**Title:** AUTOMATED PEDESTRIAN DETECTION: ASSESSING DEVICE EFFECTIVENESS AND POTENTIAL BARRIERS TO ACCEPTANCE IN NORTH AMERICA

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Abstract:
The 2008 U.S. Federal Highway Administration Pedestrian Safety Report to Congress emphasized the potential of automated (or passive) pedestrian detection to improve safety. However, it also found that these technologies "require additional research and extensive field testing to demonstrate and evaluate the benefits of deploying the systems." It pointed to concerns about costs and reliability, as well as the gap between limited U.S. experience and broader European and Australian acceptance of these devices.
This paper presents the findings of the Institute of Transportation Engineers (ITE) Technical Committee on Automated Pedestrian Detection (APD), which is developing an informational report describing the range and effectiveness of such devices, used to control traffic signals or warning devices at street crossings. The committee is also assessing liability, maintenance, and accessibility issues that may pose barriers to greater device acceptance in North America.
In association with the University of Manitoba Transport Information Group, the ITE committee conducted an on-line survey of local agencies in the U.S. and Canada. This indeed found a high level of concern about reliability and maintenance needs. However, most respondents did not report personal experience installing or evaluating these detectors.
In contrast to this level of concern in North America, there is widespread acceptance in the United Kingdom of automated detection for "Puffin" (Pedestrian User Friendly Intelligent) crossings. Puffin installations have grown at a rate of 7.6% in each of the last two years in the U.K., used now at over 3,100 crossings, primarily midblock. A majority of British local agencies surveyed indicated that 100% of future pedestrian crossing facilities in their jurisdictions will use Puffin technology.
This paper analyzes why there is such a difference in the British and North American approach to pedestrian safety and assesses likely future directions. However, there are a number of factors that will tend to promote serious consideration of automated detection in North America. There is increasing interest in promoting safe walking to improve public health, promote air quality, combat climate change, and reduce congestion. Proposed U.S. MUTCD (Manual on Uniform Traffic Control Devices) amendments requiring longer signalized crossing times may also increase agency interest in using automated detection of pedestrians to "fine tune" crossing times to individual walking speeds.
A major decision looms on whether to invest in on-board (in-vehicle) pedestrian detection and collision avoidance technologies or in roadside APD. Such a decision is complicated by rapid changes in technology, not only in detector technology per se, but also in wireless vehicle-to-vehicle communications that would allow a single "probe" vehicle to transmit warnings to adjacent vehicles about pedestrian conflict situations.
This paper finds that the research record available is inconsistent and often inconclusive. However, it does suggest the promise of such devices for improving safety and mobility.
Additional research is needed to address the benefits, costs, and problems with APD via intensive and comprehensive field research. Laboratory or controlled experiments are also needed to compare different technologies thoroughly and fairly. Researchers need to develop

standardized and comprehensive methods of assessing APD and quantifying the benefits. These should consider not just detector accuracy, but broader criteria for impacts on safety and mobility, cost, ease of installation, maintenance record, support by the public, and ability to gather other data.

Legal, maintenance, and accessibility guidance would also be highly valuable in the decision of whether and how to use APD. Greater coverage of APD in engineering standards and technical publications will help to support their use, in part by reducing liability exposure. The most common causes of APD malfunction were identified by the ITE on-line survey as vandalism/accidental damage, inclement weather, and installation flaws. These can partly be addressed through technical guidance and greater diffusion of case study experience. While APD is unlikely to replace accessible pedestrian signals (APS) at signalized intersections, it could be a valuable supplement. The presence of APD should ideally be communicated to visually impaired pedestrians so they can make most effective use of the devices.