Cell Phones and GIS: Lessons Learned from Developing Transit Navigation Software

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Overview

• Role of travel training
• Travel Assistance Device
• Challenges and Solutions
• Next steps
Project Partners

- Sean Barbeau, Phil Winters, and Nevine Georggi, CUTR, USF
- Miguel Labrador and Rafael Perez, Computer Science & Engineering, USF
- Mark Sheppard, HART Travel Trainer
- Gigi Gonzalez, Special Education Facilitator for STAGES program at USF
- Amy Datz, FDOT Project Manager
- Harvey Berlin, TRB IDEA Project Manager

Travel Training

. . . the Challenges . . . the Victories
The Challenges...

- Transportation is essential for independent living
- Individuals with mental/cognitive disabilities (14.2M Americans, 6.9% of pop.)\(^1\) often have problems with quick actions required by transit
- Paratransit is expensive $27.90 per unlinked passenger trip (bus) versus $3.20 per unlinked passenger trip (demand responsive) and can be restrictive to riders
- Travel training helps reduce learning curve for fixed route transit


A Solution... TAD

- Develop first navigation software for public transportation using GPS-enabled mobile phones
  - Alert user when to get off the bus with audio, visual, and tactile prompts
  - Target simplicity, with cognitively disabled in mind
TAD Web Page – Create Trips

Select Trip

(1) Home to Work
(2) Work to Home
(3) Home to Movie

- Transit Rider Selects Trip That Was Planned On Website
On Bus...

⚠️ Then the user hears: “Get Ready!”

Then: “Pull the Cord Now!”

Patents Pending USF 2009
Field Tests

- Over 50 test runs in Tampa:
  - Over 38 by testing team
  - 12 trips with riders with special needs

<table>
<thead>
<tr>
<th>Alert Timing</th>
<th>Number of Occurrences</th>
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<tbody>
<tr>
<td>Ideal</td>
<td>39</td>
</tr>
<tr>
<td>Early</td>
<td>2</td>
</tr>
<tr>
<td>Late</td>
<td>6</td>
</tr>
<tr>
<td>None</td>
<td>4</td>
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</table>

- Overall, proof-of-concept was successful
- Most consistent issue in tests:
  - Error in bus stop locations
  - Problems with close proximity of stops

Challenge: GPS is very dynamic...
Google Transit provides free trip planning tool to agencies

Agency has incentive to post schedule updates to a webpage so Google can update their system

TAD system can grab the same updates and use them!

This feature also allows adding new agencies to TAD with the click of a button!

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**Challenge: Bus Stop Accuracy**

- Errors in bus stop inventory location vs. true geographic location
Lessons Learned

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- First Bus Stop Detection algorithm, based on radius surrounding final stop

Lessons Learned

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- To avoid delivering alert late, radius should be increased
Lessons Learned

- With GPS, uncertainty of true position exists

Lessons Learned

- Problems arise when alert radius and uncertainty overlap when bus stops are close
Lessons Learned

- When alert radius is big, can cause unpredictable results for certain route configurations

Lessons Learned

- New Algorithm based on circles surrounding 2nd-to-last stop
Lessons Learned

- Detects user passing 2nd-to-last stop

Lessons Learned

- Create Bus Stop Management Tool
Lessons Learned

- Human Factors – Investigate Bluetooth Headset
  - Privacy for Individual
  - Easier to hear over noise on bus

TAD with AVL

- Ideas Deserving Exploratory Analysis (IDEA) project to link TAD with AVL system
  - Provides new services based on real-time bus location
Next Steps

- Testing with HART in Tampa Bay area has been successful
- Expanding TAD deployment opportunities with other transit agencies

New TAD Partners

- Partners will be asked to:
  - Format their data into Google Transit format (HASTUS and Trapeze both provide export tool)
  - Test TAD by their travel trainer as part of daily trips with trainees
  - Correct errors in any bus stop locations through TAD webpage
  - Provide Feedback to TAD research team
New TAD Partners

- CUTR will:
  - Provide adequate TAD orientation/demo/training sessions
  - Help transit agency with TAD integration
  - Monitor TAD and provide support during tests
  - Resolve any TAD technical issues as they occur

Questions?

Please contact Sean Barbeau if you’re interested in TAD Deployment in your city!

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