Education

The ITS Institute’s education activities consist of a multidisciplinary program of coursework and experiential learning that supports the Institute’s theme. The educational program includes the disciplines of computer science and engineering, electrical and computer engineering, civil engineering, mechanical engineering, human factors, public policy, and others.

By supporting and sponsoring a variety of educational initiatives for students, the Institute is generating interest in its core ITS science and technologies. These initiatives include developing new curriculum and courses, involving undergraduate and graduate students in research projects, sponsoring students to attend national conferences, giving awards that recognize outstanding students, and offering research assistantships to help attract more students to the study of transportation. This section of the annual report highlights some of our efforts in the area of education.

Seminar Series brings transportation experts from industry, academia to Minnesota

The Fall 2007 Advanced Transportation Technologies Seminar Series featured University of Minnesota faculty and visiting researchers presenting their recent ITS-related work on a variety of transportation topics.

The burgeoning popularity of cellular phones, PDAs, and other mobile electronic devices has sparked heated debate about the potential for increased crash risk due to driver distraction. Louis Tijerina, a human factors researcher and driver distraction expert with the Ford Motor Company, presented an overview of recent research on this important safety question and on the more general issue of interface design for driving safety at a November 13 seminar.

Srinivas Peeta, director of the NEXTRANS Center at Purdue University, presented a December 4 seminar on methods for modeling the complex interdependencies
among civil infrastructure systems. The rapid growth of large urban centers, coupled with the expansion of networks providing transportation, energy, and communications, presents enormous new challenges to infrastructure managers, Peeta said. Recently, natural and man-made disasters have led to cascading system failures in many areas, highlighting the need to understand how multiple interdependent systems interact with each other.

Other presentations in the series were:
- “Driver Performance During 511 Traveler Information Retrieval,” Michael Rakauskas, research associate, HumanFIRST Program
- “Bus Signal Priority Based on GPS and Wireless Communications,” Chen-Fu Liao, senior systems engineer, Minnesota Traffic Observatory
- “Mass Transit Surveillance and Early Warning System,” Vassilios Morellas, program director, Department of Computer Science and Engineering
- “School Travel and the Implications for Advances in Transportation-Related Technology,” Elizabeth Wilson, assistant professor, Humphrey Institute of Public Affairs

This was the seventh year the Institute sponsored the multidisciplinary seminars, during which researchers report on findings from their work and bring new information to the ITS community. The series, which is a required course in the University’s Graduate Certificate Program in Transportation Studies, is offered as a one-credit graduate-level course, or attendees can earn one professional development hour for each seminar. Presentations are recorded onto DVD and are available for loan by request. Presentations can also be viewed as webinars, either live or downloaded at a later date, at www.its.umn.edu/Events/SeminarSeries/2007.

**Interactive Course Modules Enhance Learning**

Understanding the complex dynamics that underlie traffic flows and intelligent vehicle guidance systems is a challenge many transportation engineering students grapple with every semester. Adding to the difficulty is the fact that simulation and modeling rely on expensive dedicated software and powerful computer servers, so students rarely have the opportunity to experiment and explore outside of course labs.

Now, University of Minnesota students are benefiting from greater access to simulation tools both in and out of the classroom, thanks to the work of Chen-Fu Liao, the Minnesota Traffic Observatory’s senior educational systems engineer. Liao has developed several interactive course modules to help students understand complex ITS topics such as intersection signal control and vehicle guidance.

Liao developed the Online Application for Signal Intersection Simulation (OASIS) and Roadway Online Application for Design (ROAD), both of which have been incorporated into the curriculum of the civil engineering department’s Introduction to Transportation Engineering course. OASIS allows students to examine the effects of different signal timing strategies on a simulated...
intersection; ROAD is used to teach geometric design techniques for planning road alignments.

In the vehicle realm, Liao’s Simulation Visualizer for Vehicle Guidance Control was used in the mechanical engineering department’s Introduction to Robotics course in spring semester 2008.

The modules have been well received by instructors, and Liao is continuing to improve them and develop new tools that support interactive learning. He is already at work on a second-generation OASIS, which will incorporate hardware-in-loop interaction with the same signal controller hardware used by many traffic management agencies.

Pre-college students are also being exposed to transportation engineering issues through an online intersection control game aimed at high school science classrooms. The game is being integrated into a high school curriculum that will be used and tested at the University of Minnesota’s Institute of Technology Summer Exploration in Engineering, Science and Math Camp. The camp, for women and diverse students, will be held in the summer of 2008. Liao’s game is designed to help students understand the importance of predictable traffic timing and the effect of differing traffic flows on signal timing—all part of Liao’s efforts to increase K-12 students’ familiarity with transportation issues.

**Rakauskas Named Student of the Year**

Michael Rakauskas, a doctoral student in the University of Minnesota’s Cognitive and Biological Psychology program, was presented with the ITS Institute’s 2007 Outstanding Student of the Year Award at the Transportation Research Board’s annual meeting in Washington, D.C., on January 12, 2008.

The award is sponsored by the USDOT Research and Innovative Technology Administration (RITA). Honorees receive a $2,000 award as well as funding to travel to the TRB annual meeting.

Rakauskas’s current research focuses on reducing crashes and fatalities by improving the design of road environments and discovering ways to reduce driver impairment. He has led a number of studies evaluating driving performance when affected by alcohol intoxication or distractions such as phone conversations, information seeking, and common in-vehicle tasks. He has also worked on a number of other topics including the development and implementation of ITS technology to prevent crashes at high risk rural intersections; the design of visualizations and warnings to raise driver awareness of the road environment; nighttime pedestrian visibility; and safety cultures of rural and urban populations.

In addition to maintaining a 4.0 grade point average, Rakauskas has received several awards during his graduate studies. Before commencing his doctoral research at Minnesota, Rakauskas earned a master of science degree in applied psychology from Clemson University and a bachelor of arts degree in psychology from Miami University. He was nominated for the award by Michael Manser, director of the HumanFIRST program.

**Students Get Inside Look at Transportation Technology**

The ITS Institute hosted several groups throughout the school year interested in learning more about the types of advanced transportation research carried out at the University.

In August, a group of prospective Institute of Technology students were given a tour of the Minnesota Traffic Observatory (MTO) facilities as part of their visit to the University of Minnesota campus. The group, whose members were interested in pursuing science and engineering education at the University, heard from senior educational systems developer Chen-Fu Liao and MTO lab manager Ted Morris about the lab’s data gathering, simulation, and visualization capabilities.

Center for Transportation Studies (CTS) director
Robert Johns welcomed a class of first-year engineering students to the MTO in October. The class, which focuses on writing and communication skills for science and engineering, heard about the importance of communicating research results to foster successful implementation.

In February, a group of undergraduate and graduate students from the University of Manitoba (Canada) viewed the ITS Institute’s facilities, toured the Minnesota Valley Transit Authority bus with IV Lab program director Craig Shankwitz, and learned about bus signal priority research in the MTO.

Twelve students and two teachers from the Blaine High School Center for Engineering, Math, and Science visited CTS and the ITS Institute on April 23. The Center is a specialty program within Blaine High School offering an integrated and rigorous, in-depth program in mathematics, science, and engineering. The visit aimed to give students a perspective on transportation engineering and transportation careers. Students spent time learning about the uninhabited aerial vehicle in the aerospace engineering department, traffic monitoring and simulation research in the MTO, and earthquakes and structures in the civil engineering department.

Shawn Haag, program coordinator for CTS, said the students’ reactions were enthusiastic. “The visit really opened their eyes,” he said, referring to the variety of work and research in transportation. When asked who would consider transportation as a potential career, over half raised their hand.

Commuter Vehicle a Hit with Young Learners

A prototype narrow commuter vehicle being developed by University of Minnesota researchers with ITS Institute funding proved a popular attraction at the University’s Institute of Technology Alumni Society annual TechFest. The event, which aims to interest grade-school-age students in science and technology, is held every year at The Works, a “hands-on” science and technology museum for children aged 5 to 15. This year’s event drew more than 1,000 visitors—the largest one-day attendance in the museum’s history.

Lee Alexander, a member of the team of engineers developing the vehicle, accompanied the prototype and explained the vehicle’s cutting-edge features to children—and their commute-savvy parents.

The design features two wheels in front and a single wheel in the rear, and the vehicle tilts automatically when turning. Tilting is necessary to achieve stability and safety with a relatively tall and narrow chassis. The driver never has to worry about how to tilt—a sophisticated computerized steering system handles all the necessary wheel and suspension adjustments to keep the vehicle safely upright when taking corners.

While the narrow commuter vehicle may be years away from appearing on city streets, some of the young learners who visited TechFest might find themselves at

Lee Alexander demonstrates the narrow commuter vehicle for kids attending TechFest.
the controls of a similar set of wheels when they are old enough to drive—or they might be inspired to go on and design their own innovative vehicles.

**INSTITUTE FUNDS STUDENT TRAVEL**

University of Minnesota students joined ITS Institute researchers again this year at the Transportation Research Board Annual Meeting in Washington, D.C. Twenty-two students received travel awards from the Institute to travel to the meeting, where they attended presentations and workshops by researchers from around the world and enjoyed networking with fellow scholars. The students sponsored were Adam Danczyk, Joran Deckenbach, Saif Jabari, Wenteng Ma, Jory Schwach, Nebiyou Tilahun, Carly Turgeon, Ryan Wilson, Xinkai Wu, Feng Xie, Hui Xiong, Kelcie Young, and Shanjiang Zhu.

During the past year, the Institute also funded Michael Rakauskas to attend the 4th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design in Stevenson, Wash.; Chinweikje Eseonu to attend the American Society for Engineering Management National Conference in Chattanooga, Tenn.; Zhiqiang Xing to attend the Position, Location, and Navigation Symposium in Monterey, Calif.; and Pavithra Parthasarathi to attend the Women’s Transportation Seminar International conference in Atlanta, Ga.

**CAREER EXPO HIGHLIGHTS TRANSPORTATION CAREERS**

The ITS Institute teamed up with CTS, the Minnesota Local Road Research Board, the Minnesota Local Technical Assistance Program, the Women’s Transportation Seminar, and the Council of Supply Chain Management Professionals to host the 13th annual Transportation Career Expo, held March 13 in Minneapolis. Speakers from the public and private sectors shared advice with students on three transportation-related career tracks: engineering and intelligent transportation systems (ITS) careers, transportation planning and policy careers, and transportation logistics careers.

**TRANSPORTATION CAMP SPARKS INTEREST IN SCIENCE CAREERS**

Surrounded by a 3-D box in the Minnesota Traffic Observatory and fitted with a University of Minnesota baseball cap and sunglasses, ninth grader Sean Perrin expressed his excitement about the virtual world he had just entered.
“It was sweet,” he said. “The buildings, the light poles—it’s just like going out into the street.”

Creating the attitude that the work of engineers is “sweet” is exactly what the Summer Transportation Institute hopes to achieve each summer when it visits the University of Minnesota. The Institute is a camp held by the Fond du Lac Tribal and Community College and funded by the U.S. Department of Transportation. For its fifth consecutive year, high school students from Cloquet, Minn., and the surrounding communities, including the Fond du Lac Reservation, viewed some of the newest research projects at the Minnesota Traffic Observatory and the Department of Aerospace Engineering as well as Mn/DOT’s FIRST (Freeway Incident Response Safety Team) vehicle. The freeway service patrol vehicle is used on Minnesota roads in an effort to reduce any additional traffic problems that can occur after car crashes.

The summer camp’s stop at the University last July was one of many parts of the program that offers high school students the opportunity to explore the sciences for a full week in hopes of encouraging more young people to go to college and seek degrees in “STEM” disciplines—science, technology, engineering, and math.

“Some of these kids will be the first in their families to go to college,” said director Holly Perlerin. “They have a new mindset and start thinking about college and careers.”

This year, the participants took a peek at the Minnesota Traffic Observatory’s various projects, including a satellite aerial map of Denali National Park projected onto the interactive GIS table and streaming video of traffic in the Twin Cities. Perrin and others also tested the 3-D box in the observatory, which allows people to walk through the University campus projected on the surrounding walls. The aerospace department gave students a first-hand look at flight simulations and a miniature aircraft. Finally, they learned about Mn/DOT’s FIRST vehicle and the role it plays in improving safety on Minnesota highways.

Perlerin said the program is meant to give the kids a “hands-on approach” to what they can do if they pursue careers in math and science and, she hopes, give them the confidence to eventually attend the University.

**Civil engineering student receives Huber award**

Nebiyou Tilahun, a student in the University’s civil engineering Ph.D. program whose research includes ITS-related work, was one of two recipients of this year’s Matthew J. Huber Award for Excellence in Transportation Research and Education. Tilahun is in the final year of his civil engineering Ph.D. program and has done “much innovative work,” said David Levinson, his advisor. Tilahun’s work on the value of different features of bicycle facilities, which made up his master’s thesis, was incorporated into National Cooperative Highway Research Program (NCHRP) report 552, *Guidelines for Analysis of Investments in Bicycle Facilities*. Tilahun said the Huber award encourages him to continue his work in the field.

The Huber award is presented annually to University of Minnesota graduate students demonstrating an outstanding contribution in research, writing, and educational activities in the field of transportation.

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