Private Unpaved Road Inventory – A Measurement Solution to an Inventory Question

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Overview

- Data to collect
- Measurement platform design
- Data collection methods
- Field changes in the collection methods
- Analysis of the data
- Summary of program
# Data – Physical Road Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Example data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment width</td>
<td>1, 2, 3+ lanes</td>
</tr>
<tr>
<td>Traffic speed</td>
<td>&lt;25, &gt;25 mph</td>
</tr>
<tr>
<td>Road stabilization</td>
<td>Stabilized, unstabilized, weather</td>
</tr>
<tr>
<td>Road material</td>
<td>Paved, gravel, dirt, millings</td>
</tr>
<tr>
<td>Road type</td>
<td>Regular, tracks with vegetation</td>
</tr>
<tr>
<td>Road usage</td>
<td>Farm, residential, canal, utility</td>
</tr>
<tr>
<td>GIS verification</td>
<td>Matches, does not match</td>
</tr>
<tr>
<td>Road access</td>
<td>Locked, unlocked</td>
</tr>
<tr>
<td>Vehicle travel</td>
<td>Offroad only, all vehicles</td>
</tr>
<tr>
<td>Evidence of vehicle travel</td>
<td>&lt;50, &gt;50 ADT</td>
</tr>
<tr>
<td>Segment safety</td>
<td>Safe, unsafe</td>
</tr>
<tr>
<td>Comments</td>
<td>Anything useful</td>
</tr>
</tbody>
</table>
**Measurement Platform Design**

- ArcGIS database
- Real-time data entry using ArcPad for data interchange
- Real-time data collection
  - Vehicle position, speed, direction (GPS)
  - High resolution forward and rear facing cameras
  - Dust measured at rear of vehicle (optical PM-10)
  - Sampling at 2-sec intervals, 8-second data recording
  - Vehicle local area network with real-time data display
Measurement Platform Design

National Air Quality Conference - Ambient Monitoring 2012
Measurement Platform Design
Measurement Platform Design
## Data Collection Methods

<table>
<thead>
<tr>
<th>Last Scan</th>
<th>Battery</th>
<th>Speed</th>
<th>Direction</th>
<th>PM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:44</td>
<td>12.73</td>
<td>17.4</td>
<td>332</td>
<td>23.64</td>
</tr>
</tbody>
</table>
## Data Collection Methods

<table>
<thead>
<tr>
<th>Last Scan</th>
<th>Battery</th>
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<th>Direction</th>
<th>PM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:28</td>
<td>12.73</td>
<td>6.6</td>
<td>092</td>
<td>1.342</td>
</tr>
</tbody>
</table>
Data Collection Methods

<table>
<thead>
<tr>
<th>Last Scan</th>
<th>Battery</th>
<th>Speed</th>
<th>Direction</th>
<th>PM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:41</td>
<td>12.55</td>
<td>7.6</td>
<td>359</td>
<td>0.569</td>
</tr>
</tbody>
</table>
# Data Collection Methods

<table>
<thead>
<tr>
<th>Last Scan</th>
<th>Battery</th>
<th>Speed</th>
<th>Direction</th>
<th>PM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:10</td>
<td>12.73</td>
<td>5.9</td>
<td>177</td>
<td>0.082</td>
</tr>
</tbody>
</table>
Data Collection Methods
Data Collection Methods
Changes in the Data Collection

- Increase the data sample and picture frequency to allow a more rapid capture of data
- Use the ArcPad handheld computer as a tracking device to mark roads already traveled with “bread crumbs”
- Change in data collection plans for dense road networks
- Limited access roads filled in with aerial imagery
**Data Analysis**

- Nightly uploads to our home server of all collected data from the cameras and vehicle system
- Daily merging of data into GIS compatible files with ingest into the ArcGIS database
- The resulting database presented in a “clickable” segment structure displaying all of the field collected data
- Visual analysis of the collected data then performed using the pictures and metadata from each segment driven
- Post-field analysis and completion of the GIS data set
Data Summary

- 18 contiguous days of sampling
- Over 2,000 off road miles driven to characterize 1,100 miles of unpaved private roads in 13,000 segments
- Over 100,000 time synchronized pictures merged with the logged GPS and dust data resulting in over 50,000 geotagged HTML files in the GIS database
- ~90% of the data analysis performed using the merged data and picture files in the GIS database to fill out the road attributes
- Concept to measurements to completion of GIS database in approximately 3 months
GIS Data Available

For Each Segment

- Segment width
- Traffic speed
- Road stabilization
- Road material
- Road type
- Road usage
- GIS verification
- Road access
- Vehicle travel
- Evidence of vehicle travel
- Segment safety
- Comments

Mobile data along each segment
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