

Autonomous Car Equipment

Autonomous cars are the future of our transportation. The goal is to provide a safer driving environment where every car binds by the law. In order to confirm that autonomous cars are safer than automated cars, we must decrease the accidents an autonomous car can cause. This is achieved by looking at each individual piece of equipment installed into the car. In many cases, the lack of knowledge on autonomous cars has resulted in (bad) consequences. One of these problems, which occurred recently, is an Uber accident which resulted in a death of a pedestrian. To improve the functionality of autonomous cars, I propose that there should be research done to the equipments installed into the car such that there will always be a back-up plan in the case that it malfunctions. By the end of this research, I hope to understand the equipments installed into autonomous cars and how to increase their functionality so that it does not make the same errors as automated cars. For the research which I propose, autonomous car developers will be looking at the hardware in autonomous cars and ways to improve its functionality.

One of the major objectives of autonomous car is to solve traffic issues. The reason behind this is that traffic states that a lot of people are driving. This increases the chances of car accidents. According to association for safe international road travel, about 1.3 million people die in car accidents per year with an additional 20-50 million people injured. Majority of the accidents involve young adults whom range from the ages 15-44. With autonomous cars, the accidents should decrease since young adults are usually the ones who drive when they're drunk. They're also not experienced with the law and moral rights which is not required for autonomous cars. Autonomous cars can help young drivers with their decisions, especially the bad ones such as drinking and driving. This option is only available if autonomous cars work as well as we hope it does. Richtel and Dougherty explained in their article "Google's Driverless Cars Run into Problem: Cars with Drivers," that autonomous cars cause accidents only when there are reckless drivers who do not bind by the rules. This relates back to how autonomous cars will not be "reckless drivers" unless a function in the car malfunctions. With the decrease of "reckless drivers" on the road, there should be less car accidents and thus, a decrease in injuries and deaths in terms of driving. The research which I propose will go further into detail on how the program will work such that they will work in the most efficient way possible. With that said, working more efficient means that autonomous cars are not reckless as young adults.

As of today, there are civilians who own autonomous cars, but there are also companies who use them. An example of companies who use this service is Google; Who uses autonomous cars for their Google maps service. Since Google is using autonomous cars to profit society in

the long run, it indicates that trucking corporations can use autonomous cars to replace jobs such as truck driving. This will only work if autonomous cars are as safe as we state it is. If autonomous cars malfunction more than the car accidents of automated cars, society would not benefit from this technology. An example of a company using autonomous cars is Uber. According to Beene, there was an Uber accident which occurred because the built-in sensor broke. From our knowledge of autonomous cars, they can definitely improve on the hardware installed. By improving the hardware, autonomous cars will less likely make similar mistakes as the Uber car did. Although the cars are programmed to be as cautious as possible, if any hardware malfunctions, there will be a lot of damage done. In the case of the Uber, the car did not warn the driver that a part of the car was not working, thus resulted in death.

All programs have some form of inaccuracies including autonomous cars. Daily mentions in his article "Self-Driving Cars." That, Baidu a company in China, is installing features into autonomous cars which includes obstacle perception, route planning, cloud simulation, HD maps, and end-to-end learning. He also mentions that the cars will have deep learning capabilities so that previous mistakes will not be made again. Although these ideas sound very nice, there are many ways these features can be implemented. Only one of those implementations will be the most efficient and safest. In the case that the feature malfunctions, autonomous cars can result in accidents that is worse than accidents caused by automated cars. Recently, an Uber driverless car killed a pedestrian whom was crossing the street. Beene explains that the car did not slow down nor swerve while hitting the pedestrian with full force due to the built-in sensor malfunctioning. These kinds of malfunctions can occur with other equipments installed in the car. Assume that the GPS malfunctions, the car can drive into an obstacle. Also, GPS recommendations are not always up to date. If an autonomous car was to follow those navigations, it would be very inefficient and could lead to harm the passenger. To sum this up, there are many flaws in the hardware installed into autonomous cars. There are a few flaws which we know exist but there are definitely more which we should look into.

As of today, we do not know what would occur if an equipment installed into autonomous cars malfunctions. This research proposal aims to figure out what would occur in such cases so that the Uber accident will not recite. There are a few options which autonomous car developers can do to gain this information. One of the many options is to have more people and companies use them and record the results. This is not the best option because equipment malfunction will result in (bad) consequences which we do not want, especially on the road. An alternative option is to test each equipment individually. Suppose we install a sensor into an automated car, even if the sensor malfunctions, there will always be someone who can prevent any accidents from occurring. After a while of testing each equipment, we will gain the average amount of time it takes for an equipment to malfunction. Thus, we can suggest to consumers of autonomous cars to have check-ups on their car in a certain amount of time. We can also test autonomous cars with back-up drivers so that the driver can take over when required. Along with

the testing, each equipment must be looked at individually and examined for bugs which it may contain. After we figure out the bugs in each equipment, developers can then piece the equipments together to build an autonomous car that is less likely to malfunction.

The goal of autonomous cars is to provide a safer and better environment. This is not possible unless autonomous cars are as safe as the developers state they are. One factor which we must consider is the equipments installed. With functioning and efficient equipments, autonomous cars will less likely result in car accidents. The goal is to provide less to none car accidents compared to automated cars. Although there are autonomous cars in the streets today, not all the equipments are rightfully tested. This resulted in the Uber car accident since the built-in sensor did not function accordingly. Since autonomous cars are new technologies after all, we do not know if it will be safer than automated cars, but what we can do is make sure that it works efficiently so that it will not cause more damage than it could. In conclusion, equipments installed into autonomous cars are not at their best state. Thus, they can be improved by figuring out the flaws they have and modifying it accordingly.

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