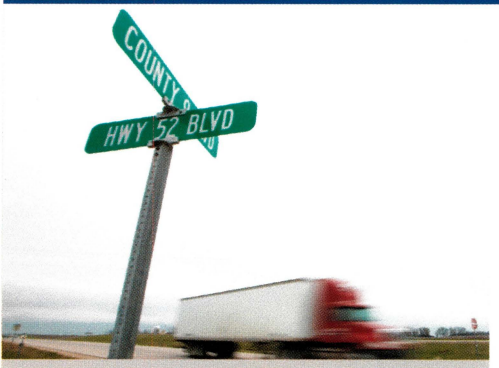
UTC Spotlight

University Transportation Centers Program

October 2008

U.S. Department of Transportation, Research and Innovative Technology Administration



This monthly report from the University Transportation Centers Program highlights some of the recent accomplishments and products from one of the University Transportation Centers (UTCs) managed by the U.S. Department of Transportation's Research and Innovative Technology Administration.

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A New Approach to Rural Intersection Safety

The University of Minnesota's Intelligent Transportation Systems (ITS) Institute is working to reduce highway crashes by using advanced traffic monitoring technologies that will help drivers safely navigate rural intersections where there are no traffic lights. In the near future, a new safety system will be field tested at a selected rural crossroad. Researchers believe the equipment will reduce crashes without disrupting traffic flow by helping drivers safely judge gaps in traffic.

Although intersections make up only a small part of the U.S. highway network, intersection crashes comprise more than 40 percent of all vehicle crashes nationwide. In rural Minnesota, crash records show that approximately one-third of all crashes occur at intersections—and researchers have found that failure to select a safe gap in traffic is a factor in more than three-quarters of these incidents. Twenty percent of all fatal crashes in Minnesota occur at rural unsignalized intersections.

Traditionally, installing a traffic signal has been seen as the best available approach to reduce crashes at locations where a high-speed, high-capacity rural expressway intersects a low-speed, low-volume rural road. However, it is well known that adding a traffic signal to rural highway intersections often brings a new set of safety problems, including increased rates of rear-end vehicle collisions. Traffic signals on rural expressways also disrupt the flow of traffic and may needlessly waste fuel while increasing air pollution.

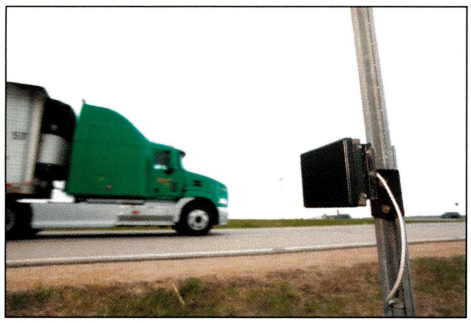
Helping drivers make better decisions

In 2002, the ITS Institute began an ambitious research project aimed at developing infrastructure-based technologies capable of reducing driver error at unsignalized rural highway intersections. The main idea behind Intersection Decision Support was to help drivers select a safe gap in traffic—a more effective way to improve safety than regulating traffic flows. The project's goal was to create a system that is widely deployable and comparable in cost to traffic signal installation.

Researchers from the Institute's Intelligent Vehicles Lab designed a sensor network, incorporating multiple radar units mounted along the high-speed expressway, that can track approaching vehicles and determine whether gaps between them are sufficient for a stopped vehicle to safely enter or cross the highway. A methodology was also developed to identify candidate intersections for the technology.

Jonathan Chapman

The HumanFIRST Program's immersive driving simulator enabled researchers to test a variety of infrastructure-based driver interface concepts.



Jonathan Chapman

A compact radar sensor, part of the integrated sensor network monitoring traffic approaching the intersection on the rural highway.

This sensor system, installed at a rural intersection in southern Minnesota, was used to collect data to help researchers better understand driver gap decision-making behavior and the different ways in which drivers negotiate highway intersections. The instruments and cameras have also captured several crashes, providing valuable insights into the causes of highway intersection collisions. This information was then used to develop an effective driver interface design.

The Intersection Decision Support concept attracted the interest of several state Departments of Transportation, who joined with Minnesota in a pooled-fund effort. The Minnesota Mobile Intersection Surveillance System was deployed at through-stop intersections with serious crash histories in Wisconsin, Iowa, Michigan, North Carolina, Georgia, Nevada, and California in order to evaluate whether regional differences would affect the design.

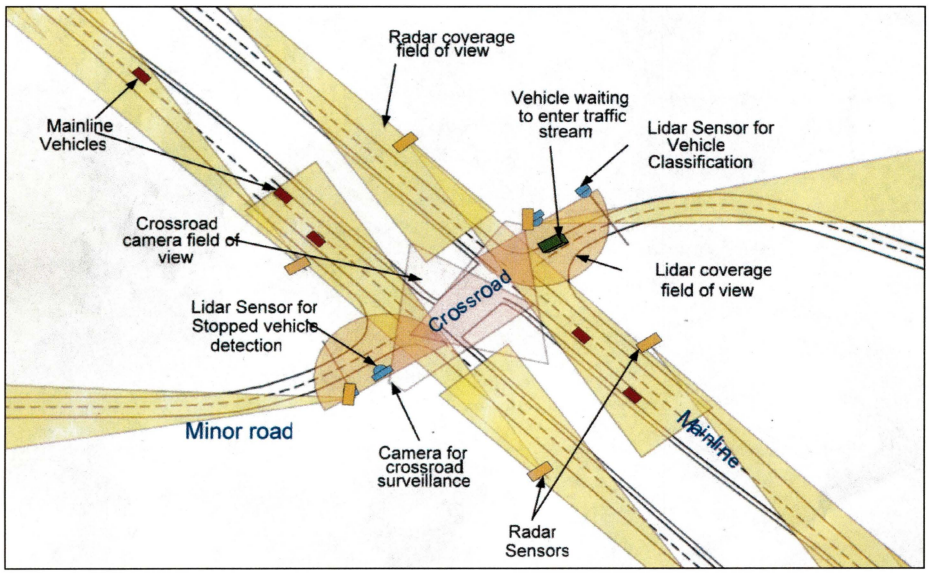
In 2007, the Minnesota Department of Transportation and the ITS Institute were selected by the U.S. Department of Transportation (USDOT) to participate in the Cooperative Intersection Collision Avoidance Systems (CICAS) research initiative. CICAS brings together federal agencies, automobile manufacturers, and university transportation centers with the goal of developing new technologies to prevent intersection collisions that kill thousands of Americans and injure more than one million more every year. Minnesota's Stop Sign Assist research focused on rural unsignalized intersection crashes.

This work took advantage of new resources emerging from the USDOT Vehicle-Infrastructure Integration (VII) Initiative. Under VII, a wireless communication mechanism between vehicles and the infrastructure was evaluated that might facilitate the efficient transfer of relevant data between vehicles and infrastructure. Although Minnesota's research focused on infrastructure-based solutions, the ability to send and receive data directly from vehicles opens up new possibilities, such as tailoring the system response to individual drivers and vehicles.

Researchers have now installed four sensor-driven animated graphic displays at the Minnesota research intersection. The ITS Institute's HumanFIRST Program in human factors had previously evaluated several display concepts in the program's immersive driving simulator, researching ways for intuitively displaying information about gaps in traffic to drivers stopped at the intersection. During the Field Operational Test, driver response to the prototype display system will be observed by the instrument suite at the research intersection.

In August 2008, the USDOT announced that the Wisconsin DOT together with the ITS Institute will receive an award from the Rural Safety Initiative Program to deploy and evaluate the Intersection Decision Support technology at a northern Wisconsin intersection.

Test Intersection Sensor Configuration: Hwy 52 & Goodhue County Rt. 9



SOURCE: ITS Institute, University of Minnesota

About This Project

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Photos on banner by: Jonathan Chapman