

Ethical Issues of Automatic Driving in the Society

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Abstract. Autonomous driving is a very hot development direction in the future. With the application of electricity and the development of technology, autonomous driving technology will also be widely adopted. This study discusses the ethical issues of autonomous driving in society from the perspectives of social exclusion and private issues. The results demonstrate that although automatic driving is an excellent technology, it still needs more time to improve the whole systems and hardware facility to provide the best experience for people.

Keywords: automatic driving, gasoline vehicles, electrical vehicles, privacy.

1. Introduction

With the development of intelligent transportations, high technology has utilized for transport to ensure it is efficient, safe and fast. Automatic driving is one of the key solutions. It is a very advanced technology that can not only control the vehicle, but also operate through motors, sensors, so that the car can move in the environment without human driving. However, to achieve this technique, there are different systems that need to be researched and developed such as automatic parking systems and speed automation systems. But power steering control is still a problem for us to solve. It needs to imitate human driving and dynamic models[1]. Because of that, so many complex algorithms are required to perform different maneuvers whereas the algorithms are not accurate enough to perform all the situations which is key to avoiding accidents. There is no doubt that full steering management for vehicle applications still has a long way to go.

Nowadays, almost all automatic cars use electricity as power rather than traditional gasoline. There are several merits[2]; first, the electron power takes up less space, so that more sensors and cameras can be installed in a car and a big battery can support complex operation systems including parking navigation systems and so on. Then, environment and resources are another reason. We all know the savings of gasoline is limited so that means there is one day we cannot consider gasoline as the main power source for all transports. With the usage amount of gasoline continueing to increase, the price has grown at the same time. People start to use the electron to replace gasoline. Definitely the maintenance of electronic cars costs less than the traditional cars for the reason that electronic cars only need to fix circuits and batteries. But problems also exist in the new power vehicles such as aging of batteries causing a fire.

This paper presents the ethical issues of automatic driving in society in three parts, the social exclusion problem, the private problem, and the autonomy problem.

This paper is organized as follows, the next part is to communicate the three big problems, and the final part is about the conclusion.

2. Automatic driving problems

2.1. Social exclusion problem

Automatic driving is a creative application combining motion and sensors. With this technology, the flexible braking system protects people in the face of collisions and other emergencies[3]. Algorithms are the key to computing the whole system. Automatic vehicle is the main direction of development in the future. People are yearning for the car without human driving[4], and it is safe and intelligent that human can reduce the risk of accident. When there is another car nearly in front of the car, the sensor can detect the obstacle and transform the information to the main systems. Then, the “brain” will stop the car at the safe time to avoid accidents. Absolutely, automatic vehicle starts to come into the market with different types.

However, a new problem has appeared; how do people charge the electron for the cars because almost all the automatic vehicles utilize the electron as power. To meet electric vehicle charging needs, many companies cooperate with the government. These companies hope to build charging piles around cities to ensure that customers can complete work, shopping, hobbies, etc. while charging. While electricity is cheaper than gasoline, infrastructure costs are much higher. Consumers therefore have to pay for it, which makes autonomous cars more expensive than conventional cars[5]. For the use of charging piles, advantages and disadvantages coexist[6]. The charging piles are just set up for several years, therefore the limit number of piles cannot ensure the customers to charge freely. People need to find a specific place like a gas station, and the number of charging piles is relatively less than the number of gas stations, which brings a bad experience to drivers. With the increasing number of electric vehicles, the daily charging behavior will inevitably affect the smart grid system. Reasonable management of EVs and charging stations can improve the stability of the smart grid’s properties, maintain the system’s energy balance, and so on. At the charging station, drivers need to park the car next to the piles to charge; it always takes a longer time than gasoline vehicles, depending on the scale of the battery. So, secure management of charging must be addressed because long time charging may cause the battery to catch fire owing to high temperature, which is a reason why people do not buy electric cars.

On the one hand, charging is cheaper than refueling, and the price gap between the two will continue to widen. People can recharge themselves while shopping, or parking their cars in a park to recharge, saving drivers time. On the other hand, the cost of charging can be higher than normal because many countries have time-out rules to prevent people from parking deliberately.

Additionally there are not enough charging stations in cities, let alone highways. With an electric car, it is very difficult and inconvenient to drive to another city to travel. Because the car can't get charging supplies in the process of telling the form.

Although electric vehicles have many disadvantages, they cause less air pollution. Electric vehicles are being widely adopted, and many countries are already deploying electric vehicle programmes[7].

However, sales of self-driving cars are still not overtaking gasoline cars.

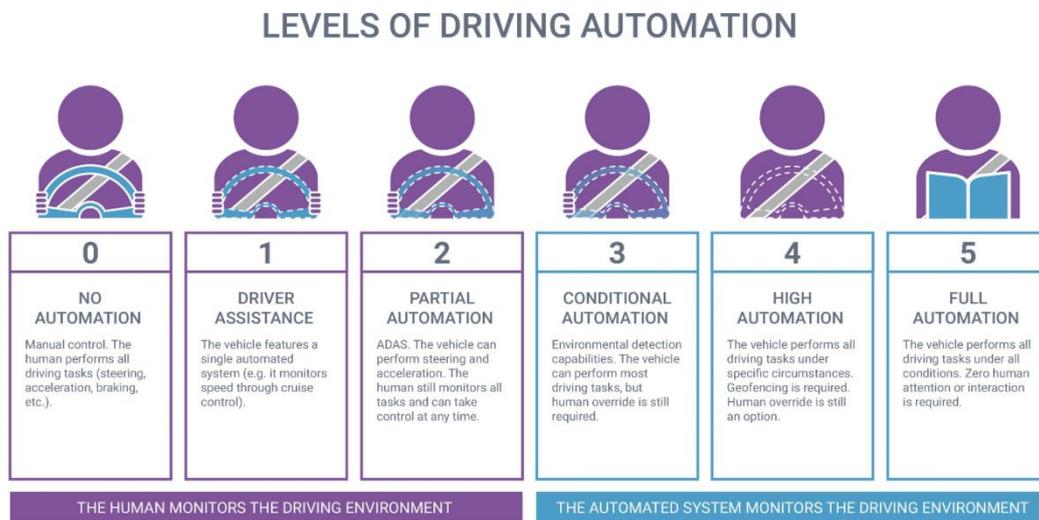


Figure 1. The level of automation driving.

The level of driving automation has been divided into 6 levels by the Society of Automotive Engineers (SAE), ranging from level 0 to level 5. As such, although a given vehicle may be equipped with a driving automation system that is capable of delivering multiple driving automation features that perform at different levels, the level of driving automation exhibited in any given instance is determined by the feature(s) that are engaged. Nowadays, most automatic vehicles are L0 to L3, which means they can not achieve full automation of a driverless car. Tesla is one of the most popular brands of new power vehicles and automatic vehicles. Their products are L2 and L3, so they still need to achieve the expected results of full driving automation. It is one of the main reasons for social exclusion. If the vehicle is not fully functional, consumers will not pay. Second, the safety of current autonomous vehicles is also an important factor. For consumers, price and functionality are not the first considerations, and safety performance is the primary factor in deciding whether to buy. Since 2013, at least 200 electric vehicle accidents have been caused by battery fires and loss of car control. This has led some consumers to be wary of driverless vehicles. Also, electric cars are not cheap compared to gasoline cars. However, despite the many shortcomings of driverless vehicles, consumers continue to choose new power vehicles with autonomous driving systems.

2.2. Private problem

To improve the level of safety and better navigation systems, vehicle manufacturers need to collect data from the customers and drivers. Some of the private information is leaking including the specific journey and location [8]. A smartphone is one of the tools of the electric vehicle control system. If the customer connects to the in-vehicle system by phone, the phone's data is transferred to the car development company. Therefore, the developers have a detection system called "OWL" that recognizes collisions and records the relationship between the collision parameters and relevant information for the car owner. These companies filter information to ensure vehicle owners have the greatest possible privacy protections. At present, many car owners are starting to bind their mobile phones and cars, which helps car owners avoid the risk of hacking into the system. But phone numbers are already bound, and insurance companies can analyze accident reports individually through a web database service.

Personal navigation services in vehicles can effectively provide and present high-resolution traffic information to drivers. At the same time, algorithms need to collect more data on unmonitored roads. A complete monitoring system is expensive to install, so traffic information on many roads is lacking. GPS is a system that covers timelines and locations, with devices such as loop detectors, cameras, and human reporting. With this device, traffic information on the road can be collected at minimal cost. But there

are still some problems in achieving more feasible flow estimation through simulation, analysis and experiment. This requires more accurate monitoring systems and correct data from customers, which also means an increased risk of personal information leakage. Because more users participate, companies have more and more accurate data. Inaccurate GPS positioning and fake data injected by malicious users can reduce the accuracy of the data. Especially in self-driving cars, since some technologies are not as mature as in traditional cars, manufacturers need to take a lot of information from experimentation and owner experience to change and improve their hardware and software. As it shows, in order to achieve the most secure system, the risk of leaking information is higher. In addition, the number of sensors in self-driving cars that support automatic steering is very large, which requires that the number of tests must be higher to ensure the highest degree of safety performance.

3. Conclusion

Two ethical issues have been proposed in this paper. From the information provided by reality, there is no doubt that the future direction of vehicles is automation. Humans are pursuing vehicle's becoming more intelligent, more convenient and faster. Meanwhile, humans are detecting a further level of automation in driving, which means one day we will be able to drive on the road without our hands. But there are still many systems and algorithms that need to be improved to ensure that they are safe enough to drive. Also, the supporting infrastructure needs to be perfected, which improves the charging speed and increases the number of charging piles.

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