SmartPark Pilot in TN

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Presentation Outline

• Motivation
• SmartPark in TN
• SmartPark Technology
• Data Gathering and Validation
• Survey Responses
• Evaluation of Other Technologies
• Conclusion
Motivation (1)

• Truck parking is a major problem
• Lack of available truck parking
  - forces truck drivers to remain on highways or park illegally

Source: http://www.charlotteobserver.com/
Source: http://www.linkedin.com/
Motivation (2)

• In 2007, FMCSA initiated “SmartPark” program
  - Designed to match supply/demand of truck parking

• The initiative relies on
  - truck parking detector technologies integrated with real time information system
SmartPark in TN

- Two locations on I-75 (MM 45, and 23)
Two Phases of Pilot

- Phase I
  - Implemented detection technology at MM45
  - Tested accuracy of technology

- Phase II
  - Implemented detection technology at MM23
  - Distribute parking availability information to drivers
Phase I - Site Selection

• Criteria
  - Recent reconstruction
  - Single points of ingress and egress
  - Separated truck and car parking
  - Ample lighting for nighttime
  - Downstream of another site meeting criteria for Phase II
Phase II - Site Selection

- Criteria
  - Upstream of Phase I site
  - Within 35 miles of Phase I site
  - Controlled ingress and egress points
Detection Technology

- Source: Gannett Fleming FMCSA Study
Technology Components

- Gantry Structures
- Detectors
- On-site Processor
- Off-Site Server
- 7 CCTV Cameras
- Website and Data
  - Archive

Source: FMCSA SmartPark Technology Demonstration Project
Detection Technology Visualization
Phase I - Lot Occupancy

Hourly Occupancy
1-2 A.M.

Average Occupancy

Day of the Week

Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Phase I - Analysis

• Detection Accuracy
  - Overhead - Overhead 97.76%
  - Light Curtain - Overhead 93.46%
  - Side - Side 97.75%

• Side - Side was chosen for Phase II location
Phase II - Parking Information

• Dynamic Message Signs (DMS)
  - Available: more than 4 spaces
  - Limited: 2-4 spaces
  - Full: 1

• Where?
  - Website
  - SmartParkUSA App
Validation-1

Simultaneous ingress/egress only one is captured
# Validation-2

Discrepancy between lot cameras and lot count

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Lot MM</th>
<th>Count from Data</th>
<th>Estimation from Still Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/30/16</td>
<td>9:11 AM</td>
<td>45</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>8/30/16</td>
<td>4:09 PM</td>
<td>23</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9/1/16</td>
<td>9:06 AM</td>
<td>45</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>9/1/16</td>
<td>11:52 AM</td>
<td>23</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9/7/16</td>
<td>9:41 AM</td>
<td>45</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>9/7/16</td>
<td>2:40 PM</td>
<td>23</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
Validation-3

01/01/16 through 09/14/16

\[
\% \text{ error} = \frac{\text{number of egresses from empty lot}}{\text{total number of events}}
\]
Validation-4

01/01/16 through 09/14/16

% error = \( \frac{\text{number of egresses from empty lot}}{\text{total number egresses}} \)
Phase II - Trucker Surveys

- Collected over 150 responses on September 12th and 13th

- Results
  - Most drivers experience difficulty parking between 6 PM and 6 AM
  - Drivers think the parking information is accurate “most of the times”
Survey Results (1)

1. Employer Type

- Employee Driver: 78%
- Owner-Operator: 10%
- Independent Contractor: 12%

2. Truck Operation Type

- Truckload: 65%
- LTL: 10%
- Flat: 8%
- Tank: 7%
- Express: 6%
- Intermodal: 4%
- Other: 4%
- None: 2%
3. What is your average length of haul?

- Local: 24%
- Regional: 44%
- Inter-region: 28%
- Long haul: 4%

4. Primary vehicle configuration

- 5-axle dry: 28%
- 5-axle cold: 44%
- 5-axle flat: 24%
- 5-axle tank: 4%
Survey Results (3)

10: What Time is it Hardest to Park Safely?

- 6AM - 9AM: 10%
- 9AM - 2PM: 4%
- 2PM - 6PM: 6%
- 6PM - 9AM: 5%
- 9AM - 2PM: 4%
- 2PM - 6PM: 6%
- 6PM - 9AM: 5%
- Never: 71%
- No response: 13%

9: How Often is it Hard to Find Safe Parking?

- Never: 13%
- Rarely: 9%
- Occasionally: 26%
- Regularly: 52%
11. Do you stop frequently here?

- Yes: 31%
- Sometimes: 52%
- First: 17%

12. Did you know about SmartPark Technology Here?

- Yes: 65%
- No: 35%
Survey Results (5)

19: How Often is the SmartPark App Accurate?
- Always: 15%
- Usually: 63%
- Rarely: 5%
- Never: 17%

23: Do You Feel Safer Here?
- MM45
- MM23
Survey Results (6)

Question 25: Desired Amenities

26a: Pay for Full Amenities?

- No Response
- $5
- $10
- $15

Bar graph and pie chart showing the distribution of responses.
Other Technologies

• Evaluation of other detection technologies
  - Image processing
    • Spotwise
  - Internet of Things (IoT)
    • TSPS
  - More....
Conclusion

- There is a need for real time truck parking information
- Number of technologies is growing
- Accuracy of detection is a critical component
- Life cycle cost is a factor for wider adoption
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Q&A

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