

AUTONOMOUS VEHICLES- FROM SCIENCE FICTION TO REALITY

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ABSTRACT

The automotive sector has changed a lot since the time when a first car rolled out of the production line in the United States. Due to this the automation sector has become a very interesting area of research upon and especially for automobile enthusiasts. In every decade we have seen some new inventions in the cars and each car-maker is investing huge money in such research and development of new technologies for their cars. For example, in 1960s the concept of electronic guided system came into being, then two decades later the world saw the first concept of what could an autonomous vehicle could look like, and it must be noted that it was way ahead of its time and was a major milestone in technology and we still use those but a bit in a modified form. Apart from the technological perspectives of those vehicles, they also have some legal issues which need to be looked up to.

This research paper will extensively deal on the legal side of those vehicles such as who will be held responsible during the time of an accident, the liability etc. The most important part of the paper is the owner's data that which are stored somewhere in the cars and how it could also breach the cyber security. The research paper will also look upon the Indian perspective of the automated vehicles that whether India is ready for such vehicles or not and what all kinds of amendments needs to be done in the Motor Vehicles Act, 1939 and other concerned laws. And lastly, it will also be discussing about how certain data are collected in the autonomous vehicles and how it could also be misused. Therefore, the future of the autonomous vehicles is pretty interesting in the coming times and will also help laying down the ambition of safe and comfortable transportation. As in the automotive world is said that *"the car that you arrive in, says everything about your personality"*.

Keywords- autonomous vehicles, cyber security, data collection, motor vehicles act, 1939, liability.

INTRODUCTION

The automotive industry has been improving and developing since the day when Henry Ford rolled out his first car the Ford Model T from the production line. There has been rapid rate of technological advancement in the automotive industry, there is a lot of things in our future but It's just limited by our thoughts and imaginations. Among these one the imagination that man ever did was of the autonomous vehicles or in other words the Driverless Cars. The concept of the driverless cars may sound some science fiction stuff but actually it's coming to reality in the time being. The driverless cars are now most probably to join the controversies of the unmanned drones and other digital surveillance devices. In the past years it could be seen that many automotive companies had tested their driverless cars and to some extents it was even successful. some of the leading automotive companies who have tested their driverless cars are Tesla, Mercedes Benz, Volvo and even Google is also testing their driverless car since the year 2009. So, this paper will deal with the issue that what would be the legal ramifications on the autonomous vehicles, the Indian Laws concerned with the autonomous vehicles, the global status of the autonomous vehicles and how the autonomous cars are concerned with cybersecurity.

The autonomous cars usually depend upon the information that they collect by the surrounding environment during travelling from point A to point B. there are number of ways by which they collect the information such as sometimes they use their own devices, obtain information shared by other vehicles, the connected devices or infrastructure.¹ Google was the first one to enter into the race of the autonomous vehicles category and they stated testing their driverless cars since the year 2009. During its trial period the Google cars was involved in 11 crashes but there was no human harm. In the year 2015, Google claims that their car has clocked more than 1 million miles on a public report during which they came across 2,00,000 stops signs, 6,00,000 traffic lights and more than 180 million vehicles.² Another leading company that clicks our mind when we hear the driverless cars is Tesla. Tesla in very short duration of time was capable of setting

¹ McMillan, *The Cybersecurity Implications of driverless Cars* (December 2016)
http://www.mcmillan.ca/Files/196067_The_Cybersecurity_Implications_of_Driverless_Cars.pdf accessed 23 October 2017

² Fergal Gallagher, Google's Self-driving cars have clocked 1 million miles (3 June 2015)
<http://www.techtimes.com/articles/57698/20150603/google-s-self-driving-cars-clocked-up-1-million-miles.htm>
accessed 23 October 2017

their foot tight in the electric car segment and now they played it all perfect in the driverless car category. They call their driverless car as “*Tesla Autopilot*”. This system of tesla allows the driver to rely wholly upon the autopilot mode of the car. They started giving this Tesla Autopilot system in their cars since the year 2014, and this all started with their “*Tesla Model 3*” and now which is followed by their “*Model S and Model X.*” Their autopilot mode functions on the Level 2 automated system by National Highway Transport Safety Administration (NHTSA).³ The driverless car functions on five different levels i.e., Level 1 (driver assistance), Level 2 (partial control), Level 3 (partial automation), Level 4 (high automation) and Level 5 (full automation)⁴ and Level 2 is one amongst them which is now being used by some of the automotive brands who are now entering into the field of autonomous driving.

THE LEGAL RAMIFICATIONS

It's quite obvious that this being an autonomous car will get involved into some or the other major or minor accident. In that case on whom will the liability all lie upon? The autonomous cars travelling from place A to place B depends upon certain instruments like, radars, lidars (laser surveying technology) and three-dimensional maps etc. They even use many sensors to identify the nearby surrounding and this is very obvious that these sensors will also malfunction sometime or the other. A perfect example for this situation could be the incident that happened while the testing of the Tesla Model S's Autopilot mode when the sensors of the could not identify the color of the incoming truck due to the bright daylight and which resulted into a major accident in which the test driver lost his life. Now coming back to the point of the legal ramifications, in this situation arises some of the main points which comes to mind such as, who would take the liability and insurance, standard of performance and car and the most importantly the privacy, data protection and cyber security which is considered to be of the utmost importance.

³ Tesla, <https://www.tesla.com/presskit/autopilot> accessed 23 October 2017

⁴ McMillan, *The Cybersecurity Implications of driverless Cars* (December, 2016)

http://www.mcmillan.ca/Files/196067_The_Cybersecurity_Implications_of_Driverless_Cars.pdf accessed 23 October 2017

Liability and Insurance

Referring back to the first point that when a driverless car gets involved into an accident, then whose liability will be there in that scenario. Well, herein it becomes very complicated to point out that whose mistake is here. Earlier when accident used to happen, the driver was adjudicated but now where the situation is such that where there is no driver rather the car runs fully on computer and software assistance, there is no chance that any driver could be adjudicated. Traditionally, when an accident would happen then in that time the underwriting criteria of the insurance companies was much dependable as it led to know that how many times the driver has been into an accident, how much distance he/she expects to drive, the place where the car is to be finally parked, the make, model, style and the manufacturer of the car and many other essential factors. But sadly, the same principle could not be applied to the future driverless cars, in the case with future cars the officials have to replace calculations of the individuals with issues such as hacking of cars, analyzing which part of the country will have better satellite imagery etc.⁵ This may also lead to identify the difference in quality of the driverless cars in different parts of the country. The very same example could be cited here also where the individual was killed in Tesla's accident during its testing. Accident of this individual highlights many of the unsolved issues for the manufacturers who are going up for the autonomous driving. In any of the accident where a driverless car is involved the liability is fall on the car manufacturer, the driver of the car sitting inside or the third party. In most of the cases it is being argued that the manufacturer or seller of the car must held liable for whatever the malfunctions the car faces due to which any of the minor or major accident occurs. The products liability law provides a legal framework to an individual for seeking remedies when any defective products cause any harm to any person or a property. This is a mixture of both tort law and contract law, tort usually covers the civil as oppose to the criminal wrongs. In a product liability lawsuit, the plaintiff applies basically multiple types of theories to obtain their damages award. The basic theories that a plaintiff applies is liability of negligence, strict liability, misrepresentation and breach of warranty.⁶

⁵ Preparing for a Driverless Future, Nishith Desai Associates (September, 2017)

⁶ John Villasenor, Products liability and Driverless Cars: Issues and Guiding Principles for legislation (Thursday, April 24, 2014) <https://www.brookings.edu/research/products-liability-and-driverless-cars-issues-and-guiding-principles-for-legislation/> accessed 24 October 2017

- **Negligence-** the product or the automotive manufacturers has to take due care during the manufacturing of the autonomous vehicles while their initial stages of the research and development or even in the production stages of the vehicle. The radars and the sensors which are installed in cars for collecting the data of the surrounding must function properly and it should also be capable of avoiding crash while it is in autopilot mode. In this case when an automated car gets involved into an accident and the person is injured in accident, that individual may directly attribute to the manufacturer of the car for their negligent failure to avoid a crash. We could understand it with a simple example an automated car is being tested on a wet road, but somehow or the other car is unable to avoid any frontal collision and a pedestrian is injured in a frontal collision, in that case he or she may argue that their injury happened directly due to the negligence of the car manufacturers who negligently equipped their car with automated braking system which at the time did not functioned.
- **Strict liability-** during the research and development and the production of the car, each and every manufacturer tries to focus on that, the products which they produce are safe enough for the purpose of conveyancing on public road and at time of any accident the automated braking system of the car would function properly. But taking all their precautions, there are some cars which comes out to be defective in nature. And if that particular car gets involved into an accident and the user of the product gets injuries due to the accident, in that situation the manufacturer would be ‘strictly’ liable for the damages to the user. In the year 1998, American Law Institute published ‘Restatement (third) of Torts: Product Liability. This particular was the third restatement which specifically addresses that any of the manufacturing defects, design defects, and failure to warn this all will be considered under “foreseeable risks”.
- **Manufacturing defects-** Suppose that there is a car manufacturer company which is indulged in production of fully autonomous vehicle. The vehicles which they produce are well-tested; all the quality control is perfect, market ready automatic braking software and other parameters of the manufacturers. Take an instance wherein, the manufacturer somehow or the other ships one of the prototype models of their car which is having some type of the flaw that doesn’t exists in the present manufacturing car. If that car gets involved into an accident, the person injured in that accident may claim for damages from

the manufacturer. In this situation the manufacturer may be held strictly liable for the damages arising of the manufacturing defect even if they took all the due care during production on the assembly line.

- **Failure to warn-** the manufacturers of the autonomous cars needs to pay special attention in the functioning of the warning system of their car. This is because if their warning system fails, then it may also lead to death of the passengers in car. For example, Mercedes Benz came up with their automatic braking system which they call them as “Distronic Plus”, the Distronic Plus system helps the car to apply automatic brakes in case of any frontal collision when the driver delays in applying brakes on themselves. They even mention that always pay attention of the traffic conditions even if the Distronic Plus is activated.

Standard of Performance and Care

If any accident happens which involves driverless cars for there needs to be proper rules and regulations. If we see the current scenario, we are now available with driverless cars but the irony is that there is no proper rules and regulations related to it. There should be certain parameters upon which the mistake of the parties could be identified such as speed of the vehicle, human involvement in case of any emergency, liability in case of damage to the third party etc.⁷ But the situation maybe different when an accident involves both autonomous cars at the same time. Well in that situation it will involve all the parties who were engaged in the assembling and manufacturing of the two cars whether it be both different companies. The involvement of both the parties will result in long list of plaintiffs and the defendant. The research and development of autonomous vehicles is not a new issue, it has been kept on taking place through a long period of time. For example, the traces of autonomous vehicles could also be seen in the cars of 80s and 90s era as since that time cars were started being equipped with certain technicalities such as cruise control, Anti-lock Braking System (ABS), Electronic Stability Control (ESC) etc. These functions worked autonomously as in cruise control vehicle used to move in a constant speed without any human interference, the ABS system prevented the vehicle from locking up of brakes and the ESC prevented car from the danger of roll over at the

⁷ Preparing for a Driverless Future, Nishith Desai Associates (September, 2017)

time of turning at higher speeds. But in the present situation the concept of autonomous vehicle is now all on its literal term i.e. that movement of car without any human involvement. We indeed had achieved this victory but the core point is that we have created such innovation but there are no proper laws related to driverless vehicles. So, this is the question that has no answer till now also.

Privacy, Data Protection and Cyber Security

As we all know safety and security of personal information is very important whether it be giving some sort of information on any online database or to an autonomous vehicle. The autonomous vehicle also requires an individual's personal information at the time when individual is buying that particular vehicle, it collects all the personal information. The data that are collected by the autonomous vehicles are interconnected through a central server, which is considered to be the most important. But the problem which arises out from here is that there is no legal provision or regulation which would protect the data collected from the vehicle. Autonomous cars are equipped with whole lot of sensors, radars and lidars which may result into violation of personal data violations. Extracting personal data of the owner of the car is not a big issue in automated cars, who they are, where they belong to, where they are going, where the car is usually parked etc. these kinds of information can be extracted out of the car. There are many unauthorized elements in our society such as hackers and terrorists, they may track our regular travel routes, alter records, they may evade into our privacy by tracking individual vehicle. If we see through a hacker's perspective then we may come to conclusion that a device which is connected to online server for a long time then the danger of cyber-attack on any device will be very high. Few years back hacking a car seemed to be like a science fiction movie or story but presently it has actually become reality. In July 2015, United States came up with bill which introduced with automotive cyber-security standards. In America, 'The Grow America' Act in Congress has laid down that hacking a vehicle is a criminal offence. This particular bill also lays down guidelines to the automotive companies to establish a real time monitoring to detect report and prevent any kind of cyber-attacks. FBI also pays special attention regarding to the autonomous vehicles as these could be used by terrorists to transport weapons from one place to another. If we take at a look at the safety of autonomous vehicles in America, National Highway

Traffic Safety Administration (NHTSA) is being working on the security protocols to protect the driverless cars from various kinds of threats, they are trying that how their cars can send and receive trusted messages from authorized places and even from the owner of the cars. Some of the automakers such as Volvo, Mercedes Benz, Tesla, and Google etc. have already took the liability of their cars to protect from such threats.

The PIPEDA or also commonly known as PIPED Act is a Canadian law which is related to data privacy. The Personal Information Protection and Electronic Documents Act (PIPEDA)⁸ is basically concerned with the protection of personal information in the use of commercial vehicle activities. In Canada, PIPEDA become as a law on 13th April 2000 and its motive was to promote consumer trust in electric commerce. Apart from PIPED Act in Canada, there are further more similar legislations which exist in other countries such as Alberta, British Columbia and Quebec. Hence, being an autonomous car, there can be huge risks of intrusion into the personal lives of the people because it collects data through various sources. The personal data can be utilized by the unwanted parties, they may adjust the route of the car according to their own wish due to which the car would pass through the way the hacker wants and may also steal the car.

INDIAN LAWS RELATED TO AUTONOMOUS VEHICLES

For getting into this discussion much further we need to look on the fact that are we ready for driverless cars in India? The reason for this type of question is that the self-driving cars totally rely on special sensors and many onboard computers to drive. But due to heavy traffic which each and every state of India faces, it could become difficult for conveyance of driverless cars. There is one more reason which could prove that driverless cars could be a tough decision, if suppose driverless cars makes their way to the streets of India then a lot of people would gather around to see a car with no driver on the driving seat and which may lead to some major accidents. Other than these reasons, there is one more possible reason, it's hard to believe but it is a fact that we Indians are not good in driving.⁹ Majority of the drivers in India do not follow traffic rules, do not have civic sense to drive on the public roads and more or less the list goes on

⁸ Personal Information Protection and Electronic Document Act, SC 2000, c 5.

⁹ Kunal Khattar, Are Indian Roads Ready for Driverless Cars, The Blog (April 11, 2017, 2:06 PM), http://www.huffingtonpost.in/kunal-khattar/are-indian-roads-ready-for-driverless-cars_a_22034856/

and on. These are also the factors that could lead to failure of driverless cars in the Indian Territory. There are certain legal provisions which are related to the driverless cars in the Indian laws. Some of the provisions are Motor Vehicles Act, 1939, Consumer Protection Act, 1986, Information Technology Act, 2000, Geospatial Information Regulation Bill, 2016.

Motor Vehicles Act, 1939

The most important thing that the MV Act lays down is that a motor vehicle may not be driven without a license and if anyone found driving without a license they he/she may be penalized for that and the other thing is an individual below the age of 18 is not allowed to drive a vehicle. Now the question over here arises that in case of autonomous vehicles, will the owner of the vehicle would still be liable for any mishap? Unfortunately, there is no proper provisions for the autonomous vehicles under the Motor Vehicles Act, 1939. For this, proper amendment would have to be made for accomplishing the different criteria for licensing for the autonomous vehicles. There are many issues that arise within this particular aspect only which will come in front of the law makers of India. First and the most important question that may arise is that the autonomous vehicles that functions completely by its own, so the individuals aged below 18 would be allowed to operate the vehicle or not. While on the other hand there is one more important question that as for now the registration of the vehicle that is mentioned in Section 41 of MV Act is the most important thing for conveyance of the vehicle on public roads, and the State Government looks over this aspect that no vehicle should move on the public roads without registration in interest of 'Public Safety'. So, over here the question arises that if the vehicle is autonomous then what would be the procedure of registration? So, if we are actually thinking of getting a driverless vehicle on the Indian Territory then first of all proper amendments should be done in the Motor Vehicles Act of 1939.

Consumer Protection Act, 1986

The thought of driverless cars really excites us a lot bit on the other hand there arises the most important question that if there is an accident then who would be held liable? If we take a look at the provisions of the various other countries concerned with driverless cars, where there is an

accident of driverless cars the manufacturers are held liable at first and even in the case of India also the manufacturers. There are many issues due to which an accident of autonomous vehicles may take place such as negligence, manufacturing defect, design defects, failure to warn, misrepresentation, unfair trade practices, breach of warranty and strict liability. These issues can be covered under the Consumer Protection Act 1986 (CPA). Moreover, the Consumer Protection Act even also establishes the right to consumer education that means that it will now teach or educate the consumer how to driver an autonomous vehicle and how not to panic and what to do in the situation of emergencies. In simple words it could be said that the driverless cars had made easier to find out that due to whom an accident had took place, it could be either by manufacturer or technology provider. This has reduced the chances of human error. The leading manufacturers of driverless cars like Volvo, Tesla, Google and Daimler AG's Mercedes Benz has took all the liability in case of any accident.

Information Technology Act, 2000

Basically, privacy and data protection would come under the Information Technology Act, 2000 commonly known as "IT Act" and Information Technology Rules, 2011. Within the Information Technology Act, 2000 section 66¹⁰ explains hacking as the situation where someone who, with the intent to cause wrongful loss or damage, or knowledge of the same, destroys, deletes or alters any information in a computer resource or diminishes its value or affects it in injuriously.¹¹ For protection of our privacy and data, necessary laws have to be incorporate. These laws should basically be concerned with the protection and responsible utilization of passenger data, and with increasing threat of hackers, cyber espionage, and warfare.

THE COLLECTION OF DATA IN DRIVERLESS CARS

¹⁰ If any person, dishonestly or fraudulently, does any act referred to in section 43, he shall be punishable with imprisonment for a term which may extend to three years or with fine which may extend to five lakh rupees or with both.

¹¹ Preparing for a Driverless Future, Nishith Desai Associates (September, 2017)

The thought of manufacturing a driverless car was a very good thought by the car manufacturing companies but they were not familiar with the consequences in the cyber security world. The automotive bodies did not ever think of by any hacker's perspective that a driverless car could ever be hacked. The danger of hacking of the car is more also due to the reason that car is always connected with internet and this will drastically increase the attack surface area of the vehicle. Due to hacking of the car, the hackers may do whatever they want, they may cause a lot of traffic by hacking, they may intentionally indulge into crashing of the cars etc. There was a statement given by Jan Mohr who co-authored a research report on driverless cars that "such incidents could demolish public confidence in autonomous vehicles overnight and undo years of costly research and development".¹²

Now the core question arises that how personal information does is collected in driverless cars? So, for this there is a very simple answer that the driverless cars heavily rely on external sensors installed on the cars such as 'Lidar', which is the most important sensor in a driverless car and was first used by Google in its car and other than Lidar they use lasers, radars and three-dimensional maps etc. There is a lot of risks in such cars and these risks are related to are personal information and security. When it comes to consumer safety, there arises one more issue of privacy and exposure to sensitive data. In a driverless car personal information can be easily stolen and this information could either be sold, leaked or even used by the hackers for blackmailing any individual. The driverless cars know anything and everything about the owner, it could be the places you daily visit, residential address, daily workplace and even the person with whom you often travel with, the car has each and every data. No individual can even think of leaking of their personal information. So, to be protected from such kind of issues the manufacturing companies should come up with concrete solution to tackle with such kind of issues and if we take a look into or Indian jurisdiction then we may find some legal remedies if somehow or the other personal information of an individual is leaked and this is available under Information Technology Act, 2000. But it is not enough; there should be more proper amendments in the Motor Vehicles Act which could properly legalize the movement of driverless cars and proper privacy legislation concerned with driverless cars. For example,

¹² Tripwire Guest Authors, *Security Nightmare of Driverless Cars*, TRIPWIRE (October 25, 2015), <https://www.tripwire.com/state-of-security/security-data-protection/cyber-security/security-nightmare-of-driverless-cars/>

Canada has PIPED Act which is concerned with privacy even in terms of driverless cars. So, these are some loopholes that need to be fulfilled.

If we take a look at the collection of data by a vehicle during its move from one place to another, then the data is collected by various sources as also mentioned above. Apart from Lidar, one more element plays an important role in the movement of car is the real-time location. Take a simple example, imagine if the car is on its move and is on autopilot mode the car would need to follow the lane (which starts by switching on the 'Lane Assist Mode') and this would happen only when the car would be able to know the real-time location, that at what place the car is travelling. Not particularly the 'Lane Assist Mode' depends on real-time location but each and every aspect of driverless car depends on real-time location. While Lidar on the other hand plays an important role in identifying the light and color of the surrounding atmosphere. Lidar is an acronym for 'Light Direction and Ranging'. Basically, it is a high-resolution, three-dimensional image of the vehicle's immediate environment to a distance of 200 feet.¹³ However, to understand the surrounding more accurately the Lidar is connected to further more data inputs. These data inputs include digital images, these helps in providing supplemental visual information like color and shape and GPS coordinates which helps the car in understanding its position on the road. Moreover, sonar and radar help in detecting the nearby object and other alien objects which may come on their way. If we see the recent scenario, now biometric data about the driver has been made mandatory in order to enhance the road safety and to prevent road accidents. This has been laid down in the recent report on connected vehicle, by the BC Freedom of Information and Privacy Association¹⁴ that the car manufacturers should be made sure that the car must have an inward facing camera and biometric sensors to monitor the driver's alertness and behavior. This could become a source of evidence at the time when an accident would take place either between two driverless cars or one driverless car and another normal car. So, these are the ways and modes how the driverless car collects its data and how the data of an individual is also recorded by vehicle.

¹³ McMillan, *The Cybersecurity Implications of driverless Cars* (December 2016) http://www.mcmillan.ca/Files/196067_The_Cybersecurity_Implications_of_Driverless_Cars.pdf accessed on 10 November 2017.

¹⁴ The Connected Car: Who is in the Driver's Seat, BC Freedom of Information and Privacy Association, at page 41

CONCLUSION

Since the time when the first petrol car rolled out from the production line made by Henry Ford, they have seen innovations in each and every era. As years kept on passing, much technological advancement kept on taking place, advancement in respect with safety of the passenger, the power of the engine, the build quality of the vehicles etc. Vehicles have been kept on developing in every phase of their time. The vehicles which we ride on today will definitely get much more advanced when it will go into the hands of the coming generations. Earlier listening or even thinking about driverless cars or autonomous vehicles was like any science fiction story or a James Bond movie scene. But now it has come to reality, many automotive companies had now come into the race of producing driverless cars like Tesla, Google, Mercedes Benz, Volvo etc. Driverless cars may sound something cool and enjoyable to be in but there are certain negative aspects which I guess still not got any proper solution to it. If we think about the conveyance of the autonomous vehicles in India, then in the current situation it is not at all possible because first and foremost there is no proper roads for conveyance of these vehicles and the traffic that India has, in such traffic where people jump traffic lights autonomous vehicles can never move from one place to another. If it does, this will end up with an accident which will further cause chaos in the citizens that these sorts of vehicles should not be allowed and all.

On the other hand, if we want that autonomous vehicles would be able to run successfully on Indian roads, so for that purpose a lot of amendments need to be done in the Motor Vehicle Act because this doesn't talk about autonomous vehicles or anything similar to that in any of the provisions within it. No doubt these vehicles are one of the outstanding innovations of mankind in automotive industry but then also it needs much more accuracy in terms of the privacy of data and the legal provisions concerned with vehicles. Driverless cars come up with whole lot of opportunities and even with risks and these risks are in the form of privacy issues and cyber security. All in all, the core point is that the manufacturing companies must look into the fact that how the personal information of the drivers could be protected. If the manufacturers successfully overcome this issue then only in real terms the concept of autonomous vehicles would be accomplished.

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