Review of Traffic Control Signal Timing Parameters for Autonomous Vehicles

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Presentation Outlines

- NHTSA classification
- Scope
- What is the AV promising?
- What hardware is included in the AV?
- Review of signal timing parameters
- Findings & Recommendations

NHTSA Classification

Level 0 – No Automation
Level 1 – Function Specific Automation
Level 2 – Combined Function Automation
Level 3 – Limited Self-driving Automation
Level 4 – Full Self-driving Automation

Scope of Review

- In this review the following is assumed:
  - V2V, V2I & V2P comm. established and reliable
  - The Automated Vehicle is capable of adjusting itself momentarily to inclement weather & roadway conditions.
  - The AV abides with local traffic laws.
  - The AV is capable of responding to TCS indication changes in a split second.

Introduction

- What is the AV promising?
  - Congestion
  - Safety
  - Mobility
  - Air Quality

- Hardware included in the AV

Signal Timing Parameters

- Basic signal timing parameters
  - Minimum Green
  - Passage time
  - Maximum Green
  - Yellow change interval
  - Red clearance interval
  - Pedestrian timing intervals

- Coordinated System parameters (C, S, O)

Factors affecting signal timing parameters

- Driver perception-reaction time
- Design Speed of vehicles
- Others

Review of Signal timing Parameters

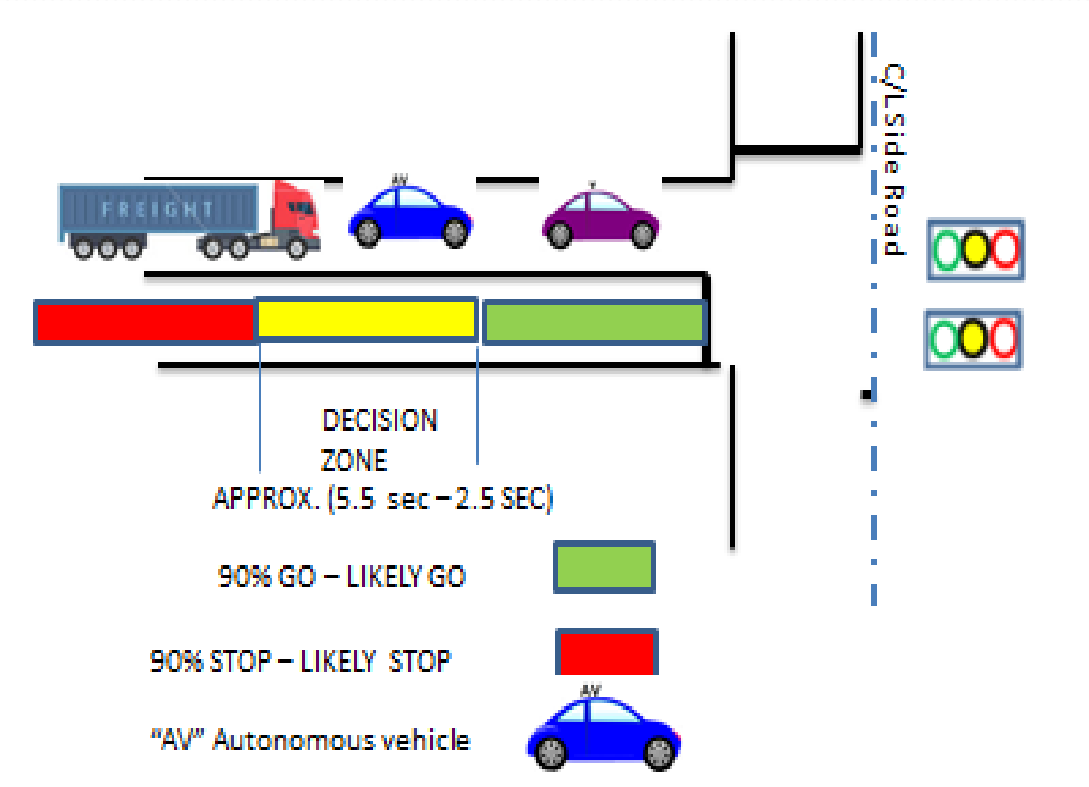
- Min Green Time
- Passage time
- Max Green time
- Yellow change interval
- Red clearance interval
- Pedestrian timing intervals
- Cycle, Split, Offset (Coordinated Systems)

Findings & Recommendations

- The current method of calculating the minimum & maximum green time parameters is acceptable for both conventional vehicles and AVs

- The calculation of the passage time parameter & associated detection zones based on fixed speed could be problematic.
  - At high speed approaches to signalized intersections, the use of advanced detection methods (e.g. wide area detection utilizing radar base technology) will better serve the conventional vehicles and AVs traffic flow.

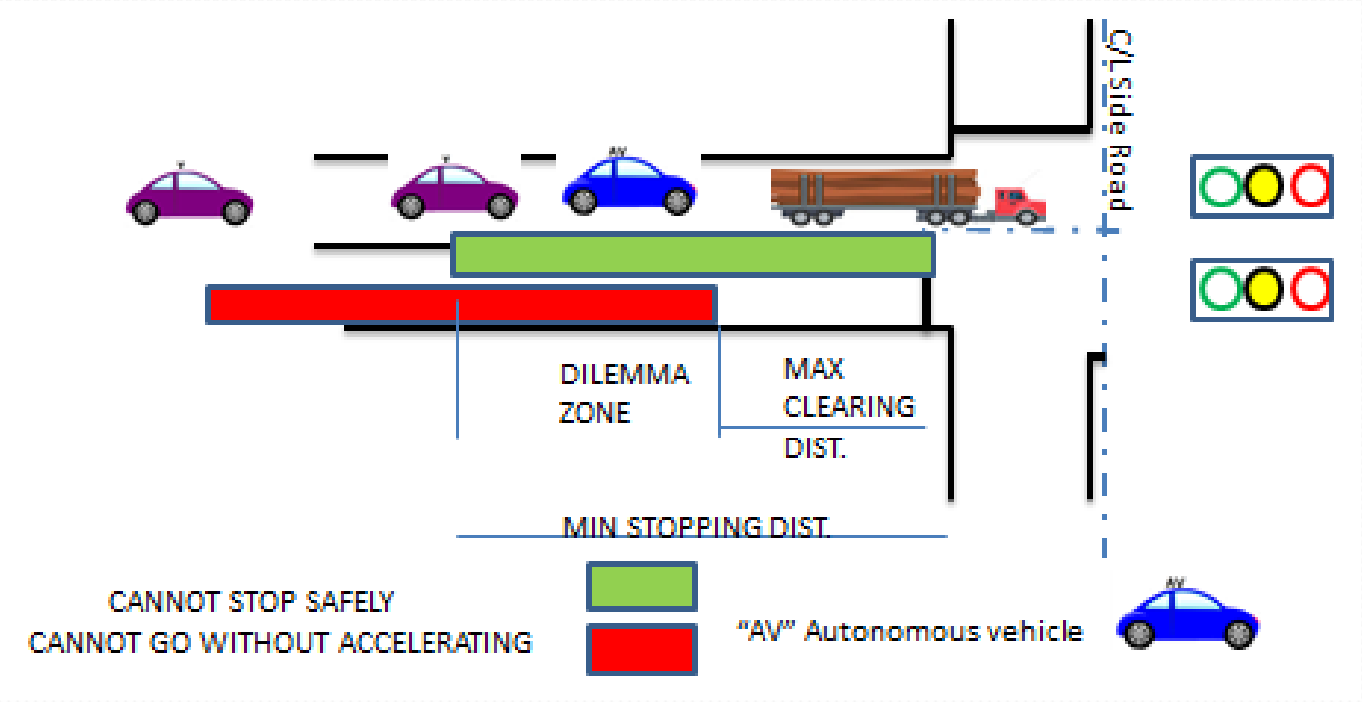
Findings & Recommendations (cont.)



"AV & Conventional vehicles on a high speed approach"

Findings & Recommendations (cont.)

- The duration of yellow change interval calculated according to ITE kinematic equation suffice for the needs of AVs.



Findings & Recommendations (cont.)

- The red clearance time should be calculated using the posted speed limit.
- In coordinated systems, the AVs may disrupt the progression of traffic flow due to their low operating speeds.
- From a safety point of view, the algorithms ruling the on-board computer in the AVs should be programmed to react to traffic control devices as expertly as a skilled defensive driver would.

Disclaimer

The contents of this presentation reflect the views of the author

Questions & Comments

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