**Topic:** Deploy and Test a Smartphone Based Accessible Traffic Information System for the Visually Impaired (Idea 111)

**Date:** June 29, 2017  
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**Resources searched:** MnDOT Library catalog, TRID, RiP, Transport, ASCE Civil Engineering database

**Summary:** I didn’t find many relevant results. The “Most Relevant” section has two results by the same lead author who developed a smartphone-based system to assist visually impaired pedestrians at intersections; however, this research doesn’t involve beacons or transmitting traffic signal information. The “Less Relevant” section offers two results about phone-free intersection safety for visually impaired pedestrians and one older study about VPN used in an advanced signal systems.

**Most Relevant Results:**

**Title:** Crosswatch: a system for providing guidance to visually impaired travelers at traffic intersection  
**Authors:** James M. Coughlan, Huiying Shen; Smith-Kettlewell Eye Research Institute  
**Source:** Journal of Assistive Technologies, Vol. 7 Issue: 2, pp.131-142, (2013)  
**Abstract:** The purpose of this paper is to describe recent progress on the “Crosswatch” project, a smartphone-based system developed for providing guidance to blind and visually impaired travelers at traffic intersections. Building on past work on Crosswatch functionality to help the user achieve proper alignment with the crosswalk and read the status of walk lights to know when it is time to cross, the authors outline the directions Crosswatch is now taking to help realize its potential for becoming a practical system: namely, augmenting computer vision with other information sources, including geographic information systems (GIS) and sensor data, and inferring the user’s location much more precisely than is possible through GPS alone, to provide a much larger range of information about traffic intersections to the pedestrian.  
**Full text:** Contact the library to obtain full text.  
[https://doi.org/10.1108/17549451311328808](https://doi.org/10.1108/17549451311328808)
Title: Smartphone-based crosswalk detection and localization for visually impaired pedestrians
Authors: James M. Coughlan, Vidya N. Murali; Smith-Kettlewell Eye Research Institute
Source: 2013 IEEE International Conference on Multimedia and Expo Workshops, pp.1-7
Abstract: This paper describes recent work on the “Crosswatch” project, which is a computer vision-based smartphone system developed for providing guidance to blind and visually impaired travelers at traffic intersections. A key function of Crosswatch is self-localization - the estimation of the user's location relative to the crosswalks in the current traffic intersection. Such information may be vital to users with low or no vision to ensure that they know which crosswalk they are about to enter, and are properly aligned and positioned relative to the crosswalk. However, while computer vision-based methods have been used for finding crosswalks and helping blind travelers align themselves to them, these methods assume that the entire crosswalk pattern can be imaged in a single frame of video, which poses a significant challenge for a user who lacks enough vision to know where to point the camera so as to properly frame the crosswalk. In this paper we describe work in progress that tackles the problem of crosswalk detection and self-localization, building on recent work describing techniques enabling blind and visually impaired users to acquire 360° image panoramas while turning in place on a sidewalk. The image panorama is converted to an aerial (overhead) view of the nearby intersection, centered on the location that the user is standing at, so as to facilitate matching with a template of the intersection obtained from Google Maps satellite imagery. The matching process allows crosswalk features to be detected and permits the estimation of the user's precise location relative to the crosswalk of interest. We demonstrate our approach on intersection imagery acquired by blind users, thereby establishing the feasibility of the approach.
Full text: Contact the library to obtain full text.
https://doi.org/10.1109/ICMEW.2013.6618432

Less Relevant Results:
Research in Progress project. Not related to a smartphone app but involved safety at signalized intersections for limited vision or mobility.
Title: Evaluation of Ultra-wideband Radio for Improved Pedestrian Safety at Signalized Intersections
Performing Organization: University of Idaho
Abstract: The goal of this project is to increase the safety of signalized intersections for pedestrians with special needs due to limited mobility or vision. This aligns directly with the strategic goal of "Safety" and addresses the topic of "Technological Impacts on Safety." The research outcomes and technology developed under this proposal can be applied to existing intersections throughout the United States without significant changes to the infrastructure other than additional electronics.
https://trid.trb.org/View/1346273
Not related to a smartphone app but shows example of a system installed to assist visually impaired pedestrians at a roundabout intersection

Title: Multimodal Accessibility of Modern Roundabouts: An Intelligent Management System versus Common Signalization Scheme
Source: Transportation Research Record, no. 2183, pp. 103-119 (2010)
Abstract: With almost uninterrupted traffic flows on roundabouts, it is difficult for the visually impaired to determine safe gaps relying on auditory cues alone. Crossing is particularly complicated by ambient noises and circulating vehicles on busy roundabouts in urban settings. The United States Access Board published a draft guideline proposing pedestrian signals at all roundabout crossings to ensure access for the visually impaired. The roundabout operation is a complex process of transporting multimodal travelers. There are increased interests in harnessing artificial intelligence to address complex issues to improve transportation systems. This research developed a crosswalk signal and introduced fuzzy logic control (FLC) into the signal timing to accommodate all roundabout users. The new system was assessed against the PUFFIN (Pedestrian User-Friendly INterface) under varied geometries and different traffic volumes. The objective was to identify potential treatments for improving roundabout accessibility, safety, and efficiency. The results reveal the FLC controls the signal timing effectively and outperforms PUFFIN from safety and operational perspectives, especially under congested traffic conditions. It significantly decreases pedestrian delay while maintaining adequate vehicle circulation. Multimodal travelers' needs are satisfied in terms of improved pedestrian accessibility and safety, reduced potential for rear-end collisions, enhanced operational efficiency, and lessened social cost.

Title: CITY OF SAN LEANDRO. METRICOM'S RICOCHET NETWORK: ALTERNATIVE NEW WIRELESS TECHNOLOGY FOR TRAFFIC SIGNALS
Abstract: The City of San Leandro is implementing a new Advanced Signal System. The majority of the city's 58 traffic signals are located in remote locations that cannot be connected to city-owned fiber in a cost effective manner. The City chose to use an existing commercial communications service in the city as an alternative. This phase will install several fiber spurs, closed circuit television cameras, and implement wireless communications to remote signals via an integration of Metricom's Wireless Ricochet Network with Econolite's ASC/2s controllers. The City's icons central system will utilize this packet radio network operating under Star Mode, a proprietary, connectionless service, via a virtual private network configuration. The City's Advanced Signal System will utilize a new communication protocol being developed by Gardner Systems that is "event driven." The City's system will use the State of California's AB3418E (extended) message sets for system communications. The City will implement modems at traffic signal locations that will ultimately be connected over fiber. As each of these signals is connected with fiber, the modems will be relocated to other remote locations in the City. This paper will discuss the basic technology and versatility of this packet radio network for communications with traffic signals, the new communications protocols being developed, and the future enhancements to this technology.
Full text: Contact the library to obtain full text.