Analysis of Peer Intersection Data for Arterial Traffic Signal Coordination Decisions

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Analysis of Non-Coordinated, Fully Actuated (“Free”) Corridor Operations During Overnight Time Periods

Impact of Perspective: Cyclic Flow Profiles From Fully-Actuated Operation Arrival Data

- Traffic engineers think in terms of platoon formation & dispersion down a corridor
- In non-coordinated, fully-actuated operations, a local controller is only able to “see” local arrivals and only knows when its own green indications occur, not the upstream ones
- Using adjacent intersection beginning of green time enables trends in vehicle platoons to be visualized from field data

Proportion of Detected Vehicles

0.01
0.02
0.03
0.04
0.05
0.06
0 20 40 60 80 100 120
Time after Beginning of Upstream Green

Proportion of Vehicle Distribution

0
0.01
0.02
0.03
0.04
0.05
0.06
0 10 20 30 40 50 60 70 80 90 100 110
Time in Cycle (sec)

Changes in Platoon Formation Characteristics During the Fully-Actuated Period

Coordination begins at 0600
Coordination ends at 2200

Context of Study

Question 1
- When should free operations begin and end?

Question 2
- Can we change the frame of reference of arrival data to be based on an adjacent intersection to assess platoon characteristics and progression opportunities?

Study Corridor

System 1
2.4 mi
(3.8 km)
System 2
2.8 mi
(4.5 km)

SR 37
Int. 1 (SR 32)
Int. 2 (Pleasant St.)
Int. 3 (Town and Country Blvd.)
Int. 4 (Greenfield Ave.)
Int. 5 (146th St.)
Int. 6 (144th St.)
Int. 7 (131st St.)
Int. 11 (SR 337)
Int. 18 (80th St.)

Study Corridor Map

As high resolution event data from signalized intersections becomes more readily available, it becomes possible to analyze actual link vehicle flows to better characterize whether (and when) signal coordination is desirable. This paper proposes and demonstrates a methodology to assess opportunities to improve arterial progression if a non-coordinated system is coordinated, using peer data obtained from adjacent intersections.
Conclusions

- Analysis of data showed that platoon profiles can be constructed with peer intersection data during fully-actuated operations with no fixed cycle length. Using only local intersection data, arrivals appeared random on average.
- Extending an existing coordination plan to cover two additional hours formerly operated as fully-actuated resulted in improvement of 1 minute of travel time over 5 miles.
- The shifted time reference technique provides a tool for leveraging field data to make coordination decisions.

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Analysis of Free Operations (2200-2400)

Southbound

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<th>Intersection</th>
<th>Downstream</th>
<th>Upstream</th>
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<td>Int. 2</td>
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<tr>
<td>Int. 8</td>
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Northbound

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Implementation of Coordination Plan from 2200-2400

Change in Cycle Length and Delay

- Estimated average delay by phase
- Estimated total delay by phase
- Percent on Green (POG) at Coordinated Approaches

Arterial Travel Time

- Northbound Travel Time
- Southbound Travel Time

Cumulative Frequency

- Cumulative Frequency
- Mean Effective Cycle Length (s)
- Standard Deviation

Vehicle Arrival Distribution

- V/D Coupling Index
- Cumulative Frequency