University of Minnesota
CTS
Center for Transportation Studies
REPORT
A monthly report on transportation research, education, and outreach activities at the University of Minnesota
November 2006

# Robotics center receives federal grant for transportation security research

The University's Center for Distributed Robotics, led by CTS Faculty Scholar **Nikolaos Papanikolopoulos**, was awarded $1.95 million in the 2007 Defense Appropriations Bill. The funding was secured by Congressman **Martin Sabo** to advance the center's robot technology and its transportation security applications.

*Nikolaos Papanikolopoulos*

The robotics center is closely coordinated with SECTTRA—Security in Transportation Technology Research and Applications—a joint program of the Department of Computer Science and Engineering (CSE) and CTS established earlier this year. Papanikolopoulos, a CSE professor, is SECTTRA's director. SECTTRA's mission is to earn recognition for the University of Minnesota as a world leader in the development and application of technologies for transportation security.

"This support will take our transportation security research leadership to a new level of national importance," says **Robert Johns**, CTS director.

The robotics center is developing transportation security technology that can be used in many ways. For example, it responded to the U.S. military's need for a small, throwable robot for urban warfare situations. The remote-controlled, four-inch "scout robot" is especially useful as U.S. forces secure buildings, caves, tunnels, and underground bunkers in urban combat situations, particularly in Iraq. This robot is significantly less expensive than similar technology in use, and could also be used by search/rescue teams, firefighters, and SWAT teams.

Advancements in the robot technology will also be used by the University to enhance transportation security technologies for monitoring

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# Roundtable to explore economic issues facing interstate system at age 50

"As long as the interstate is the highway supporting our society, economy, and national security," says **Dan McNichol**, author of *The Roads That America Built,* "it will forever need to be the beneficiary of our attention and investment."

*Dan McNichol*

Minnesota's experience will receive attention at a transportation roundtable titled "At 50: Economic Issues Facing an Aging Interstate System." The purpose of the event is to celebrate the achievement of the Interstate Highway System while raising the policy questions that national, regional, and local officials will need answered for the next 50 years in transportation—including those related to funding.

The event will take place November 29 from 8:00 a.m. to 11:00 a.m. in the McNamara Alumni Center on the University of Minnesota East Bank Campus. Sponsors are CTS, the Humphrey Institute's State and Local Policy Program, the Minnesota Department of Transportation (Mn/DOT), and the Federal Highway Administration (FHWA).

The program will begin with opening remarks by Lt. Governor **Carol Molnau**, commissioner of Mn/DOT. Next, McNichol, a best-selling author and nationally recognized expert on the U.S. Interstate System, will give the keynote. This year McNichol was the lead spokesperson for the American Association of State Highway and Transportation Officials' cross-country convoy between San Francisco and Washington, D.C., which celebrated the 50th anniversary of the interstate system. (For more information, visit the Dan McNichol Web site at www.danmcnichol.com.)

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## Inside



# Michael Darter is new PRI director

The Pavement Research Institute (PRI), a joint program of the Department of Civil Engineering (CE) and CTS, has a new director.

*Michael Darter*

**Michael I. Darter**, Ph.D., P.E., is Emeritus Professor of Civil and Environmental Engineering at the University of Illinois and principal engineer with Applied Research Associates (ARA), Inc.

Darter has been involved in pavement engineering throughout his entire 40-year career and is an internationally recognized authority in highway and airport infrastructure.

"Through his extensive work in research, teaching, and consulting, Professor Darter has contributed significant new knowledge and many widely used engineering tools," says **Robert Johns**, CTS director.

Darter will have a 25 percent appointment while continuing his work with ARA, says **John Gulliver**, CE department head.

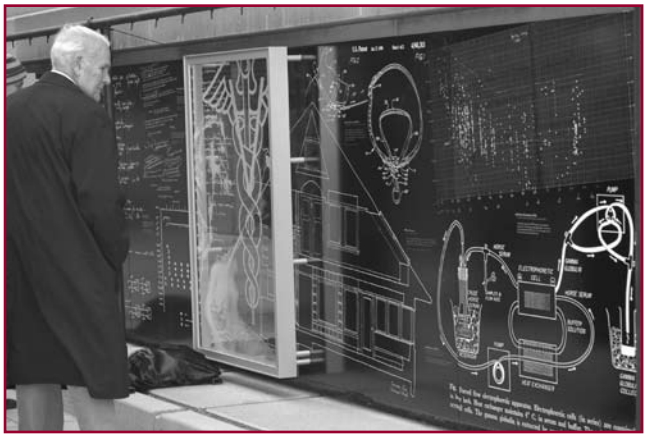
Darter succeeds **Erland Lukanen**, who accepted a position in Mn/DOT's Office of Materials.

For more about the PRI, please visit www.pri.umn.edu. **CTS**

# CTS researchers among U's 'greatest minds'

Three transportation researchers are among 92 University of Minnesota faculty and alumni represented on the Wall of Discovery, unveiled September 29 along with the dedication of another new monument, the Scholars Walk. The monuments celebrate the 155-year-old institution's "greatest minds."

The 253-foot-long artistic tribute to the "drive" that leads to great moments of discovery spans the north side of the Electrical Engineering and Computer Science Building. It is located at the halfway point of the 2,200-foot-long Scholars Walk, which stretches across the Minneapolis campus, from Walnut Street, adjacent to the McNamara Alumni Center, all the way to Pleasant Street and Appleby Hall.



*The Wall of Discovery on the Minneapolis campus*

Civil engineering professor **Panos Michalopoulos** is on the wall for his patented Autoscope® artificial vision system, which integrates miniature video cameras and microprocessors for traffic sensing and measurement extraction to control congested street and highway networks, detect incidents, improve safety and security, and manage traffic efficiently.

Mechanical engineering professor **Max Donath**, director of the ITS Institute, is noted for a patent using GPS, a digital map database, obstacle detection radar, and a head-up display to provide drivers with a virtual reality representation of the road when driving conditions make it almost impossible to see. Coinventors **Craig Shankwitz, Heon Min Lim, Bryan Newstrom, Alec Gorjestani, Sameer Pardhy, Lee Alexander**, and **Pi-Ming Cheng** are also mentioned.

Michalopoulos and Donath are CTS Faculty Scholars.

Finally, former mechanical engineering professor **James "Crash" Ryan**, best known for designing and patenting the automatic retractable seat belt that's standard issue in today's cars, is featured for inventing the flight recorder, commonly referred to as the "black box."

All three mentions include handwritten notes, sketches, or drawings to illustrate the inscribed text upon a metaphorical blackboard. Completing the wall are 20 edge-lit glass panels, which will appear to float in the front of the blackboard.

Among the other items featured on the wall are **Seymour Cray**'s calculations for the first Cray Supercomputer, a hand-written score of **Dominick Argento's** Pulitzer Prize-winning song cycle "From the Diary of Virginia Woolf," a sketch of **William Pedersen's** Shanghai World Financial Center, and notes from breakthrough medical operations.

**Drew Sternal** of L.A. Ink, who spent two years researching and creating the Wall of Discovery, says these panels, etched and carved with abstract images, are meant to inspire multiple interpretations and reflect the continuing work that is leading to tomorrow's achievements.

The Scholars Walk was designed by landscape architect **Gary Fishbeck** of Hammel, Green, and Abrahamson, and was first suggested by U of M landscape architecture professor **Clint Hewitt** in 2000 as a way to mark the University's 150th anniversary.

More information is available online at www.alumni.umn.edu/Wall_of_Discovery.html. **CTS**

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transit stations, airports, and other critical infrastructure.

The scout robot is featured in the University's "Driven to Discovers℠" promotional campaign, a two-year initiative designed to communicate how University researchers have changed life for the better for people all over the world—and continue to do so every single day. The campaign includes print, radio, and TV ads; signs and posters; and other materials.

As part of the campaign, a video of Papanikolopoulos was aired during halftime of a recent Minnesota Gophers football game (see it on the Web at www.discover.umn.edu/featuredDiscoveries/television.php). More information about transportation security research is on the SECTTRA Web site: www.secttra.umn.edu. **CTS**

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The roundtable will conclude with a panel discussion of Minnesota's experience. Moderated by CTS director **Robert Johns**, the panel will feature Molnau; **Thomas Sorel**, Minnesota division administrator with the FHWA; and **Ron Have**, chair of the Minnesota Freight Advisory Committee and president of Eagan-based Freightmasters, Inc.

This year marks the 50th anniversary of the signing of the Federal Highway Act of 1956. The legislation provided initial funding for construction of the national system of Interstate and Defense Highways. This year Minnesota and the rest of the nation have been commemorating the event, one of the most significant transportation developments in history. The goal of these events has been to educate and inform the public about the interstate system, which is responsible for dramatically improving mobility, highway safety, quality of life, and commerce in the United States. **CTS**

## New research reports available

Research reports published since June 2006 by CTS and Mn/DOT are listed in the enclosed insert. **CTS**

# ITS Institute research leads to new lane markings on I-94

Based on findings from researchers at the Intelligent Transportation Systems (ITS) Institute, the Minnesota Department of Transportation painted new markings on a stretch of westbound I-94 in Minneapolis last month. The white lines are intended to reshape the flow of merging traffic, thus reducing driver conflicts and preventing accidents.

The findings came from phase one of research by Professor **Panos Michalopoulos** and former research fellow **John Hourdos**, both with the University's Department of Civil Engineering. Their goal is to develop real-time algorithms needed to create a driver-warning system that will help prevent crashes in high-risk areas. (In October Hourdos was appointed director of the department's new Minnesota Traffic Observatory, formerly known as the ITS Institute Laboratory. Details to come in a future *CTS Report*.)

Their first step was to study the reasons for, and mechanics of, crashes by recording them and extracting raw traffic detector measurements. The researchers designed and assembled a set of unique sensors and surveillance equipment, which they deployed along I-94 westbound through downtown Minneapolis—a stretch of road with the highest rate of crash occurrences in Minnesota. With these instruments, the researchers collected individual vehicle speeds, headways, and lengths at 52 points along the freeway. In addition, they simultaneously recorded video 12 hours a day for two years, capturing all of the crashes and near misses occurring during that time.

As they reviewed the collected data, the researchers pinpointed the entire sequence of events leading to each crash and identified three specific elements contributing to nearly all crashes in this area: congestion shock waves that propagate backwards from the merge area of a downstream entrance ramp; the large difference in driving speeds between the right and middle lanes, which makes lane-changes difficult and therefore dangerously distracting for drivers; and last, the fact that in the area where the shock waves begin, vehicles are simply too close to each other to allow drivers time to take evasive actions.

Researchers also verified that the same elements contributing to crashes also cause "near miss" events. They recorded four times the number of near misses as crashes and observed that the difference is a matter of split seconds. With these findings, the team developed an algorithm capable of accurately detecting the presence of crash-prone conditions nearly 70 percent of the time.

The project was featured in an article in the October 16 Minneapolis *Star Tribune* and in the ITS Institute's 2006 annual report, available online at www.its.umn.edu/publications. **CTS**

*John Hourdos and Panos Michalopoulos examine their system to collect data on the most crash-prone section of highway in the state.*

# CTS seeks nominees for Research Partnership Award

CTS is accepting nominations for the 2007 Research Partnership Award. The award honors research projects within the CTS program that have resulted in significant impacts on transportation. Criteria and submission instructions are in the enclosed form.

An evaluation committee will review the nominations and recommend a winning partnership to the CTS director for approval. The award will be presented at the CTS annual awards ceremony on March 27. Please return your nomination form to **Chad Rathmann** of CTS by January 16, 2007. **CTS**

# CE seeks practitioner-mentors for capstone course

The Department of Civil Engineering (CE) at the University of Minnesota is again seeking volunteers to serve as practitioner-mentors in its Capstone Design course. The purpose of this course, required of all seniors, is to prepare them for their professional career by integrating basic material learned during the civil engineering undergraduate program to address real-life design problems provided by their mentors.

Each practitioner-mentor presents a problem statement for a design project to be solved. Students then form teams of four or five to work with the individual practitioner-mentors in addressing the design problems at the feasibility level. The students meet with their practitioner-mentor once per week at a place chosen by the mentor. The mentors receive professional development hours for their efforts.

If you are interested in becoming a mentor-practitioner for a transportation-related project, please contact Professor **Panos Michalopoulos** at 612-625-1509 (micha001@umn.edu). Spring semester begins in January. **CTS**

# CTS staffer named University iFellow

The University's Office of Information Technology (OIT) has nominated and selected **C.J. Loosbrock,** information technology professional at CTS, as an iFellow for the 2006-2007 academic year. The iFellow Program is a consortium of early adopters who are interested in trying hardware and software as they appear on the market. (See http://iroc.umn.edu/ifellows.html for more information about the iFellows program.)

Working in conjunction with managers from OIT, iFellows provide useful knowledge and experience in helping to determine what and when new technology products and services are rolled out to the University community. Participants in this program agree to present and share their ideas, and each participant is eligible for an award of up to $2,000 to prototype an idea.

Loosbrock joined CTS in 1992. **CTS**

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# Student Connector shares resources, opportunities

Representatives from professional and student organizations met with current University students at the first "Transportation Student Connector" September 29 on the Minneapolis campus. CTS and the Interdisciplinary Transportation Student Organization (ITSO) hosted the event.

**Robert Johns**, director of CTS, and **Tyler Patterson** of ITSO kicked off the event with an overview of University opportunities and resources for transportation students. (For more about ITSO, see www.umn.edu/~itso.)

**Trish Will**, director of campus and community programs with the University of Minnesota Alumni Association (UMAA), discussed available transportation mentoring programs and gave advice on how to best enter into and carry forward a meaningful mentor relationship. (To learn more about the UMAA mentoring program, see www.alumni.umn.edu/mentor.

Following Will's comments, **Tamara Cameron** of the U.S. Army Corps of Engineers and Institute of Technology student **Kayleen Fabini** shared lessons learned from their mentor-mentee experience. **CTS**

# Exhibitors sought for Career Expo

CTS is cosponsoring the 12th Annual Transportation Career Expo on March 1, 2007. The event has a new format and time—1:30 p.m. to 5:00 p.m.—and will immediately follow the Interdisciplinary Transportation Student Organization's third networking and paper presentation conference.

As part of the Career Expo, representatives from a variety of companies and public agencies will set up exhibits to inform participants about their organizations and job opportunities. If your organization would like to participate, please fill out and return the enclosed form. For more information, contact **Mindy Carlson** at 612-625-1813, carlson@cts.umn.edu. More details to come in future issues of the *Report.* **CTS**

# Upcoming events

To publicize your event, call CTS at 612-626-1077, fax 612-625-6381, or e-mail snopl001@cts.umn.edu. Visit the CTS Web site—www.cts.umn.edu—for more comprehensive event information.

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| Nov. 29 | "At 50: Economic Issues Facing an Aging Interstate System," Minneapolis. Contact **Stephanie Jackson,** 612-624-8398, sjackson@cts.umn.edu. |
| Dec. 1 | CTS Freight and Logistics Symposium, Minneapolis. Contact **Electra Sylva**, 612-624-3708, conferences5@cce.umn.edu. |
| Dec. 6 | Minnesota Association of Asphalt Paving Technologists 53rd Annual Asphalt Conference, Brooklyn Park. Contact **Tim Mueller**, 612-221-0428. |
| Dec. 7 | 56th Annual Concrete Conference, St. Paul. Contact **Kay Syme**, 612-624-4938, ksyme@cce.umn.edu. |
| Dec. 8 | Department of Employment and Economic Development Job Fair (including transportation), Rosemount. Contact **Anna Christopherson**, 952-346-4326, anna.christopherson@state.mn.us. |
| Jan. 16–19 | 62nd Annual Minnesota County Engineers Conference, Brainerd, Minn. Contact **Oona Besse**, 612-624-3492, conferences3@cce.umn.edu. |
| Jan. 31– Feb. 2 | City Engineers Association of Minnesota (CEAM) Annual Conference, Brooklyn Center, Minn. Contact **Oona Besse**, 612-624-3492, conferences3@cce.umn.edu. |
| Feb. 8 | CTS Winter Luncheon with **Bruce Simons-Morton**, Radisson University Hotel, Minneapolis. Contact **Electra Sylva**, 612-624-3708, conferences5@cce.umn.edu. |
| Feb. 15 | 11th Annual Minnesota Pavement Conference, St. Paul. Contact **Shirley Mueffelman**, 612-624-4754, conferences2@cce.umn.edu. |
| Feb. 28 | 21st Annual Mn/DOT - ACEC/MN Consultant Conference, Brooklyn Center. Contact **David Oxley**, 952-593-5533, doxley@acecmn.org. |
| March 1 | Transportation Career Expo, Minneapolis. Contact **Mindy Carlson**, 612-625-1813, carlson@cts.umn.edu. |
| March 14 | ITS Minnesota 13th Annual Meeting. Contact **Electra Sylva**, 612-624-3708, conferences5@cce.umn.edu. |
| March 15–16 | Concrete Paving Association of Minnesota Annual Conference, St. Cloud. See www.concreteisbetter.com. |
| Apr. 10–11 | Spring Maintenance Training Expo, St. Cloud. Contact **Shirley Mueffelman**, 612-624-4754, conferences2@cce.umn.edu. |
| Apr. 22–25 | 2007 American Public Works Association North American Snow Conference, St. Paul. Contact **Brenda Shaver**, 816-595-5240, bshaver@apwa.net. |
| May 1–2 | CTS Eighteenth Annual Transportation Research Conference, Saint Paul RiverCentre. Contact **Electra Sylva**, 612-624-3708, conferences5@cce.umn.edu. **CTS** |