The Impact of Connected Vehicle Market Penetration and Connectivity Levels on Traffic Safety in Connected Vehicles Transition Period Dataset

Dataset available at: https://doi.org/10.7910/DVN/7Q28BA

(This dataset supports report **The Impact of Connected Vehicle Market Penetration and Connectivity Levels on Traffic Safety in Connected Vehicles Transition Period,** http://safersim.nads-sc.uiowa.edu/final_reports/UCF%201%20Y1_report.pdf)

This U.S. Department of Transportation-funded dataset is preserved by the SAFER-SIM University Transportation Center in the Harvard Dataverse Repository (https://dataverse.harvard.edu/), and is available at https://doi.org/10.7910/DVN/7Q28BA

The related final report **The Impact of Connected Vehicle Market Penetration and Connectivity Levels on Traffic Safety in Connected Vehicles Transition Period**, is available from the National Transportation Library's Digital Repository at https://rosap.ntl.bts.gov/view/dot/42277

Metadata from the Harvard Dataverse Repository record:
Dataset Persistent ID: doi:10.7910/DVN/7Q28BA
Publication Date: 2018-10-08
Title: The Impact of Connected Vehicle Market Penetration and Connectivity Levels on Traffic Safety in Connected Vehicles Transition Period
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Description: The recent advent of connected vehicles (CV) technologies could bring unprecedented opportunities to improve road safety, especially under reduced-visibility conditions. Reduced-visibility conditions increase the probability of rear-end crash occurrences and their severity. Moreover, slow traffic may be formed due to bottlenecks on freeways. This phenomenon may lead to higher rear-end crash risk when vehicles approach slow traffic, since drivers might not notice front vehicles' speed reduction in time to respond. For the abovementioned reasons, this research investigates the CV crash warning systems that have the potential to improve vehicle safety by alerting drivers of imminent situations so they can take timely crash-avoidance action(s). This study provides a driving simulator study to evaluate the effectiveness of the head-up display (HUD) warning system and the audio warning system on drivers' crash-avoidance performance when the lead vehicle makes an emergency stop under fog conditions. Drivers' throttle release time, brake transition time, perception response time, brake reaction time, minimum modified time-to-collision, and maximum brake pedal pressure are analyzed. According to the results, the crash warning system could help decrease drivers'

reaction time and reduce the probability of rear-end crashes in a CV environment. In addition, the effects of fog level and driver characteristics, including gender and age, are investigated in this study. The findings of this study could help car manufacturers design rear-end crash warning systems that enhance the effectiveness of the system's application under fog conditions. Furthermore, this study also aims to develop an integrated variable speed limit (VSL) and CV control strategy to reduce the rear-end crash risk at freeway bottlenecks under fog conditions. Based on the car-following model, the VSL control algorithm is developed considering the different relationships between gap and visibility distance. Then, a feedback control framework is developed to combine the VSL and CV control. The proposed VSL strategy is tested for a freeway section with a bottleneck through VISSIM, and the Intelligent Driver Model (IDM) is employed to build the CV environment. Finally, two measurements, time-to-collision at braking (TTC_brake) and total travel time (TTT), are employed to evaluate the effectiveness of the proposed control strategy. The results demonstrate that the VSL control played an important role in reducing the rear-end crash risk. The CV control could also enhance traffic safety by increasing the traffic homogeneity. Moreover, the combination of VSL and CV control (VSL&CV) could further enhance traffic safety and diminish the increase in travel time due to VSL.
Subject: Engineering
Depositor: Heiden, Jacob
Deposit Date: 2018-10-02

Recommended citation:
Abdel-Aty, Mohamed; Wu, Yina; Wang, Ling, 2018, "The Impact of Connected Vehicle Market Penetration and Connectivity Levels on Traffic Safety in Connected Vehicles Transition Period", https://doi.org/10.7910/DVN/7Q28BA, Harvard Dataverse, V1,
UNF:6:fQ1Gf2AjbeQIbw7cwer5fQ== [fileUNF]

Dataset description:
This dataset contains 1 .zip file collection described below.

Data_SAFERSIM_CV.zip:
This collection contains one .xlsx file of the same name (Data_SAFERSIM_CV.xlsx). The .xlsx file is a Microsoft Excel file, which can be opened with Excel, and other free available software, such as OpenRefine

National Transportation Library (NTL) Curation Note:
As this dataset is preserved in a repository outside U.S. DOT control, as allowed by the U.S. DOT's Public Access Plan (https://ntl.bts.gov/public-access) Section 7.4.2 Data, the NTL staff has performed ***NO*** additional curation actions on this dataset. NTL staff last accessed this dataset at https://doi.org/10.7910/DVN/7Q28BA on 2019-09-04. If, in the future, you have trouble accessing this dataset at the host repository, please email NTLDataCurator@dot.gov describing your problem. NTL staff will do its best to assist you at that time.