An Investigation into the Process of Fostering Public Trust in Autonomous Vehicles

An **STS Research Paper** Submitted to the

Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements of the Degree

Mechanical Engineering, Bachelor of Science, School of Engineering

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Spring 2022

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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The implementation of autonomy into society has inevitably brought with it many ethical dilemmas. As human hands are removed from the wheels of cars, how can we as a society trust that a machine will make the right decision in a complex scenario? A study conducted by The Brookings Institution found that only 21% of participants were willing to ride in a self-driving car (West, 2019). There undoubtedly needs to be extensive testing of these systems in realistic scenarios to gauge their performance, though there are further dilemmas in doing so. It is very challenging to insert an autonomous car in a testable, realistic driving scenario without risking the safety of those involved. The way to get the best and most accurate understanding of a self-driving car's performance would be to put it in a real-life environment with actual humans and cars, though this puts at stake the safety of others in the event that the vehicle doesn't perform well. Waymo, an autonomous vehicle manufacturer, had 18 self-driving vehicle accidents in only 2 years of their development process (Wiggers, 2017). Many of these involved pedestrians, cyclists, or other drivers. It is also imperative that these tests can be highly repeatable, especially in the early stages of development. High repeatability means high cost of money, resources, and manpower. Clearly there is a need to assess the functionality of self-driving cars accurately and repetitively without risking the safety of others and expending excessive resources. Simulation technology is the best way to accomplish this. The safety of pedestrians and car operators are not put at risk in simulation software. Repeatability in a simulated environment incurs virtually no additional expenses than what it cost to develop and initialize the program. In this way, manufacturers of autonomous vehicles can test their products without bearing the burden of financial and safety hazards, furthering the development of these machines so that one day they can safely navigate our roadways without inducing fear and distrust in the public.

While data from simulation trials can help legitimize the safety of self-driving cars from a technical standpoint, government involvement in autonomous development would also bring about more trust from the public. A 2018 report from the RAND Corporation suggested that local DMVs play a larger role in requiring autonomous vehicle manufacturers to more transparently demonstrate their progress in the development process. The report also called for efforts towards data-sharing between different self-driving vehicle corporations and government (Fraade-Blanar, 2018). While this might hamper competitiveness between these companies, having access to larger pools of test trial data would allow for each manufacturer to address points of safety concern in their products with more awareness and understanding. Overall, the field of autonomous vehicle development is still very young, and while it is a great field of financial opportunity, it is imperative that the safety of these products is prioritized in order to procure public trust.

The technical portion of my research, involving the capstone project for my major, is at its core guided by the necessity for alternative testing options for autonomous vehicles. As was discussed, simulation technology provides a critical platform for which self-driving vehicle manufacturers can develop their technologies without facing the significant risks of real-life studies. Additionally, simulators can benefit consumers in providing an opportunity for familiarization. Autonomous technologies are still very much a foreign concept to most people, so simulators can offer a better method of easing people into the potentially daunting experience of being driven around by a computer. Autonomous vehicles are surely going to be a part of our world's future, but it is important that the ethical and safety concerns surrounding their development are addressed with appropriate attention. Simulation provides an effective way to

ensure safety requirements are met, but other actions such as government involvement would also benefit the ethical aspect of this technology.