Traffic Signal Adaptive System
Andrea Renny, City of Monterey
A TRAFFIC STUDY SHOULD LEAD TO ADJUSTING THE TIMING OF TRAFFIC LIGHTS. IF IT DOESN’T, I’LL GET A LADDER AND DO IT MYSELF.
30,000 Residents

20,000 Work force

2 to 4 M Visitors per year
Why Adaptive?

- Visitor Experience
- Constraints
- Businesses
- Unpredictable Peaks
- Staffing
- Residents

$87bn
Cost of congestion in the United States in 2018

97 hours per year
Time lost per person in the US while commuting in 2018

Source: Inrix (2019)
The performance of adaptive systems over time stays constant, continuing to add value to system.

![Graph showing the effectiveness of fixed timing plans over time.](image-url)
Objectives

- Delay
- Travel Time
- Stops
- Travel Speed
REAL-TIME ADAPTIVE CENTRAL Control System

- Split
  - Phase Change
- Cycle
  - 2.5 to 5 min
- Offset
  - Each Cycle
- Optimisation
- Technique
• Continually collects detector data
• Fully optimizes cycle length, splits, and offsets
• Uses an online (real-time) simulation model
• Makes frequent small adjustments to parameters
• Uses no fixed timings, only ranges
• Uses profile data (historic data) for faulty detectors
Lighthouse/Del Monte Corridor Adaptive System (16 signals)
Adaptive System Cycle Length vs. Fixed Timing Plan

- Cycle length can vary every 2+ minutes over the day
- Changes with demand
What are the benefits of this adaptive system?

1. Less time in traffic
2. Reduces carbon emissions
3. Improves traffic flow
4. No need for reprogramming
### Lighthouse Adaptive - Before and After Study

#### TRAVEL TIME
-10%

#### AVG DELAY

#### AVG STOPS
-32%

#### AVG SPEED
+13%

### Table:

<table>
<thead>
<tr>
<th></th>
<th>Average Travel Time (sec)</th>
<th>Average Delay (sec)</th>
<th>Average Stops (#)</th>
<th>Average Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM PEAK Northbound</td>
<td>-3%</td>
<td>-23%</td>
<td>-38%</td>
<td>3%</td>
</tr>
<tr>
<td>AM PEAK Southbound</td>
<td>-3%</td>
<td>-11%</td>
<td>-18%</td>
<td>2%</td>
</tr>
<tr>
<td>MD PEAK Northbound</td>
<td>-1%</td>
<td>-36%</td>
<td>-43%</td>
<td>1%</td>
</tr>
<tr>
<td>MD PEAK Southbound</td>
<td>-28%</td>
<td>-66%</td>
<td>-57%</td>
<td>40%</td>
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<tr>
<td>PM PEAK Northbound</td>
<td>-6%</td>
<td>-9%</td>
<td>0%</td>
<td>7%</td>
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<tr>
<td>PM PEAK Southbound</td>
<td>-17%</td>
<td>-19%</td>
<td>-27%</td>
<td>20%</td>
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<tr>
<td>WEEKEND Northbound</td>
<td>-13%</td>
<td>-43%</td>
<td>-43%</td>
<td>15%</td>
</tr>
<tr>
<td>WEEKEND Southbound</td>
<td>46%</td>
<td>113%</td>
<td>8%</td>
<td>-31%</td>
</tr>
</tbody>
</table>