

Catalyst



Accelerating the pace of transportation innovation

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The changing landscape of shared mobility

From the quick rise of the electric scooter to Lyft’s expansion of bike-share networks across the country, change is constant in the shared mobility industry. This changing landscape was the topic of the CTS Spring Luncheon presentation by Caroline Samponaro, a longtime bike and pedestrian advocate in New York City who now leads micromobility policy at Lyft.

Samponaro spoke first about her own professional journey, which included 12 years as deputy director of Transportation Alternatives, a New York City nonprofit. She played a role in significant

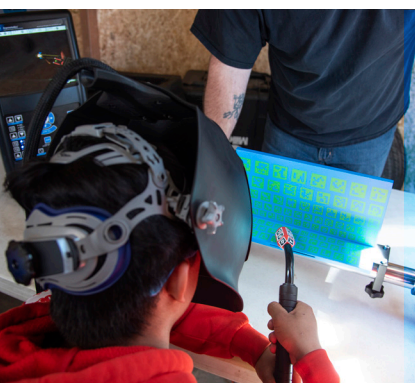
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High school students dig into transportation construction careers

More than 100 students from five area high schools got an up-close, hands-on look at transportation construction jobs during MnDOT Construction Career Day on May 15 at the Minnesota State Fairgrounds.

During the daylong event hosted by CTS on behalf of the MnDOT Office of Civil Rights, students rotated in small groups through nine demonstration stations focused on highway heavy construction. These included planning, design, grading and base materials, iron work, carpentry,

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Outreach and enforcement improve pedestrian safety near public transit stops



The recent rise of pedestrian crashes represents a pronounced threat to public safety, particularly near public transit stops. In a new study focused on combating this problem, a U of M-led research team examined how a combination of community outreach and high-visibility enforcement campaigns led to increased pedestrian safety and driver yielding near public transit stops in Saint Paul, Minnesota.

“Many factors have been linked to the recent increase in pedestrian crashes, such as higher pedestrian and vehicle volumes, proximity to bus stops, increased driver distraction, and other risky driving behaviors that result in poor yielding rates,” says lead researcher Nichole Morris, director of the HumanFIRST Laboratory at the U of M. “Reducing pedestrian crashes involves more than changes to roadways and crosswalks. It also means changing the cultural influences that tolerate dangerous driving behaviors.”

In this project, the researchers took

a multifaceted approach to improving driver compliance with pedestrian yielding laws. The interdisciplinary team included Curtis Craig, a research associate in the HumanFIRST Lab; Ron Van Houten, a professor in Western Michigan University’s Department of Psychology; and David Mayou, a student in the U of M’s Department of Design, Housing, and Apparel.

First, the researchers investigated whether the presence of a bus stop influences the likelihood that a driver will yield to pedestrians. The team also aimed to determine the relative risk of failure-to-yield events near bus stops.

“This step was important because pedestrian crossings near bus stops have been associated with a higher pedestrian crash risk, likely due to increased risk exposure along with psychological factors such as driver confusion as to whether the pedestrian intends to cross or is waiting for a bus,” Morris says.

Then, the research team evaluated the effect of high-visibility enforcement

and community outreach on both transit bus and regular driver yielding behavior. In addition, the team examined the effectiveness of enforcement on multiple-threat passing rates.

“We saw that one particular risk factor of multi-lane roads were multiple-threat crashes, in which one vehicle stops or yields to the pedestrian and a vehicle in the same direction of travel passes in the next lane,” says Craig. “This may be particularly problematic at crosswalks near public transit stops with waiting buses.”

Data for the study were collected by observing pedestrian crossings at 16 selected crosswalk sites in Saint Paul. First, data were collected to create a baseline measurement. Next, the Saint Paul Police Department conducted two waves of high-visibility enforcement at eight of the study sites, which coincided with a public outreach campaign. Additional pedestrian crossing data were continuously collected at the 16 study sites through the first and second waves of enforcement.

Results of the study showed the percentage of drivers who yielded to pedestrians was lower near bus stops, but that the enforcement and outreach campaign improved yielding and multiple-threat passing rates over time. In addition, public transit vehicles were significantly more likely to stop for pedestrians than other vehicles. Findings also indicate that high-visibility enforcement had a greater impact on the yielding rates of public transit vehicles, possibly because those drivers communicate the presence of enforcement efforts among themselves or hear about it from their employers.

The research was published in the *Transportation Research Record: Journal of the Transportation Research Board* (Vol. 2673).

New asphalt testing methods evaluate crack resistance

In a new study, U of M researchers have proposed four tests to evaluate the susceptibility of asphalt materials to cracking. The tests could help with materials selection testing, quality control, and forensic examination of samples from existing asphalt pavements.

"These test methods produce repeatable, consistent results, are simple to perform, and differentiate between mixtures," says Mihai Marasteanu, a professor with the Department of Civil, Environmental, and Geo-Engineering.

"They could provide critical information on the evolution of pavement performance since they can be used for forensic analyses."

The Minnesota Department of Transportation (MnDOT), in partnership with the National Center for Asphalt Technology and four other state transportation agencies, is part of a pooled-fund study to develop mixture performance testing focused on cracking. The group wanted to better understand the viability of testing methods that were not included in other related studies.

"This was a knowledge-building, data-gathering study that will help fill out our materials library database to correlate test results of asphalt materials to field performance," says David Van Deusen, research operations engineer with MnDOT's Office of Materials and Road Research.

The tests were conducted on asphalt mixtures sampled from test sections of the MnROAD pavement test facility. Researchers pulled cores from eight existing pavement sections and ran three tests on the eight asphalt mixtures and one test on the five asphalt binders used in the pavement mixtures. They found that all four tests were viable options, that sample performance was highly dependent on temperature, and that the eight mixtures tested may perform similarly.

MnDOT will share test results with its research partners and include them in the overall examinations of the MnROAD test cells. Researchers recommend repeating these tests with the pavement cells periodically to correlate field conditions and tested mixture performance over time. In addition, MnDOT will consider some of these testing methods and findings for its continuing effort to develop a performance-based balanced mix design approach for asphalt pavement.



This test applies pressure diametrically on an asphalt pavement "puck" along the axis of a 6-inch pavement cylinder to measure susceptibility to cracking at low temperatures.



CTS Scholar receives innovation award

Nichole Morris, director of the HumanFIRST Laboratory and a CTS Scholar, received the Innovative Transportation Solutions Award at the WTS Minnesota annual scholarships and recognitions luncheon in April.

The award recognizes a transportation initiative, project, or policy from initiation to completion, led by a woman, with support from numerous other women. Morris was honored for her work as the principal

investigator of a research project that evaluated the impacts of enforcement, education, and engineering measures on driver behavior at pedestrian crossings (for more about the project, see the December 2018 *Catalyst*). The main goal of the study was to measure and enhance driver compliance to the crosswalk law in Saint Paul.

According to the WTS Minnesota website, Morris helped develop an education and awareness campaign and

"relentlessly contacted media to get the word out." She also worked through agency concerns to install weekly updateable signs that communicate the yielding percentage of motor vehicles to pedestrians along selected Saint Paul roadways. During the project, the overall yielding rates improved at the recorded sites from an average of under 30 percent to 70 percent.

Smart vehicle technology aims to help drivers merge safely



U of M researchers are working to develop smart vehicle technology to help drivers merge more safely and reduce crashes at potentially dangerous locations.

“Sometimes merging drivers cannot see fast-moving vehicles on the main freeway, and other times it can be difficult to judge if it is safe to merge even when vehicles on the main road are visible,” says M. Imran Hayee, a professor in the University of Minnesota Duluth’s Department of Electrical Engineering. “A system that could help drivers safely merge onto the freeway would significantly reduce crashes around the freeway ramp.”

In a study sponsored by the Roadway Safety Institute, researchers proposed a method to estimate the “merge-time cushion”—the time it takes the vehicle in the right-most lane of the main freeway to reach the common merging position with the merging vehicle. This innovative technique uses only standard GPS and dedicated short-range communication (DSRC)-based vehicle-to-vehicle communication.

First, the research team worked to accurately determine vehicles’ relative positions. Researchers discovered that while they were not able to determine the absolute position of vehicles using today’s standard GPS receivers, relative

position accuracy could be sufficient.

“We found that when vehicles were close together, their GPS receivers had similar errors at any given time,” says Hayee. “We were able to cancel out those errors to obtain a more accurate estimate of the relative distance between any two vehicles. This allowed us to calculate the relative trajectories of vehicles traveling in multiple lanes toward a merging junction with an accuracy of less than half of the lane width.”

The next research task was relative lane identification, which is critical not only for a merge-assist system but for many other advanced driver-assist systems as well. In this case, it was important to know which vehicles were traveling in the right-hand lane, as this is the lane the merging vehicle would be entering. Researchers found that the lateral distance between vehicles was easy to calculate on straight roads, but on curves the task became more complex.

“We worked on normalizing this curvature error so that we could determine accurate relative lane position on both straight and curved road segments simultaneously,” Hayee says. Extensive field tests were performed on I-35, a two-lane freeway in Duluth.

The results of field tests show that the relative position of the surrounding

vehicles—ahead or trailing behind—can be identified in real time without any errors as long as the relative distance between them remains at least a few meters. “Most of the errors occurred where the road segment had sharp curves and the relative distance between the two vehicles was more than 80 meters,” Hayee says. No errors were observed when the distance between the two vehicles was less than 50 meters, regardless of the degree of curvature of the road.

Finally, to estimate the merge-time cushion, the researchers developed two distinct merging scenarios and their solutions based on road geometry. They also recommend additional field tests to better gauge the performance of their proposed method, including scenarios with two or more vehicles on the main freeway.

“With the wider deployment of innovative intersections such as restricted crossing U-turn and continuous green T-intersections, engineers are introducing more merge points into the transportation system,” says Victor Lund, St. Louis County traffic engineer. “Merge points are no longer just contained within the freeway system. Development of intelligent tools like merge assist will be important for the future.”

Visit CTS’s Open House

Join CTS for an open house on Thursday, August 15, 2019, from 3:30 p.m. to 5:00 p.m. at our new home in the University Office Plaza building. Come pay us a visit and check out our new space!

For directions and parking information, please visit www.cts.umn.edu/openhouse.



maintenance, safety, bridges, and labor.

Each group of students, guided by chaperones from their school, had an opportunity to hold or try on equipment, climb aboard heavy machinery, assemble models, and test their skills in a few different work simulators. A variety of transportation construction professionals—including representatives from several MnDOT offices, contracting and consulting firms, and trade unions—offered insight, encouragement, and practical advice at every station.

“This has been an extremely valuable event to me personally,” said Cole, a Roosevelt High School student interested in carpentry. “Not every kid is going to be able to get out here and see this, and that’s honestly, I think, why a lot of kids just don’t really get the jobs that they want.”

In 2018, 73 percent of Minnesota firms surveyed said they were having a hard time filling salaried and hourly craft positions, according to a survey commissioned by the Associated General Contractors of America. MnDOT especially has been challenged in recent years to replace retiring workers.

“Baby boomers are retiring and we need to develop and train the workforce of the future to step into these positions,” said Kim Collins, director of the MnDOT Office of Civil Rights. “The workforce of tomorrow also will be very diverse, so as an industry we need to foster work environments that are inclusive, where



everyone can perform at their best.”

CTS associate director for engagement and education Gina Baas added that many of today’s youth, especially those with diverse backgrounds, are not aware of the opportunities within the transportation industry. “Events like Construction Career Day help make those vital connections between young people and transportation agencies and contractors,” she said.

Gary Larsen, apprenticeship coordinator for the Laborers Union, attracted the attention of several students at his station with a compelling pitch about the benefits of a career in the trades—good pay, good benefits, and doing something you like right out of

high school.

Among the several heavy construction and maintenance vehicles on hand for the event, MnDOT’s Alex Bruch and his colleagues let a fully rigged snowplow with state-of-the-art sensors and controls do much of the talking. Bruch, a Metro District coordinator for the maintenance decision support system, guided several students into the driver’s seat for a glimpse of the world at the wheel of one of MnDOT’s most recognizable and important vehicles. The moment perfectly capped the snowplow training scenarios many of the students had just experienced in MnDOT’s simulator trailer.

“It’s not always obvious that highway heavy construction trades are both innovative and technology focused,” Collins said. “We wanted to share a hands-on experience with the students so they could see how we use technology in some areas of our work.”

Roosevelt High School career and college center coordinator Eric Rodgers noted how the outing gave students an opportunity to connect in a meaningful way with companies and labor unions and helped them realize viable next steps after high school. “Roosevelt offers a lot of different programming that supports and directly connects to what our students are experiencing here,” he said.



CTS to support Shared Mobility Collaborative

CTS has secured a one-year grant from the McKnight Foundation to support the Twin Cities Shared Mobility Collaborative (SMC), a regional partnership of stakeholders, local operators, and national experts. CTS will provide organizational, communications, and public engagement support to advance the collaborative's leadership as a focal point for shared mobility issues and initiatives in the Twin Cities region.

The collaborative is one outcome of the Twin Cities Shared Mobility Action Plan, which was developed in 2017 with support from the McKnight Foundation. "The plan establishes a goal of removing 50,000 cars from Twin Cities roads in 10 years," says Gina Baas, CTS associate director of engagement and education. The collaborative is united around the action plan's goals and is guided by staff from Metro Transit and the Metropolitan Council, Move Minnesota, the University of Minnesota, MnDOT, the City of Minneapolis, and the City of Saint Paul, among others.

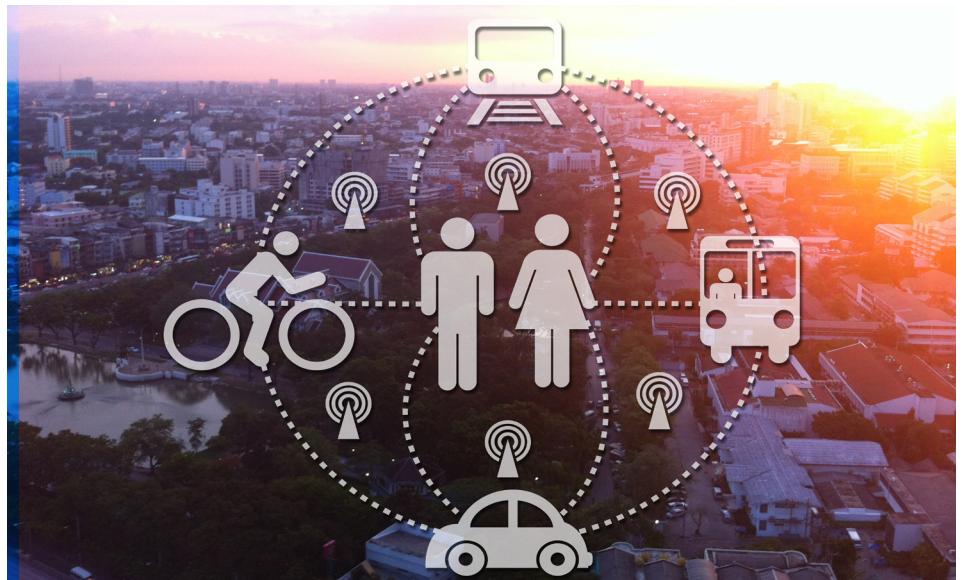
"SMC has set an ambitious work plan to meet the action plan goals by advancing initiatives at the regional and local levels," Baas says. Examples include

mobility hub location and construction, a framework for addressing equity issues, guidance for policy and agreements development, and support for local implementation.

Chicago's Shared Use Mobility Center had been supporting the work of the Twin Cities collaborative, but the SMC steering committee decided to transition to local support in order to build more regional capacity and independence. "The collaborative would also like to offer technical assistance and guidance

when requested to improve and advance local projects being proposed by shared mobility providers, right-of-way owners, and transit operators," Baas says.

The work of the SMC also aligns well with the University's Initiative on the Sharing Economy (see related story below), a multidisciplinary research program that was founded to build research capacity and expertise on the sharing economy, with a primary focus on the transportation industry.



U of M student competition focuses on the sharing economy

This spring, the U of M's Initiative on the Sharing Economy sponsored a student competition designed to encourage research and innovation on sharing economy topics.

As part of the contest, two student teams identified transportation-related challenges and proposed solutions using a sharing economy approach. After receiving feedback and guidance on their initial ideas from the Initiative's advisory board, teams had three months to develop and refine their solutions, meet with campus and community partners, and compile their findings into a final presentation. In May, projects were evaluated by the advisory board based on their relevance, research methodology, and impact.

The winning team, which received a

\$1,000 prize, included Shannon Evans Engstrom, John Fleming, and Lynda Chao, all master's students in urban and regional planning at the Humphrey School of Public Affairs. Their project proposed the development of GPHR, an app-driven last-mile package delivery system that could be piloted on the U of M Twin Cities campus. The system's goal is to eliminate the need for freight carriers to idle in lots for long periods of time, save delivery companies cost, and improve delivery efficiency.

Using GPHR to make deliveries, student couriers would receive turn-by-turn directions from an app that leverages an open-sourced digital map of campus and augmented reality wayfinding technology. This would enable anyone to be a courier with

minimal training, regardless of their experience, familiarity with campus, or language ability. Eventually, the system could be expanded to other universities, large corporate campuses, or dense central business districts.

The second-place project focused on innovative ways to motivate ride sharing. Team members were Department of Industrial and Systems Engineering students Kang Kang, Bingnan Lu, Zicheng Wang, and Xiaotang Yang.

As part of the project, the team explored how such factors as the size of a car-sharing fleet and the introduction of platform-owned vehicles as a buffer for those unable to find a match could affect individuals' willingness to participate in ride sharing.

transportation shifts including a car-free Times Square, a successful bike-share program, and several major protected bikeway projects.

After a decade in nonprofit advocacy, Samponaro was initially surprised when Lyft founder John Zimmer reached out with a job offer. "However, I was immediately struck by how mission-driven he is," she said. "He was talking about green cities, carrying bike share into a new setting, and scaling bike share in a way that hadn't been possible before."

Lyft is now the largest bike-share operator in the US and owns the company that operates Minnesota's Nice Ride bike-sharing program.

As head of bike, scooter, and pedestrian policy at Lyft, Samponaro leads efforts to form strong partnerships with cities on policy initiatives such as Vision Zero (a multinational movement for road safety) and complete street redesigns. She's also working to help realize specific goals around bike and scooter shared mobility.

These goals include Lyft's three "micromobility pillars": transportation equity, streets for people, and transit integration. For example, Nice Ride for All, a member program launched in May, addresses equity concerns by giving low-cost access to Minneapolis residents who use food- or transit-assistance programs. Lyft lobbies for road safety—"not just for the passenger and driver but for everyone on the road," she said—and supports multimodalism and reducing vehicle-miles traveled.

Lyft is part of the solution for delivering public sector goals, she continued, stressing that "transit integration is fundamental." Its new app



provides real-time transit information and allows users to piece together trips with bike and car sharing. "We want to teach people how to be multimodal... and reach people we never reached before," she said.

During her time at Lyft, Samponaro has observed trends in micromobility, including a "dockless bubble that has... popped in some areas," an increase in station-based bike-share trips, and the growth of scooter trips. "With scooters we are tapping into latent demand to get out of the car and do something different," she said. "People are getting a taste of something new with scooters, and we see it as a way to get them onto bike share and transit." Lyft, she concluded, is positioning itself to be "a platform for people who want our service."

Bill Dossett, executive director of Nice Ride Minnesota, then moderated a question-and-answer session. In starting the discussion, he said that public-private relationships will be critical to moving shared mobility forward in Minneapolis and the region. "We have a huge challenge," he said. "We have to

build processes to communicate with organizations like Lyft that want to be the Amazon of transportation."

Samponaro agreed that working together will be essential. "We need ways to come together, challenge each other, and embrace each other... and make the tent bigger by bringing more voices into the discussion."

Lyft operates
scooters in
15 US CITIES.

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Center for Transportation Studies
University of Minnesota
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