

Orientation and Alignment for Street Crossing: Pedestrians who are Blind or Visually Impaired

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Travel Aids and Techniques

Pedestrians who are blind or visually impaired use different travel aids for obstacle and curb detection, depending on their personal preferences:

- Long white cane used as a probe of the walking surface
- Dog guide used to guide around obstacles and recognize and stop at curbs or drop-offs
- Remaining vision, possibly with an additional aid, such as a telescope
- May also use electronic travel aids

Orientation is maintained by the combination of a number of skills and information gained from the environment by other senses.

Some examples include:

- Awareness of slight changes and slopes underfoot, or a detectable change in surface texture
- Sidewalk, grass, or building lines
- Location of poles or trees
- Sound and travel paths of other pedestrians
- Smell/odors
- Knowledge of the area
- Traffic sounds, both parallel to travel path and perpendicular to travel path

Individuals are not oriented and trained only on specific intersections or routes. They commonly travel to new locations and intersections and 'figure them out' by listening and exploring.

Street crossing tasks and traditional techniques

Street crossing tasks include the following:

- Locate edge of the street
- Determine where to begin crossing (locate crosswalk)
- Establish crossing direction and alignment
- Determine traffic control and use pushbutton, if necessary
- Decide when to begin crossing
- Maintain alignment during crossing
- Monitor traffic during crossing
- Recognize end of crossing (other side of the street)

This workshop and paper will focus on the orientation and alignment aspects of the street crossing task, which include: determine where to begin crossing (locate crosswalk), establish crossing direction and alignment, and maintain alignment during crossing.

Traditional techniques for alignment include:

- parallel alignment with grass line (foot against grass line)
- perpendicular alignment with curb (feet on curb edge)
- maintain line of direction from approach
- auditory parallel or perpendicular alignment with traffic sounds

(from *Orientation and Mobility: Techniques for Independence*, LaGrow & Weesies, pg 147-149)

This textbook and others suggest that the first two techniques should now only be used if the pedestrian is familiar with the area and is sure that the grass line is straight and/or the curb is perpendicular to the crossing. The second two techniques are the preferred alignment techniques but may not be reliable or usable at many street crossings.

Most individuals align before crossing, then listen to the traffic

moving parallel to them through the intersection to maintain alignment during the crossing or to correct from initial misalignment. Stopped perpendicular traffic is also used as an alignment cue during the crossing as well as sounds of other pedestrians, and underfoot cues such as the crown and slope of the street. A dog guide will often compensate for slight misalignments and head straight for the correct destination curb, but if the handler is severely misaligned, the dog may lead across the wrong street or cross the intersection diagonally.

Alignment techniques and cues are also needed when making turns, for example, when the pedestrian wants to turn and cross the parallel street after completing one crossing. Traditionally, pedestrians who are blind who use canes have been taught to step up on the curb, take three steps, then turn 90 degrees to approach and align to cross the other street. If that doesn't seem to work, the alternative technique was to walk back along the sidewalk for 20 feet or so, and reapproach the curb, using the sidewalk direction to provide alignment cues. Many cane and dog guide users, in making a turn before an intersection, go to the edge of the perpendicular street, turn 180 degrees (about-face), then walk back and turn 90 degrees toward the street they want to cross.

Why traditional techniques no longer work:

Advances in intersection design have affected the information available to pedestrians who are blind. These include changes in geometric design and intersection signalization.

Large radius corners mean that cars are able to turn faster and more efficiently, but the approach sidewalk may curve and maintaining alignment for pedestrians who are blind is more difficult. Curb ramps at large radius corners typically slope toward the intersection to avoid warping and cross slopes that negatively

affect wheelchair users. Pedestrian crosswalks are also longer at a location with large radius corners.

Installation of curb ramps aligned at various angles in relation to intersection, crosswalk and approach sidewalk has meant that pedestrians who are blind need to cross various sloping surfaces on approach to street and may have difficulty locating the actual street edge. While many blind pedestrians state that they try to ignore the slope of curb ramps, the slope does sometimes affect balance and alignment.

Crosswalks that are not parallel to traffic lanes or where the distance from travel lanes changes, such as a location where there is a dedicated right turn lane, further complicate the task of maintaining alignment while crossing.

In some situations, the traditional technique of relying on traffic sounds for alignment works well, but there is not consistent traffic throughout the day. There may not be traffic at the time that the pedestrian who is blind wants to cross.

At many intersections outside of downtown areas, pedestrians need to use pedestrian pushbuttons. This may require pedestrians who are blind to divert from their path of travel to find and use the pushbutton. When pedestrian pushbutton use is required to get the walk signal, the pedestrian has to align and cross during the next pedestrian phase, leaving no time to listen to moving parallel traffic and realign before crossing

Possible solutions

Numerous possible solutions have been discussed and some have been tried in some locations. Many questions and issues remain to be resolved. Below, under the specific tasks, are listed some of the issues that need further discussion, research, and experimentation.

Determine where to begin crossing (locate crosswalk)

Where is a specific cue needed?

- Roundabout crosswalks
- Crosswalks that are offset from the corner
- Midblock crosswalks
- Others?

Tactile cue across sidewalk, such as bar tiles

Issues:

- How wide (deep)?
- Full width of sidewalk or partial?
- Does it cause problems for wheelchair users? Too bumpy?
- What's detectable for blind pedestrians
- How to determine/define locations where such a cue is needed?
- Should cue be aligned with middle of crosswalk or on one side?
- Other issues?



Auditory cues, such as locator tone of APS

Issues:

- Can it be heard from sidewalk before turning toward crossing?

- Is cost prohibitive at unsignalized locations?
 - What kind of message can/should be provided at unsignalized location?
 - Other issues?
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GPS/GIS system

Issues:

- Can system provide information that is accurate enough to identify the crosswalk location?
 - How to assure accuracy of information?
 - How to get information entered and provided as part of GPS mapping system available to pedestrians who are blind?
 - How available and usable is it for blind pedestrians (cost, ease of use, small size, etc)
 - Maintenance of equipment by pedestrians who are blind (batteries, etc)?
 - Other issues?
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Establish crossing direction and alignment

Locations where a specific clue may be needed

- Where sidewalk approach is not in line with crosswalk
- Corners with large radii
- Where curb ramps slope toward center of intersection
- Where traffic movement and/or stop lines are not parallel to crosswalk

Tactile alignment surface, such as specially aligned truncated dome detectable warnings, bar tiles, Blind Signs, Canadian grooves, or others, provided on or near curb ramp

Issues

- Where to install to be useful to pedestrian who is unfamiliar with intersection?
 - What material and type of surface is consistently detectable both under foot and by use of a long cane, and consistently discriminable from a detectable warning?
 - What material and type of surface is easy to align with?
 - How and what to install (materials, durability, maintenance in sidewalk environment)?
 - Effect on other pedestrians, including walking aid and wheelchair users (tactile devices)?
 - Other issues?
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Tactile arrows on APS devices used for alignment

- What type of arrow is most usable?
- Is it possible to align well with small arrows such as are mounted on the pushbutton?
- What orientation of arrow is most usable?

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- How to provide for consistent pushbutton location in line with crosswalk?
 - How to assure proper installation
 - Other issues?
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Audible signal with beaconing feature (may also aid in “maintaining alignment while crossing)

- How can signal function to provide adequate alignment information? (recent research has indicated that typical cuckoo/chirp overhead signals don’t provide good alignment information; NEI project will be evaluating modifications to signals to provide an ‘alignment tone’ when the button is pressed and held)
 - How can we indicate to pedestrians who are blind when a signal has additional features
 - Effect on nearby neighbors
 - Other issues?
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Handheld receiver-based APS (may also aid in maintaining alignment)

Issues:

- Providing access to devices to all pedestrians who are blind or visually impaired
 - Need to maintain device and batteries, weather proof?
 - Can pedestrians who are blind or visually impaired use the devices effectively while crossing?
 - Other issues?
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GPS system that provides alignment and intersection

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information (may also aid in maintaining alignment)

Issues:

- How available is it to blind pedestrians (cost, ease of use, small size, etc)
 - Getting accurate information into the system
 - Other issues?
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Maintain alignment during crossing

Locations where a specific clue may be needed:

- Skewed intersections
- Locations where the crosswalk is not parallel to the traffic movement
- Wide intersections

Guidestrip in roadway to follow while crossing

Issues:

- Can pedestrians who are blind follow a guidestrip while crossing
 - Where should it be located to be usable by pedestrians who are blind (center of crosswalk, crosswalk lines, other?)
 - Is a cue needed to enable blind pedestrians to find guidestrip (how do they know that it's there)
 - What materials will hold up in the roadway environment?
 - How can integrity of guidestrip be maintained, maintenance and durability
 - Other issues?
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APS signal with beaconing

See issues in section on Establish crossing direction and

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alignment

Handheld receiver-based APS

See issues in section on Establish crossing direction and alignment

GPS system that provides alignment and intersection information

See issues in section on Establish crossing direction and alignment

Next steps

As the above suggests, a number of possibilities need further experimentation and evaluation. Technology may also provide some solutions, however, access to technology is often limited. PROWAAC discussed at length the concept that solutions should be accessible to all and available at the location where used. That tends to suggest physical modifications to the built environment rather than devices that are carried and maintained by pedestrians.

Some changes in sidewalk and curb ramp construction may be minimal and could be implemented in new construction immediately. It's also important to recognize that developing intersections that are more friendly to all pedestrians may mitigate some of the crossing problems mentioned and provide an environment where the traditional techniques again work. For example, smaller radius corners may allow for straighter approach, and shorter crossings make small misalignments less critical. This workshop should help identify some of these possibilities also.