IMPROVING THE ACCESSIBILITY OF PUBLIC TRANSIT
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What’s wrong with this picture?

I hate these $#& things; takes about 10 minutes to load & unload me since I need the lift - combined total of 20 minutes; and for the operators who know what they’re doing :) Give me a low floor New Flyer any day
—Rider Comment

Accessible Mass Transit

- A typical problem:
  - Buses and trains are difficult to board for someone in a wheelchair or with mobility issues
- A typical solution:
  - Buy vehicles with low floors and lifts to assist riders during boarding

Cost is a big issue

- King County Metro’s Access Transportation Service
- Paratransit, dial-a-ride
- Operating costs up to $22.14 per trip vs $2.75 for fixed service

Question

How can we use technology to address public transit accessibility issues?
Let’s start with OneBusAway

OneBusAway – Real-Time Arrivals

- Better user interface to King County Metro real-time arrival info
- Supports phone, web, SMS, mobile web, iPhone, other mobiles
- Born out of frustration with existing tools

Basic Features

- Real-time arrivals, schedule data, map interface

Usage Statistics

- On a daily basis:
  - Web: 4k visits
  - iPhone: 4.5k
  - Phone: 2k
  - SMS: 0.5k
  - More traffic than KCM’s own tracker pages

Mobile Tools

- Native mobile apps combine real-time arrival info with location-aware features
- Nokia, iPhone, Palm Pre, Android…
- Even more as mobile web app

Motivations

- The goal of OneBusAway is to encourage the use of public transit.
- Focus on:
  - Innovative technological solutions
  - Usability
  - Free as in speech and beer
- Selfish reasons: I don’t own a car and ride the bus everywhere
**Question**

What is the best use of our limited resources to meet the needs of the transit-using community?

- New smart phones are sexy…
  - but not everyone has one
- Can we assume even a cell-phone?
- Are we putting technology ahead of the problem?
- Who is OneBusAway for?

**Value Sensitive Design Study**

- Class project at UW (Borning, Friedman)
- VSD: Design of tech focusing on human values in a principled way
- For OneBusAway:
  - Systematic evaluation of direct & indirect stakeholders
  - Value inventory of stakeholders
  - Study of existing tools and potential future tools
    - What do we build next? How can we maximize our impact?

**Stakeholders: Riders**

- “Typical” rider?
  - Age: children, teens, parents with children, elderly
  - Captive vs choice rider
  - Male vs female
  - Socio-economic
  - Commute vs non-commute
- Access issues:
  - Blind
  - Deaf
  - Deaf-blind
  - Cognitive
  - Mobility: wheelchair, crutches, walker, cane

**Riding a bus in 16+ easy steps**

- Leave the place of origin and arrive at the bus stop on time.
- Demonstrate appropriate street crossing skills.
- Travel to and from bus stop.
- Stand at the bus stop at the appropriate place.
- Look in the direction of bus travel.
- Carry a bus pass or take out the correct fare.
- Identify the correct bus.
- Signal to the driver the desire to board.
- Board the front entrance in consecutive turn.
- Select a seat or proper place to stand.
- Watch for landmarks.
- Recognize a landmark near the desired bus stop.
- Signal for exiting at the proper time.
- Exit the bus through the proper door.
- Travel to any necessary transfer points or destinations through the most direct or the safest route.
- Read the bus schedule and/or find routes.

**Potential Problems**

- Can't find the correct stop
- Can't find the correct bus
- Missed the bus
- Bus is running late / not-at-all
- Got on the wrong bus
- Got off at the wrong stop
- Couldn't get off because bus is too crowded
- Couldn't find a seat
- Bus is dirty
- Bus is full
- Bus is uncomfortable
  - Bumpy ride
  - No A/C
  - Low floor, lift, wheelchairs
- Bus is loud
- Bus is scary
- Bus is smelly
Question
How can we improve the accessibility of public transit for blind and deaf-blind users?

Accessible Mobile Tools
- Working with blind and deaf-blind user groups
- Develop usable tools for transit
- Focus on powerful mobile phones:
  - Location-aware
  - Text-to-speech

Accessible Mobile Tools
- Exploring interesting interface modalities for blind, deaf-blind:
  - Simulating braille on a touch-screen phone with vibrations
  - Touch-screen + audio only interface
- Pursuing a Sound Transit grant for future research

Answers
Let's get the discussion going

Research Question
Can we build a mobile tool that knows in real-time which bus you are on and where you are going?

Intelligent Mobile Tools
- Intelligent Travel Assistant
- Automatically learns travel patterns
- Detects errors by the user and provides directions when things go wrong
Data Collection

![Map Image]

Initial Goals

- Can we reliably predict:
  - Your current travel mode in real-time?
    - YES: With 90% accuracy using accelerometer + GPS + simple boosted classifier
  - Which transit vehicle you are currently on?
    - Working on it... initial results good.
  - Your final destination?
  - When something has gone wrong?

Long Term

- Once we have a good travel activity logger
  - Build models of long-term travel patterns
- Use patterns:
  - To detect exceptions, errors
  - For better travel choice modeling
  - For everyone: better mobile trip planner

Thanks!

Any questions?