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Executive Summary

Introduction

With the staggering amount of fatalities from car accidents coupled with the emissions from vehicles, the current United States transportation system is highly inefficient and unsafe. There has been a lot of innovation surrounding electric and autonomous vehicles, but these do not fully address some of the problems that crowd our roads today. Platooning systems may have a way of creating a more efficient transportation system in America. They work by using advanced sensor technology and vehicle communication to allow the vehicles to follow each other at very close distances. Despite providing such a bright future for roadways in America, the technology has not become widespread enough to impact the country overall. Peloton Technology was founded to bring this vision to life in America, but failed due to a number of factors which are discussed in my Science and Technology in Society Research Paper.

On a smaller scale, platooning can also help small communities by moving a large group of people with only one driver. Using platooning algorithms and sensors, different vehicles can be used to follow each other and almost create a train for passengers to ride on. In my capstone report, I detail the development of a golf cart platooning system whose final goal is to transport staff with limited mobility from parking lots to their working facilities.

It is important to take in both large scale and small scale use of platooning technologies in order to understand how it can benefit communities all over the United States. By understanding both aspects, it can help make platooning technologies more successful in the future, thus helping the transportation systems of America.

Summary of Capstone Project

The Autonomous Campus Vehicle team had the overall goal of updating the existing golf cart platooning system at UVA to use a CACC platooning algorithm that uses feedback from LiDAR and Camera sensors. In order to achieve the main goal, the group came up with three smaller objectives: establish a functioning platooning system, integrate sensors into the platooning system, and apply additional system upgrades. The system should be able complete a loop around Engineer's Way and OMERF using the completed system fit with the platooning algorithm and the sensors.

The report describes the background of the preexisting technology along with the design process that was followed this year and includes the future work for following teams. The past years' work was studied by reverse engineering the current carts coupled with the reports and design schematics created by past teams. A summary of the team's findings is included in this report. For the design process, we followed the product design method laid out in "Product Design and Development," by Karl T. Ulrich and Steven D. Eppinger. This led us through investigating the customer needs, target specifications, concept generation, and concept selection. Using the information gathered from these, the team was able to begin work on the system, with progress explained in the report.

Summary of STS Paper

This paper uses a case study to understand why the United States has not been able to successfully implement commercial platooning systems in cars or trucks even though the technology exists. It looks to answer the question, "What factors led to the underperformance of Peloton Technology's platooning system in the United States?" To answer this, I use Actor Network Theory to support my research, specifically to organize the different factors which led

to the failure of the company. The framework analyzes the impacts of the factors on the company and how their impacts affect each other. My research expects to find a gap in existing knowledge of the failures of commercial platooning systems- the interactions of the factors that lead to failures. The failure of these companies contribute to a wider problem in the United States, the lack of efficient transportation nationwide. The methods of transportation currently used in the United States could be safer and more environmentally friendly, but businesses who are using technology that can help in both of these areas are failing. My research will create a better understanding of what affected those failures, and seek to find solutions so the technology could come to the roads faster.

Conclusion

Both of these projects focus on the impact platooning technologies have on the community- whether it is widespread or on a very small scale. It was important to have done the research and development for both of these simultaneously because it allowed me to see the full extent to which platooning technologies could help. While understanding societal, legal, and economical impacts of a large business dealing with nationwide platooning systems, I could also identify small versions of these impacts in our small setting. Dissecting the underperformance of Peloton Technology, allowed me to improve upon my own research and construction of the golf cart platooning system. Overall, both projects have helped me realize the value of platooning systems as a role of helping create a safer, more efficient transportation system in America.