Thesis Portfolio

Autonomous Driving Simulator Final Report

(Technical Paper)

Analyzing the Dangers and Ethical Concerns of Autonomous Vehicles

(STS Paper)

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Sociotechnical Synthesis

Introduction

Artificial intelligence and autonomous technology are increasingly integrated into our daily lives. These advancements have the potential to significantly enhance various aspects of our lives and bring numerous benefits. One example of implementing this type of technology for everyday use is the utilization of autonomous vehicles (AVs). Many car companies have already started implementing this type of technology to improve their vehicles in order to make them easier to drive and safer to operate. However, autonomous technology faces many challenges, and each comes with great responsibility. With some AVs now making their way onto the roads, it is imperative that the proper research and testing is done to ensure the safety and dependability of these vehicles. The overall goal of this research is to analyze the major ethical concerns associated with AVs in order to overcome these obstacles and ensure that the benefits of AVs far outweigh their drawbacks. Further, the motivation for this research was to address the ethical concerns of AVs and to evaluate autonomous technology for solutions to these concerns in a safe and controlled environment through the use of a driving simulator in order to advance the progress of self-driving cars.

Capstone

The technical portion of my thesis produced results that display the complexities and obstacles involved in the implementation of autonomous vehicles. This project revealed numerous considerations that must be examined in order to analyze the safety and reliability of self-driven cars. Every system within a vehicle such as the steering, braking, emergency sensors, and coding or computer systems must work simultaneously, and they must work consistently.

Furthermore, this research project demonstrated the dangers of AVs when these systems fail to work properly or consistently.

The driving simulator design that my group work and improved upon revealed the importance of utilizing realistic testing environments and conditions in order to collect valuable information regarding how an autonomous vehicle would respond to various driving conditions. New software and up to date computer programs were installed on the system to allow different driving environments, vehicles, weather conditions to be examined. All of these factors were evaluated to analyze how an autonomous vehicle would perform in different scenarios. In addition to working towards autonomy, this project consisted of a number of mechanical fixes and adjustments to make the driving environment more realistic. A driving simulator cannot reflect a real road vehicle if it is not realistic. Moreover, the systems and safety procedures of the simulator are not credible if the surrounding environment does not accurately represent the real scenario.

Autonomous Vehicles

In my STS research I discovered that there are a number of concerns surrounding AVs. Most of the ethical concerns involve the AI technology and coding algorithms involved to allow vehicle systems to make decisions. For example, how can a car morally choose to protect its passengers or pedestrians given a dangerous situation? Additionally, with different legislation in different states, who is to determine when AVs are safe enough to be widely available for everyday use? Should it be car companies and manufacturers, engineers, computer/software developers, legislators, or consumers and those who will be using AVs? Moreover, what is the threshold for what is considered safe and what morals should a vehicle follow when morals vary by person? Should a vehicle owner be allowed to change the algorithm and software of the

vehicle so that it follows their morals? All of these questions must be considered when designing, producing, and testing AVs. Similarly, it is vital to recognize who is responsible when an AV makes a "wrong" decision or fails to perform properly. In essence, addressing these ethical, legal, and practical considerations is critical to the responsible development and implementation of AVs.

Conclusion

My technical portion and STS research enriched each other by highlighting key concerns that needed to be addressed among both the technical aspect of driving simulators and the ethical concerns of AVs. Recognizing ethical dilemmas associated with AVs advanced the progress needed to ensure that vehicle systems correctly function together. Similarly, examining vehicle system performance through a driving simulator revealed new driving scenarios that needed to be addressed and assessed. A major takeaway from this research was the realization that sometimes there are no correct reactions to certain driving scenarios; however, consistency and predictability is much safer than incongruity among systems. Choosing which morals a vehicle should follow is a hard obstacle to overcome but ensuring that a vehicle can consistently make decisions through the use of testing and research is one step closer to establishing safety and dependability among self-driving cars.