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 in order 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 website. But perhaps the most direct method of transferring technology has been to educate students who join the workforce.

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

Research showcased through demos, tours, and exhibits

Two ITS Institute projects were featured at University Research Technology Transfer Day, an exhibition of the U.S. Department of Transportation’s Research and Innovative Technology Administration (RITA), on April 6 at the USDOT headquarters in Washington, D.C.

“Traffic Signal Performance Measurement Using High-Resolution Data: The SMART-Signal System,” led by Associate Professor Henry Liu of the Department of Civil Engineering, simultaneously collects event-based

Members of an international research organization visited campus as part of a scan tour of U.S. transportation research facilities.
high-resolution traffic data from multiple intersections and generates real-time arterial performance measures. “Smartphone-Based Novice Teenage Driver Support System (TDSS)” was developed to help inexperienced drivers by providing real-time, in-vehicle feedback. In addition, the TDSS project was selected for a podium presentation, given by researcher Janet Creaser. Co-investigators of this research are ITS Institute director Max Donath, research fellows Creaser and Alec Gorjestani, and HumanFIRST Program director Mike Manser.

“Janet and Henry did a great job answering questions from the many participants who stopped at their tables,” Donath said, adding that the posters generated considerable interest among attendees. The event highlighted research products that have been or are in the process of being deployed into the marketplace or affecting policy.

The ITS Institute was among several University of Minnesota research laboratories that hosted tours from European transportation organizations.

On September 22, members of FEHRL–ECTRI visited campus as part of a scan tour of U.S. transportation research facilities. FEHRL, the Forum of European National Highway Research Laboratories, provides a coordinated structure for the interests of more than 30 national research and technical centers from Europe, together with associated institutes from around the world.

ECTRI, the European Conference of Transport Research Institutes, is an international nonprofit organization whose members are 27 major transport research institutes or universities from 20 European countries. Together, they account for more than 3,800 European scientific and research staff in the field of transport.

Steve Phillips, FEHRL secretary-general, presented the objectives of the tour—the group’s first to the United States—and introduced FEHRL-ECTRI scan team members from France, Great Britain, Spain, Germany, Hungary, Poland, South Africa, and Sweden. Phillips said the aim of the scan was twofold: to identify what’s missing in existing U.S. and European research facilities to meet current and emerging needs, and to recommend opportunities to use existing facilities and collaborate to develop new ones. Minnesota was selected for a site visit because of its research facilities and its extensive experience with international cooperation, he said.

Michael Manser, director of the HumanFIRST Program, provided a tour of the program’s driving simulator, and John Houdos, Minnesota Traffic Observatory (MTO) director, demonstrated the MTO’s lab equipment and technologies.

On September 23, a similar tour was given to representatives from the Swedish Transport Administration. Research fellows Alec Gorjestani and Justin Graving gave a demonstration of a Teen Driver Support System under development in the IV Lab. Mechanical engineering professor Rajesh Rajamani presented an overview of his research related to automated applicator control on snowplows. The group also toured the MTO and HumanFIRST labs and attended an ITS Institute Advanced Transportation Technologies Seminar.

On August 26, a delegation from Russian transportation organizations visited campus for an information exchange and tours focusing on safety innovations. The group heard overviews of various CTS programs and also toured the HumanFIRST lab and the MTO.

The ITS Institute and CTS showcased a variety of transportation-related attractions at the 2010 Minnesota State Fair. Visitors to the University of Minnesota building on August 27 and September 3 chatted with CTS and Institute staff and checked out the latest transportation innovations. Fairgoers of all ages played Gridlock Buster, an interactive traffic-control game designed by the ITS Institute and Web Courseworks (see page 37 for more about the game).
Technology holds promise to prevent drunk driving, speaker says

Addressing the 2011 CTS Winter Luncheon on February 15, highway safety researcher Susan A. Ferguson described how a system to unobtrusively measure a driver’s blood-alcohol content (BAC) is being developed by a government–industry partnership. The Winter Luncheon is sponsored by the ITS Institute.

Ferguson is president of Ferguson International LLC, a consulting firm focused on highway safety issues, and a former senior vice president for research at the Insurance Institute for Highway Safety. ITS Institute director Max Donath welcomed Ferguson and praised what he called her seminal research on crash avoidance and safety technologies.

“There are many people out there drinking and driving...who are involved in fatal crashes who have never been caught,” Ferguson said. According to conservative estimates, even someone who drives drunk 50 times may only be caught once, she explained.

Ferguson described how a consortium of private firms and government agencies came together in early 2008 to explore the potential benefits of in-vehicle alcohol-detection technology as well as the implementation challenges and policy issues associated with introducing such a system.

A blue-ribbon panel spent a year identifying promising technologies, then awarded contracts to two companies to develop their approaches to the challenge.

The research enjoys widespread support within the automotive industry, Ferguson said. In addition to the U.S. government, the consortium includes Transport Canada, the Swedish national road administration, and the Japanese government. Ferguson believes that the future of driver alcohol-detection technology is tied to voluntary acceptance by drivers and demand for the systems as a safety feature. Eventually, engagement with the auto insurance industry could lead to incentives for vehicles equipped with these systems.

Institute researchers and their work receive honors

The Minnesota Public Transit Association (MPTA) awarded Intelligent Vehicles (IV) Lab director Craig Shankwitz and Minnesota Valley Transit Authority (MVTA) transit planning manager Mike Abegg its Management Innovation Award for their work on the “Bus 2.0 Driver-Assist System” project. (See page 16 for more about the project.)

The award is given for innovative work in the field of transit or creative new methods of addressing the transit-related concerns of transit users. It was presented at the MPTA annual conference on September 13 in Rochester, Minnesota.
“This [project] is a great example of a successful university–transit agency partnership that is deploying innovative technology to solve a problem,” says Max Donath, director of the ITS Institute.

Shankwitz credits the significant contributions of team members from the IV Lab and the HumanFIRST Program, both units of the Institute, for the success of the project.

The Bus 2.0 project also received a CTS Research Partnership Award at the Center’s annual Meeting and Awards Luncheon in April. The annual award recognizes research projects within the CTS program that have resulted in significant impacts on transportation, and rewards teams of individuals who have drawn on the strengths of their partnerships to achieve those results. Project partners were:
- MVTA: Michael Abegg, Glenn Boden
- Schmitty & Sons Transit: Connie Massengale, Jesse Borchowiec, Mary Blanchard
- University of Minnesota: Max Donath, Michael Manser, Craig Shankwitz, Eddie Arpin, Pi-Ming Cheng, Peter Easterlund, Alec Gorjestani, Justin Graving, Erin Kurshoff, Arvind Menon, Bryan Newstrom

Also at the CTS awards luncheon, David Levinson, an associate professor in the Department of Civil Engineering and the Braun/CTS Chair in Transportation Engineering, was presented with the Richard P. Braun Distinguished Service Award. The award is given to a transportation official who has demonstrated outstanding leadership in research and innovation. Levinson’s current Institute-funded research includes work with the Humphrey School’s TechPlan program, “Consumer Travel Behavior and Retail Geography: A Microscopic Investigation Using GPS Data and Parcel-Level Land Use.”

**IV Lab patents research on vehicle positioning system**

Craig Shankwitz, director of the Intelligent Vehicles Laboratory, was granted a patent titled “Vehicle Positioning System (VPS) Using Location Codes in Passive Tags.”

The patent employs passive electronic tags installed in or on roadways to locate vehicles for a number of ITS applications. (See page 22 for more about the patent.)

**Benefits of Institute work highlighted in media coverage**

During the past year, local and national media featured Institute research numerous times in print and over the airwaves, in publications that included USA Today,
the Minneapolis Star Tribune, the Chicago Tribune, Minnesota Public Radio, WCCO-TV, and KSTP-TV.

Among the headlines were:
- Researchers aim to make roadsides safer for officers KSTP-TV, May 12, 2011
- MnDOT to study mileage-based user fee to replace gas tax KSTP-TV, April 18, 2011
- Pay tax by the mile, not gallon? Star Tribune, April 20, 2011
- To curb congestion, buses to ride on shoulders Chicago Tribune, February 18, 2011
- U tech helps buses battle ice and snow Minnesota Daily, February 16, 2011
- Buses using virtual world to navigate Star Tribune, January 19, 2011
- Technology aids bus drivers on narrow shoulder lanes UTC Spotlight, January 2011
- An integrated study of road capacity at Denali National Park Park Science, December 6, 2010
- SE Minnesota highway intersection chosen as site for safety study Marshall Independent, December 16, 2010
- Smart phones let parents track teen drivers WCCO-TV news, September 15, 2010
- Using tech to curb deaths on Minnesota’s roadways Minnesota Public Radio, August 10, 2010
- Elbow room on the shoulder: DGPS-based lane-keeping enlists laser scanners for safety and efficiency GPS World, July 1, 2010

Institute researchers share expertise at local, national events

ITS Institute researchers discussed their work at the 22nd Annual CTS Transportation Research Conference in St. Paul, Minnesota, May 24 and 25. Presentations included:
- “Development and Evaluation of an Advanced LED Warning System for Rural Intersections,” Taek Kwon, Department of Electrical and Computer Engineering (Duluth)
- “eWorkPlace: Telecommuting Reduces Congestion in the Twin Cities Metropolitan Area,” Adeel Lari, Humphrey School of Public Affairs
- “Impact of Transit Signal Priority on Bus Service Performance,” Chen-Fu Liao, Department of Civil Engineering
- “Vision-Based Bicyclist and Pedestrian Counting Systems,” Guruprasad Somasundaram, Department of Computer Science and Engineering
- “Weekday Peak Hour Mean Flow Estimation Using Two-Day Short-Count Data,” Hui Xiong, Department of Civil Engineering
• “Rural Safety, Health, and Emergency Response,” Tom Horan, Center for Excellence in Rural Safety
• “Mileage-Based User Fee Demonstration and Policy Study,” Lee Munnich, Humphrey School of Public Affairs
• “Traffic Performance Measurements Using Event-Based Detector Data—Recent Developments on the SMART-Signal System,” Henry Liu, Department of Civil Engineering
• “Arterial Travel Time Characterization and Real-Time Traffic Condition Identification Using GPS-Equipped Probe Vehicles,” Yiheng Feng, Department of Civil Engineering

Three University of Minnesota researchers presented their work with ITS technology at the ITS Minnesota 17th Annual Meeting and Information Exchange on March 8 in St. Paul.

Associate Professor Xun Yu (electrical and computer engineering, Duluth) discussed his work with intelligent pavement, which eliminates the need for external sensors by enabling the pavement itself to detect vehicles. Yu creates the pavement by incorporating carbon nanotubes—cylindrical molecules that exhibit changes in electrical resistance in response to mechanical stress—in cement. The resulting pavement has a longer service life and lower maintenance costs than those of traditional vehicle sensors. Yu said the pavement has performed well in preliminary studies.

Center for Excellence in Rural Safety researcher Benjamin Schooley outlined the CrashHelp system, which allows emergency responders to collect information about crash victims on-scene and send it directly to hospital emergency rooms (see related story on page 9).

Minnesota Department of Transportation (MnDOT) commissioner Tom Sorel gave the keynote presentation, which highlighted how ITS technology can improve Minnesota’s transportation system. In-vehicle signing, integrated corridor management, intelligent work zones, and intersection warning systems all have great potential for increasing safety and mobility, Sorel said. In particular, Sorel cited the Cooperative Intersection Collision Avoidance Systems–Stop Sign Assist project currently being conducted by ITS Institute researchers as an example of ITS technology’s potential for improving safety (see related story on page 18).

Linda Preisen, ITS Minnesota chapter president and CTS director of research administration, gave opening remarks and moderated the keynote presentation.

Institute researchers presented their work at the Transportation Research Board 90th Annual Meeting January 23–27 in Washington, D.C. Approximately 4,000 presentations and papers addressed topics of interest to attendees—policymakers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions.

University of Minnesota faculty and staff presenters included:
• Department of Civil Engineering: Gary Davis, Henry Liu, Panos Michalopoulos
• Department of Computer Science and Engineering: Shashi Shekhar
• Humphrey School of Public Affairs: Xinyu Cao, Frank Douma, Yingling Fan, Adeel Lari, Lee Munnich
• Northland Advanced Transportation Systems Research Laboratories, UMD: Eil Kwon
• Department of Electrical and Computer Engineering, UMD: Imran Hayee, Taek Kwon

ITS researchers also presented at the annual Toward Zero Deaths Conference in October in St. Paul. This conference serves as a forum for sharing information on how to reduce the number of fatalities and injuries on Minnesota roads. Three University of Minnesota researchers gave presentations in concurrent sessions:
Technology Transfer

The 2010 annual Summer Institute of the Center for Excellence in Rural Safety, held in Minneapolis, focused on creating a national strategy to improve rural safety. The event featured speakers from across the nation, including ITS Institute researchers. Humphrey School of Public Affairs associate dean Greg Lindsey stressed the need for a collaborative, performance-based approach to rural transportation safety. Tom Horan, who introduced version 3.0 of the online crash-mapping tool SafeRoadMaps, and researcher Benjamin Schooley shared the latest about their ongoing research to improve rural emergency response. And Institute director Max Donath discussed projects under way to support novice teen drivers using special safety technology in vehicles.

Transportation experts, scholars, and industry professionals from Minnesota and across the country gathered July 9 in Minneapolis for roundtable discussions of a number of TechPlan projects. TechPlan is a program of the ITS Institute that focuses on planning and policy for ITS. Under TechPlan, researchers with the Humphrey School of Public Affairs investigate how new technology can be used to solve transportation planning and infrastructure challenges.

In the annual forum, called “TechPlan: New Frontiers in Transportation Policy, Technology, and Planning,” researchers received feedback from forum participants about the current findings of their research. Twitter was used to broadcast the talking points in real time during the presentations.

Greg Lindsey gave opening remarks, and Jan Lucke, manager of research administration services for the ITS Institute and CTS, served as moderator. Max Donath, Institute director, gave closing remarks. Humphrey School presenters and their projects were:

- Jason Cao, “Benefit-Cost Analysis of Value Pricing: Case Study for MnPASS”
- Lee Munnich, “Implementing Distance-Based User Fees as a Replacement for the Fuel Tax”
- Melissa Stone and Barbara Crosby, “From Start to Finish: Cross-Sector Collaboration and the Urban Partnership Agreement”
- Tom Horan and Benjamin Schooley, “ITS and Transportation Safety: EMS System Data Integration to Improve Traffic Crash Emergency Response and Treatment—Phase II”
- Lindsey, “Understanding Use of Nonmotorized Transportation Facilities”
- Frank Douma, “ITS and Locational Privacy: Suggestions for Peaceful Coexistence”

Visiting researchers bring expertise, build partnerships

During the past year, the Institute continued to work with visiting researchers, 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 four national researchers (see page 33 for details).

Other visiting researchers include Thomas Horan, an associate professor at Claremont Graduate University and visiting scholar at the Humphrey School of Public Affairs, and Nobuyuki Kuge and Tomohiro Yamamura of Nissan, Jeff Caird of the University of Calgary, and Dick de Waard of the University of Groningen, all working with the Institute’s HumanFIRST Program.
Publications, web highlight Institute work

This year, the Institute updated its web pages for major projects, including rural unsignalized intersections, the teen driver support system, and SMART-Signal. Staff also created a web page compiling all the Institute’s distracted driving research projects.

Among its other electronic communications are the ITS Institute Update, a bimonthly publication sent to about 1,200 individuals. E-mail announcements publicized upcoming events, including Advanced Transportation Technologies Seminars. The seminars as well as luncheon presentations are now regularly broadcast live on the web and recorded for later viewing on the web and through iTunesU.

Nineteen articles about ITS-related research projects ran in the Center for Transportation Studies’ Research E-news electronic newsletter, which is mailed to about 4,000 subscribers and is available at www.cts.umn.edu/Publications/ResearchENews.

In other efforts to explore new channels of communication, staff worked with a production consultant to create a video about ITS careers (see related article, page 32). Staff also created a video highlighting the Institute’s Bus 2.0 project to explain and promote the research’s technology. Both videos are available on the Institute’s website and YouTube channel; more videos are planned for the coming year.

Print publications continued to share the results of Institute research. The Sensor newsletter covered Institute research activities, education, and technology transfer activities; upcoming ITS-related events; and recently published research reports (21 reports were published). 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 12th ITS Institute annual report, highlighting work by ITS researchers and students, was mailed to more than 1,400 individuals and is available on the Institute’s website.

Annual report wins third design award

The ITS Institute’s FY10 annual report received its third consecutive American Graphic Design Award from Graphic Design USA, a news magazine for graphic designers and other creative professionals. The competition honors outstanding new work of all kinds—print, packaging, point-of-purchase, Internet, interactive, and motion graphics—and is open to any agency or firm engaged in design.

As a recipient of this award, the Institute received an embossed Certificate of Excellence and was published in the print and web version of Graphic Design USA Awards Annual.

Graphic designer Cadie Wright Adhikary, who designed each winning report, has been with the Institute for seven years. In addition to working on the report, Adhikary designs all the Institute’s communications products—posters for conferences, research fact sheets, displays, the Sensor newsletter, and numerous other materials. So she understands well the role that graphically appealing design can play in communicating complex research concepts.

“Graphic design makes science and research accessible to a wider audience,” she says. “Good design is good communication. A successful design uses visual elements like photography, informational graphics, and typography to communicate a message in a way that resonates with the audience, as well as supporting an audience’s understanding and memory of the message.”

Because science and technology are always developing new ideas, the need for creative design to communicate those ideas to potential end users will grow and evolve as well, Adhikary says. These qualities make her job endlessly interesting and challenging. “I’m always curious to see what technologies in transportation are on the horizon,” she says.