

Research on the Responsibility of Automatic Driving Vehicle Accident

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ABSTRACT

Law is the minimum morality, and the formulation of law should have moral consideration. These moral standards are forward-looking. If we can fully consider the technical risk of automatic driving, we will provide directions and boundaries for the legislation of autopilot. Automatic driving technology is the latest application of artificial intelligence technology in the field of automobile. With the change of this technology, the civil tort liability of accidents caused by automatic driving vehicle has also changed. According to the international standards, the automatic driving vehicle can be divided into several stages. Only in the highest stage of technology can we completely realize the unmanned driving and eliminate the human factor, while in the lower stage, the existence of drivers is still needed. It still needs further consideration to what extent the automatic driving technology in different stages will affect the current responsibility system. Therefore, under the framework of the current law, the legal interpretation method cannot deal with the new problems brought about by the new technology. If the time for making new laws is not yet ripe, legal amendment is the most direct and feasible way.

Keywords: automatic driving vehicle, artificial intelligence, Autopilot, traffic accidents, tort liability

1. PREFACE

Artificial intelligence is the frontier and hot issue in the development of science and technology, which has gradually affected people's daily life. The intelligent technology of autonomous unmanned system is the key technology of artificial intelligence development. At present, autonomous unmanned system technology has been gradually applied to the automotive industry. Autopilot is also the focus of the development of the automobile industry at present, such as automatic cruise system, automatic braking auxiliary system, etc., has been applied to the driving behavior of automobiles. However, the development of autopilot has also challenged the current legal system, particularly the tort liability caused by accidents caused by autopilot has become a hot issue. Autopilot is regarded as the greatest safety technology invention in automobile history. However, from the existing and exposed traffic accidents of autopilot, autopilot is not absolutely safe, which makes it the focus of current scholars.

2. TRAFFIC ACCIDENT CASES OF AUTOPILOT CARS

2.1. Related cases

2.1.1. Google autopilot car and bus collision case.

On February 14, 2016, a Google autopilot car collided with a bus while it was autonomous on a road large enough to accommodate two cars running side by side in California. After investigation and analysis, it was found that the speed of the autopilot car was only 2 miles per hour at the time of the accident. Because the sensing system of the autopilot car informed the vehicle that there were sandbags in front of the vehicle, the system decided to change from the right lane to the left lane to continue driving. Unexpectedly, when changing the lane, it was the same as the bus that was driving in the same direction and reached 15 miles per hour. There was a collision. In the end, Google took the initiative to take all the responsibility for the accident and ended the curtain.

2.1.2. *Death case caused by Tesla Model*

On May 7, 2016, in Florida, the United States, a Tesla Model S vehicle running on the highway unfortunately collided with a tractor trailer preparing to turn left in the forward direction. The traffic accident caused the death of the Tesla car owner. After investigation, it is found that when a collision accident occurs between Tesla vehicle and tractor trailer, the Tesla vehicle owner sets the car to autopilot mode, and both hands leave the steering wheel of the car, which means that Tesla vehicle is in the situation of automatic driving. There are two main reasons for the fatal accident: one is that the Tesla owner failed to notice the white semitrailer in front of him in time; the other is that Tesla's intelligent system did not accurately identify the white semitrailer and other obstacles in front of it according to the preset procedures, so it failed to brake and stop in time, leading to the death of Tesla owner. Unfortunately, the play happened. Within two months after the accident, there were traffic accidents of Tesla Model S in different degrees on June 30, July 1 and July 9. After a detailed investigation of the accidents, it is proved that the occurrence of the four accidents is closely related to the autopilot mode of Tesla Model S. Accordingly, the AI vehicle should bear the corresponding responsibility for the occurrence of traffic accidents.

2.1.3. *Uber autopilot death case in the United States.*

On the evening of March 18, 2018, a vehicle with technical grade of level2 specially used for Uber unmanned driving test was involved in an automatic driving accident in Tempe, Arizona, USA, which resulted in the collision and death of a pedestrian crossing the road illegally. After the investigation and research, we found that there are three reasons for the accident: first, the pedestrian who was hit had the illegal behavior of crossing the road; second, although the unmanned vehicle in the automatic driving mode was equipped with a safety officer, but the safety officer did not find the abnormal situation and take braking and parking measures in time; third, the intelligent system of the unmanned vehicle did not recognize the front cross Pedestrians crossing the road brake. In this case, the illegal pedestrian crossing the road, the safety officer and the intelligent system of autopilot car all need to bear certain responsibility for the pedestrian death accident. The case is the first fatal case of Uber autopilot in the world. This incident has aroused the concern of all sectors of the society in the boom of artificial intelligent vehicle infringement.

2.1.4. *China Tesla auto driving fatal case*

On January 20, 2016, a Tesla AI car owner named Gao Yaning rear end sweeper in front of the Beijing Hongkong Macao Expressway in Handan City, Hebei Province,

China under automatic driving mode, resulting in the death of Gao Yaning, the driver of Tesla AI automobile, and the Tesla automobile was also seriously damaged. At the time of the accident, Tesla Model S was driving along the leftmost lane after entering the freeway. It can be seen from the picture recorded in the dash cam that a road sweeper stops at the side of the road in front of the vehicle with flashing signs. The vehicle in front of the model S turned to the right lane after seeing the sign. The model S did not change lanes, and there was no sign of slowing down or turning before the collision. After the inspection of the traffic police, also did not check the car brake and steering signs. Relatives of Tesla car owner Gao Yaning believe that the cause of the accident is the failure of Tesla's automatic driving mode, which led to the death of Gao Yaning. According to this, Gao Yaning's father filed an appeal court against Tesla's Chinese supplier for 10000 yuan, which has been accepted by Beijing Chaoyang District People's court.

2.2. *Case analysis*

The U.S. Transportation Administration has classified five levels according to the degree of vehicle automation: non automation, specific function automation, combined function automation, limited autonomous driving, and full autonomous driving. The automation of the first four levels of artificial intelligence vehicles is inseparable from the whole process control of people's will. Only the fifth level, that is, the stage of full autonomous driving, can be completely separated from people Control. Based on the degree of automation of AI vehicles in the United States, AI vehicles are classified into SAE0-5. From the SAE automatic classification table of unmanned vehicle automatic cruise, we can see that with the improvement of SAE level, the degree of automation is also improving, but the human driver's control ability shows a trend of gradual disappearance. In other words, SAE is positively correlated with the degree of automation and negatively correlated with the degree of human manipulation. At the level of 0-1, the driver is in the state of complete control of the vehicle, which is a general traffic accident, and the driving state of the vehicle is still a direct reflection of human will. At level 2, the human driver still controls the car, but the auxiliary facilities will control part of the acceleration and deceleration mode, and the rest of the driving orders are still issued by the human driver. At this time, this control mode only improves the safety of the car driving, and the artificial intelligence program will not intervene in the driving environment data entry and the whole driving of the intelligent car. The level 3 status is the degree of automation and control of artificial intelligence vehicles. If the separation point of human driver's control degree and the artificial intelligence program can realize the full operation of intelligent vehicles under certain modes, and conform to the use specifications, then the manufacturer shall be responsible for the accident when the intelligent program at this level controls the human intelligent vehicle and causes

infringement. The state of level 4 is highly automated, and autonomous vehicles have been able to fully control dynamic driving. However, in emergency situations, human drivers can still take over the car at any time. It is only normal for the artificial intelligence vehicle automatic driving program to control dynamic driving, and the manufacturer is generally responsible for the accident. The driver is no longer the driver, but the passenger. When the artificial intelligence vehicle infringes, there is no need to carry out complex infringement judgment procedure, and the manufacturer is directly responsible for the accident. There are more traffic accidents between artificial intelligence vehicles and pedestrians.

Through the analysis of the above four cases of AI vehicle infringement, this paper puts forward the following four questions: first, the AI vehicle has a certain sense of autonomy, and the program algorithm allows it to make its own self-choice about dealing with complex situations. Then, should the AI vehicle itself bear the tort liability when there is infringement? Second, emerge in an endless stream of casualties caused by artificial intelligent cars. Whenever such incidents occur, the social sectors are often concerned about the automatic driving system of the artificial intelligence vehicle as the actual driving procedure. Should the accident be subject to accountability at the same time? Third, how should the law determine the responsibility of the infringement of artificial intelligence vehicles? Is it the artificial intelligence auto driving program that actually drives, or is it the artificial intelligence program designer, producer, seller and user? Fourth, if the automatic driving procedures of AI vehicles should be punished, should they be manually destroyed or eliminated? At present, there is no corresponding conclusion, which should arouse the thinking and attention of jurists.

3. PARTICULARITY OF TRAFFIC ACCIDENTS ON AUTOPILOT CARS

Autopilot is a new generation of automobile which appears along with the development of artificial intelligence. It has the intelligent attribute that traditional automobile does not possess. This constitutes the particularity of self-driving vehicle. It is this particularity that makes the identification and commitment of traffic accident responsibility different from that of the traditional vehicle, and it is the foundation and premise of exploring the problem of tort liability.

3.1. The difference between autopilot and traditional cars.

In the past, traditional machines, including automobiles, whether advanced or not, regardless of their shape, had a common universal feature in the determination of legal liability, that is, the decision-making and functions of

machines can always be traced back to human beings. It is human beings who embed design, knowledge and programming into machines, or human actors are making progress on machines operation and control, that is to say, these machines, no matter how sophisticated and complicated, are only used as tools by human beings. However, the automatic driving vehicle, especially the fully automatic driving vehicle, has certain learning ability and autonomous decision-making ability, which has been detached from the boundaries of traditional tools or machines to a certain extent.

Autopilot is the product of combining artificial intelligence with traditional cars. The integration of artificial intelligence is the most distinctive feature of autopilot, and it is also the root of the particularity of automatic driving vehicle which is different from traditional automobile. Although the academia has not reached an effective consensus on the concept of artificial intelligence, they all agree that artificial intelligence is a subversive technology. Its state is to make machines think rationally, judge independently and act consciously like human beings. That is to say, machines with "human like intelligence" created by human intelligence are different from all traditional human inventions. In short, artificial intelligence is a kind of software and hardware technology that enables machines to perceive, think and act like human beings to complete a certain task. Self-driving vehicle is one of the typical products of artificial intelligence, and is an artificial intelligence product with automobile appearance. It has the ability of deep learning and data analysis, and can realize the specific transport function on the basis of automation.

The automatic driving vehicle is composed of deep learning algorithm, which is called "intelligent brain". The sensing device constitutes its "data blood". It can rely on the intelligent computer system equipped with the car and real-time electronic sensors such as real-time positioning, signal transmission, graphic processing, natural language interaction and traffic warning to deal with traffic information, make driving decisions, and use the Internet and big data. Collect road information, continuously "learn" progress, optimize driving route and enhance autonomous driving ability. The realization of these abilities is because the autopilot vehicle has the "driving brain" which simulates the structure of human prediction, control and learning ability. It can accomplish automobile cognition, online learning and predictive control by driving brain.

To sum up, the AI attribute of a self-driving vehicle is a kind of "personification property". Its performance is mainly embodied in three aspects: a. The self-driving vehicle is a direct carrier which affects the external environment by artificial intelligence, which takes the automobile as the physical form. b. It relies on artificial intelligence technology, whether it is data collection, analysis, update and processing, or decision-making, are not subject to human external control, with a high degree of independence or autonomy. c. It takes big data, neural network, machine learning and other technologies as the leading technology, obtains data and knowledge from the

outside world, completes its own continuous learning, accumulation and improvement, that is, it carries out continuous "deep learning" process, so as to realize self-adjustment to adapt to the change of driving environment.

3.2. Specific manifestation of particularity

3.2.1. *Infringement is decided and carried out by the machine*

The self-operation function of artificial intelligence system to autopilot is one of the essential characteristics distinguishing from traditional vehicle. Traditional automobile is a man-made tool in a complete sense. Its starting, driving, stopping and other behaviors are under the control of human beings. Just like axe and sickle, it is only a tool made and used in the process of understanding and transforming nature. It does not go beyond the category of tools and products in human history. It acts on all things under the control of human beings and is a "dead thing". Self-driving vehicle is not the same. Because of the disruptive technology of artificial intelligence, it is able to make independent decisions within a certain range. It is more like a horse or a hunting dog used by humans, or a slave controlled by a master. It is a "living thing". As mentioned above, on the one hand, autonomous driving vehicle can achieve autonomous decision making by deep learning algorithm and sophisticated sensing system. It is through the machine brain to simulate the cognitive ability of the driver's brain's driving experience memory and on-the-spot disposal, and uses the deep learning design self-learning module to learn the experience of human drivers to make autonomous decisions. On the other hand, although the procedures and algorithms of autopilot are created by human beings, the creator provides only the initial training data, and the system can acquire data and information through the deep learning algorithm during the process of using, and remember users' driving habits. New rules can be generated continuously through these new data, and then adapt and adjust continuously. In other words, intelligent system relies on computer algorithm rules, but creates its own rules through deep learning algorithm. Its behavior and decision-making are not completely within the preset program rules of human beings, and it has autonomy. For the traditional car, safe driving is the result of the driver's will control, and the accident also comes from the driver's dominant behavior on the car. However, for self-driving vehicles, because of their autonomy, some driving behaviors are not driven by human drivers, but are driven by the car itself. At this time, it is a question to consider whether the blame is attributable to the traditional vehicle drivers' subjective manipulation and attribution to the driving behavior of the self-driving vehicle itself. Therefore, from this point of view, the driving accident caused by the driving behavior

of an autopilot car is different from that of a traditional car.

3.2.2. *The subject of infringement is complex and extensive*

The automatic operation of autopilot is its essential feature, but it does not mean that it does not need human manipulation. Especially in the current low degree of automatic driving, the existence of human drivers is indispensable. Even more often it is the driving mode of human and automatic driving system. Compared with the traditional vehicle can only be driven by qualified human drivers, automatic driving vehicle has many driving modes, which is also one of its main characteristics, which also makes the subject of tort liability for traffic accidents special. The driving mode of autonomous driving vehicle comes from its different grades. This is based on the level of automation and the degree of liberation of human drivers. At present, there are two widely accepted divisions in the world, namely, the "five stage division method" of NHTSA and the "six stage division method" of SAE. On this basis, many theorists divided them into two parts.

Combined with these classifications, to facilitate research, we can classify the autonomous driving vehicle roughly according to whether the intervention of human drivers is needed. First of all, the car is divided into three categories: auxiliary automatic driving vehicle, fully automatic driving vehicle and free switching automatic driving vehicle. The auxiliary automatic driving vehicle is low in automation, and requires human drivers to actively intervene in some situations. Fully automatic driving is a high-level automatic driving without the need of human driver's control. Secondly, the driving vehicles can be divided into two categories, one is the vehicle with no automatic driving function; the other is the vehicle with automatic driving function. In the different stages of the automobile and the vehicle running in different conditions, the subject of the burden of driving is variable, so that it is necessary to identify and determine who is the subject of the responsibility for the auto driving automobile accident under these circumstances. This problem is also complicated. This is a special case that the traditional automobile has not faced. In addition, for the traditional automobile, the main body of responsibility may be involved in the traffic accident, such as the driver, the owner, the automobile manufacturer, the seller, the insurance company, etc. the responsibility sharing is only distributed among these subjects, that is, if the accident is caused by the illegal driving of the driver or the owner, they shall bear the responsibility, if the vehicle is missing The producer and seller may be responsible for the accident. In the automatic driving vehicle, the designers of intelligent systems, programmers of software and operators of Internet networks are added. These subjects can make the responsibility more extensive. These conditions make the determination of the liability subject

of auto driving vehicle accidents different from ordinary cars.

3.3. Causality is difficult to define

Machine learning is the core of artificial intelligence, which refers to the ability of machine to simulate human learning and improve skills. It is the unique function of AI products, and the self-driving car is no exception. As for the process of machine learning, simply speaking, it starts from the input data to the generation model as the terminal. During this period, the intelligent computer integrates, analyzes and evolves the empirical data through self-learning, so as to generate advanced cognitive results. This process is completed within the algorithm and is opaque, so it is also known as the "algorithm black box". This opacity gives the law predictability and certainty pose challenges. Specific to the automatic driving vehicle, there are three main aspects:

3.3.1. Driving decisions are made in the algorithm black box

The operation decision of autopilot is carried out in the "algorithm black box", and the input data information and the set program are easy to be known to the public. But the operation of the two in the black box and the models generated are difficult to understand. That is to say, the self-driving car can learn to decide independently by learning in the face of complex reality, so that it can exceed the established rules set by the programmer. Then, this process is completed in the algorithm black box and is opaque. As a result, it is difficult to explain which link has problems after the traffic accident, and the underlying causes of the accident may be difficult to find out, so it is difficult to identify the causal relationship. At present, the principle of proof of tort liability is "who claims, who gives proof". But the operation of these algorithms is that it is difficult for programmers to explain clearly, let alone ordinary car users, which will lead to the inability of proof and substantial increase of judicial cost.

3.3.2. Driving behavior may come from learning later

The machine learning algorithm enables the self-driving vehicle to have acquired learning ability. For example, the above-mentioned ability makes the behavior of an intelligent vehicle with automatic system not only because of the "innate" program setting, but also because of the "acquired" autonomous learning. If the former may be able to assign responsibility to the manufacturer or programmer, if it is obvious, the latter cannot. Again, it is simply because it is impossible for a manufacturer or programmer to know or control the experience of an autopilot.

3.3.3. Autonomous behavior of intelligent system coexists with driver's manipulation behavior

People will make mistakes and mistakes, so will intelligent systems. Both of them can cause traffic accidents. In an autopilot, the control of vehicle operation can be either an intelligent system or a human driver. It may also be a joint action between the two parties, or it may be one party control, and the action or omission of the other party has an impact on the driving of the car. When a vehicle is under full control, the traffic accident of an autopilot can be directly transferred to the party. However, when the control actions of the two parties coexist or alternatively occur, the causality of the accident can hardly be identified. For example, in an accident, if both the driver and the intelligent system make mistakes or faults, how can we find out who's behavior is caused by the intelligent system or the driver? How to deal with the accident caused by the concurrence of the two behaviors? All of these have brought trouble to the determination of accident causality. These new situations that arise due to the intelligent attributes of the self-driving car are not encountered in the traffic accidents of traditional cars, and the problem of tort liability for traffic accidents which is a new thing in the study of autopilot is also an unavoidable particularity.

4. EXPLORATION ON THE RESPONSIBILITY OF AUTOMATIC DRIVING VEHICLE ACCIDENTS IN VARIOUS COUNTRIES

Artificial intelligence objects, including autopilot cars, change the human world, profoundly affect the human legal system, and bring a series of challenges to the existing legal system. These challenges are not limited to a country or region, but rather global. At present, some international organizations and countries in the world have begun to explore relevant laws and regulations, and are committed to the construction and improvement of relevant legal systems, and have made certain achievements. Based on the particularity of autopilot, these exploratory achievements cannot be ignored in improving relevant laws and regulations. Therefore, in order to solve the legal problems brought about by the development of new technology in the automatic driving automobile traffic accident liability, it is necessary for us to analyze the extraterritorial related exploration results and gain useful reference.

4.1. International organizations

Many countries in the world are the countries that have signed the Vienna Convention on road traffic. The treaty has made restrictions on the driving vehicles, that is, the vehicles must be operated by the driver, which excludes the legality of "unmanned" driving. This regulation is not consistent with the automatic driving vehicle. For this reason, the United Nations Economic Commission for Europe (UNECE) formulated and published an amendment to the Convention in March 2016, which clearly defines the conditional use of autopilot technology, that is, "under the premise that the driver has the right to choose the switch of automatic driving technology or fully comply with the relevant provisions of the United Nations vehicle management regulations." Automatic driving technology is allowed to take the responsibility of driving vehicles in transportation. " This amendment has initially removed the legal obstacles for developing autopilot vehicles, including Germany and Japan. Autopilot is one of the typical products of artificial intelligence. It is a vehicle shaped intelligent machine. Its tort liability is a sub field of artificial intelligence robot's civil liability.

With regard to the infringement and liability of intelligent robots, on February 16, 2017, the European Parliament voted to adopt a legislative proposal on the civil legal rules of robots. In the same year, it issued the European Union rules of civil law on robots. These documents have more pioneer provisions on the civil rules of robots, which can be simply summarized into two aspects: on the one hand, intelligent robots have autonomy and learning ability. The stronger their autonomy, the more difficult it is to classify them as simple tools in the hands of human beings. The application of the existing legal liability system can only attribute the behavior and fault of robots to the producers and agents behind them. When users and owners make autonomous decisions, the existing legal rules cannot determine the responsible party and allocate the responsibility. In this regard, we can consider establishing compulsory insurance system and compensation fund system for intelligent robots, and require robot manufacturers and all people to buy such insurance. On the other hand, in terms of the subject of tort liability, a brand-new concept of "Electronic Person" is proposed, that is, we can consider giving highly intelligent robots the status of legal subject, recognizing that they are "Electronic People" with clear rights and obligations in law, and making them bear the responsibility for their own infringement acts. At the same time, the electronic personality is suitable for the robot to communicate with the third party. This will provide ideas for the study of tort liability of intelligent robots including autopilot.

4.2. USA

The legislation of autopilot in the United States is divided into federal legislation and state legislation. First, at the

federal level, NHTSA promulgated the Federal Automated Vehicles Policy in September 20, 2016, which mainly stipulated the quality requirements of the automatic driving vehicle, the adjustment of the current regulatory regulations, the application of the public road test, and the safety assessment. Although it does not directly stipulate the responsibility problem, the regulations on the safety standards of self-driving vehicles can provide some reference for the proof of product liability. In September 6, 2017, the antithetical couplet of SELF DRIVE ACT was approved by the house of Representatives. The bill mainly stipulated the legislative priority of the federal government, updated the safety standards of federal motor vehicles, and set up relevant agencies, such as the automatic driving Advisory Committee.

In September 12, 2017, NHTSA released the 2.0: vision of automatic driving system (Automated Driving System2.0: A vision for Safety), the main contents are as follows: 1. Encourage the introduction of automatic driving technology; 2. Recommends that all States review laws and regulations that impede the development of automatic driving vehicles, and actively legislate in various states to create a "technology neutral" environment for them; 3. Encourage the exploration of the law of adjusting the liability for tortious driving of autopilot; 4. Stipulate the requirements for timely taking over automobiles when identifying automatic driving system failures; 5. The design goal of the designer is to reduce the instability of driving behavior and facilitate the operation of users. Then, at the state level, Nevada took the lead in the legislation of autopilot. In 2011, Nevada passed the No. 511 bill, which mainly includes: 1. The automatic driving vehicle is legalized, that is, after special authorization, it can drive on the state highway; 2. The open access to the road test is strictly restricted, that is, the automatic driving must be automatic. The driving test and driving behavior are insured, and the most basic and minimum safety standards are established. The test is strictly controlled in a clear geographical area. 3. The concepts of automatic driving vehicle, artificial intelligence and sensors are specified. Other states in the United States have also made legislation on autopilot. There are more than 9 states in tort liability, or by modifying old laws or making new laws. For example, Michigan promulgated the Senate bill 644th in 2013, which stipulates that unless the vehicle is transformed into an autopilot by the third party, unless there is evidence that it is being changed. The original manufacturer will no longer be responsible for the defects caused by accidents during the test if there are defects in the vehicle before construction.

4.3. Germany

Germany, a traditional automobile manufacturing powerhouse, has been in the forefront of the world in the legislation of automatic driving vehicles in order to promote the development of automatic driving vehicles. The German Bundestag passed the eighth amendment to the road traffic act in June 2017, allowing the automatic

driving vehicle to run on the road legally, stipulates the driver's rights, obligations and responsibilities in the condition of automatic driving, as well as the identification and compensation of accidents. It includes: 1. Define the intelligent car clearly. 2. Clearly stipulates that it is lawful to drive on the road automatically by allowing "automatic driving" according to regulations. 3. Clarify the obligations and responsibilities of the intelligent car driver, that is, the driver is ready to take over the car at any time. 4. The rules of intelligent vehicle information storage, preservation and utilization are defined, that is, installing "black box" to record driving activities. 5. The responsibility allocation rules between the driver and the producer are designed. When the driver operates in compliance, he does not bear the responsibility for the accident caused by the system fault. 6. A higher amount of compensation is provided, that is, the maximum amount of compensation for property loss is 2 million euro, and the maximum compensation for personal injury is 10 million euro. It can be seen that this amendment has built a more comprehensive and comprehensive responsibility system for autopilot cars. In addition, in June of the same year, the German Ministry of transport released a report called "automatic Internet driving", which means that Germany has taken the lead in introducing the moral standards of automatic driving in the world. The moral code has established a series of principles in the value pursuit and balance, which are as follows: 1. The admission prerequisite of automatic driving must be safety. 2. In human-computer interaction, to achieve safety, effectiveness and reliability, that is, the system should adapt to human communication behavior. 3. Extreme situations should not be standardized or programmed, for example, a choice must be made between the lives of two people. 4. In the event of an accident, it is forbidden to identify the difference according to the driver's personal characteristics, such as age, gender, etc. 5. For the subject of legal liability, besides the driver, the designer and producer of intelligent system should also be included. 6. The way of legal regulation is to create a balance between individual freedom, others' freedom and security.

4.4. UK

In February 2017, the British motor technology and aviation act was introduced to expand the scope of compulsory motor vehicle insurance. It stipulates that insurance should not only be oriented to ordinary cars, but also include automatic driving vehicles. Specifically, on the one hand, on the one hand, in terms of insurance coverage, the act stipulates that the loss caused by auto driving accident is also caused by the insurance company. The victim has the right to claim compensation directly from the insurance company, and the insurance company will recover the liability person according to the current law. On the other hand, in the sharing of responsibilities, first of all, the new insurance system and liability rules can only be applied to the automatic driving vehicle on the

list of autopilots listed and promulgated by the government. Secondly, if the insured person has a breach of contract, if the violation of the regulations is to change the automatic driving vehicle, or the accident caused by the illegal operation of the autopilot system, the insurance company has the right to avoid. In addition, the insurance company will not make compensation or limited compensation for the accident liability caused by the insured's violation of the policy requirements to update the vehicle system.

4.5. Comment and analysis

The legislative practice of these international organizations and countries is groundbreaking and representative all over the world. Based on this, we can see the general situation of the current international legislation on the tort liability of auto driving automobile accidents: 1. although the whole country is in active exploration stage, some countries have already been at the front end; 2. the rule of law is assimilated and unified; 3. most countries still have only In terms of the legal status and road test of autopilot; 4. focuses on responsibility, product liability and insurance system. These Regulations are the response of all countries to the challenge of tort liability brought by self-driving cars. Whether they can be perfectly solved or not, they are the wisdom crystallization of the legal system to deal with technological innovation, which can bring a lot of beneficial enlightenment to our country.

First, these Provisions define the rules of tort liability for motor vehicle accidents to a certain extent. For example, Germany has determined the responsibility distribution of drivers and manufacturers of self-driving cars. There are drivers, users, reformer, insurance companies and manufacturers in the legislative documents. Although the concept of "electronic man" is put forward in international organizations, there is no state legislation to stipulate the legal responsibility of the autonomous driving vehicle as a legal entity. At the same time, it can also be seen that the current legislation on this issue is cautious. Basically, all countries are based on the current legal system of rights and responsibilities, exploring the solution path on the basis of motor vehicle road traffic accident liability and product liability, and there are no major changes in the current driver's obligations, the concept of automobile, and the composition of tort liability. Such a legislative attitude is safe and will not cause great impact on the existing laws, thus causing confusion of legal theory and legal order.

Second, we should actively legislate to remove the legal obstacles to self-driving cars, and emphasize the technical risks and safety requirements of self-driving cars. Many countries have actively promulgated relevant policies and laws, encouraged the introduction of automatic driving, encouraged technological innovation, determined that the bottom line of automatic driving vehicles is the legality of road test, and actively explored other relevant legal rules, stipulating the concept, safety standards, regulatory

responsibilities and tort liability of autopilot cars, and prudently restricting and gradually releasing them.

Third, emphasis is placed on data retention in the operation of autopilot. A typical example is the German regulation on the installation of "black box", which is helpful to restore the facts of infringement accidents, whether it is the determination of causality or the submission of court evidence.

Fourth, focus on supporting measures such as the construction of insurance system. Typically, the United Kingdom introduces the automatic driving vehicle into the scope of traffic liability insurance. The ultimate goal of traffic accident is to make the victim get relief. The insurance system is indispensable for the protection of victims. It is very feasible to apply the insurance system to the field of autopilot.

Fifth, we should seek the solution to avoid and prevent the risk of infringement liability from the root. From the ethical point of view, we should standardize and guide the automatic driving vehicle, and create a moral principle for the identification of infringement liability. In this regard, the German practice is most typical, that is, the German moral standards of automatic driving mentioned above. These 20 moral principles set a moral requirement for the automatic driving vehicle with a forward-looking perspective, which can provide directional guidance for the establishment and legal rules of tort liability for auto driving accidents.

5. CONCLUSION

Autopilot has brought great changes to the automobile industry and human travel, and profoundly affects the current tort liability legal system. In order to solve the problem of traffic accidents caused by self-driving cars, China can learn from the achievements of foreign legal research on the basis of the particularity of the liability of automatic driving vehicle, and based on the two principles of properly relieving victims and encouraging technological innovation, we should improve the rules of tort liability for self-driving motor vehicle accidents. At present, it is not mature to formulate special laws on artificial intelligence or automatic driving. We can first improve the legal rules in the tort liability law. The specific measures are as follows:

First, define the main body of the liability for tortious liability of auto driving vehicle accidents, including drivers and owners, as well as automobile manufacturers, sellers and insurance companies, such as intelligent system manufacturers.

Second, through the design of "inversion of burden of proof", the black box information analysis center should be established to allow producers to bear more burden of proof.

Third, we should clarify the standards for determining the "product defects" of self-driving vehicles, and properly adjust the terms of exemption from producers so as to improve the application of product liability.

Fourth, the automatic driving vehicle accident should be

included in the category of high risk liability, and the insurance system and compensation fund should be established to compensate for the infringement liability so as to fully relieve the victims and fill the damage.

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