Thesis Portfolio

Development of an Autonomous Campus Vehicle
(Technical Report)

Social Factors Affecting Autonomous Public Transit Adoption
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Autonomous vehicle (AV) technology has advanced significantly in the past decade, promising solutions to driving problems that have existed since the invention of the automobile. Modern AVs can communicate their routes to each other with the intent of reducing traffic as much as possible. Consequently, cars spend less time idling and use fuel more efficiently, reducing pollution. Another advantage of autonomous vehicles is their lack of human error caused by distraction or drowsiness. With improved algorithms and sensor technologies, fully autonomous roadways could someday be accident-free. AVs are being deployed at limited scale as driverless shuttles in some major cities. The challenging scenarios presented by urban driving environments such as pedestrian interaction provide valuable training data that improves AV reliability and safety. Additionally, the limited speed of urban routes makes it easier for vehicles to come to a complete stop and avoid potential collisions. The vehicles being tested are designed to replace human-operated taxis and ride sharing vehicles. Passengers summon a vehicle by phone much like an Uber or Lyft and are taken to their destination without the presence of a human backup driver. A secondary goal of testing these vehicles is to give passengers personal experiences with driverless cars and improve public opinion of their safety.

To add to the fabric of AV research, the technical project was focused on designing, building, and testing an autonomous campus vehicle. The vehicle was intended to travel between buildings on grounds and demonstrate the engineering program to prospective students. By analyzing the work of previous teams and developing new systems, the team gained knowledge of the challenges facing autonomous shuttle design. The design process also involved identifying customer needs given by the technical advisor and other students. Customer needs included passenger/vehicle interaction to increase confidence that all systems were running properly with

reliable object detection and avoidance. The team developed and tested all mechatronic systems necessary for future teams to implement autonomy, incorporating computer-controlled steering, braking, and acceleration into the golf cart. Sensors and software were also implemented that allowed the cart's computer to detect obstacles and create a map of its surroundings.

To learn how driverless shuttles are being designed to satisfy customer needs for transportation and their potential impact on society at large, the research paper focuses on social groups affected by driverless shuttle deployment. Riders who fear that AVs are not as safe as human-operated vehicles will be hesitant to ride in driverless shuttles. Therefore, it is essential to consider the concerns of passengers in user interface design and provide passengers with personal experiences riding in AVs. Transit drivers and the labor unions representing them see driverless shuttles as a threat to existing jobs, so the scale of deployment must be regulated to ease concerns over job security. This research paper also examines the history of AV development, which is useful for understanding both how public perception of the technology has changed over time and the research that has led to the current state of the art.