



Institute for Transportation Research and Education
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ITRE research improving safety for sight-impaired pedestrians

New National Institutes of Health-funded technology can improve the navigation of roundabouts

RALEIGH, N.C. — Researchers at the Institute for Transportation Research and Education (ITRE) at NC State University (NCSU) have completed a major stage of a nine-year study to assist blind pedestrians safely cross single- and multi-lane roundabouts (also known as traffic circles). “Blind Pedestrians Access to Complex Intersections” is an interdisciplinary national study conducted in partnership with Western Michigan University’s Department of Blindness and Low Vision Studies, funded by Bioengineering Research Grant NIH/NEI BRP R01 EY12894-03 from the National Eye Institute (NEI).

Research in the United States has shown that roundabouts – when contrasted with standard intersections – have helped reduce vehicle crashes and improve traffic flow, while international studies (roundabouts have been a main-stay in Europe for more than a century) show that pedestrian travel at roundabouts is safer than at regular intersections and zebra crosswalks. On the other hand, research involving the accessibility of pedestrians who are blind or have impaired vision has demonstrated significant crossing challenges for these populations. The lack of signal control and a confusing auditory environment make it challenging for the blind to identify crossing opportunities in the form of gaps in traffic or yielding vehicles. This research has led the United States Access Board to include language in their draft guidelines for accessible public rights-of-way (PROWAG) that would require pedestrian signals at multi-lane roundabouts, potentially impeding benefits to motorists and increasing the cost of these facilities.

In an effort to address this problem, ITRE researchers have developed an *Automated Yield Detection System* (AYDS). The technology “reads” live video feeds from an overhead vantage point. The video is then sent to an image processor that uses “virtual loops,” or “zones” that look for pixel

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changes on a background image. When a vehicle moves through the predetermined zones and yields, information is sent to audible pedestrian signals located at the pedestrian crossing. A wireless signal triggers an audible message that informs the visually impaired pedestrian when vehicles have slowed down to the point where a crossing opportunity is created. The pedestrian is then able to confirm, through his or her own senses, if the vehicle has truly stopped and if it is safe to cross.

To test the effectiveness of the system, the research team recently completed an initial field experiment with sixteen (16) blind volunteers, who had been briefed on the roundabout geometry and operations before attempting to cross, while accompanied by a certified orientation and mobility (O&M) specialist. Crossing difficulty ranged from slight to high, based on individual travel skills, risk-taking behavior, traffic volumes, and the drivers' willingness to yield for pedestrians. In a comparison of crossings done with and without AYDS in place, the percentage of utilized yield crossings increased from approximately 55-72% — an increase of over 33%.

As part of the larger research scope, the team has previously studied roundabouts in Raleigh, N.C.; Charlotte, N.C.; Baltimore, Md.; Tampa Fla.; Nashville, Tenn.; and Golden, Colo.

“We believe this study is of the utmost importance in providing access to pedestrians with limited or total loss of vision as well as preserving the very nature of roundabouts which is to keep traffic flowing,” says ITRE director Nagui M. Roupail, Ph.D.

Chris M. Cunningham, P.E., and Bastian J. Schroeder, Ph.D., are ITRE's key researchers in the study.

“One of our obligations is to provide information on how to cross a roundabout safely,” says Cunningham. “And we're interested in providing information to all pedestrians through various treatments that could be implemented at similar complex intersections.”

The team presented their latest findings at the Transportation Research Board annual meeting on Wednesday, January 14, 2009, in Washington, D.C.

Dr. Schroeder says the collected data will be used to determine the next steps in the study, which may involve the application of AYDS at larger multi-lane roundabouts or other unsignalized pedestrian crossings.

See a video summary and demonstration of the project at the ITRE Website:

The Institute for Transportation Research and Education, administered by North Carolina State University, is a non-profit organization that conducts research and provides education and technical assistance for a wide variety of transportation issues with the goals of solving problems and creating new products, better services, and smarter workers. ITRE is located on NCSU's Centennial Campus. For more information about ITRE and its related programs, visit www.itre.ncsu.edu.