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Project Deliverable 1

User Research and User Needs

People with vision impairment may experience some barriers when attempting to cross the street. From street indicators to walk signals, some street crossing are inaccessible to visually impaired people. The Centers for Disease Control and Prevention (CDC) estimates that more than one million people in the US were blind in 2015, and there are more than three million people who had some form of vision impairment, the majority of whom are Americans over the age of 40, both figures projected to double by 2050 (“The Burden of Vision Loss”). Of these, 33% live in cities, 37% live in suburbs, 28% live in non-metropolitan areas, and 1% live in farming areas, with a higher percentage of people with visual impairments living in cities (“Blindness and Vision Loss”). This may be attributed to public transit access since driving with visual impairment can be more difficult (“Blindness and Vision Loss”). As such, it is particularly important that walking environments are safe and equipped with Accessible Pedestrian Signals (APS), but even then, pedestrians with vision impairment may not be entirely safe while traveling.

The new kind of APS is typically called pushbutton-integrated APS (pictured below) and provides continuous pushbutton sound to assist those who are trying to locate the button and some indication to WALK, such as a rapid tick or speech (“Accessible Pedestrian Signals

(APS)”). They also have the street name in braille and raised tactile arrows that line up with the direction of the crosswalk for users to evaluate where they are facing. Pushbutton-integrated APS have pushbutton locator sounds playing that assist users in locating the button. They should also adjust volume based on traffic and extended button presses. Pushbutton-integrated APS,



however, is not a one-stop solution for safe pedestrian crossing since they can only tell pedestrians when to cross, not if it is safe to cross.

A 2003 case study conducted in Atlanta found that pushbutton-integrated APS had been installed at some intersections since 1992 (“Case Study - Atlanta, Georgia”). The study found that the vast majority of traffic lights, however, were pedhead-mounted APS with loudspeakers (pictured below), which pose several issues for visually

impaired pedestrians, as they are often too loud, masking vehicular sounds, and are confusing because users have to figure out which direction the sound is coming from (Barlow and Dawson 8). Additionally, pedhead-mounted APS typically play chirping sounds to indicate WALK, which can be difficult to differentiate from actual bird chirping (Barlow and Dawson 8).

It is important to understand how pedestrians with visual impairments cross the street. There are several ways visually impaired people travel. They may travel with a sighted guide, a long white cane that they swing back and forth to detect changes in their environment, dog guides, or no aid (“Travel Tools and Techniques”).

The Accessible Pedestrian Signals Guide outlines several tasks that must be completed before people can cross:

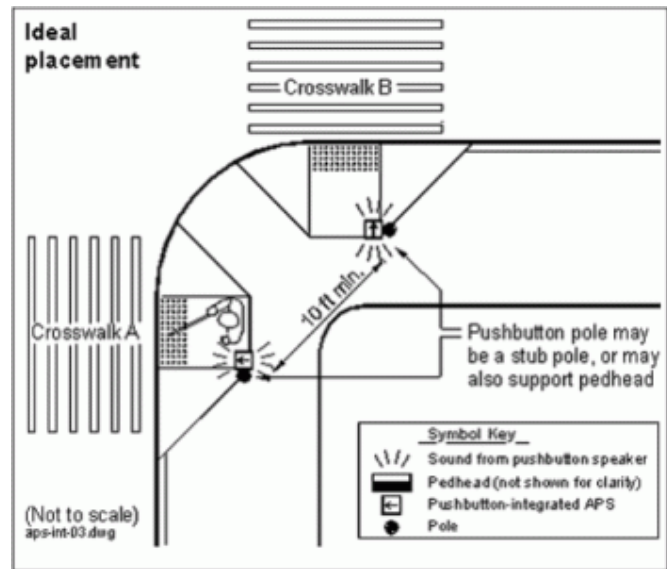
1. Pedestrians must first determine that they have arrived at the street, often aided by cues, such as curbs or slopes, vehicle sounds, and warnings.
2. Pedestrians must then figure out which street they are on, but typically this information is not provided in an accessible format.
3. Next, pedestrians must determine the geometry of the intersection, including the location of the crosswalk, the distance from the next sidewalk, whether there are any medians between the two streets, and the flow of traffic, among other factors.
4. The last task is to cross the street. Pedestrians with visual impairments typically wait until there is pedestrian traffic coming from the street opposite them, but it is often difficult to determine if there are vehicles turning onto the street.



Pedestrians with visual impairments may experience problems locating the pushbutton and orienting themselves in the correct direction. If they wait one traffic cycle after pressing the pushbutton to measure traffic flow, they must then locate and push the button again and then re-establish their heading (“Travel Tools and Techniques”). For street crossings with little vehicular traffic, they may not be able to establish when to cross because there are too few cues to indicate safe crossing. Although there are recommended APS guidelines for traffic light and pushbutton

placement and features, some intersections may not be in accordance with them or have them installed incorrectly (“Common Problems”).

It is possible that an audio-based wearable application could assist visually impaired users in safely arriving at their destinations by indicating when it is safe to



cross the street, if there are incoming vehicles, where pushbuttons are located, and help users understand the layout of the intersection. In addition, a wearable application can help users orient themselves in the user’s intended direction and tell the user which street they are on and the street across from them. While APS can improve user safety, they cannot guarantee that there are no incoming dangers. Some may not be installed correctly or follow recommendations, and in some cities, such as Atlanta, they may be few and far between.

User Persona

Cynthia is 55 years old and is a salesperson at an electronics store located in downtown Atlanta.

She lives at the perimeter of the city with her husband and daughter. Cynthia has age-related macular degeneration, which has worsened in the last five years. Although she wears glasses, she is legally blind and uses a cane while walking.

Cynthia has worked at the store for ten years and takes the same bus route to and from work everyday. She is used to the routine and has a mental map of where to go. To get to the bus stop, she has to cross three streets, but she finds it hard to hear the crosswalk signal because of age-related hearing loss and has to feel for the pushbutton to find it. She will wait for incoming pedestrians to begin walking before she crosses. Sometimes when she is crossing the street, cars will almost turn into her, which she finds frustrating and scary because she cannot tell when they are coming.

Cynthia finds it harder to get to places she has never been before. Every so often during the weekend, she will go out with her husband or daughter to the farmer's market or the mall. They act as her sighted aid and help her navigate unfamiliar surroundings. When she is alone, though, she finds traveling more challenging. She has no problem asking other people for help and will sometimes ask them for directions. There are times when she is late for engagements because she will wait for several traffic cycles to pass before she can gauge how traffic is moving.

Works Cited

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