Policy Update: Driverless Cars

Background

Technological advances have actuated a major shift in the future of automobiles in recent years. As safety and efficiency have gained the spotlight, better sensor and satellite technology have improved the functionality of vehicles and provided greater safety and convenience to drivers. Cars have advanced quickly, with systems such as collision avoidance technology, automatic parking, and lane assist. As these systems improve, technology firms and traditional manufacturers are pouring resources into developing a new generation of cars capable of driving with little or no human operation. These driverless, or autonomous, vehicles are currently being tested in beta mode on many roads throughout the U.S.

In line with this trend, Secretary of Transportation, Anthony Foxx, recently announced a Department of Transportation (DOT) plan to assist in the expedited development of autonomous vehicle technology.[1] The announcement echoed the administration's commitment to the greater integration of technology in everyday life. Over the next decade, the plan proposed $3.9 billion in federal funding for pilot programs focused on research, development, and enhancement of driverless car technology. Additionally, the DOT will issue guidelines for autonomous vehicles within the next six months and work with technology firms and vehicle manufacturers to create a strong regulatory framework aimed at easing the inclusion of these technologies.

Opportunity

Autonomous and advanced technology vehicles create a great opportunity to reduce automobile accidents. Utilizing sensors and lasers, these vehicles create a virtual map of all objects in proximity to the vehicle. Radar systems and cameras work with the information provided allowing the vehicles to maneuver through traffic and avoid collisions. Further, the software has the ability to read and interpret road signs and react to stationary and dynamic objects in the roadway.[2]

Many drivers are already familiar with many functional aspects of driverless technology. A 2013 study conducted by Princeton University highlighted how driver assistance systems like backup alerts, automatic braking, and proximity or collision avoidance all help to keep drivers safe by eliminating common human errors. With more research and innovative techniques, these systems will be able to operate with no driver at all.[3]

As more of these technologies are incorporated into vehicles, accident rates and injuries have decreased. Simple features like backup cameras or beeping sensors have decreased backup accidents and injuries by 46 percent.[4] Roughly 80 percent of vehicle collisions are caused by distracted drivers[5], but with a car that pays attention to the objects around it, these

[1] Vlasic, Bill (2016). The New York Times. U.S. Proposes $4 Billion on Self-Driving Cars. Retrieved January 21, 2016, from http://www.nytimes.com/2016/01/15/business/us-proposes-spending-4-billion-on-self-driving-cars.html?_r=0

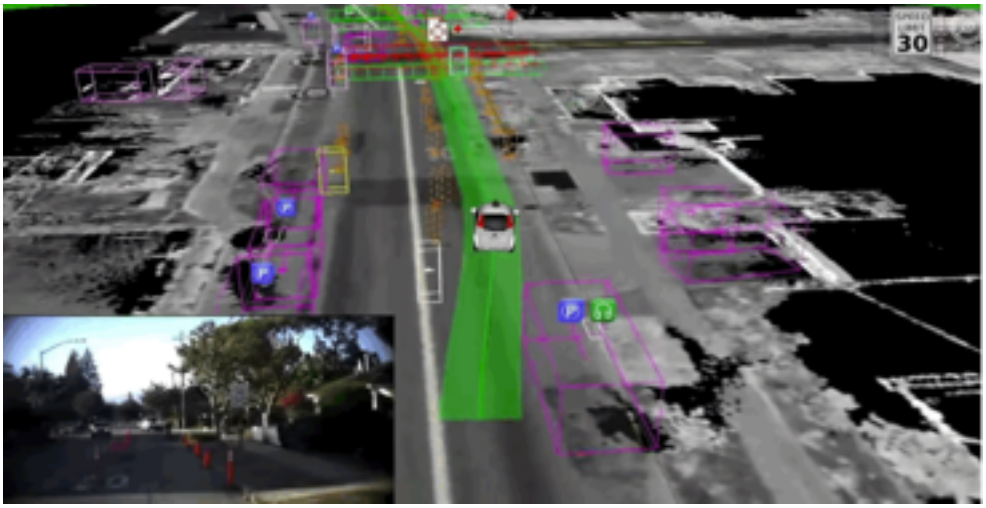
[2] Guizzo, Erico (2011). IEEE Spectrum. How Google's Self-Driving Car Works. Retrieved January 25th 2016, from http://spectrum.ieee.org/automaton/robotics/artificial-intelligence/how-google-self-driving-car-works

[3] Shanker et al. (2013). Princeton University. Autonomous Cars: Self-Driving the New Auto Industry Paradigm. Retrieved January 25th 2016, http://orfe.princeton.edu/~alaink/SmartDrivingCars/PDFs/Nov2013MORGAN-STANLEY-BLUE-PAPER-AUTONOMOUS-CARS%EF%BC%9A-SELF-DRIVING-THE-NEW-AUTO-INDUSTRY-PARADIGM.pdf

[4] AAA Foundation For Traffic Safety. (n.d). Back-up Cameras. Retrieved January 21, 2016, from https://www.aaafoundation.org/back-cameras

[5] AAA News Room (2015). New Hands-Free Technologies Pose Hidden Dangers For Drivers. Retrieved January 21, 2016, from http://newsroom.aaa.com/tag/distracted-driving/

Google Car[11]



incidents can be reduced as well. Technology in the car can either alert the driver or take independent action to avoid contact with another car.

Other issues like fatigue and intoxication, which significantly increase the likelihood of an accident, can also be addressed by cars that compensate for driver inattention, or eliminate the need for the driver altogether. As more cars with this technology are introduced, incidents caused by human error will continue to decrease because these vehicles are programmed to follow a strict set of rules and will be interacting more with each other and less with unpredictable drivers. Combined with intelligent road features, driverless cars can reduce fatalities and infrastructure damage by communicating with other autonomous vehicles and with the roadways.

Challenge

Between 2014 and 2015 autonomous Google vehicles drove over 420,000 miles. Over that distance, the company reported the technology failed 272 times, requiring the test driver to take control of the vehicle. According to Google's simulation analysis, only 13 of those instances would have resulted in a wreck.[6] Under controlled and monitored circumstances the cars performed well, but questions remain about the safety of autonomous cars when tested in more complicated urban traffic or in inclement weather.

While highly tuned and programmed to follow the rules of the road, the electronic systems are unable to make human judgments that fall outside of the strict parameters of traffic laws. The algorithms can only "think" out a finite number of scenarios.[7] Several accidents involving Google driverless cars were the fault of human activity in other vehicles. These accidents occurred because the automated vehicle was not equipped to make intricate judgment-based decisions like complex right-of-way intersection variability, unpredictable pedestrian movements, and appropriate cultural road aggressiveness or boldness.[8] There is no doubt that driving in a city differs significantly from rural roads, as speed, lane changes, and road design makes reaction to other drivers increasingly difficult. This in effect means that if all cars were automated, roads would be safer because every car would heed the rules and have very technical and precise interactions.

[6] Harris, Mark. (2016). The Guardian. Google reports self-driving car mistakes: 272 failures and 13 near misses. Retrieved January 25, 2016, from http://www.theguardian.com/technology/2016/jan/12/google-self-driving-cars-mistakes-data-reports

[7] Google. Google Self-Driving Car Project. Navigating city streets. Retrieved January 25, 2016, from https://www.google.com/selfdrivingcar/how/

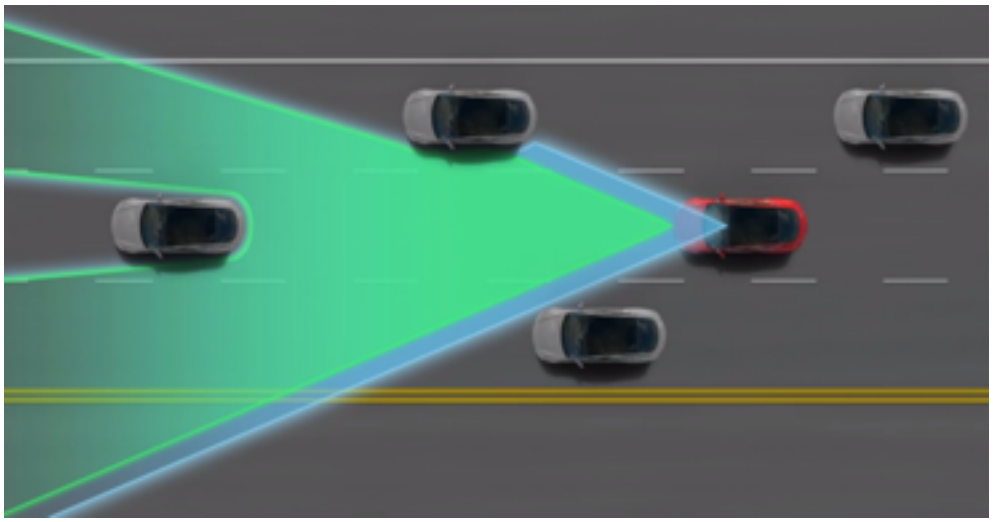
[8] Richtel & Dougherty. (2015). The New York Times. Google's Driverless Cars Run Into Problem: Cars With Drivers. Retrieved January 25th 2016, from http://www.nytimes.com/2015/09/02/technology/personaltech/google-says-its-not-the-driverless-cars-fault-its-other-drivers.html

The potential to hack automated systems creates additional challenges as more computer elements are integrated into vehicles. There have been reports of remote hackers gaining access to a vehicle's controls. Encryption or firewalls will need to be improved and fully integrated into the electronic components of autonomous vehicles prior to large-scale commercial sale in order to ensure safety. These cars are currently designed to assist with human oversight and not to counter malicious human activity.[9]

What's Next?

Heavy investments by Silicon Valley and traditional auto manufacturers in driverless technology combined with supportive government funding, pilot programs, rules, and regulations, the potential for safer and more efficient transportation is significant. In the next five years, experts predict that as many as 10 million self-driving cars will be on the roads of North America.[10] The pace of technological advancements in all fields improves our confidence in researchers' predictions about the potential for a brave new world in the auto sector. As autonomous vehicles become a reality it would be pertinent to introduce the concept on intelligent roads that together would make transportation safer and more efficient.

The Alliance for Innovation and Infrastructure (Aii) consists of two non-profit organizations, The National Infrastructure Safety Foundation (NISF) a 501(c)(4), and the Public Institute for Facility Safety (PIFS) a 501(c)(3). The Foundation and the Institute focus on non-partisan policy issues and are governed by separate volunteer boards working in conjunction with the Alliance's own volunteer Advisory Council.



Tesla Car[12]

[9] Gibbs, Samuel. (2015). The Guardian. Hackers can trick self-driving cars into taking evasive action. Retrieved January 25th 2016, from http://www.theguardian.com/technology/2015/sep/07/hackers-trick-self-driving-cars-lidar-sensor

[10] Greenough, John. (2015). Business Insider. 10 million self-driving cars will be on the road by 2020. Retrieved on January 25ht 2016, from http://www.businessinsider.com/report-10-million-self-driving-cars-will-be-on-the-road-by-2020-2015-5-6

[11] Thompson, Cadie (2015). Tech Insider. There's one big difference between Google and Tesla's self-driving car technology. Retrieved January 21, 2016, from http://www.techinsider.io/difference-between-google-and-tesla-driverless-cars-2015-12

[12] Id.