minnesota Minneapolis campus on July 28. The U of M's team was among 24 from around the world competing this year. The team's car is just over 3 feet tall, about 16 feet long, and nearly 6 feet wide, and weighs just under 400 pounds. The team finished second, behind the University of Michigan.



Photos courtesy College of Science and Engineering

ROADWAY SAFETY INSTITUTE

Advancing roadway safety with user-centered solutions

Roadway Safety Institute launches new seminar series

A new safety-focused seminar series sponsored by the Roadway Safety Institute will kick off September 11 in Minneapolis. Seminars will be held Thursdays from 3 to 4 p.m. throughout the fall semester on the U of M's east bank campus. The seminars, which will also be streamed live on the web, will feature the work of Institute researchers.

Stay tuned to roadwaysafety.umn.edu/events for details.

Scholarship fund honors James Oberstar

The Humphrey School of Public Affairs has announced the establishment of the James L. Oberstar/CN Endowed Scholarship Fund, with major funding from CN, one of the country's largest freight railroads. The scholarship fund honors the life of the late United States Representative James "Jim" Oberstar, as well as his leadership and distinguished career in public life.

Scholarships made possible by the endowed fund will support students at the Humphrey School with commitments to public service, and will encourage students to follow in Congressman Oberstar's footsteps to become experts and leaders at the local, state, and national levels in public affairs and public policy.

"We believe the fund creates an enduring tribute to the congressman's vast contributions to public life and will connect those contributions to the Humphrey School and our mission," says Eric Schwartz, dean of the Humphrey School.

Oberstar, who represented northeastern Minnesota in Congress for 36 years, died May 3. He chaired the House Transportation Committee between 2007 and 2011 and was instrumental in establishing several University of Minnesota programs to improve transportation.

With Oberstar's cooperation and support prior to his death, the Humphrey School established the endowed scholarship fund in January 2014. CN was among the first to step forward with a contribution. To date, \$256,500 has been raised.

The first recipient of funds raised through the new fund is Madeline Mitchell, who is pursuing a master of public policy degree at the Humphrey School. "The congressman's work and legacy will continue to inspire and guide me through my time at the Humphrey School," she says. "I am truly honored to be the first recipient of this scholarship."

To support the scholarship fund, please visit <http://z.umn.edu/oberstar> or call 612-625-9588.

Cyclopath from page 1

team with access to data on state roads and trails.

“MnDOT frequently receives requests from the public for long-distance route planning,” says Jasna Hadzic, a bicycle and pedestrian planner at MnDOT. “Last year, we updated the print version of the Minnesota Bicycle Map, but we still needed a tool that was more up-to-date and user friendly. Expanding Cyclopath helped us meet that need.”

Cyclopath generates personalized bicycle routes for its users. For instance, cyclists can look for routes that minimize distance or that favor bike trails or lanes. It also features a “Bike + Bus” multimodal option that lets cyclists integrate Metro Transit bus routes into their trips. What makes the tool unique is that it allows users to edit the system’s maps of roads and trails. Cyclists can add and connect new trails to the map, enter tags to identify characteristics, participate in discussions, and rate roads and trails for “bikeability.”

In addition to the statewide expansion, the new version of Cyclopath features a variety of updates to the original online site.

“Cyclopath was retooled to handle the massive amounts of new data,” says Landon Bouma, Cyclopath’s lead software engineer at the U of M. “This included rewriting the route planner to be more efficient and to return even better bicycle routes.”

The new version also features a simpler, more user-friendly website design and an updated map display that emphasizes bicycle facilities. The goal was to make it easier for cyclists to identify bike-friendly roads and trails, Bouma says.

Although the new version includes more route information than ever before, the data for Greater Minnesota isn’t as complete as the data for the Twin Cities. The Cyclopath team is counting on the tool’s users to help fill the gap.

“We encourage all cyclists to help us bring



the rest of the state up to date by adding trails where they’re missing and editing roads to indicate bike lanes and other bike facilities,” Bouma says.

MnDOT, too, hopes that cyclists will add to and edit the state’s cycling network.

“A long-term goal is to use Cyclopath as a way to import data into MnDOT’s database system and as a way to maintain and update the state’s bicycle inventory,” Hadzic says. “We also hope that this tool can help prioritize future road maintenance and project investment, so encouraging cyclists to not only use the tool, but also to edit it, is very important.”

Going forward, the Cyclopath team is also interested in further expanding the tool’s availability.

“Cyclopath is a great tool, but it’s only available for cyclists in Minnesota, and it’s not available across all platforms,” Bouma says. “We would love to continue developing the software by optimizing the code, creating apps for all devices, and expanding the map to include other states and even other countries. We want to continue exploring possibilities to make Cyclopath even better.”

Cyclopath was developed with support from the National Science Foundation, MnDOT, the Metropolitan Council, and other local partners. It’s available online at cyclopath.org.

Cyclopath has more than

5,000

REGISTERED USERS

and has generated more than

140,000

ROUTES

since its launch in 2008.

Bottleneck from page 1

data specific to heavy truck traffic. “While MnDOT collects a significant amount of data about highway performance in the metro area with loop detectors, that data doesn’t distinguish between trucks and passenger vehicles,” explains Chen-Fu Liao of the U’s Minnesota Traffic Observatory.

To meet this information need, MnDOT funded a project led by Liao to integrate commercial data about heavy truck movement along the Twin Cities’ freight corridors with MnDOT’s existing data. The goal was to create freight mobility and reliability measures and identify significant freight bottlenecks.

Liao’s team began by identifying performance measures for surface freight movement. Then, the researchers analyzed and validated truck data collected from several sources, including 12 months of truck data collected using GPS on 38 freight corridors in the Twin Cities area. Next, researchers processed the raw truck data and used it to create freight performance measures including corridor target speed, truck volume, truck mobility, truck delay per day, and truck travel time reliability.

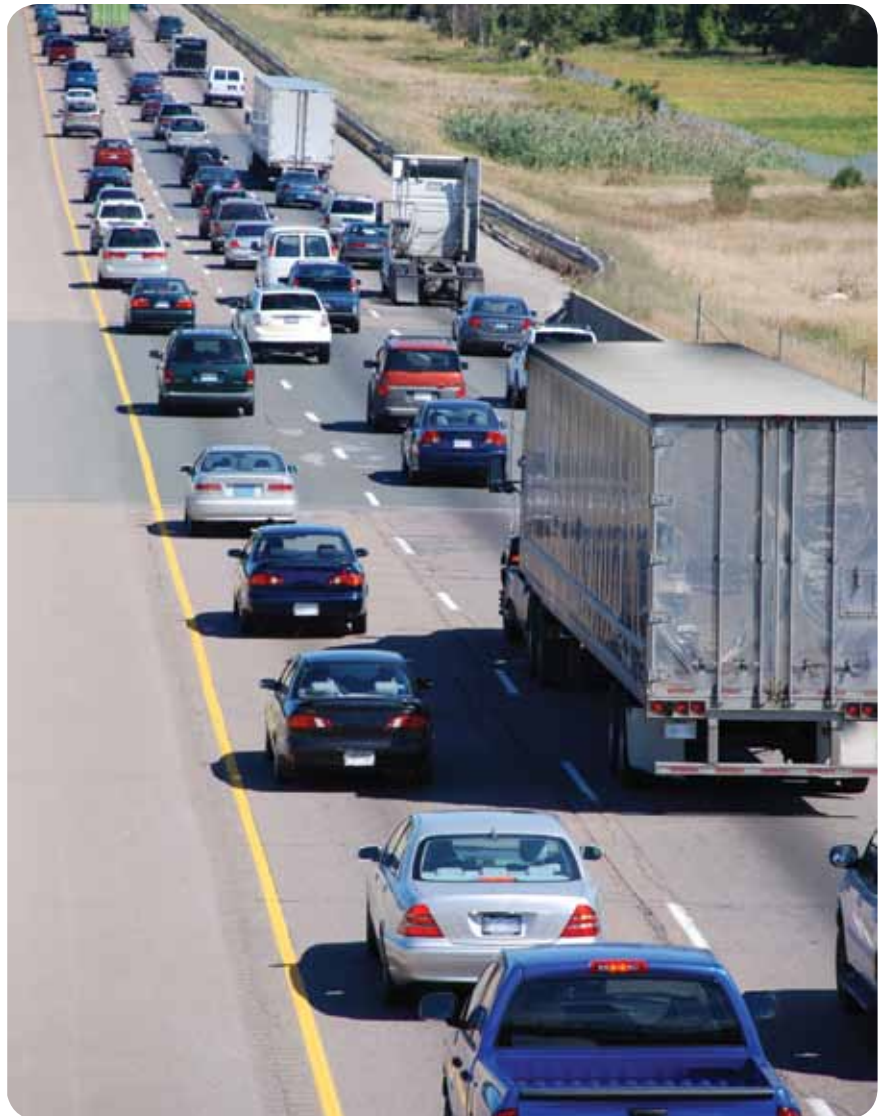
Based on these performance measures, the research team identified and ranked the truck bottlenecks in the Twin Cities. “We found that most of the bottlenecks are located near intersections,” Liao says. “We also discovered that contrary to prior assumptions, trucks sometimes face delays due to road curvature, grade, or geometry that do not cause problems for general traffic.”

This research offers a wealth of information that will complement data already being collected for transportation planning to improve truck movement on Twin Cities highways and develop a statewide freight

system plan.

“Chen-Fu and his team provide MnDOT an opportunity to improve statistical evidence to aid in measuring truck mobility along significant freight corridors,” says John Tompkins of MnDOT’s Office of Freight and Commercial Operations.

The project also identifies issues that may shape future investments. For example, MnDOT may eventually look to areas with high levels of trucking activity to identify where there is a need for increased truck parking facilities. “By pinpointing the areas where trucks are highly concentrated, we have found the areas that are likely to be fruitful sites for further study and eventual efforts to reduce congestion and delays,” Liao says.



I-94 between the
TWIN CITIES AND CHICAGO
will carry nearly
20,000
HEAVY COMMERCIAL TRUCKS
per day by 2020.

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