

Project Title: PedPal Lite: An ATSC-Independent Safe Intersection Crossing App

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Center Name: Safety21 National University Transportation Center for Promoting Safety

Research Priority: Promoting Safety

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Project Partners:

- Miovision Inc
- pathVu Inc.

Research Project Funding: \$198,000.00

Project Start and End Date: 07-01-2023 to 06-30-2024

Project Description:

PedPal is a smartphone app designed to assist pedestrians with disabilities in safely crossing signalized intersections, developed originally as part of the Federal Highway Administration's Accessible Transportation Technology Research Initiative (ATTRI). PedPal interacts directly with the Surtrac adaptive traffic signal control (ATSC) system operating at the intersection using real-time traveler-to-infrastructure (T2I) communication and standard DSRC messaging to provide crossing support to its user. Upon arrival at the intersection, PedPal receives and presents information to its user about the intersection's geometry, crossing options, and current traffic signal state. When the user indicates her crossing intent, the app then communicates this information to the intersection (eliminating the need to locate and push a pedestrian call button), along with how much time is required by the user to safely cross the intersection. In response to receiving this information, the traffic signal system will set the pedestrian crossing time in the desired direction to ensure that upon getting the crossing signal, the user will receive crossing time that has been requested. More advanced PedPal capabilities include the ability to monitor user crossing progress in real-time, to recognize when the user is traveling slower than expected, and to trigger the traffic control system to dynamically extend the crossing time in such circumstances. The PedPal app is integrated with the smartphone's native accessible features and provides visual, auditory and haptic interaction modalities. This project focuses on producing a cheaper and more broadly deployable version of PedPal. Whereas the ability to exploit Surtrac's real-time ATSC capabilities enable advanced capabilities such as dynamic extension of the current phase duration that enhance safety, its deployment cost to municipalities presents a significant barrier to widespread deployment of the PedPal technology. Furthermore, a recent UTC funded project centered on technology support for the 'complete trip' has expanded the scope of PedPal's capabilities in several new safety-related directions, none of which depend on interaction with surtrac. To foster more widespread deployment of the PedPal technology, this project will develop and pilot test a stand-alone version of PedPal (referred to as "PedPal-Lite") that will interact directly with the hardware controller at the intersection via an ATSC-independent PedPal intersection manager. This manager will take over responsibility from the Surtrac ATSC system both for broadcasting information about the intersection and the current traffic control state to the smartphone app and for interacting with the traffic controller in response to messages received from the app, exploiting the same underlying T2I connectivity. The manager will run on a low-end processor residing in the cabinet at the intersection and will take advantage of the V2I-hub software module developed under sponsorship of FHWA to generate DSRC formatted messages for broadcast to PedPal users. To maximize deployment potential, we will focus on integrating the PedPal intersection manager with controllers that support standard NTCIP interaction protocols. We will demonstrate and pilot test the developed PedPal-Lite variant on a TBD intersection near the CMU campus that is running a conventional fixed signal timing plan on a hardware controller that supports the NTCIP standard.

Outputs:

This project will produce a smartphone app that safe intersection crossing and broader complex trip technology support to pedestrians with disabilities in a form that is ready-made for inexpensive, and more broadly scoped deployment in large urban settings. The PedPal-Lite app will operate at a much broader class of intersections including intersections that operate with conventional fixed signal timing plan. By focusing on integrating with a class of controller types that adopt interaction protocol standards, widespread deployment is explicitly emphasized. We also expect this project to yield a conceptual system design that can subsequently be adapted to provide similar technology support of our classes of vulnerable road users.

Outcomes/Impacts:

We believe the PedPal-Lite technology that this project proposes to develop will have a profound effect on increasing the safety of pedestrians with disabilities, by lowering the cost of deployment and making this technology support for safe intersection crossing accessible to pedestrians with disabilities in a more equitable manner. Separation of dependencies on advanced ATSC system technologies significantly hinders the ability of municipalities to make such smartphone-based apps an option for pedestrians with disabilities. By eliminating this cost barrier, this problem is overcome. Further, a system design that emphasizes equitable accessibility to such apps allows all pedestrians some access to safe intersection crossing and more generally other broader scoped complete-trip capabilities. For example, one point of discussion with our pathVu deployment partner (and current collaborator) has focused on providing a design that can fallback and provide (at least a more limited set of functional capabilities) if acquisition of a state of the art smartphone is beyond the potential user's financial means and a lesser mobile phone alternative is the only possibility for gaining access. In the longer term, analogs of the PedPal-Lite system design could be adopted for other classes of vulnerable road users (e.g., cyclists) which can lead to an even greater increase in overall safety at and around intersections.