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

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Speaker notes and photo descriptions

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Travel aids for obstacle and curb detection

- 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

Individuals who are blind may use a variety of travel aids and techniques in traveling.

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Orientation

- Maintained by the combination of a number of skills and information gained from the environment by other senses
- Examples:
  - Awareness of slight changes and slopes underfoot, or a detectable change in surface texture
  - Sidewalk, grass, or building lines
  - Location of poles or trees
Orientation

- More examples:
  - 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

Travel in unfamiliar areas

-Pedestrians who are blind or visually impaired in the US travel to new locations and intersections and 'figure them out' by listening and exploring

Many people seem to think that pedestrians who are blind only travel in familiar areas or that they only cross streets where they have been previously trained or oriented. That is not true.

Street crossing tasks

- 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)

There are a number of tasks involved in crossing a street for a pedestrian who is blind or visually impaired.
In this workshop and presentation, I’m going to focus on three tasks involved in street crossing: determine where to begin crossing (locate crosswalk), establish crossing direction and alignment, and maintain alignment during crossing.

Photo of a sidewalk approaching a crosswalk, sidewalk is 4 feet wide and aligned with direction of travel on the crosswalk. Outside edge of sidewalk and crosswalk are aligned.

Two photos: Photo one is a blind pedestrian with a cane beginning to step off the curb ramp at an intersection, somewhat aligned toward the center of the intersection. Photo two is a blind pedestrian with a guide dog, waiting to cross an intersection; crosswalk angles off to left but she is squarely aligned with the curb 45 degrees to the right of the crosswalk.
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**Traditional techniques**
- 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)*

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**Maintaining line of approach**
- Works where sidewalk is in line with crosswalk
- Easier where sidewalk has a defined edge such as a building line or landscape strip

Photo of blind pedestrian stepping out into the street, where building line is close to the sidewalk and crosswalk is aligned with sidewalk and building line.

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**Alignment with traffic**
- Individuals align in relation to available traffic sounds and mentally project intended line of travel
- Parallel alignment – tracking cars into or from the distance and aligning with them
- Perpendicular alignment – squaring the body to traffic heard equally well in both ears, traveling across their body
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Maintain alignment during crossing

- Begin crossing when there is a surge of through traffic on the parallel street.
- Maintain the straight travel direction by aligning with the sound of traffic, moving and stopped.

Photo of individual crossing the street with a car traveling in parallel traffic lane on his left. There’s also a car waiting behind the crosswalk line on the far side of perpendicular street.

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Techniques for making turns

Photo showing one corner of an intersection in the city with wide sidewalks, wide crosswalks and relatively square corners from overhead.

The traditional technique for making a turn after crossing the street is to take three steps and make a 90-degree turn toward the parallel street. Or if approaching intersection along sidewalk and wanting to turn, blind pedestrian would go to the curb, turn around and walk back three steps, then turn to cross. This technique works very well in situations like shown in this illustration.

But intersections seldom look like that one any more, except in downtown areas of cities.

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Modern Realities

- Large radius corners - rounded corners, wider crossings
- Curb ramps aligned at various angles in relation to intersection and crosswalks
- Need to use pedestrian pushbuttons - have to divert from path of travel to find and use pushbutton
- Crosswalks at roundabouts and channelized right turn lanes and offset crosswalks require a turn in travel direction.
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Wide radius corner with diagonal curb ramp

Photo of a blind pedestrian at a very rounded corner. He is aligned to cross with his feet on a sloping surface of the flare of the curb ramp; he’s obviously had to cross part of the ramp on his approach.

Comments: This blind pedestrian has approached and held his line of approach along the sidewalk. He’s standing on the flare of the curb ramp at the curb, where it slopes up and to the left (street is on his right). The very rounded curb line is at a diagonal to his body. His first step off the curb is going to be in the midst of all these changing surfaces. This particular intersection has very steady parallel traffic so he has reasonable cues but this is a difficult task here and even more difficult if he doesn’t have the steady traffic.

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Wide radius corner, changing slopes of ramps on approach

Photo shows a relatively narrow sidewalk where the ramp to cross the parallel street must be crossed before reaching the curb/ramp/crossing location to continue straight ahead.

Comments: As seen in this photo, pedestrians often have to cross the flare of ramps or ramps to the parallel street in their normal approach line. This can cause problems with balance, particularly for low vision pedestrians, and affects alignment.
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Wide radius corner with curved approach sidewalk

Photo of sidewalk that curves around a wide radius corner with a wide grass landscape strip. A 6 foot wide sidewalk extends off the curve, toward the intersection and crosswalks in both directions. Comments: Here’s a photo of a type of curb ramp design used in some areas.

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Sidewalk is aligned diagonally toward the intersection

Another photo of the same corner, looking toward the intersection along the sidewalk extension/curb ramp. This added approach sidewalk is aimed toward the very center of the intersection. Comments: This sidewalk approach provide confusing alignment cues for pedestrians who are blind.

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Need to use Pushbutton

Photo of APS positioned near the curb, facing the intersection and in line with the crosswalk. Comments: Even where pushbuttons are well positioned in relation to the ramp, it’s necessary to push the button and go back to the curb and realign quickly. Using a pushbutton gives pedestrian no time to realign with parallel traffic before needing to cross the street. Must cross on next phase to cross with the WALK signal.
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Photos of two pushbuttons that are located well back from the intersection and crossing location, one is on the signal mast arm pole in the grass, approximately 6 feet off the sidewalk, past the controller box, another pole and another cabinet. The other is on a pole that is about 15 feet from the curb; there is another pole closer to the intersection.

Comments: Here are some examples of fairly typical pushbutton placement. They may be back from crosswalk, off the pavement in the bushes and there may be other poles or objects between pushbutton and crossing location.

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Photo of roundabout crosswalk, where it’s necessary to travel around the corner to the left, then turn right to make the crossing.

Comments: Some geometric configurations make wayfinding difficult.
Two photos: One of signalized midblock crossing with no cues to indicate its location to a pedestrian who is blind. Other of blind person with dog guide walking past a roundabout crosswalk, because the dog is continuing straight along the sidewalk.
Comments: some examples of locations where it's difficult to locate the crosswalk.

Photo of crosswalk offset from corner at an offset intersection, so a pedestrian continuing straight in direction of travel on the sidewalk would be crossing into the middle of the oncoming traffic.
Comments: Here are the types of locations that additional cues to locate the crosswalk may be needed.

Photo of a pedestrian using a cane at tactile bar tiles in Australia. Bar tiles are across the sidewalk aligned at a slight angle to the sidewalk (in line with the angle of the crosswalk that is outside the frame).
Comments: some possible solutions and issues to resolve with those solutions.
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**Auditory cues such as locator tone of APS**
- Can it be heard from sidewalk?
- Is cost prohibitive at unsignalized locations?
- What kind of message?

**Photo:** Photo of an angled signalized crosswalk at a right turn lane and a wide sidewalk, with pedestrian signal pole located right beside the crosswalk departure location

**Comments:** There are some questions when you consider auditory cues.

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**Pedestrian fence or landscaping to direct pedestrians to crosswalk**
- What works well?
- Sight distance issues?
- Proper design to provide good clues?

**Photo:** Photo of a location where the sidewalk curves sharply right then left to guide pedestrians to a roundabout crosswalk; landscaping on each side of the sidewalk with small bushes and plants prevent crossing straight ahead at the wrong location

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**GPS/GIS system** (may aid in aligning and in maintaining alignment)
- Can system provide accurate information?
- How to assure accuracy?
- How to keep information updated?
- How to make available to pedestrians who are blind?
- Purchase and maintenance of equipment?

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Establish crossing direction and alignment

Photo of blind pedestrian standing at curb of very wide skewed intersection.

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Where is a specific cue needed?

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

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Tactile alignment surface provided on or near curb ramp

- Specially aligned truncated dome detectable warning
- Bar tiles
- Blind Signs
- Canadian grooves

Photo of “Canadian grooves” - inch wide rounded grooves aligned parallel to crosswalk direction cut into curb ramp, at angle to ramp slope
Comments: surfaces installed on ramps have been suggested
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**Tactile alignment surface**
- Where to install to be useful to pedestrian who is unfamiliar with intersection?
- What's detectable?
- What easy to align with?
- Maintenance, durability, materials?
- Effect on other pedestrians, including walking aid and wheelchair users

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**Audible signal with beaconing feature** (may also aid in maintaining alignment)
- Typical cuckoo/chirp signals don't provide good alignment information
- NEI research investigating signal that provides alignment tone when pushbutton is pressed and held

Photo of signal pole along wide street with pushbutton-integrated APS device at 3.5 feet and additional overhead speaker mounted on the pedhead

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**Audible signals with beaconing feature**
- How can signal function to provide adequate alignment information?
- How to indicate that signal has additional features?
- Effect on nearby neighbors?
Handheld receiver-based APS 
(may also aid in maintaining alignment)

- Can blind pedestrians use them effectively to align?
- System for providing receivers to pedestrians who need them?
- Maintaining devices?
- Work in varied lighting?

Can blind pedestrians use them effectively to align?
System for providing receivers to pedestrians who need them?
Maintaining devices?
Work in varied lighting?

Maintain alignment during crossing

Comments: Here’s an example where the crosswalk alignment is not parallel to traffic; blind pedestrians don’t have a cue to that crosswalk alignment and will not be in the crosswalk while crossing.

Where are additional cues needed to maintain alignment during crossing?

- Where crosswalk is not parallel to traffic
- Where there isn't traffic
- Very wide intersections
- If crosswalk turns during crossing
Maintain alignment during crossing:
- Already discussed
  - APS signal with beaconing
  - Handheld receiver-based APS
  - GPS system that provides alignment and intersection information
- Other possibility during crossing
  - Guide strip in roadway to follow while crossing

Guidestrips in roadway:
- Can pedestrians who are blind follow it during crossing?
- Where should it be located?
- Cue to find guide strip?
- Maintenance of guide strip in roadway environment

More experimentation and evaluation needed:
- Intersections that are usable by all pedestrians
- Thoughtful consideration and experimentation
- More research on solutions
- Solutions based on experience of other countries

Photo of guide strip in center of crosswalk at wide skewed crossing.