University of Minnesota
Center for Transportation Studies
Research E-News

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CTS Research E-News brings you the latest research project milestones, published reports, and seminar coverage.

In this issue:

Policy & Planning

Managing conflicts in public involvement

Productive public involvement is key to successful transportation projects, but when conflicts arise, the process can become a source of frustration not only for the public but for transportation officials—especially if public involvement is only an occasional part of their jobs. With support from the Minnesota Department of Transportation, **Gary Barnes** and **Stephanie Erickson** of the Humphrey Institute of Public Affairs set out to help public officials deal with these problems effectively using a simple system for conflict management in transportation projects.

Barnes and Erickson developed their system through discussions with experts in managing public involvement for transportation projects, encompassing a variety of different types of projects and conflicts. These case studies were used to develop a general framework for dealing with conflicts. Within this framework, a set of managerial strategies are provided, emphasizing principles for managing relations with stakeholders in order to minimize sources of conflict.

The researchers state that their approach is not intended to supplant more elaborate systems for conflict management often used by specialists working on large and complex projects. Instead, the system has been designed as a tool for less-experienced personnel who may not have access to advanced conflict management training and generally work on less-complex projects.

The work by Barnes and Erickson will be incorporated into a revised edition of the Minnesota Department of Transportation's conflict management manual, *Hear Every Voice*. A research report detailing the history and methodology of the project, and including the material prepared for *Hear Every Voice*, has been published by the Minnesota Department of Transportation under the title *Developing a Simple System for Public Involvement Conflict Management* (Mn/DOT 2006-24).

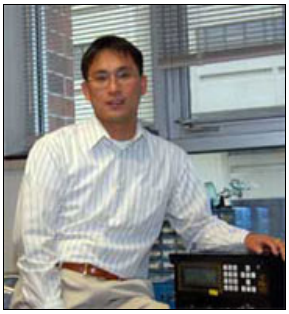
Intelligent Transportation Systems

Signal priority technology to put buses on the fast track

Chen-Fu Liao and **Gary Davis** are University of Minnesota researchers using intelligent transportation systems technologies to make bus transportation faster and more reliable. Combining newly available technologies such as onboard GPS and advanced traffic signal control systems, Davis and Liao's bus signal priority system will subtly adjust the operation of traffic signals along bus routes so that buses carrying passengers receive fewer red signals—with minimal disruption to other traffic.

A report on the research, focusing on the development of control algorithms and the use of microscopic traffic simulation to test and refine the system, has been published by the ITS Institute. Liao and Davis hope to begin real-world testing of their system on an urban bus route during the next phase of their research.

The idea of preempting the normal operation of traffic signals in order to help certain vehicles move through intersections has been widely applied in the area of emergency vehicle operations. Such systems currently enjoy wide popularity because they can reduce emergency response times.



Chen-Fu Liao

One commercial example is the Opticom system, built by 3M, which uses an infrared emitter mounted on fire trucks and ambulances to activate special sensors on signal structures. As an emergency vehicle approaches an intersection, coded pulses from the emitter tell the signal to depart from its normal timing scheme and display a green light for a fixed period of time.

However, the approach taken by Opticom and similar commercial systems has proven to be ill-suited to the needs of bus operations. In particular, the strategy of providing a green light for a fixed period of time, while suitable for emergency vehicles that travel quickly and without stopping, is problematic in the case of buses. Many bus stops are located immediately before intersections. These "near side" stops cause problems for fixed-interval signal preemption systems because buses may stop to pick up passengers before proceeding through the intersection.

Current systems designed for emergency vehicles do not take this kind of movement into account, causing the green signal phase to expire while the bus is still picking up passengers. In other instances, a bus stop may be located on the far side of an intersection, or the intersection may have no bus stops nearby. These factors complicate the parameters of bus movement, making fixed-interval signal preemption impractical for transit vehicles.

The priority approach

Metro Transit, the transit agency serving the Minneapolis-St. Paul metropolitan area, has recently installed Automatic Vehicle Location (AVL) systems in its fleet of buses in an effort to improve service quality. These systems utilize Global Positioning System receivers to determine the exact position of each bus. This information is commonly used by bus operations centers to determine whether buses are adhering to their schedules, and can also be used to provide updates on arrival times at major transit stations.

Davis and Liao are working to coordinate the operation of computerized traffic signal controllers with the movements of buses using wireless data transmission. Two protocols currently support this type of communication: the consumer-oriented wireless computer networking protocol such as IEEE 802.11a, b, and g, and the 802.11p Dedicated Short Range Communication (DSRC) protocol designed specifically for use in vehicle-to-vehicle and vehicle-infrastructure communications.

Communication between vehicles and infrastructure systems is a very active area in ITS research, with much current work being carried out under the auspices of the federally funded Vehicle Infrastructure Integration (VII) initiative. Other research in this area focuses on using such communication to help prevent collisions and to gather better information about traffic conditions and vehicle operations.

One of the chief challenges facing engineers developing complex traffic-control systems is the need for calibration and testing. Simply unleashing a set of unproven algorithms in the real world, where buses full of harried commuters negotiate rush-hour traffic snarls, is not a good option. Instead, Davis and Liao turned to the traffic simulation capabilities of the ITS Laboratory, where Liao is senior systems engineer.

Analysis of the simulation results showed a consistent decrease in bus travel times during both morning and evening rush hour conditions, despite the heavier volumes present on the corridor in the evening. Delays experienced by non-transit vehicles, on the other hand, were slightly increased by the signal priority strategy.

Future directions

While any deployment of transit signal priority in the Twin Cities area is still some time off, Davis and Liao say they hope to work with Metro Transit to explore ways of implementing their work to improve transit service in the Twin Cities. The next phase of their research will focus on developing a prototype system to further validate signal priority using wireless communication.

Integration of transit signal priority with the federal VII initiative will also be an important part of future work. As specialized wireless protocols for communication between vehicles and infrastructure facilities become available, Davis and Liao will work to ensure that their system is compatible.

Liao and Davis's report on this research, *Bus Signal Priority Based on GPS and Wireless Communications Phase I - Simulation Study* (CTS-06-07) is available from the CTS Web site.

Transportation & the Environment

Measuring hazardous chemicals in recycled subgrade materials

To better understand the potential environmental impact of recycled materials used to stabilize subgrade soils, a research team from the University of Minnesota's Department of Soil, Water, and Climate and the Minnesota Department of Public Health tested samples of fly ash from different coal-burning power plants and pavement samples from roads constructed with different asphalt mixes. The team included graduate student **Kim Grosenheider** and professors **Paul Bloom** and **Thomas Halbach**.

Coal combustion fly ash and ground asphalt pavement are increasingly popular additions to road subgrades. Cheap and readily available, these materials can be used to help stabilize subgrade soils. However, the potential of fly ash and recycled asphalt to contain unacceptably high levels of chemicals such as arsenic, mercury, and polycyclic aromatic hydrocarbons must be taken into account when deciding whether to use these materials. The question is complicated by the fact that fly ash and asphalt from different sources can contain widely varying concentrations of hazardous chemicals.

The researchers obtained samples of fly ash from 18 coal power plants in Minnesota, Wisconsin, and South Dakota. The plants used different types of boilers and pollution-control systems, but all used low-sulfur coals from the western U.S. rather than eastern bituminous coals, which are characterized by higher sulfur and arsenic content. They found that different plants produced fly ash with markedly different chemical characteristics. These ashes were then mixed with soil samples typical of subgrade soils in need of stabilization, and potential pollution impacts were calculated based on standards published by the Minnesota Pollution Control Agency.

Analysis of recycled asphalt pavement materials focused on the different properties of asphalt made from petroleum and asphalt made with coal tar. Coal tar asphalt was found to be largely unsuitable for use as a subgrade stabilizer due to the potential for groundwater contamination. In general, the team concluded that most recycled asphalt materials available in the Minneapolis-St. Paul area could safely be used for subgrade stabilization.

Chemical Inventory and Database Development for Recycled Material Substitutes (Mn/DOT 2006-28) is available on the Mn/DOT Web site.

Transportation Infrastructure

TERRA adds new partner, launches Web site

The Michigan Department of Transportation is the newest addition to the Transportation Engineering and Road Research Alliance (TERRA). The Michigan partnership is an important milestone for TERRA, said CTS associate director **Laurie McGinnis**, because it shows the potential for greater regional cooperation on pavement research topics to benefit states across the Upper Midwest. **Dick Stehr**, Mn/DOT division director and co-chair of the TERRA board of directors, said he welcomes another state DOT and hopes that others will see the value of the partnership.

Michigan joins a number of partners including Mn/DOT, the Minnesota Local Road Research Board, pavement industry associations, and Iowa State University's Center for Transportation Research and Education (CTRE). The Norwegian Public Roads Administration is also a member.

In other news, TERRA launched a Web site, www.terraroadalliance.org, featuring information on the organization and its activities. The site is a good place to learn more about partnering with TERRA, according to **Fred Corrigan**, co-chair of the organization's board of directors. Corrigan said TERRA is actively seeking to expand its research activities through partnerships with pavement stakeholders in both the public and the private sectors.

Developed by CTS, the new Web site will play a key role in communicating the results of research at MnROAD to a broad audience of pavement stakeholders. As new research results and projects are generated, they will appear on the site. TERRA is also developing an electronic newsletter to highlight developments in pavement research.

The Web site was featured in TERRA's exhibit at the national Research Advisory Committee of the American Association of State Highway and Transportation Officials (AASHTO) in July. McGinnis was among the Minnesota representatives who traveled to Columbus, Ohio, for the meeting.

TERRA was established in 2004 as a new governance structure for MnROAD, Minnesota's large-scale pavement research facility. With a combination of mainline freeway sections and dedicated low-volume test roadway, MnROAD enables researchers to carry out long-term evaluations of pavement materials and designs under real-world conditions. More information about MnROAD is available on the TERRA Web site.

The success of MnROAD as a research tool during its first decade of operation, along with a desire to expand pavement research at the facility, prompted Mn/DOT to create the partnership-based research model for future operations.

Transit & Alternative Modes

National Transit News

TCRP research publications available online

The federal Transit Cooperative Research Program (TCRP), administered by the Transportation Research Board, provides practical transit research to address technical and operational issues. TCRP emphasizes putting research results into the hands of organizations and individuals that can use them to solve problems. TCRP publications may be viewed at www4.trb.org/trb/onlinepubs.nsf/web/crp.

Recent TCRP publications include:

- *Using Archived AVL-APC Data to Improve Transit Performance and Management* (TCRP Report 113)
- *Improving Pedestrian Safety at Unsignalized Crossings* (TCRP Report 112)

Journal of Public Transportation

The *Journal of Public Transportation*, Vol. 9, No. 4, 2006, published by the National Center for Transit Research at the University of South Florida, includes these articles, available at www.nctr.usf.edu:

- Bus Transit Oriented Development—Strengths and Challenges Relative to Rail
- Report from an Interdisciplinary Case Study on a Public Transit System in Crisis
- Total Quality Transportation Through Deming's 14 Points
- Tracing Individual Public Transport Customers from an Anonymous Transaction Database
- A Multidisciplinary Approach Toward Improving Bus Schedule Readability
- A DSS Framework for Advanced Traffic Signal Control System Investment Planning

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Upcoming Events

Here are selected events related to transportation research. Visit the CTS Web site, www.cts.umn.edu/events, for more comprehensive event information. You may also subscribe to e-mail event announcements using our subscription form.

October 10, 2006
Advanced Transportation Technologies Fall Seminar: *Lateral Stability of a Narrow Commuter Vehicle*, Minneapolis, Minnesota. Contact Stephanie Malinoff, 612-624-8398, malinoff@umn.edu. [More]

October 11-12, 2006
AirTAP Fall Forum, Breezy Point, Minnesota. Contact Mindy Carlson at 612-625-1813 or e-mail carlson@cts.umn.edu. [More]

October 24, 2006
Advanced Transportation Technologies Fall Seminar: *Toward Scalable and Privacy-Aware Location-Based Services in Transportation*, Minneapolis, Minnesota. Contact Stephanie Malinoff, 612-624-8398, malinoff@umn.edu. [More]

November 2-3, 2006
Toward Zero Deaths Conference, Duluth, Minnesota. Call Shirley Mueffelman, 612-624-4754, conferences2@cce.umn.edu. [More]

November 14, 2006
CTS Fall Luncheon, Minneapolis, Minnesota. Contact Electra Sylva, 612-624-3708, conferences5@cce.umn.edu. [More]

December 1, 2006
Freight and Logistics Symposium, Minneapolis, Minnesota. Contact Electra Sylva, 612-624-3708, conferences5@cce.umn.edu. [More]

May 1-2, 2007
18th Annual CTS Transportation Research Conference, RiverCentre, St. Paul. Contact Electra Sylva, 612-624-3708, conferences5@cce.umn.edu.
