FEASIBILITY OF USING CELLULAR TELEPHONE DATA TO DETERMINE THE TRUCKSHED OF INTERMODAL FACILITIES

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INTRODUCTION

Demand of freight movement increase
- Global supply chains, goods spread out
- More trucks expected through intermodal facilities

Understanding the impact of geographic extent (truckshed)
- From intermodal facilities
- On transportation network
- Is an important and the first step to mitigate any negative consequences
RESEARCH SCOPE

- The feasibility discussed in three aspects
  - Technique analysis
    - Location technologies and accurate test reviews
  - Data coverage analysis
    - Cluster of data available for truck tracking
  - Truck tracking process
    - Truck identification and tracking process proposed and demonstration
- Field test in progress
TECHNOLOGIES ANALYSIS

Cell phone location tracking technologies

- Network-based
  - One or several signal towers involved
  - Accuracy depending on methods
    - Triangulation method: 50-200 meters
  - Cell phones must be in active

- Handset-based (GPS enabled)
  - Accuracy is about 5-30 meters
  - Number of GPS enabled phones is limited
TECHNOLOGIES ANALYSIS

- Most field tests focus on travel time estimate
  - More than 16 Traffic monitor test systems
  - Location accuracy within 100 meters
  - Is feasible under normal conditions but not in congested condition
  - Need real time and more accurate

- Feasible to determine truckshed
  - Truck tracking from area to area
  - Location accuracy is acceptable
DATA COVERAGE ANALYSIS

- Cell phone subscriptions
  - More than 270 million cell phone in USA
  - Which is about 87% of total U.S. population
  - Covers nearly all ranges of vehicle users

- Cell phone data for truck tracking
  - Depends on data provider’s system
    - Top four cell phone carriers cover 28.5%, 26.7%, 18.2%, and 12.1%
  - No. of drivers using cell phones within intermodal
DATA COVERAGE ANALYSIS

- Clusters of Cell Phone Data
- Only partial data available for tracking

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<th>Non truck drivers</th>
<th>Truck drivers</th>
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Available cell phone data

- No Service
- Cell phones not in use
- Available data for truck tracking
TRUCK TRACKING PROCESS

Network cell phone data

Cell phone data in intermodal

Identify Trucks

Filter rules:
Rule 1: xxxxx
Rule 2: xxxxx
...
...
...

Truck tracking database
- Land use category
- Truck stops

Truckshed Mapping
TRUCK TRACKING EXAMPLE

- Truck Stops /rest Area
- Business region
- Truck Stops Area
- Super market logistic
- Intermodal Facility
- Residential region
TEST IN PROGRESS

- Location data provider
- Airsage Inc. service area
TEST IN PROGRESS

- Test area
  - Mid-America
  - Three intermodal facilities
- Data recorded
  - In a 30 sec basis
  - Were sent to KU server every 2 minutes
- Basic data structure
  - ID, longitude and latitude, Time
TEST IN PROGRESS

- Test period
  - At least one month location data

- Test process
  - Every cell phone from intermodal facilities will be tracked and mapped
  - Field data will be collected to verify trucks from intermodal facilities
CONCLUSION

- Technology analysis
  - Cell phones accuracy within 100 meters or less
  - Is feasible to be used in determine truckshed
- Data coverage analysis
  - Only partial data available for truckshed tracking
  - Long time observation can solve this issue
- Truck tracking process
  - Principle of truck identification process was proposed
  - Approach to conduct a database covering truck stops
CONCLUSION

■ Challenges
  ■ Truck tracking process
    ■ Huge data storage is expected
    ■ Truck filtering rules depend on network size
  ■ Field data collection
    ■ Verify truck identification
    ■ Derive adjustment factors

■ Perspectives
  ■ Determine truckshed from intermodals
  ■ Generate long haul truck trips
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Questions?