

University of Wales Trinity Saint David

Wales Institute of Science and Art



Prifysgol Cymru

Y Drindod Dewi Sant

University of Wales

Trinity Saint David

Safety of Autonomous Vehicles

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Matthew Starke

2200996

Contents

1	<i>Introduction</i>	1
1.1	Aims	1
1.2	Objectives	1
2	<i>Literature Review</i>	1
2.1	General Autonomous Safety	1
2.2	Fully Autonomous vs Partial Autonomous driving.....	2
2.3	Autonomous Vehicles are safer for the roads?.....	3
2.4	Fully Autonomous Vs Semi-Automated.....	3
3	<i>Results and Discussion</i>	4
4	<i>Conclusion</i>	4
5	<i>References</i>	4

1 Introduction

This report will investigate the overall safety of a modern-day autonomous vehicle that could soon be commonplace on our roads. The report will decide whether the future of autonomous vehicles is here yet or if we still have a long way to go from a safety point of view. This is quite a lot of uncertainty in the world today surrounding the topic of self-driving/autonomous vehicles and what the future holds for them. There are many legal aspects and regulations these specific vehicles will have to abide by and test they will have to pass before being put to market and let into the public domain for consumers.

1.1 Aims

My aim for this report is to investigate the main safety elements of autonomous vehicles in detail, in order to determine how the overall safety element of these cars are in the real world. I will also aim to compare these findings to the general safety concerns found with everyday driving in ordinary cars to see if these outweigh any potential concerns that may arise from autonomous vehicles being on our roads in the very near future.

1.2 Objectives

The objective of this report is to find and use credible and valuable research methods, backed by trusted sources to find the best research and data I can gather to give an honest and valuable response to my report title.

2 Literature Review

2.1 General Autonomous Safety

Ensuring the safety of fully autonomous vehicles requires a multi-disciplinary approach across all the levels of functional hierarchy, from hardware fault tolerance to resilient machine learning, to cooperating with humans driving conventional vehicles, to validating systems for operation in highly unstructured environments, to appropriate regulatory approaches. Autonomous vehicles are becoming much more prevalent in today's world, with main 'off the shelf' cars you can buy these days coming with lots of autonomous driving technology as standard. For example, Tesla themselves have provided credible data to show how they believe safety concerns surrounding self-driving cars should not be looked upon too closely. They say that 'In the 4th quarter of 2021.... we recorded one crash for every 4.31 million miles driven in which drivers were using Autopilot technology (Autosteer and active safety features). For drivers who were not using Autopilot technology...., we recorded one crash for every 1.59 million miles driven. By comparison, NHTSA's most recent data shows that in the United States there is an automobile crash every 484,000 miles.' (Tesla.com, 2021, Available at: <https://www.tesla.com/VehicleSafetyReport>, visited 15th November 2022)

2.2 Fully Autonomous vs Partial Autonomous driving

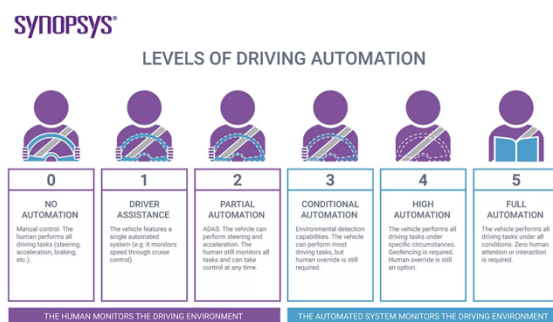


Figure 1, Shows the levels of autonomous driving (Synopsys.com, available at: <https://www.synopsys.com/automotive/autonomous-driving-levels.html>, Visited 15th November 2022)

There are different levels of autonomy when it comes to autonomous cars and autonomous driving capabilities. Figure 1 above displays the % levels of driving automation, ranging from no automation at all where the driver is fully in control, to full automation, where the car will do everything for you. Therefore, this displays how there can be different levels of safety risks depending on what part of the ‘automation scale’ a specific vehicle is on. In the article, ‘Synopsys.com’ go on to say that Level 5 vehicles do not require human attention.... the “dynamic driving task” is eliminated. Level 5 cars won’t even have steering wheels or acceleration/braking pedals. They will be free from geofencing, able to go anywhere and do anything that an experienced human driver can do. Fully autonomous cars are undergoing testing in several pockets of the world, but none are yet available to the general public. (Synopsys.com, available at: <https://www.synopsys.com/automotive/autonomous-driving-levels.html>, Visited 15th November 2022)

This statement provides a feeling of how seriously the safety elements of these cars is being taken to the fact that thorough testing is still undergoing and not 1 fully autonomous car is on sale to the public yet, bearing in mind the quite substantial amount of time autonomous vehicles have been in design/testing production for.

2.3 Autonomous Vehicles are safer for the roads?

As much as people and certain research suggests that autonomous vehicles are more likely to be dangerous to modern day driving society and a 'death trap' on the world's roads, these allegations may be premature and autonomous vehicles could prove safer for passengers and other road users due to removing and eliminating the driver error which is the cause for many crashes on today's roads. A statement from the NHTSA (United States Department for Transportation) says, 'Vehicle safety promises to be one of automation's biggest benefits.... Higher levels of automation, such as automated driving systems, remove the human driver from the chain of events that can lead to a crash. While these systems are not available to consumers today, the advantages of this developing technology could be far-reaching'. (NHTSA.gov, Available at <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>, visited 18th November 2022). These comments come from quite a credible organisation agency within the US government's department for transport, therefore I believe these comments 'shouldn't' be taken with a pinch of salt and instead viewed in a positive way for the future of autonomous vehicles.

2.4 Fully Autonomous Vs Semi-Automated

The main type of automated driving we see in current day is semi-automated vehicles, which allow a certain level of self-driving capability, we still require the driver to be aware and alert of their surroundings should anything go wrong with the car's system. "In the case of driver's assistance systems, the driver monitors the technical system and must pay close attention to the traffic situation. The driver is supported when driving. The current Mercedes-Benz models are available with a system called "DISTRONIC PLUS with Steering Assist and Stop&Go Pilot" This system supports the driver in guiding the vehicle both laterally as well as longitudinally. The driver still needs to follow events on the road, and the steering assist system deactivates after a specified time if the driver takes his hands off the steering wheel." (Andreas Reschka, 2016, p475). Therefore, even if fully autonomous vehicles are not in a position for 'production' yet, people can still buy semi-automated vehicles to have that 'self-driving' feeling they may be looking for, but whilst still maintain a decent level of safety for themselves and others.

3 Results and Discussion

Taking all my research and information above into account, it is somewhat clear that autonomous driving vehicles can in fact be a safe place to travel in the future, due to its ruling out of human driver error that is the cause of many accidents on today's roads. However, we are in a position where the future is just not here yet. The current semi-autonomous vehicles on sale today provide a sense of self driving but are not fully autonomous yet for this reason, due to the technology not being 100% there yet to guarantee a safe travelling experience for anyone looking at purchasing such a vehicle. Self-driving vehicles are the future and a massive leap forward for the car and travelling industry, to get more people from one place to another.

4 Conclusion

To conclude my findings, the overall safety of autonomous vehicles is not here yet and therefore fully autonomous vehicles can be considered 'unsafe' at this current time and their current point in production. This doesn't come at much of a surprise due to the nature of the technology being very new and being a learning curve for all current car engineers and manufacturers to learn to best put the technology into practice in the best possible way for the market and consumers. I believe if this study/report was to be conducted again in 5-10 years' time, the research and findings would be different and the overall conclusion to the question would have a different outcome. If I was to do this report and research again in the future, I would most likely receive different results and possibly a whole new outlook on the topic due to the progression of research and technology in this field as we move into the future. Therefore, having more sources of research and information to assist any future reports on this topic.

5 References

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