Self-driving Trucks aren’t the Stuff of Science Fiction Anymore

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The idea of an 18-wheeler cruising through Colorado at 55 mph without a human behind the wheel may conjure up a vision of Optimus Prime battling Decepticons in Michael Bay’s Transformers franchise or marauding big rigs in Stephen King’s Maximum Overdrive, but it may not be that long before you see a self-driving truck hauling freight on an interstate near you.

In May 2015, Freightliner’s Inspiration truck became the first ever self-driving commercial truck to receive a road license plate for autonomous operation on public highways. The truck features a system called Highway Pilot, which uses forward-looking stereoscopic cameras and radar sensors to give it an autonomous autopilot mode when cruising on the highway. Autonomy in vehicles is not an on/off state; it is a continuum with a blending of the human driver and the machine over control of the vehicle. The National Highway Traffic and Safety Administration (NHTSA) adopted the Society of Automotive Engineers (SAE) International’s levels of on-road vehicle automation as a standardized scale and set of terms to use when discussing automated driving. The SAE definitions divide vehicles into levels based on who does what, when. Generally:

Level 0: The human driver does everything;

Level 1: An automated system on the vehicle can sometimes assist the human driver conduct some parts of the driving task;

Level 2: An automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving task;

Level 3: An automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests;

Level 4: An automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operated only in certain environments and under certain conditions; and

Level 5: The automated system can perform all driving tasks under all conditions.

Freightliner’s Inspiration truck is a Level 3 automated vehicle. The truck can cruise on the highway in its Highway Pilot mode while the driver does other things, but the driver must be in the seat and must be ready to take back control when required, e.g., negotiating surface roads and exits and interchanges.

More recently, Uber acquired self-driving trucks startup Otto and formed an alliance with Volvo to develop self-driving cars. In October 2016, a Volvo semi outfitted with Otto hardware and software made the world’s first
autonomous truck delivery, hauling 50,000 cans of Budweiser over 120 miles in Colorado. Otto’s hardware works on any truck with an automatic transmission with only minor retrofit. Otto’s system offers Level 4 autonomy, which means that it can conduct the driving task and monitor the driving environment, and the driver need not take back control, but the system can only operate in certain environments and under certain conditions.

The Otto technology could bring a future where trucks operate autonomously on the interstate then stop at transportation hubs where humans drive them the last mile.

While the automation technologies being developed by Freightliner and Otto have potential in the long-term, others are experimenting with automated truck platooning technology which likely has more near-term potential. Platooning uses a relative low level of automation. The driver of the lead truck is in control, and the other trucks in the convoy follow automatically and closely behind.

Omnitracs LLC, a truck fleet services company, has partnered with Peloton Technology, a developer of autonomous systems for truck firms, to develop platooning technology that will allow Omnitrac’s customers to run small, partly automated truck convoys. Additionally, a coalition in Texas was recently approved to conduct testing on the open road in order to put the platooning technology up against real life scenarios. Testing is scheduled to start in January 2018.

Despite sensationalist and misleading headlines suggesting that self-driving vehicles are going haywire, most accidents involving self-driving vehicles have not been caused by the self-driving vehicle’s hardware or software. For example, in May 2016, Tesla’s “Autopilot” software (Level 2 autonomy – automated control of braking, steering, and torque of drive motors) made national headlines when Joshua Brown, driving a Tesla Model S, crashed into the side of a tractor trailer turning across his path on a divided highway, becoming the first person to die in a partially autonomous car. Brown’s Tesla was in “Autopilot” mode at the time of the crash, and neither human nor computer hit the brakes.

The NHTSA opened an investigation into how Autopilot works and its role in the crash, and in January 2017, concluded that “[a] safety-related defect trend has not been identified at this time and further examination of this issue does not appear to be warranted.” According to the NHTSA’s report, crash rates for Tesla vehicles have plummeted 40% since Autopilot was first installed.

The NHTSA’s regulations do not generally prohibit or uniquely burden automated vehicles. To the contrary, the NHTSA has embraced autonomous vehicle technology because it believes that the technology has the potential to make roads safer. To accelerate the development of the technology, the NHTSA issued guidance on automated vehicles in September 2016. The guidance includes a model state policy, and a 15-point safety assessment for manufacturers, developers, and other organizations to guide the safe design, development, testing, and deployment of automated vehicles. Although the model state policy is not binding on states wishing to take action on autonomous vehicles, it is offered to ensure the establishment of a consistent national framework rather than a patchwork of incomplete laws.

At the state level, state vehicle codes probably do not prohibit - but may complicate - autonomous driving. Although there is no state statute that expressly requires that a vehicle have a driver, state statutes appear to assume the presence of licensed human drivers. Additionally, rules requiring safe driving have uncertain application to autonomous vehicles and their users. Finally, state requirements regarding following-distance may also restrict the lawful operation of platooned vehicles.

Currently, five states - California, Florida, Michigan, Nevada, and Tennessee - have passed legislation authorizing the operation of autonomous vehicles under certain circumstances. Six additional states and Washington D.C., have enacted legislation related to autonomous vehicles. Most recently, Michigan enacted a law that explicitly excludes platooned vehicles from the requirement that commercial vehicles maintain a minimum following distance of 500 feet.

As recognized more broadly by the NHTSA, autonomous truck technology has the potential of making roads safer. In 2014, 3,744 large trucks (GVWR > 10,000 pounds) were involved in fatal crashes, 88,000 were involved in injury crashes, and 346,000 were involved in property damage crashes. Singles (tractors pulling a single trailer) accounted for 62.5 percent of the large trucks involved in fatal crashes in 2014. At least one driver-related factor was coded for 33.6% of the large trucks involved in fatal crashes. “Speeding of Any Kind” and “Distraction/Inattention” were the most common driver-related factors, at 7.1% and 6.2% respectively. Whether through technology that corrects for human mistakes, or through technology that takes over driving responsibility, autonomous truck technology could dramatically decrease the number of crashes tied to human choices and behavior.

Additionally, autonomous truck technology has the potential to allow for greater fuel efficiency for trucks, address
the chronic shortfall of qualified commercial drivers, reduce labor costs, improve operational efficiencies, and reduce emissions.

To help ensure that these safety, economic, and environmental benefits are more likely to emerge from current streams of innovation, all interested parties must continue to work cooperatively.

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