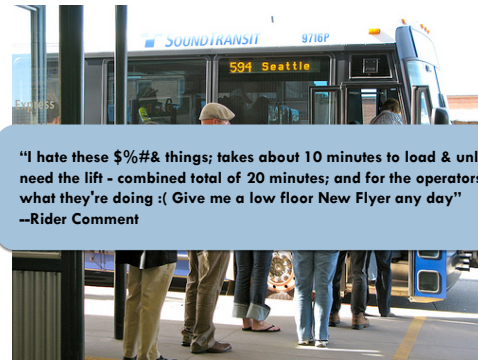


## IMPROVING THE ACCESSIBILITY OF PUBLIC TRANSIT

Brian Ferris – University of Washington

## What's wrong with this picture?



Hint: Think Accessibility

"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

## Accessible Mass Transit

- A ton of problems:
  - ▣ Riders with special needs or access issues face huge challenges in using mass transit
- No easy solutions:
  - ▣ Solutions, when available, are often expensive or difficult to use

## 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

## 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



## 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



## 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?

## Who do we build for?

- 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

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

## Research Question

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

## Accessible Mobile Tools

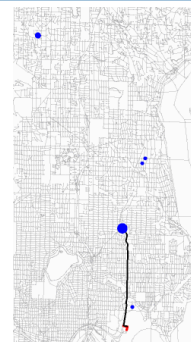


- Working with blind and deaf-blind user groups
- Develop usable tools for transit
- Focus on powerful mobile phones:
  - ▣ Location-aware
  - ▣ Text-to-speech

## Answers

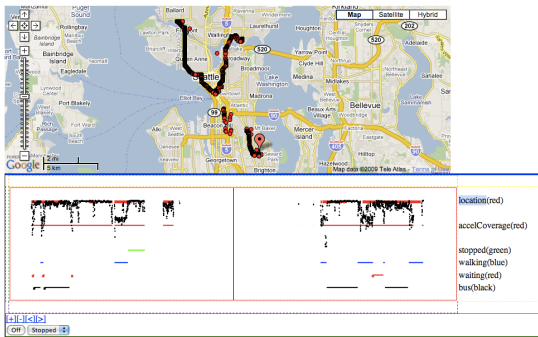
Let's get the discussion going

## Intelligent Mobile Tools



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

## Data Collection



## 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?