Evaluation of Automation Technologies to Pedestrian Safety and Operations

Problem: Pedestrian injury and fatality statistics have essentially held steady at around 4,800 deaths per year for the last three years. Although total fatalities have remained roughly the same, pedestrians may be facing increased risks because it is conjectured, but not proven, that the amount of exposure of pedestrians is decreasing. A method of reliably and efficiently counting the amount of pedestrian use is urgently needed.

The AASHTO (American Association of State Highway and Transportation Officials) has included pedestrian safety in their Strategic Highway Safety Plan, and improved pedestrian safety is a major goal. The AASHTO plan for "Making Walking and Street Crossing Safer" includes a number of initiatives pertaining to engineering, enforcement, education, as well as research. The Federal Highway Administration has included pedestrian safety as part of its Vital Few with the goal of reducing the number of pedestrian deaths by 10 percent by 2007.

One major hurdle in evaluating the effectiveness of pedestrian safety countermeasures is the difficulty in determining pedestrian crash rates or risk likelihood. While vehicle volumes and crash rates have been collected and measured for years, equivalent pedestrian data have lagged behind. The lack of good pedestrian exposure data makes it difficult to identify what countermeasures really improve safety for pedestrians. Because of these concerns, in 1996 there was a joint FHWA & NHTSA workshop to identify gaps in pedestrian and bicyclist research and data. State pedestrian and bicyclist coordinators, local engineers, researchers, and Federal agencies including FHWA and NHTSA identified the need for improved techniques to collect pedestrian data.

Recent developments in advanced technology offer the potential to better gauge pedestrian activity to improve pedestrian safety, and to help achieve a reduction in pedestrian fatalities. The goal of this project is to examine the role automation can play in: (1) increasing our understanding of pedestrian volumes and Pedestrian Level of Service (PLOS); and (2) increasing pedestrian safety at signalized intersections though use of automated pedestrian detectors.

A key problem in developing effective pedestrian safety countermeasures is a lack of knowledge about pedestrian capacity, density, and PLOS. For example, there is no clear standard for measuring pedestrian volumes on sidewalks or at intersections—most methods are manual and involve extrapolation from measurements during 15-minute peaks or require many hours of observation. The many directions of pedestrian movements also make it difficult to obtain accurate counts. The knowledge gaps and lack of accurate measurement techniques pose problems to safety researchers and traffic engineers alike who must rely on inaccurate measurement methods in order to select and evaluate safety countermeasures.

The second part of the project pertains to the use of automated pedestrian detectors designed to provide pedestrians with safe, signaled crossing opportunities. As previous

research has shown, pedestrians frequently do not actuate pedestrian pushbuttons and, in fact, often doubt that pushbuttons do anything at all. The use of automated detectors offers the possibility to increase the likelihood of safe pedestrian crossings. This type of technology is not new as evidenced by their use in Europe and elsewhere. The United Kingdom and the Netherlands have used automated detection devices at PUFFIN (Pedestrian User-Friendly Intelligent) crossings and PUSSYCATS (Pedestrian Urban Safety System and Comfort At Traffic Signals) crossings. Similar devices have also been used recently in the US (e.g; for in roadway lighting actuation). In recent years, new technologies have emerged and there have been improvements to existing technologies.

The principal tasks to be performed for this project will be:

1. A literature review to identify technologies relevant for automated pedestrian counting and detection.
2. An analysis of automated pedestrian counting devices
    a. Experimental evaluation of the identified devices under simple and complex situations.
    b. A report describing findings from the evaluations.
3. An analysis of automated pedestrian detection devices
    a. Experimental evaluation of the identified devices under simple and complex situations.
    b. A report describing findings from the evaluations.
4. A final report reviewing the technologies including their strengths and limitations.

Objective: To determine how accurately new measurement technologies can be applied to pedestrian movements for either regular monitoring (e.g. automated pedestrian detection at signalized intersections) or specialized research purposes (e.g., pedestrian counting, analyzing conflicts).

Key Words: Automation, Pedestrian Counts, Pedestrian Level of Service, and Pedestrian Crossing.

Urgency/Priority: High.

Cost: $560,000 over 4 years.

User Community: Traffic engineers, city planners, and transportation researchers.

Implementation: Distribution of review and methodology report to major city traffic departments, FHWA, state engineers, and Internet.

Effectiveness: Provide better planning to anticipate poor sidewalk environment adjacent to traffic and increase the likelihood of safe pedestrian crossings.