Impact of Autonomous Vehicle (AV)-Based on Demand Transportation Services on Traffic Crashes

Project Number:

22ITSUTA50

Start Date:

04/01/2022

Principal Inverstigator(s):

Sharareh (Sherri) Kermanshachi

University of Texas at Arlington

Lead Institution:

University of Texas at Arlington

Funding Source(s):

Tran-SET

University of Texas at Arlington

Total Project Cost:

$ 106,006

Evaluating the impact of AV-Based services on traffic crashes

There has been two recent major advancements in the area of transportation industry which facilitated the mobility across the nation. The first technological advancement has brought Autonomous Vehicles (AVs) into reality, and the other major advancement is the emergence of on-demand ride services which has overcome many of the conventional travel barriers and improved personal mobility options. Although some studies explored the benefits and positive outcomes of both AVs and on-demand services; however, there are some other studies which found different outcomes and do not recommend the technology and service for safety reasons. Therefore, there is a need to study the impact of AV-based on-demand services on crashes as this will be future of the transportation systems in various cities and states. This study aims to evaluate the impact of AV-based on demand transportation services on traffic crashes with different severity levels. This project will analyze the (1) impact of the AV-based on-demand transportation services on frequency (number of) of crashes, (2) impact of the AV-based on-demand transportation services on total number of injuries, and (3) impact of the AV-based on-demand transportation services the number of serious injuries to analyze the crash patterns before and after the deployment of these services. To successfully achieve the objectives of this project, this study will use the data from City of Arlington, Texas Department of Transportation (TxDOT), and Arlington RAPID project. Arlington RAPID project is an implementation case study which has integrated the AVs into on-demand transportation services in Arlington, Texas.

Problem Statement

There are several studies which have focused on either adoption of AVs or ridesharing services, and their impact on crashes. While both AVs and ridesharing services are getting significantly adopted across the nation, a service which integrates both transportation advancement has been rarely implemented and therefore, their impact on frequency and severity of crashes was not studied. Although many studies explored the benefits and positive outcomes of both AVs and on-demand services, however, there are some

other studies which found different outcomes and do not recommend the services for safety reasons. Therefore, there is a need to study the impact of AV-based on-demand services on crashes as this will be future of the transportation systems. Some studies argue that the introduction of TNCs such as an private app-based mode (e.g., Uber and Lyft) into the urban mobility market of the United States has intensified road congestion in large cities by decreasing the average weekday speed. Meanwhile, on-demand ride services that provide real-time shared rides to users can be a game changer, as they have the ability to decrease traffic congestion by increasing the level of vehicle occupancy. However, some studies tout the positive effects of ridesharing services on the number of motor vehicle crashes. On-demand ridesharing services are perceived as a more convenient, accessible, and affordable travel mode than taxis that have the potential to reduce the probability of alcohol-related crashes. Since the results of different geographical contexts are inconsistent, it is vitally important to explore the relationship between the presence of AV ridesharing services and changes in crash incidence.

Objectives

This study aims to evaluate the impact of AV-based on demand transportation services on traffic crashes with different severity levels. Therefore, this project will analyze the (1) impact of the AV-based on-demand transportation services on frequency of crashes, (2) impact of the AV-based on-demand transportation services on total number of injuries, and (3) impact of the AV-based on-demand transportation services the number of serious injuries to analyze the crash patterns before and after the deployment of RAPID project.

Figure 1. Arlington RAPID Project – Evaluation of Integrating the AVs into Transit Services ($1.7M Federally Funded Project-PI Kermanshachi)

Intended Implementation of Research

The developed models will be implemented in three other cities and evaluate the adoption impact of AV-based on-demand services on traffic crashes and safety enhancement. The goal is to assist Departments of Transportations and cities to make proper decisions regarding their future directions for their transportation services. In this regard, cities with different levels of traffic, population, and geographical characteristics will be selected. The models will be implemented in these three cities to determine the changes in frequency and severity of their traffic crashes with the next one, five, ten, and twenty years. The results of this project will be disseminated through various means. The findings of this project will be published as journal articles in ASCE journal of Transportation Engineering and Transportation Research Record. The PIs have also planned to present the process and results in the 2023 TranSET Conference and 2023 Transportation Research Board Annual Meeting which has more than 14,000 audiences. The results will be also shared with the authorities in DOTs and cities to benefits from the results and help them with making strategic decisions.

Anticipated Impacts/Benefits of Implementation

This study has a great impact on future infrastructure design decisions of Region 6. In general, cities in the Region 6 and other locations of the United States have experienced a remarkable evolution that has stemmed from changes and advancements in transportation technologies. As the results from different geographical areas on the impact of AV on traffic crashes are mixed: some studies show no association, while others observe an increase in fatalities, this study will be very helpful to DOTs to formulate strategic decisions in their areas. The outcome of this project will help DOTs to make proper long-term planning for their

infrastructures and ensure that the safety of their communities would not be endangered by adoption of AVs.

Web links

- Tran-SET's website https://transet.lsu.edu/research-in-progress/

Tran-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes".

Learn More

For more information about Tran-SET, please visit our website, LinkedIn, Twitter, Facebook, and YouTube pages. Also, please feel free to contact Dr. Momen Mousa (Tran-SET Program Manager) directly at transet@lsu.edu.