Sociotechnical Synthesis

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Introduction

The objective of this technical project and STS research paper is to contribute to the research and development of autonomous platooning technology while understanding how the design of these systems can impact user confidence, and vice versa. The aim of the technical project is to implement computer control of the primary motion subsystems - braking, steering, and acceleration - in a vehicle. Furthermore, these vehicles should be able to autonomously detect and follow the vehicle in front of them while navigating their surroundings. Should this technology be commercialized, the STS research paper examines what factors are important to potential consumers that influence whether they will purchase a self-driving car for themselves and the steps car manufacturers can take to improve their systems that will increase the general public's confidence in autonomous vehicles.

Technical Project and STS Research

For my technical project, I worked on a team with five other students to implement autonomous driving and platooning technology between two golf carts. The goal for this system is to serve as a mode of transportation on a college campus for anyone, including the disabled and the elderly. Between the two carts, one was chosen to be a leader and would be driven manually, while the other is an autonomously driven follower cart. On the follower cart, we made improvements to the autonomous acceleration, braking, and steering systems to boost their performance and reliability. For the leader detection portion of the project, we devised a system for the follower cart to know its distance from the leader cart and the leader cart's orientation using four heat lamps on the leader cart and an infrared (IR) sensor on the follower cart. We

learned about what technology and devices would result in a more safe and comfortable driving experience than other devices. For example, we used a DC motor to operate the brake pedal since it could be placed in a discrete location and perform smooth braking. Additionally, while our team produced individually functional subsystems, we learned that it would take many rounds of testing and refining to reach a point where our platooning and driving technology could be used for mass transportation.

For my STS research, I wanted to investigate the current opinions of autonomous vehicles held by the general public and what factors drove an individual's acceptance level of this technology. I also considered how accessible self-driving cars might be for the disabled community. Upon analyzing multiple research studies, it was evident that more trust in the technology's performance, including understanding how it works, and greater personal compatibility with the system operation resulted in an increased likelihood of an individual purchasing or using an autonomous vehicle. For disabled people, ease of use was an essential criterion for using a self-driving car, but there are a few potential barriers that could make it difficult for the disabled community to have greater access to these vehicles. To accomodate people with varying disabilities, cars would have to operate fully autonomously (Level 5 Autonomy) so as to not require any manual system override. Additionally, the added sensors and robust algorithms that allow for autonomous driving will significantly increase the cost of these cars, making them unaffordable for many potential users. Car manufacturers must take these beliefs and circumstances into account when designing their systems to make them safe and accessible for all.

Conclusion

The technical project and STS research underscore the importance in considering the needs of a customer base to influence the design of autonomous vehicles. By studying customers' requirements and thoughts, manufacturers can use this information to design transparent and intuitive systems. From the technical project, I learned that even if a system functions smoothly in a technical sense, it will have to be fully redesigned if the operation is not safe or intuitive for its users. Ultimately, the safety and reliability of the system from the user's perspective is the most crucial factor in its effectiveness. While conducting my STS research, it was interesting to see how driving laws vary between states and nations and how the acceptance of autonomous vehicles could change with location and culture. It was also upsetting to see how little research was done into the accessibility of autonomous vehicles for the disabled community even though the benefits for them were often cited in many other articles. It reinforced the notion that considering diverse perspectives is imperative for creating a safe and comfortable environment for all people.

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