Joint Transportation Research Program

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Developing a Business Ecosystem around Autonomous Vehicle Infrastructure in Indiana

Introduction

INDOT will soon be embarking on infrastructure planning to accommodate autonomous vehicles (AVs). This new technology affords the ability to impact economic creation across the supply chain in Indiana, as well as enable economic development in the state to support these emerging technologies. This proposal is a first cut toward exploring a strategy to realize this potential. Our proposal consists of two phases.

Phase 1: A focus on industry choices and plans that can inform INDOT choices.

Phase 2: A focus on INDOT's internal decision-making, risk tolerance and thus choices regarding infrastructure projects.

Findings

- After years of research and development, AVs have arrived. The developmental history of such vehicles can be traced to the early 1920s. Their development reached a critical mass in 2013, when autonomous driving was defined by the National Highway Traffic Safety Administration (NHTSA) (Fortuna, 2017).
- Significant research and development by major technology development companies have impacted the industry.
- Use of machine vision or computer vision coupled with neural networks enables data from multiple sensors to be combined with an offline map. The combination of this data with machine learning advancements has enabled sufficient fidelity to identify objects on the road.
- Ridesharing has been helpful in combating the argument of the high cost of AV utilization.
- Electrification is the best choice for fully automated vehicles. Thus, most AV implementations include a discussion of promoting air quality and greenhouse gas emission goals.

Positive and negative effects of fully AVs are as follows.

Positive Effects

- Research by the NHTSA estimates that 94% of serious crashes are people-related (Lewis et al., 2017). Thus, the safety of AVs can be assumed as a key reason for their adoption.
- Currently, congestion causes increased commuting time. The benefit of reducing this time is increased productivity for individuals and businesses.
- AVs are a more sustainable (i.e., energy efficient) mode of transportation.

Negative Effects

- Assigning responsibility for crashes (i.e., is it the autonomous system or the driver who set the controls?).
- Dealing with legacy costs (i.e., time and cost to replace current systems).
- Cybersecurity issues with connected transportation.
- Managing the economic shift for drivers who will be impacted and manufacturing shifts from current vehicle production.

Recommendation and Further Areas to Explore

INDOT's Action Item: Research and gain a better understanding of the VMT fee structure for AVs and potential revenue stream that might result in responsible use of AVs on public roadways.

INDOT's Action Plan: Initiate pilots of dedicated short-range communications (DSRC) and 5G wireless connected vehicle (CV) technologies.

INDOT's Action Item: Fund research at universities to understand the potential short-, medium-, and long-term effects of AVs on the transportation network, including the environment, social equity, and economic vitality.

The following are further questions to be explored.

- Developing a proper framework for the survey and further questions to be explored.
- Identifying more primary and secondary players.
- New opportunities for existing Indiana manufacturers.
- Transportation equipment.
- Specialty chemicals.
- Advanced materials.
- Overall, some key topics from the business case for Phase 1 have been covered in this report. Further expansion can be done by data gathering and one-on-one meetings with potential industries.

Implementation

This study can be used by personnel at a number of divisions, offices, program areas, and units at INDOT to assess the benefits of future similar initiatives in Indiana. A core group of individuals at INDOT can further define specific implementation initiatives from the research product resulting from this study.

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