Connected / Automated Vehicles (CAV)
Traffic Forecasting Perspective

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Overview

• Background for Modeling CAVs

• CAV Transportation Impacts
  • Transportation Supply Side
  • Transportation Demand Side

• Modeling Approach

• Future Applications
Background for Modeling CAVs

• Part of future transportation network
  • Not about if, but when
  • Potential disruptor
Background for Modeling CAVs

- Traffic modeling is data dependent
  - Lack of actual data for CAVs
- New modeling paradigm
- Need consistent methodology
  - Long-term projects
- Another reference point
CAV Transportation Impacts

- Hot topic in transportation
- Substantial research
- Transportation Supply
  - Available network capacity
- Transportation Demand
  - Number of trips on network
- No consensus
  - Magnitude
  - Effect
  - Timing
Transportation Supply

- Increased roadway capacity
  - Shorter gaps between vehicles
  - Mixed traffic conditions
  - Perfect driver
- Vehicle platooning
- Reduced right-of-way needs
Transportation Demand

- Land use
  - Where people live and work
- Trip production
  - Number and types of trips
- Trip distribution
  - Trip lengths
- Mode choice
  - New modes
- Assignment
  - Route choice
Transportation Demand

- Mobility independence
  - Induced trips by seniors, elderly, children, etc.
- Zero occupancy vehicles
- Auto ownership
- Mode shifts (ride-sharing)
- Longer commutes/trips
Fleet Adoption Timeline

- Market Penetration is overriding input
  - Determines other assumptions
- Estimates vary
  - Year and magnitude
- Factors
  - Vehicle capabilities
  - Price
  - Retrofitting existing vehicles
- Adoption rate will drive design
- Non-uniform impacts
  - Transportation supply
  - Transportation demand
Modeling Approach

• Network flexibility
• Model variables
  • Transportation supply
  • Transportation demand
• Control Inputs
  • Highway network
  • Land use
  • Value of time
  • Trip lengths
• Sensitivity analysis
Modeling Approach: Transportation Supply

### Congested Speed by CAV Percentage

- Increase capacity with higher CAV adoption
- Impact will vary by facility type
- Dependent on the percentage of CAVs on roadway link
- Focus on shorter gaps
- Facility preference
Modeling Approach: Transportation Demand

• CAV ownership and use
• Initial CAV adoption in certain areas
  • Urban areas
  • Affluent areas
  • Similar to other technology adoption trends
• Followed by widespread adoption
  • Safety benefits
  • Transportation benefits
• New trips
Modeling Approach: Central Florida CAV TAZ Inputs

Legend
Traffic Analysis Zone (TAZ)
Population Density (Persons/Sq Mile)
< 1k
1k - 2k
2k - 4k
4k - 8k
> 8k

Legend
Traffic Analysis Zone (TAZ)
Average Property Value ($)
<75K
75K - 150K
150K - 225K
225K - 450K
>450K
Modeling Approach: Central Florida CAV Trips

Legend
Traffic Analysis Zone (TAZ)
CAV Percentage

< 10%
10% - 20%
20% - 30%
30% - 40%
40% - 50%
> 50%

20% CAV Regional Adoption
### 2050 Statewide Network Comparison

<table>
<thead>
<tr>
<th></th>
<th>Non-CAV</th>
<th>50% CAV Adoption</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled (VMT)</td>
<td>687,245,676</td>
<td>717,845,808</td>
<td>+4.5%</td>
</tr>
<tr>
<td>Vehicle Hours Traveled (VHT)</td>
<td>16,838,945</td>
<td>16,130,688</td>
<td>-4.2%</td>
</tr>
<tr>
<td>Average Network Speed (mph)</td>
<td>40.81</td>
<td>44.50</td>
<td>+9.0%</td>
</tr>
<tr>
<td>Average Network Volume/Capacity</td>
<td>0.54</td>
<td>0.42</td>
<td>-22.2%</td>
</tr>
</tbody>
</table>

- Non-Uniform CAV ownership
- Non-Uniform distribution of CAV trips
- Dynamic roadway impacts
- Overall network travel increases while delays decrease
Modeling Approach: 2050 Network Congestion

Legend
Network
Volume / Capacity Ratio

<0.6
0.6 - 0.7
0.7 - 0.8
0.8 - 0.9
> 0.9

2050 0% CAV Statewide Adoption
Future Applications

• Analyze model results
  • Compare with Non-CAV results
  • Identify trends and areas of impact
  • Long-term project traffic evaluation

• Consider other variables
  • Trip lengths
  • Land use changes
  • Parking

• Other model years
• Other model types