AUTONOMOUS PLATOONING GOLF CART FOR SHORT DISTANCE TRAVEL

THE NEXT INDUSTRIAL REVOLUTION: AUTONOMOUS VEHICLES DISRUPT AMERICAN TRUCKERS

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Mechanical Engineering

By

Charles Rushton

May 9, 2022

SOCIOTECHNICAL SYNTHESIS

During the coronavirus pandemic, companies turned towards automation to fulfill demand as workers left the work force, particularly in the automotive industry. However, the technology surrounding autonomous vehicles allow only for semi-autonomous vehicles, limiting the societal benefits of self-driving cars. The technical research explores the ability for autonomous vehicles to platoon in a GPS-less environment. The STS research investigates the impacts of autonomous technology within the American trucking industry. This research primarily focuses on the economics, liability, and perception of truckers. The technical project researched the feasibility of platooning vehicles in an environment without GPS, a crucial step towards full autonomy, while the tightly coupled STS topic analyzes a hypothetical world where companies already implemented said technology.

Benefits of the autonomous vehicles increase as the computer's algorithms operate properly in more situations. Therefore, vehicles operating in GPS denied areas greatly contributes to the utility of the technology. To research these vehicles, the technical team synthesized the previous work in industry and academia. Next, the team worked to implement a new design for platooning vehicles on two Club Car golfcarts. One cart would detect the environment and generate a map of the surroundings. The second cart would receive information from the first cart and follow the first cart's path.

The capabilities of the two-cart system contributed the knowledge of autonomous vehicles. The front cart produces a map from two depth cameras and a lidar sensor. Additionally, this cart sends accurate information to the follower cart. The follower cart receives this information and follows the path in computer simulated environment. The mechatronics systems for steering, accelerating, and breaking all successfully execute when given adequate commands.

The cart system provides a proof of concept of a novel platooning system, which expands the body of knowledge of autonomous vehicles.

The central question for the STS research is two-fold: how autonomous vehicles affects American truckers; what potential policy can lessen probable negative consequences. A modified Actor Network Theory (ANT) framed the issue in the correct scope. This framework implemented a Foucauldian view alongside the traditional ANT, giving keen insight into the power dynamics of corporations. For supplementary evidence, academic journals and recent news articles supports the exploration of the topic.

Through this investigation, three major changes arise from implementation of autonomous technology. First, truckers lose bargaining power against their companies as autonomous vehicles give a direct substitute. Second, public's perception of truckers change, allowing for an influx of new workers. Additionally, the public may misattribute liability to the trucker. Third, the trucker's unhealthy lifestyle may compound given the implementation of the technology. Corporate and governmental policy limits these negatives of these primary changes. The corporate policy focus on the social changes, while the governmental focus on the legal and future innovations of autonomy.

The technical research provides a base for autonomous vehicles to become more advantageous. However, the technology creates unintended consequences. Two potential policies will minimize the fallback of autonomous trucks while maintaining the benefits of the technology.

TABLE OF CONTENTS