Technology Transfer

The Institute could not accomplish its goals without sharing its expertise and research results with local, national, and international audiences for use in real-world applications. Technology transfer also communicates to the world who we are—raising the profile of the Institute and its research—and educates students, policymakers, and the general public about ITS issues and solutions.

Our efforts in this area are far-ranging to reach a broad and diverse audience of researchers, students, practitioners, policymakers, and others among the public. Over the past year, we have provided tours and demonstrations of our research and facilities, sponsored seminars, sent electronic newsletters and announcements, published printed pieces, and enhanced our Web site. But perhaps the most direct method of transferring technology has been to send graduating students out into the workforce.

This section of the annual report highlights some of our technology transfer activities over the past year.

Human factors key to safe road design

If it looks like a freeway and acts like a freeway, motorists are likely to treat it like a freeway—even if the road in question is a suburban arterial. How drivers respond to the “road message” has important implications for safety, said human factors expert Alison Smiley in her presentation at the 2010 CTS Winter Luncheon. The February 9 luncheon was sponsored by the ITS Institute.

Smiley is president of HumanFactors North, Inc., adjunct professor in the Department of Mechanical and Industrial Engineering at the University of Toronto, and adjunct professor in the Department of Civil Engineering at Ryerson University. In her presentation, titled “Saving
Us from Ourselves: Human Factors and the Design of Safer Roads,” Smiley brought a human factors perspective to issues of road design.

Human factors analysis can contribute to road safety in several important ways, Smiley said. As an example of how human limitations affect road safety, Smiley explained that the human visual system gives drivers cues about changes in the distance between vehicles. Because this visual cue is nonlinear, drivers find it difficult to distinguish between a gradual approach to another vehicle and a dangerous rapid approach until they are too close to the other vehicle. This limitation contributes to many rear-end crashes. Knowing about this limitation enables us to design effective countermeasures to address the problem, Smiley explained.

Smiley went on to discuss the role of human factors in road design standards. Understanding how drivers process information can help designers avoid overloading drivers with too many complex tasks, she said.

**Partnership award goes to automated deicing research**

An automated system to reduce the unnecessary use of roadway deicing chemicals received this year’s CTS Research Partnership Award. The annual award recognizes research projects within the CTS program, which includes the ITS Institute, that have resulted in significant impacts on transportation and rewards teams of individuals who have drawn on the strengths of their diverse partnerships to achieve those results.

“Automated Friction Measurement, Data Recording, and Applicator Control for Winter Road Maintenance” developed a tire-road friction measurement system for snowplows and a closed-loop control system that uses these friction measurements for automatic applicator control. By measuring friction, only spots on the road that are indicated as icy are treated with deicing chemicals, which reduces unnecessary use of chemicals—and thus, costs. The equipment uses a GPS system to provide quantitative data on winter maintenance operations—data that could be disseminated as public information on travel routes. The technology is being prepared for limited deployment in two snowplows and one pick-up truck. [For more on this research, see page 21.]

In accepting the award for the team members, Professor Rajesh Rajamani of the Department of Mechanical Engineering thanked Mn/DOT for sponsoring the research, the ITS Institute for providing initial funds, and the Technical Advisory Panel members and Mn/DOT staff who were involved. Project partners were:

- University of Minnesota: Lee Alexander, Gurkan Erdogan, Rajesh Rajamani
- Mn/DOT: Curtis Gobeli, Farideh Amiri, Gabe Guevara (now with the Federal Highway Administration), Roger Hille, Sue Lodahl, Mark Panek, Dan Warzala, Thomas Zimmerman,
- SRF Consulting Group, Inc.: Brian Scott
- Hennepin County: Dharam Bobra

Dan Warzala, Farideh Amiri, Curtis Gobeli, Dharam Bobra, Brian Scott, Rajesh Rajamani, Lee Alexander, Dawn Spanhake
Institute research showcased in demos, tours, and exhibits

A new version of the Teen Driver Support System (TDSS), in development at the ITS Institute, took center stage June 4 at a teen safe driving forum held at Anoka-Ramsey Community College in Cambridge, Minnesota.

U.S. Rep. James Oberstar and transportation safety experts, including ITS Institute director Max Donath, introduced and solicited feedback on the potentially life-saving technology and called on parents to set an example by holding their children accountable. Oberstar received a live demonstration of the TDSS in a test vehicle just prior to the forum.

“You can change habits if parents take responsibility,” Oberstar said. “It’s not just the teenager. Most of what we learn, we learn by example from our families.”

TDSS is a GPS-enabled smart phone mounted on the dashboard to provide the driver real-time visual and audio feedback about driving behavior. (Other phone functions are disabled while the TDSS is in use and the car is on. All incoming calls are routed to voicemail and no outgoing calls or texting is possible, except for 911 emergency calls.) The device is intended as a tool for parents to help teens develop safe driving habits.

Donath explained that the system provides parents with data about their teen’s driving behavior. This is especially important on rural roads, which account for the majority of fatal highway crashes.

“We bother the parent,” Donath said. “When the teen is breaking the rules, such as speeding or driving with too many passengers, there need to be consequences, and at this age, the only people who can really enforce the rules are the parents.”

Isanti County Judge James Dehn moderated the forum, which also featured presentations by Gordy Pehrson, Youth Traffic Safety and Alcohol Grant coordinator for the Minnesota Department of Public Safety, and Lee Munnich, director of the Center for Excellence in Rural Safety at the University of Minnesota.

Earlier that week, Donath and research fellow Alec Gorjestani demonstrated the TDSS to U.S. Senator Amy Klobuchar and David Strickland, administrator with the National Highway Traffic Safety Administration, as part of a teen driving safety forum held June 1 at Tartan High School in Oakdale, Minnesota.

“To make a lasting difference, it’s going to take all of us working together—law enforcement, educators, parents, and teens,” Klobuchar said. “Ultimately, what we need is a change in what society views as acceptable and unacceptable behavior.”

The TDSS project is cosponsored by the ITS Institute and the Minnesota Department of Transportation.

A group of researchers from the ITS Institute’s Intelligent Vehicles Laboratory (IV Lab) traveled to the ITS America Annual Meeting and Exposition, held May 3–5 in Houston, to demonstrate their driver-assis-tive technologies for bus rapid transit (BRT) applications. IV Lab director Craig Shankwitz and staff Bryan Newstrom and Erin Kurshoff, along with Mike Abegg from the Minnesota Valley Transit Authority (MVTA), showcased the driver-assistive system developed by the IV Lab for use in MVTA buses. On May 4, the team gave a demonstration to U.S. Department of Transportation officials.
administrators and staff, including Peter Appel, administrator of the Research and Innovative Technology Administration (RITA); Peter Rogoff, administrator of the Federal Transit Administration (FTA); Anne Ferro, Federal Motor Carrier Safety administrator; Polly Trottenberg, assistant secretary for transportation policy; Brian Farber, associate administrator for communications and congressional affairs; Gail Lyssy, FTA Region VI director of program management and oversight; and John Augustine, deputy director of the ITS Joint Program Office, RITA. Also attending was Paul Feenstra, ITS America’s vice president of government affairs.

The expo demonstration featured an MVTA bus equipped with the driver-assistive system and a monitor showing video captured by a camera on the driver’s forehead. On board, the team used an extra seat and steering wheel to let passengers view the HUD technology as well as experience the different modes of feedback the IV system provides to the driver. The demos took place on roads and road shoulders near the George R. Brown Convention Center in Houston. The IV Lab research team worked closely with representatives from the Metropolitan Transit Authority of Harris County (home to Houston), to map the lanes and arrange police escorts during the demonstrations.

A fleet of 10 buses equipped with the new system is scheduled to go into service in the Twin Cities in 2010 as part of an effort to reduce congestion and improve public transportation. The high-tech “Bus 2.0” vehicles will be operated by the Minnesota Valley Transit Authority along the I-35W/Cedar Avenue commuting corridor that connects downtown Minneapolis and the southern suburbs. The technology developed by the IV Lab will help bus drivers maintain reliable schedules while operating safely on the narrow bus-only highway shoulders.

This same driver-assistive system for buses took center stage at the 2009 ITS Minnesota Fall Forum, where it was demonstrated by Craig Shankwitz. The annual event, sponsored by the Minnesota chapter of ITS America, brings together companies, transportation professionals, and researchers to exchange information on ITS projects around the state.

A bus was also exhibited at the 2010 St. Paul Winter Carnival in January, in conjunction with a display promoting the first Autonomous Snow Plow Competition of the Institute of Navigation’s North Star Section.

The University of Minnesota was the site of a “town hall” discussion on U.S. transportation policy on January 25, part of a nationwide listening tour led by U.S. Transportation Secretary Ray LaHood and U.S. Rep. James Oberstar, chairman of the House Transportation and Infrastructure Committee. LaHood and Oberstar solicited feedback from local transportation stakeholders on the next surface transportation bill.

Among those in attendance was Peter Appel, administrator of the Research and Innovative Technology
Administration (RITA). “This administration and this DOT are committed to transportation research,” he said, adding that he is pleased to see the leadership of the University of Minnesota in the area of intelligent transportation systems.

During a working lunch, USDOT leadership discussed the vision, priorities, and challenges for their respective modes. In opening remarks, Laurie McGinnis, then-acting director of CTS (and chair of the ITS Institute Board), discussed the importance of research in the next bill. As an example, she cited ITS Institute research that is developing in-vehicle systems to encourage safe driving by teens and support effective parental supervision of inexperienced drivers.

Congressman Oberstar also visited the University of Minnesota on November 12 for an update on the latest University transportation research. He met with Transportation Engineering and Road Research Alliance (TERRA) board members, tried out the HumanFIRST driving simulator, and toured the Minnesota Traffic Observatory, guided by Laurie McGinnis and Max Donath. “I love what you’re doing here,” Oberstar said.

In September, the ITS Institute and the Center for Transportation Studies participated in the 2009 Minnesota State Fair with a booth featuring Gridlock Buster, an interactive traffic-control game designed by the ITS Institute. In addition, Minneapolis Star Tribune “Roadguy” blogger Jim Foti hosted four rounds of “Transportation Jeopardy” as fairgoers competed for prizes.

In August, a team of University officials hosted a session on the ITS Institute’s Teen Driver Support System (TDSS) at the annual American Association of Motor Vehicle Administrators (AAMVA) conference in San Diego. Mike Manser, director of the Institute’s HumanFIRST program; Frank Douma, assistant director of the State and Local Policy Program at the Humphrey Institute; and Gina Baas, assistant director of education and outreach at the Center for Transportation Studies, spoke to motor vehicle licensing administrators about TDSS and its potential for interaction with graduated driver’s license (GDL) regulations.

The University officials discussed how the TDSS, which takes over the teen’s cell phone to detect such GDL-related factors as number of passengers and driving after curfew, could work with GDL regulations from both a parental and administrative standpoint. The AAMVA conference attendees drew on their extensive experience with GDL laws and training young drivers to provide feedback on the TDSS’s potential. The system’s ability to help parents understand their teen’s compliance with GDL standards, as well as issues such as the system’s data privacy implications, were among the topics discussed.

Others who toured the ITS Institute facilities during the past year include:

- Congressional transportation staffers Travis Talvitie and Kelly Scanlan, U.S. Senator Amy Klobuchar’s office
- Bill VanTassel, manager of driver training programs, AAA
- Tim Johnson, director of the Office of
Institute researchers discuss transportation at local and national events

- Institute director Max Donath presented at the second-annual *Symposium on Mileage-Based User Fees* in April in Minneapolis, which focused on methods and approaches to further the development of mileage-based road user fees. Donath shared findings from Institute research exploring technology to enable nationwide implementation of user fees.

- ITS Institute researchers discussed their work at the 21st Annual CTS Transportation Research Conference in St. Paul, Minnesota. Presentations included:
  - “The Effectiveness of Changeable Message Signs and the Aging Population,” Kathleen Harder, Center for Design in Health
  - “Lessons Learned from eWorkPlace, a State-Sponsored Telework Initiative in the Twin Cities,” Adeel Lari, Humphrey Institute of Public Affairs
  - “Snow Rendering for Interactive Snowplow Simulation—Improving Driver Ability to Avoid Collisions When Following a Snowplow,” Peter Willemsen, Department of Computer Science (Duluth)
  - “ITS and Privacy: Suggestions for Peaceful Coexistence,” Frank Douma; Humphrey Institute of Public Affairs; Sara Aue, University of Minnesota Law School
  - “Should the Fuel Tax be Replaced?” Lee Munnich, Humphrey Institute of Public Affairs,
  - “Freight Performance Analysis on I-94/ I-90 from the Twin Cities to Chicago,” Chen-Fu Liao, Minnesota Traffic Observatory (MTO)
  - “Mining Bus Location, Passenger Count and Fare Collection Database for Intelligent Transit Applications,” Chen-Fu Liao, MTO, and Henry Liu, Department of Civil Engineering

- Showcasing the diversity of ITS research at the University of Minnesota, a trio of researchers presented new technologies and recent research results at the ITS Minnesota 16th Annual Meeting & Information Exchange on March 9.
  - Professor Rajesh Rajamani, Department of Mechanical Engineering, discussed a new type of wireless traffic sensor under development in his lab that does not rely on batteries or external power sources. The sensors, based on piezoelectric technology, convert the mechanical energy of vehicles passing over them to electrical energy to power their highly efficient sensing and data-transmission systems.
  - Assistant Professor Xun Yu, Department of Electrical and Computer Engineering, Duluth, outlined the development of an in-vehicle sensor system designed to detect driver drowsiness. Yu’s approach is based on polymer-film sensors mounted on the steering wheel, which detect a driver’s heart rate through his or her palms and tracks changes in heart rate that can indicate a transition from waking to sleeping.
  - Frank Douma, assistant director of the State and Local Policy Program at the Humphrey Institute, presented recent findings from his investigation of the legal and policy implications of new ITS technology deployments.

- Institute researcher and mechanical engineering professor Rajesh Rajamani was the plenary speaker at the 29th IASTED International Conference on Modeling, Identification and Control, held in Innsbruck, Austria, in February 2010. He presented “Novel Sensors, New Estimation Algorithms and Advanced Controls: Solutions for Improving Highway Vehicle Safety and Mobility.”
Institute researchers presented their work at the Transportation Research Board (TRB) 89th Annual Meeting, held January 10–14 in Washington, D.C. Among the presentation topics were distance-based fees for funding transportation, congestion pricing and traffic modeling in networks, the effects of e-shopping on travel, and enhancing student understanding of core transportation concepts. University of Minnesota faculty, staff, and student presenters included:

- Max Donath, ITS Institute
- Lee Munnich, Frank Douma, Xinyu (Jason) Cao, and Fay Cleaveland, Humphrey Institute of Public Affairs
- John Hourdos and Chen-Fu Liao, Minnesota Traffic Observatory, ITS Institute
- Gary Davis, David Levinson, Henry Liu, Xiaozheng He, Shanjiang Zhu, Xiaolei Guo, Xuan Di, Adam Danczyk, Nebiyou Tilahun, Pavithra Parthasarathi, and Anupam Srivastava, Department of Civil Engineering
- Shawn Haag and Gina Baas, Center for Transportation Studies

Institute researchers also spoke at the annual Toward Zero Deaths Conference October 28–29, 2009, in Duluth, Minnesota. The conference serves as a forum for sharing information on how to reduce the number of fatalities and injuries on Minnesota roads. Presenters included Institute director Max Donath, speaking in a session titled “Safe Intersections Through Technology,” and Lee Munnich, discussing traffic safety in rural Minnesota.

At the annual Summer Institute of the Center for Excellence in Rural Safety (CERS), held August 3 and 4 in Williamsburg, Virginia, leading state and national transportation officials, researchers, policymakers, and professionals gathered to share information and develop strategies for improving rural transportation safety. Institute researchers who presented included Tom Horan, who gave an update of research into rural emergency response times, and Max Donath, who described a variety of available technologies with the capability to reduce rural fatalities and life-changing crashes.

Publications, Web services highlight Institute work

In November 2009, the Institute implemented blog software to streamline the management of news and events on the Web site. The software also creates an RSS news feed for that content automatically. Search engine optimization has improved the ability of search engines to find information from the Institute in response to search terms related to its work.

Electronic communications continue to play an important role in quickly disseminating information. In November, the Institute launched a new electronic newsletter, the ITS Institute Update, to reach the ITS community more quickly and to report on our activities in the areas of research and education. The bimonthly publication, which mails electronically to nearly 1,200 individuals, is designed to enable readers to scan the contents and then link to the Institute’s Web site for further information.

E-mail announcements publicized upcoming events, including Advanced Transportation Technologies Seminars, conferences, luncheon presentations, and other ITS-related events. The seminars and luncheon presentations are now regularly broadcast live on the Web as well as recorded for later viewing. They are also available through iTunesU.

Eight ITS-related research projects were featured in the Center for Transportation Studies’ Research E-news electronic newsletter, which is mailed to about 4,000 subscribers and is available on the Web at www.cts.umn.edu/Publications/ResearchENews. These articles also provide links to more information about each project.

In other efforts to explore new channels of
communication and reach new audiences, staff created a four-minute video about the Teen Driver Support System to explain and promote the technology. The video was first shown at a teen driver safety forum with U.S. Rep. James Oberstar in June and will later be available for viewing on the ITS Institute’s YouTube channel and the ITS Institute Web site. More videos are planned for the coming year.

Print publications continued to raise awareness of ITS work in academic and professional communities and share the results of research. The Sensor newsletter covered Institute research activities, education, and technology transfer activities; upcoming ITS-related events; and recently published research reports. The Sensor is available in print and online and reaches about 2,000 subscribers three times each year. It has been one of the primary vehicles for increasing the visibility of the ITS Institute, and its high circulation testifies to a broad interest in ITS research activities among academic and professional readership.

The 11th ITS Institute annual report (fiscal year 2008–09), highlighting work by the Institute’s researchers and students, was mailed to more than 1,400 individuals and is available as a PDF file downloadable from the Institute’s Web site.

Visiting researchers share ideas, expertise

During the past year, the Institute continued to work with visiting researchers and instructors, allowing for an exchange of information and dissemination of research results to the visitors’ students and colleagues.

The Advanced Transportation Technologies Seminar Series provided an opportunity to host two national researchers. Steven Shladover, research engineer with California Partners for Advanced Transit and Highways (PATH), presented “Relieving Congestion and Saving Energy by Cooperative Intelligent Transportation Systems” on October 8. On October 22, Lily Elefteriadou, a professor at the University of Florida and director of its Transportation Research Center, presented “Ramp Metering for Postponing Freeway Breakdown.”

Thomas Horan, an associate professor at Claremont Graduate University and visiting scholar at the Humphrey Institute of Public Affairs, is part of the TechPlan research program. A paper Horan authored with Benjamin Schooley, Brian Hilton, Yoonmi Lee, Rondalynne McClinton, and Samuel-Ojo Olusola was recently selected as “best paper” by the awards committee of the Seventh International Conference on Information Systems on Crisis Response and Management, held May 2010 in Seattle. The paper, “CrashHelp: A GIS Tool for Managing Emergency Medical Responses to Motor Vehicle Crashes,” presents the research, design, development and evaluation of a prototype of a comprehensive trauma information system.

Other contributing researchers, all working with the Institute’s HumanFIRST Program, include Nobuyuki Kuge and Tomohiro Yamamura of Nissan, Jeff Caird of the University of Calgary, and Dick de Waard of the University of Groningen.