SPM Basics & Applications Overview

Mark Taylor

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Mark Taylor, P.E., PTOE

Traffic Signal Operations Engineer

UDOT

marktaylor@utah.gov
SPM Basic Concept

Automated Data Collection
- Signal controller
- Probe source

Useful Information about Performance
- Signal
- Corridor
- System
System Requirements for SPM’s

1) High-resolution Controller
   - Econolite Cobalt: Any Version
   - Econolite ASC3 NEMA: V. 2.50+ & OS 1.14.03+
   - Econolite 2070 with 1C CPU Module: V. 32.50+
   - Intelight Maxtime: V. 1.7.0+
   - Peek ATC Greenwave 03.05.0528+
   - Trafficware 980ATC V. 76.10+
   - Siemens M50 Linux & M60 ATC
     - ECOM V. 3.52+
     - NTCIP V. 4.53+
   - McCain ATC Omni eX 1.6+

2) Communications
   - Econolite Cobalt: Any Version

3) Server
   - Econolite ASC3 NEMA: V. 2.50+ & OS 1.14.03+
   - Econolite 2070 with 1C CPU Module: V. 32.50+
   - Intelight Maxtime: V. 1.7.0+
   - Peek ATC Greenwave 03.05.0528+
   - Trafficware 980ATC V. 76.10+
   - Siemens M50 Linux & M60 ATC
     - ECOM V. 3.52+
     - NTCIP V. 4.53+
   - McCain ATC Omni eX 1.6+

4) Website

5) Detection (optional)

Can be done independent of a central system!
<table>
<thead>
<tr>
<th>Active Phase Events:</th>
<th>Detector Events:</th>
<th>Preemption Events:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0   Phase On</td>
<td>81  Detector Off</td>
<td>101 Preempt Advance Warning Input</td>
</tr>
<tr>
<td>1   Phase Begin Green</td>
<td>82  Detector On</td>
<td>102 Preempt (Call) Input On</td>
</tr>
<tr>
<td>2   Phase Check</td>
<td>83  Detector Restored</td>
<td>103 Preempt Gate Down Input Received</td>
</tr>
<tr>
<td>3   Phase Min Complete</td>
<td>84  Detector Fault- Other</td>
<td>104 Preempt (Call) Input Off</td>
</tr>
<tr>
<td>4   Phase Gap Out</td>
<td>85  Detector Fault- Watchdog Fault</td>
<td>105 Preempt Entry Started</td>
</tr>
<tr>
<td>5   Phase Max Out</td>
<td>86  Detector Fault- Open Loop Fault</td>
<td></td>
</tr>
<tr>
<td>6   Phase Force Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7   Phase Green Termination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8   Phase Begin Yellow Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9   Phase End Yellow Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10  Phase Begin Red Clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11  Phase End Red Clearance</td>
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<td></td>
</tr>
</tbody>
</table>
### High-resolution Data

#### Timestamp, Enumeration Code, Parameter

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Enumeration Code</th>
<th>Parameter</th>
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<tr>
<td>06/27/2013 01:29:51.1</td>
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<tr>
<td>06/27/2013 01:29:52.2</td>
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<tr>
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<tr>
<td>06/27/2013 01:29:53.3</td>
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<td>6</td>
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<tr>
<td>06/27/2013 01:30:27.5</td>
<td>81</td>
<td>6</td>
</tr>
<tr>
<td>06/27/2013 01:30:30.4</td>
<td>8</td>
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</tr>
</tbody>
</table>
Coordination Optimization Example: Progression Quality

One approach shown

Vehicles arrive on green
Vehicles arrive on yellow
Vehicles arrive on red
Purdue Coordination Diagram
Bangerter & 5400 S (3/7/2013)

Bangerter Hwy (SR-154) 5400 South (SR-173) Signal 7063 Overlap: 10 Northbound
Thursday, March 07, 2013 12:00 AM - Thursday, March 07, 2013 11:59 PM

Metric: Purdue Coordination Diagram
Detection Requirements: Advance Counters
Approach Speeds

Bluff & 100 S, St. George, NB

Use 85th percentile to set yellow & red clearance intervals

Metric: Approach Speeds
Detection Requirements: Wavetronix Advance Radar
Operations & Traffic Study Example:
Vehicle Speeds at Intersections

Metric: Approach Speeds
Detection Requirements: Wavetronix Advance Radar
Approach Volumes

➤ When to take a lane for maintenance
➤ Directional splits for offset optimization
➤ Network models

Metric: Approach Volumes
Detection Requirements: Advance Counters
Lane-by-Lane Volume Counts

Use for traffic studies, models, adjust splits, coordination balance

**US-89 Main Street (American Fork) SIG#5023**
Tuesday, October 22, 2013 12:00 AM - Tuesday, October 22, 2013 11:59 PM

**Westbound Thru**
TV: 7666 PH: 5:15 PM - 6:15 PM PHV: 721 VPH
PHF: 0.9 F/U: 0.96

**Southbound Left**
TV: 5590 PH: 1:00 PM - 2:00 PM PHV: 533 VPH
PHF: 0.89 F/U: 0.87

**Eastbound Thru**
TV: 8076 PH: 5:00 PM - 6:00 PM PHV: 757 VPH
PHF: 0.95 F/U: 0.74

**Metric: Turning Movement Counts**
**Detection Requirements: Stop Bar Counters**
Red Light Monitoring
Use for identifying safety trends and engineering countermeasures

Metric: Red Light Monitoring
Detection Requirements: Stop Bar Counters with speed filter or detectors in intersection
Red Light Monitoring

Analysis: 7:00 AM to 8:15 AM - May 18, 2015

- Is green time too short? – Would increasing the split fix the problem?
- Is coordination poor? – More vehicles arriving on green could fix this?
- Is sight distance poor? – Are their trucks or other obstructions blocking signal?
- Is law enforcement needed? – Time can be pinned down for law enforcement.
Metric 1: Purdue Coordination Diagram
Detection Requirements: Advance

Metric 2: Purdue Travel Time Diagram
Requirements: Probe data set
2013 Purdue Coordination Diagrams

Initial Percent Arrival on Green
Increase in Percent Arrival on Green
Decrease in Percent Arrival on Green
2015 Purdue Link Pivot

- Initial Percent Arrival on Green
- Increase in Percent Arrival on Green
- Decrease in Percent Arrival on Green