Event Based Data from a 2070 Controller

Automated Traffic Signal Performance Measures Workshop

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Agenda

- Introduction
- Motivation
- Module Development
- Deployment Sites
- Data Collection
- Preliminary Results
- Next Steps
SPR 781: Snapshot

- **Funding Agency:** Oregon DOT
  - **Project Title:** Improving Adaptive / Responsive Signal Control Performance: Implications of Non-Invasive Detection and Legacy Timing Practices
- **Lead:** Northern Arizona University
- **Subs:**
  - Portland State University (Sirisha Kothuri)
  - Iowa State University (Anuj Sharma)
- **Objective**
  - Different detection sources provide varying levels of accuracy
  - The impact of less than optimal detection on traditional call and extend operation is well known
  - How does sub-optimal detection impact the operation of higher level control algorithms, such as adaptive and/or traffic responsive?
Motivation

• Desire to collect high resolution event based data from 2070 running Voyage (Northwest Signal / Peek)
• Inspiration taken from ASC/3 event based data logger worked on while at Purdue
• Desire to collect as large a sample as possible
• Need for portable event based data logger
Data Flow

Vehicle Detectors
- Radar
- Video
- Loops

Traffic Controller
- Detector Status
- Event States
- Event Log

Fit PC
- Video Feed
- Dynamic Overlay
Module Development

- Northwest Signal’s Testbox
Module Development

The image shows a software interface for building dynamic objects. The interface includes a table with columns labeled 'Index', 'Dynamic Object', 'Index', 'Function', and 'Group'. The table lists various dynamic objects and their associated functions and groups. There are also buttons for inserting, removing, and moving functions.
Module Development

• Data Flow Diagram
Module Development

- Visual interface that can be overlaid on screen / video
- Event based data file recorded from state changes
Module Development

```
Intersection; Date; Time; Signal; Phase; Status
97th; 2015-07-09; 09:32:29.544; R; 3; 1
97th; 2015-07-09; 09:32:29.544; R; 4; 1
97th; 2015-07-09; 09:32:29.544; R; 7; 1
97th; 2015-07-09; 09:32:29.544; R; 8; 1
97th; 2015-07-09; 09:32:29.544; G; 2; 1
97th; 2015-07-09; 09:32:29.544; G; 6; 1
97th; 2015-07-09; 09:32:29.544; DW; 1; 1
97th; 2015-07-09; 09:32:29.544; DW; 2; 1
97th; 2015-07-09; 09:32:29.544; DW; 3; 1
97th; 2015-07-09; 09:32:29.544; DW; 4; 1
97th; 2015-07-09; 09:32:29.544; DW; 5; 1
97th; 2015-07-09; 09:32:29.544; DW; 6; 1
97th; 2015-07-09; 09:32:29.544; DW; 7; 1
97th; 2015-07-09; 09:32:29.544; DW; 8; 1
97th; 2015-07-09; 09:32:40.760; DET; 9; 1
97th; 2015-07-09; 09:32:41.748; DET; 41; 1
97th; 2015-07-09; 09:32:42.110; DET; 9; 0
97th; 2015-07-09; 09:32:42.161; DET; 9; 1
```
Module Development
Module Development

• Use HyperCam to capture screen
• Slice video and data files into 1 hr increments with batch operation
• Will run “indefinitely”
Site Locations
Town Center Loop West & Wilsonville Road, Wilsonville
97th & Lawnfield, Clackamas County
US 20 & Robal Rd, Bend
122nd & SE Division, Portland
Data Collection

- Used Fit PC and Axis encoder as hardware
- Ethernet connections
- Does not have to be onsite
Data Collection
Data Collection

- Minor issues occurred at 97th / Lawnfield & TCLW / Wilsonville related to MS Windows pop-ups
- Major issues at Bend severely limited data collection
- 122nd / SE Division was uneventful

<table>
<thead>
<tr>
<th>Location</th>
<th>Data Collection Dates</th>
<th>Good Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW Wilsonville Rd. and Town Center Loop W</td>
<td>5/11/15 – 6/18/15</td>
<td>507 hrs (~21 days)</td>
</tr>
<tr>
<td>SE 97th Ave. and SE Lawnfield Rd.</td>
<td>6/18/15 – 7/28/15</td>
<td>599 hrs (~25 days)</td>
</tr>
<tr>
<td>US 20 and Robal Rd.</td>
<td>6/25/15 – 11/6/15</td>
<td>196 hrs (~8 days)</td>
</tr>
<tr>
<td>SE Division St. and SE 122nd Ave.</td>
<td>10/20/15 – 11/16/15</td>
<td>626 hrs (~26 days)</td>
</tr>
</tbody>
</table>
Preliminary Results

• Over 5 million unique records
• Tableau used as visualization tool
Preliminary Results

First time to gap out of stop bar detectors

122div (1.45) Loop, Video Westbound Left 33ft
\[ y = -0.801 + 0.997 \cdot x \]

122div (3.34) Loop, Video Northbound Left 33ft
\[ y = -0.073 + 0.996 \cdot x \]

122div (0.38) Loop, Video Eastbound Left 33ft
\[ y = -0.057 + 0.999 \cdot x \]

122div (7.42) Loop, Video Southbound Left 33ft
\[ y = -0.635 + 0.997 \cdot x \]

57th (15.47) Loop, Video Westbound Left/Thru/Right
\[ y = -0.569 + 0.997 \cdot x \]

57th (2.33) Loop, Video Northbound Left 15ft
\[ y = -0.405 + 0.992 \cdot x \]

57th (25.57) Loop, Video Eastbound Left/Thru/15ft
\[ y = -0.435 + 0.992 \cdot x \]

57th (20.08) Loop, Video Eastbound Right 15ft
\[ y = -0.569 + 1.0 \cdot x \]

97th (6.37) Loop, Video Southbound Left 15ft
\[ y = -0.537 + 0.974 \cdot x \]

bend (6.28) Loop, Video Southbound Left 15ft
\[ y = -0.542 + 1.0 \cdot x \]

wilson (17.22) Loop, Video Southbound Left 6ft
\[ y = -1.53 + 1.0 \cdot x \]

wilson (18.7) Loop, Video Southbound Thru 15ft
\[ y = 0.794 + 0.987 \cdot x \]

wilson (2.12) Loop, Video Westbound Left 15ft
\[ y = 1.13 + 1.0 \cdot x \]

wilson (0.8) Loop, Video Eastbound Left 15ft
\[ y = 0.686 + 1.0 \cdot x \]
Lessons Learned

- Use Linux (yeah, we probably knew this before we started)
- IT policies make it challenging for an external partner to monitor data collection
  - Data lost due to site visit gaps
- Support from project partners is critical
  - ODOT
  - Clackamas County
  - Portland Bureau of Transportation
Lessons Learned

• Support from vendors is also critical
  – Northwest Signal / Peek
  – Detection vendors / manufacturers

• While data collection module does not need to be on site, much bandwidth needed

• Processing power can be an issue
Next steps

• Very promising for data collection under Voyage
  – Ability to monitor virtually anything in controller (Dynamic Object set)
  – Future of Voyage in question, however

• Scalable to other platforms, however detector status by channel must be reported
Acknowledgements

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  – Paul Zebell
Questions?
Thank you!