Accessible Bus Stops in the Presence of Bike Lanes

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What is a Floating Bus Stop? Why do we need it?

- **Conventional Bus Stop**
- **No Platform Bus Stop**
  (Bike lane is adjacent to the curb)
- **Partial-Width Bus Stop**
  (Platform width < 8 ft)
- **Full-Width Bus Stop**
  (Platform width ≥ 8 ft)
Introduction of Floating Bus Stops

**Advantages**
- Avoid conflicts between buses and bicycles
- Raised platform for bus riders to board or alight

**Disadvantages**
- Causing conflicts between bicyclists and bus riders
- Accessibility concerns

**Research Objective**
- Investigate bicyclists’ and bus riders' behavior and interactions
- Propose design improvements mitigate conflicts
Current Design Guidelines and Studies

Suggestions from Current Design Guidelines

- Platform width: 8’-10’
- Min bike lane width: 4’-5’
- Accessible boarding area: 4’x4’-5’x8’

- Signages
- Rails/Fences
Focus Groups

- 3 groups with 21 participants
- Include visually impaired, hearing impaired, and individuals with mobility impairments
Professional Communities and City Interviews

- 5 responses from Association of Pedestrian and Bicycle Professionals
- 4 cities (Amsterdam, Montreal, Toronto, Montgomery County, MD)

- Bike lane
- Narrow bike lane
- Channelized space
- Rumble strip

- Crosswalk
- Tactile Guidance strip
- Signal control

- Bus stop sign pole
- On the curb or close to shelter
- Platform
  - 5-8 ft wide
- Shelter
  - On the platform
Floating bus stop inventory

- 56 bus stops in the MBTA region
  - Inventoried by field investigation and online maps
Study Sites

- Broadway opp Beacham St
- Broadway @ Horizon Way
- Somerville Ave @ Stone Ave
- Mass. Ave opp Christian Science Ctr
- Washington St @ Walnut St
Behavior and Conflict Analysis

• 5 bus stops (Boston, Brookline, Everett*2, Somerville)
• LiDAR and 360° video camera are utilized for data collection
  ➢ 12 hours for 2 stops and 4 hours for 3 stops
Behavior and Conflict Analysis

Trajectory analysis

- LiDAR captures trajectories
- Mode classification for all types of road users
- Analyze the interactions between different road users

Video analysis

- Review manually and identify the event of interests
- Validate trajectory processing findings
Does fencing slow down cyclists?

Average Speed
11.1 mph

Average Speed
12.1 mph

Somerville Ave @ Stone Ave

U.S. Department of Transportation
Federal Highway Administration
Preliminary Design Recommendations

Safety Principles

• Maximize separation
• Speed management and situational awareness for bicyclists

Stronger speed management is needed when the separation is weak

Bus Stop Types

• Strong preference for full-width platform
• Stop bikes when the bus door is opened at No Platform Bus Stop

Somerville Ave @ Stone Ave

Copenhagen, Denmark
Toronto, Canada
Taipei, Taiwan
Preliminary Design Recommendations

**Bike Lanes**
- Speed management and situation awareness

**Wayfinding**
- Enhance accessibility for all users

- Channelized space
- Align crosswalk, tactile, and boarding area

**Commonwealth Ave & University Rd**

**Hampshire St @ Cambridge St**

**Montgomery County, MD**

**Silver Spring, MD**

**Secondary bus stop sign pole**
Next Steps

• Continue trajectory analysis and cross-validation with video recordings
• Integrate the results of behavior and conflict analysis into design recommendations
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Thank you!
Questions/Comments?