
Fehintola Sanusi1 and John O. Sobanjo2

1 Graduate Student, 2 Professor, Department of Civil and Environmental, FAMU-FSU College of Engineering, Tallahassee, Florida
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Introduction

The motivation of the research comes primarily from the consideration of deployment and full utilization of CAVs in the real traffic world, especially in work zones which typically require altered road geometry such as lane closures and reduced speed areas. With variation in market penetration rates (MPRs) of CAVs, the prospects for success are evaluated in two ways: (1) the potential benefits of CAVs in improving travel time resulting from work zone impacts and (2) safety benefits of CAVs through reduction in number of conflicts.

Methods

The experimental set up involved creating a base model in VISSIM consisting of conventional vehicles representing field traffic conditions. The field data was extracted from a previous study (3) on a work zone in Missouri. The model was calibrated and validated to match field conditions. 10% to 90% CAVs are utilized for the evaluation scenario. The assumptions for the driving behaviors of CAVs are based on estimated values selected from previous works on CAVs and adjustment of the parameters available in VISSIM. CAV’s potential for work zone conflicts reduction are evaluated using the Surrogate Safety Assessment Module (SSAM).

Results

The results obtained from the GEH formula was desirable and less than five which showed that the model was acceptable fit.

Modeling CAVs in VISSIM

The simulation of CAVs driver behaviors within VISSIM was based on the assumptions from a previous study(4). The VISSIM Wiedemann 99 driver parameters were adjusted to implement the presence of CAVs in the model.

Figure 1 Comparison between observed and simulated data

GEH = \sqrt{\frac{V_{pre} - V_{sim}}{V_{pre}} \times \frac{V_{sim}}{V_{pre}}}

Table 1

![Table showing travel time results]

Figure 2 Trend in Work Zone Hourly Travel Time with Different CAV Penetrations

Figure 3 Trend in Travel Time for Peak Period in Work Zone

Figure 4 Percent difference in conflicts between base scenario and CAVs Market Penetration

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SSAM Output

![SSAM output showing conflicts and penetration]

References


Future Research Agenda

1. Incorporate connections such as V2I and V2V for both autonomous and conventional vehicles.
2. Consider using field data from different construction work zones in Florida State.
3. Analyze more complex networks and a diversity of work zone configurations.
4. Expand the scope of the network.