Smart Arrival Notification System for ADA Passenger Paratransit Service Using Smartphone

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Introduction and Problem Statement

• ADA paratransit provides door-to-door service for registered users who reserve a ride.

• Most paratransit services have pick-up time windows ranging from 20 to 40 minutes.

• Limited dwell times at the pick-up locations.

• Problems:
  • Long wait times
  • ‘No-shows’
  • Unreliable and unpredictable transit times
# Pick-up Time Window

<table>
<thead>
<tr>
<th>Transportation Agency</th>
<th>ADA Service</th>
<th>Pickup Time Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>Access-a-Ride</td>
<td>30</td>
</tr>
<tr>
<td>San Francisco</td>
<td>San Francisco Access</td>
<td>20</td>
</tr>
<tr>
<td>North Carolina</td>
<td>SCAT</td>
<td>30</td>
</tr>
<tr>
<td>Chicago</td>
<td>Pace</td>
<td>20</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Access Link</td>
<td>40</td>
</tr>
</tbody>
</table>
Solution:

Smart Arrival Notification System
Smart Arrival Notification System

• Provides personalized ride arrival notification through a telephone call or SMS to each ADA passenger individually

• Passenger can request advance notification time that meets their own needs (usually 5-10 minutes prior to vehicle arrival)

• Utilizes Google Traffic API and GPS positioning to provide estimated time of arrival
System Architecture

Mobile Application

Service Manager

ADA Customer

4G/LTE

Automated Phone Call Message

Paratransit user database:

1) Personal data for users
2) Pick-up location (geocode) and Time
3) Preferred Advance Notification (e.g., 5, 10, 15 min)
4) Automated voice call generation using Twilio API

Voice Call

Text Message
In-vehicle Mobile Application
Phone Notification
Preliminary Field Evaluation

1. Urban Area: Downtown Newark, NJ
2. Urban Area: Newark, NJ
3. Highway Conditions: GS Parkway and US 22
4. Residential Area: Westfield NJ
## Preliminary Results

<table>
<thead>
<tr>
<th>Customer</th>
<th>Scheduled Pick-up Time</th>
<th>Notification Time</th>
<th>ETA</th>
<th>Actual Arrival</th>
<th>Time Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11:50 AM</td>
<td>11:44 AM</td>
<td>11:55 PM</td>
<td>11:53 AM</td>
<td>-2/+3 min</td>
</tr>
<tr>
<td>2</td>
<td>12:05 PM</td>
<td>12:00 PM</td>
<td>12:10 PM</td>
<td>12:08 AM</td>
<td>-2/+3 min</td>
</tr>
<tr>
<td>3</td>
<td>12:35 PM</td>
<td>12:23 PM</td>
<td>12:33 PM</td>
<td>12:34 PM</td>
<td>+1/-1 min</td>
</tr>
<tr>
<td>4</td>
<td>12:55 PM</td>
<td>12:42 PM</td>
<td>12:52 PM</td>
<td>12:51 PM</td>
<td>-1/-4 min</td>
</tr>
</tbody>
</table>
Waiting Time

![Waiting Time Chart](chart.png)

- **W/O Notification**
- **W/ Notification**

**Axes:**
- Y-axis: Waiting Time (Min)
- X-axis: Passenger (1, 2, 3, 4)

**Legend:**
- Blue: W/O Notification
- Red: W/ Notification

2016 Transport-Tech Summit
Benefits

• Customers
  • Improved comfort and accessibility
  • Reduced wait times and ‘no shows’
  • Time management aspect
  • Better customer satisfaction

• Operators
  • Increased service level (more customers served)
  • Improved efficiency
Project Team

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Questions