ETHICS OF AUTONOMOUS VEHICLES

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ABSTRACT

Right from the beginning of time, transportation has played a very crucial role in the evolution of mankind. Considering the advancements throughout history. Technology has played an essential part, be it from the invention of the wheel to building rockets and spacecraft. One such advancement is AUTONOMOUS VEHICLES. Autonomous Vehicles might be the greatest evolution in the history of transportation till date. Self-driving cars and Connected and Autonomous Vehicle (CAV) are a few of the many names that Autonomous Vehicles are known by.

Autonomous Vehicles are capable of sensing their environment to move around safely with little or no help from humans. This makes everything in transportation easy as the number of accidents will be reduced and time consumption and chaos due to traffic jams can be avoided. Although Autonomous Vehicles will be used only to transport people from one point to another, they still can be used for vicious purposes such as harm or even kill other human beings. This is where Ethics becomes an important part of an Autonomous Vehicle. These Autonomous Vehicles may not always function upto the mark, but with ethics programmed into them, the damage caused by these Autonomous vehicles can be kept to a minimum or hopefully even avoided at certain points in time. There is no doubt that operating an Autonomous safely is of the utmost importance to each and every one. Considering the laws that we have today, machines are never blamed for the mistakes caused due to malfunctions. The crimes fall either on the person who invented the machine or the company that has control over that invention or whatsoever. Coding ethics into AV's will make it easier for them to choose between saving pedestrians or sacrificing itself and its operator. The research methodology used to write this report is theoretical. A lot of paper has been carefully analyzed and studied to finalize this paper.

KEYWORDS: Autonomous Vehicles.

AUTONOMOUS VEHICLES

Its a dream of many that Autonomous Vehicles dominate the roads of the world shortly. Autonomous Vehicle is an advanced automobile system that consists of specific sensors and hardware to help it navigate around without human intervention. Autonomous Vehicles include sensors such as Radar, Lidar, Sonar, Odometry and inertial measurement technologies for its navigation. Modern vehicle companies all over the world provide partial automation features that include lane control, speed control and emergency braking. Autonomous control implies the control of performance under exceptional uncertainty where the AV should be able to operate itself and compensate for system failures without external or internal intervention. Implementing the

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communication network in these AV's help them in mapping the vicinity for collision avoidance and farther away for congestion management all by themselves. Advanced control systems included in the AV's help them interpret the information from the sensors and allow them to map the area and plot an appropriate navigation path along with recognizing obstacles and relevant signs needed.

LEVELS OF AUTONOMOUS VEHICLES

Autonomous Vehicles are classified into six different levels according to the requirement of human intervention to help it overcome its crisis. Each level is different and advanced than the older levels. These levels help companies categorize their Autonomous Vehicles for further advancement.
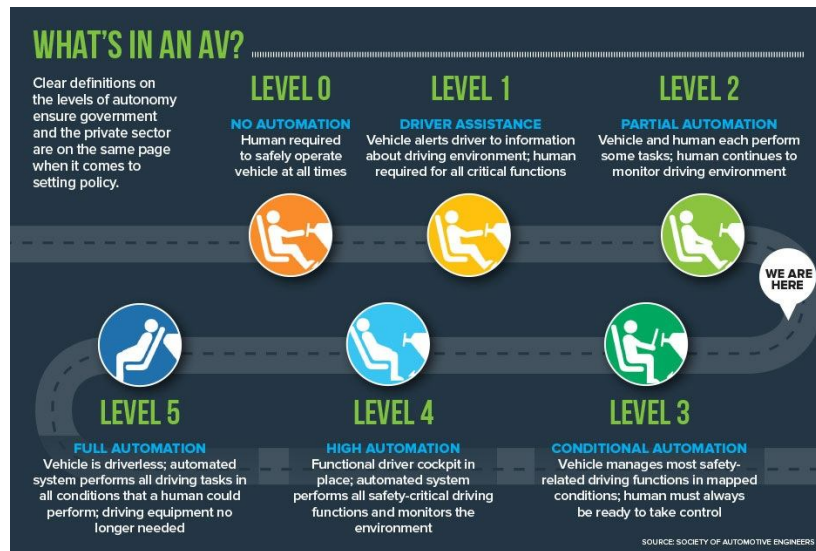
CASE STUDY I: The UBER Autonomous Vehicle

UBER first announced its intention to create an autonomous vehicle in February 2015. Soon after its announcement to create its first Autonomous Vehicles, UBER was invited by the governor of Arizona, Doug Ducey, to test their initial tests in the state. The first fleet of Uber's autonomous vehicles consisted of 20 ford fusions developed by a team of researchers from Carnegie Mellon University in Pittsburg, Pennsylvania. Soon after building its Autonomous vehicle, Uber started showing off to the local media in order to advertise by giving them free rides around the city. For all of these rides, Uber always had a trained operator in its vehicle to take control of the car at any moment needed. Following their initial experiments, Uber started using the VOLVO XC90 for the next stage. This fleet consisted of 100 VOLVOS that were used for testing in Pittsburg after mayor Bill Peduto's invitation. Uber took advantage of this and decided to test its cars to the extreme, even to a point where they built an artificial city called Almono on the outskirts of the city to achieve their test results. Even though uber kept testing their cars, again and again, they still met with a lot of accidents. One such incident is the Tempe Accident that happened in March 2018 where one of UBER's Autonomous vehicle hit and killed a pedestrian who was walking outside a crosswalk at night. There are numerous reports on that incident where reporters kept blaming the company and the operator who was supposed to take control of the car. The car was in autonomous mode at the time of the accident and the in-built emergency braking system of the Volvo car was disabled due to interference caused by the usage of the same radio wave frequency. The vehicle detected that an emergency braking was needed before 1.3 seconds to impact. The camera on the dashboard of the car that recorded the whole incident showed that the operator, a female, was busy with using her phone to watch some online sit-com. Had she been a little more attentive, then probably Uber could have avoided this whole accident.

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The TESLA Autonomous Vehicle

Tesla's Autonomous Vehicle is an advanced driver assistance system feature that includes lane centering, adaptive cruise control, self-parking and the ability to summon a car from the parking lot or the garage. The first autopilot offered by Tesla was on 9th October 2014, where Tesla's Model S was used for the testing following which Tesla's Model X was chosen. These autopilot featured cars were included with a tech package that offered drivers a semi-autonomous feature and parking capabilities. Tesla initially used Software version 7; soon, Tesla then Upgraded to 7.1 and included advanced parking capabilities in this version. On August 31st 2016, Tesla released a new version 8.0 that processes radar signals to help navigate the autopilot cars in low visibility.

Fatalities of Autonomous Vehicles

Below listed are the few of the many accidents that occurred during the testing of these autonomous vehicles.

| Date	Level of AV	Place	No. of Fatalities	Company	Notes
18-March-18	Level 2	Tempe, USA	1	UBER	Pedestrian Fatality
20-January-16	Level 1	Hebei, USA	1	TESLA	Driver Fatality
07-May-16	Level 1	Florida, USA	1	TESLA	Driver Fatality
23-March-18	Level 1	California, USA	1	TESLA	Driver Fatality
01-March-19	Level 1	Florida, USA	1	TESLA	Driver Fatality
19-September-19	Level 1	Florida, USA	1	TESLA	Driver Fatality

Ethics of Autonomous Vehicles

Coding an Artificial System with the ethics of that of humans is a wonderful achievement. Ethical judgments are a tricky subject as the system first needs to understand the factors that include a standard form of judgment, the environment included and the relationship between the two subjects without which it would make an artificial system hard to decide. Cognitive Scientist and Canadian Philosopher, Paul Taggard, Ph.D., introduced a few issues to now confront with respect to programming ethics in AI (Brown, 2019).
- ✓ Ethical theories are highly controversial.
- ✓ Acting ethically requires satisfying moral values
- ✓ to build an AI that behaves ethically, right and wrong must be programmed precisely.

Trolley Dilemma

Imagine that you are standing at a railway track intersection and are given the control to change the tracks of the oncoming train. The only issue here is that on one track, five people are tied to the tracks and on the other track, one person is tied to the track. Now it's up to you to decide on which track you let the train pass. You can either kill all five members or you can kill one person and take responsibility for that death as the train will move towards the track where there are five people tied to the track. Now, this is just a theoretical dilemma that has led to a lot of researches before coding ethics into an AI as the system will crash just before it makes up any judgment and decision. The diagram below will help you understand the dilemma even better.

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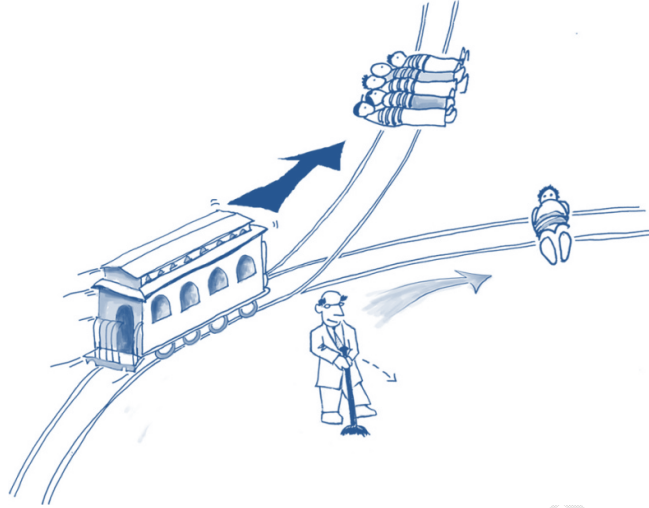
CONCLUSION

Technology will always continue to progress and provide vast advancements and opportunities to human enthusiasts to reap the fruits of benefits. Improved and more advanced systems will one day eventually take control of the future. Artificial intelligence will play a very significant role in the advancement of technology. But by then, hopefully, coding ethics into an Artificial system will be possible and accomplished. As things move forward, we must be ready to ensure control of the systems and not just blindly trust a system and endanger the safety of humanity. More number of test should be made before the system is released and proper ethics coded so that Autonomous Vehicles may be a boon for human beings rather than a curse (Golata, 2019).

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