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Research on Tort liability of Traffic Accidents of Self-Driving Vehicles

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Abstract: *With the rapid development of artificial intelligence technology, the tort of self-driving car challenges the current traffic accident liability based on driver's fault. It can be considered to construct the applicable rules of "motor vehicle traffic accident liability and product liability" according to the intelligent grade of autopilot system. In the conditional and highly autopilot stage, according to the fault identification standard of "integration of human and vehicle", the producers and drivers bear joint and several liability externally, and bear proportional liability internally according to various reasons.*

Keywords: *autopilot; liability for motor vehicle accidents; graded proportion*

1. Introduction

Self-driving car means that it is equipped with advanced on-board sensors, controllers, actuators and other devices, and integrates modern communication and network technology to realize intelligent information exchange and sharing between vehicles and people, vehicles, roads, clouds, etc., with complex environment perception, intelligent decision-making, collaborative control and other functions, can achieve safe, efficient, comfortable, energy-saving driving, and can eventually replace people to operate the new generation of vehicles. As a typical application of artificial intelligence in the field of transportation, self-driving cars have moved from technical research and development to actual operation in a short time, which has brought huge economic benefits to the society. However, with the accelerated arrival of the era of autopilot, the traffic tort accidents caused by it occur frequently. In March 2018, a self-driving car owned by Uber collided with pedestrians in "autopilot" mode in Arizona, USA, resulting in the death of pedestrians. According to a survey by the National Transportation Safety Board (NTSB), the company had 37 accidents in its self-driving test vehicles long before the world's first self-driving fatal pedestrian accident. Due to the technical characteristics of self-driving, there is a lot of discord between the accident tort caused by self-driving and the current liability system, but the current legislation of our country is still lack of specific guidance on the tort liability of self-driving car traffic accidents. In view of the fact that China has formally put forward a localized automobile automation classification standard, this paper discusses the definition of automobile tort liability under self-driving mode based on the standard level 3-4, in order to provide references and suggestions for solving the problem of tort liability in self-driving traffic accidents.

2. Challenges to the application of the tort law of self-driving vehicles

2.1. It is difficult to identify the subject of responsibility

Article 76 of China's Road Traffic Safety Law stipulates that the loss exceeding the limit of compulsory insurance liability shall be compensated by the "motor vehicle party". The theory usually adopts the dual standard of operation domination and operation benefit, and the "motor vehicle side" is interpreted as the owner of the motor vehicle. In the autopilot mode, the system will replace the driver to carry out the driving task, and the operation domination and operation interests of the self-driving vehicle will be separated gradually, which undoubtedly further aggravates the complexity of the identification of the accident responsibility subject, and the scope of "motor vehicle side" will be difficult to determine or be absent. Specifically, in the conditional autopilot stage, the human driving authority is gradually transferred to the system, the driver, as a backup user, only takes over when necessary, and the system performs all dynamic driving tasks under its design and operating conditions. at this time, there is no doubt whether the concept of "driver" has changed. In the height and fully automatic phase, all driving tasks will be transferred to the system, and the concept of "driver" will disappear. As pure passengers,

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users only enjoy operational benefits, and the subject of tort liability will be absent. In addition, when the owner of the self-driving car is separated from the user, the subject of responsibility for the accident will be more difficult to identify. According to the standard of "dualism" of the owner, if it is determined as the user by the domination of the operation, it ignores that the owner of the car still enjoys the benefits of operation. If the owner is identified as the main body of responsibility based on operational interests, it will be confused that the actual user still lacks a certain degree of driving control, and to what extent will the holder have the ability to dominate? In short, under the existing norms, it will be more difficult to identify the subject of responsibility for self-driving car accidents.

2.2. The principle of fault imputation is difficult to apply

Article 76 of the Road Traffic Safety Law stipulates the imputation principle of traffic accidents between different subjects. Among them, the responsibility between motor vehicles is borne by one side of the motor vehicle with fault, and the fault of both parties is shared in proportion; between motor vehicles and non-motor vehicles and pedestrians, if one side of the motor vehicle has no fault, it only needs to bear no more than 10% of the liability for compensation. It can be found that fault identification is still of great significance in motor vehicle traffic accidents, and the participation of autopilot system will challenge the fault judgment standard. In other words, since in the autopilot mode, human drivers no longer need to perform the usual driving operations, the determination of the driver's fault should be shifted from a positive fault to a violation of obligations. The safety duty of care of self-driving vehicles must be different from that of traditional motor vehicle drivers, so it is very important to clarify the scope of new obligations for the determination of the fault of users. In the comparative law, the Road Traffic Law amended by Germany in 2017 updates the driver's duty of care and stipulates that the driver of self-driving car has the corresponding "vigilance duty" and "takeover duty". We need to think about the rationality of the duty of care in different aspects. On the one hand, whether it is physiologically possible for human drivers to take over at any time. After giving the order to take over manually, the autopilot system usually allows only a few seconds of reaction time for the driver. In this case, the driver is not even given enough time to make decisions, let alone his ability to execute the takeover in an emergency, and the result may be that the driver needs to bear the responsibility for not taking over in time. On the other hand, the expression "obvious situation" is abstract, and there is a lack of clear criteria for judging the appropriateness of vigilance and takeover. In practice, if you fail to take over in time, it is impossible to determine whether the driver has failed to maintain sufficient caution, or whether he has paid enough attention and still cannot take over.

2.3. It is difficult to distinguish the causal relationship between accidents

In the comparative law, the research on the damage caused by self-driving vehicles emphasizes the application of product liability. Product liability is the strict liability of the producer, and it is necessary for the victim to prove that the product has defects and that there is a causal relationship between defects and damage. Compared with traditional product liability cases, self-driving vehicle is a more complex combination of software and hardware, and its highly intelligent attribute poses a new challenge to product liability. Specifically, the current mainstream deep learning algorithms do not give new step-by-step instructions to computers step by step, but allow computers to learn from large amounts of data, so although programmers have set up learning rules, however, the commands executed in every real situation are made independently by the machine algorithm based on the deep learning ability. [1] In self-driving cars, the system gradually creates independent algorithm rules through pre-built algorithm programs and new data input after entering the circulation field, and its internal logic even designers can not really understand. Therefore, in the abnormal situation, the behavior decision of self-driving car is unpredictable and unexplainable, and has a certain "black box" characteristic, so it is difficult to find out the cause of the accident. The opacity of the decision-making of the autopilot system makes it difficult to identify the causality of the accident, and the damage caused by the accident may not be reasonably attributed to manufacturing defects or design defects.

3. Adjustment of the application of the law of tort in autopilot

3.1. Expand the scope of the subject of responsibility

In the field of self-driving cars, the range of "motor vehicle side" needs to be distinguished according to the level of intelligence. In the conditional autopilot mode, the human driver, as a backup user, shares

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the driving task with the system, and can identify the system and the human driver as "co-drivers" and be responsible for traffic accidents in autopilot mode. However, the automatic system is not a qualified legal subject, so the producers and users of the system together as the subject of tort liability. In highly autopilot mode, the system also needs to drive under limited operating conditions, but the user as a passenger cannot respond to the takeover request issued by the system. The author believes that at this stage, users still have the ability to choose whether the system is open or not under specific circumstances, so they should bear accident tort liability with the system producer as a "co-driver". It is only different from conditional autopilot when dividing the proportion of internal liability.

3.2. Introduce the standard of rational car

For the determination of the fault of "one side of the motor vehicle", we should consider judging from the point of view of the integration of "vehicle" and "human", so as to solve the difficult problems such as the absence of human driver or the difficulty of fault identification. In other words, according to the fault standard objectification, as long as the objective behavior of either side of the system or the user does not meet the established standards, it can be determined that there is a fault on one side of the motor vehicle.[2] The producer and the user of the system are jointly and severally liable to the infringed party. First, for the autopilot system, the "rational car standard" refers to whether a rational car reasonably foresees the corresponding danger and takes corresponding measures. First of all, comply with the road traffic safety regulations at any stage, which is often built into the system through the algorithm. If the self-driving car makes unreasonable behaviors such as speeding or running a red light, it should be determined that the system is at fault. Secondly, make a reasonable moral choice in the stage of full autopilot. When faced with moral disputes such as the "tunnel problem", it should be judged in the light of the self-driving vehicle's compliance with the relevant ethical norms of artificial intelligence and legal obligations. [3] Second, for drivers, the duty of safety care mainly includes timely takeover obligation and risk prevention obligation. The driver's responsibility should vary according to the degree of automation of the system. In the conditional autopilot stage where the technology is not perfect, from the point of view of the balance between victim relief and industrial development, the driver's take-over obligation is still very necessary. As to whether the takeover is appropriate, it can be examined from the following aspects: improper operation of the takeover, untimely takeover and failure to recognize the necessity of the takeover. [4] Improper takeover operation means that when the driver is aware of the danger, he does not wait for the system to issue an intervention request, and takes the initiative to take back the driving right from the system control mode, which leads to an accident; untimely takeover means that after the system sends out the takeover request, the driver does not respond in a timely manner within the reserved time interval. Failure to realize the necessity of taking over means that the driver fails to take over based on obvious objective conditions, such as special weather, special road conditions, irregular driving behavior and so on. Of course, if the driver can prove that the accident damage will still occur even if he does not take the initiative to intervene or carry out the takeover, then the driver should not be considered at fault. Risk prevention obligations include obligations to maintain the system on a regular basis at any stage, obligations that should not be initiated in prohibited use cases, and obligations of prudence when handed over to third parties.[5] Therefore, if we fail to meet the above "rational car standard" or "rational person standard", it can be concluded that there is a fault on the part of the motor vehicle.

3.3. Presumption of causality

In the tort cases of self-driving vehicles, if the causality theory is strictly applied, the product liability litigation will eventually be transformed into technical proof. Some scholars believe that for the product liability caused by high-tech products, the victim generally only needs to prove that the product is damaged after using the product, and there is no need to prove the causal relationship between the defect and the damage. That is, the presumption of causality. In specific cases, if the victim can prove that the traffic accident occurred in the self-driving mode, it can be presumed that the self-driving car has product defects, and the producer will bear the burden of proof on the grounds of exemption. In the fully autopilot mode, the system performs all driving tasks under any operating conditions, and the user fully transfers the driving rights to the automated system, so it can be presumed that the damage caused by traffic accidents at this stage is caused by product defects. Of course, the producer can claim not to bear responsibility according to the exemption stipulated in Article 41 of the Product quality Law of our country. Among them, the producer is most likely to defend the third case that the scientific and technological level of the product cannot be found when the product is put into circulation. Some scholars have proposed that self-driving cars, as high-tech products, are not suitable for development risk defense from the frontier and safety aspects of this technology. [6] The author agrees with this view. As mentioned

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earlier, the "black box" feature of autopilot algorithms may become an alternative cause of accidents. [1] However, different from this technical point of view, the main purpose of tort liability law is to allocate risks and fill in damage. Producers, as the dominant position to control and bear technical risks, should be responsible for the safety defective products they produce. In addition, although the system program has a certain unpredictability in the specific behavior decision-making, the producer can still foresee the deep learning ability of this algorithm. Therefore, it should not be defended that the system decision is unpredictable and unexplainable.

4. Conclusions

The technical classification of self-driving vehicles reflects the degree of intelligence of the system. For accidents caused by self-driving vehicles, different tort liability rules can be adopted according to the level of intelligence to construct a hierarchical proportional liability distribution system for self-driving vehicles. In the accident tort under conditional autopilot and highly autopilot mode, because the intelligent system and the human driver have common driving behavior, the system producer and the motor vehicle party shall bear joint and several liability. The insurance company shall first pay compensation to the infringed within the scope of the liability limit, and the producer and the driver shall bear the compensation liability for the part exceeding the limit. The specific determination of self-driving car accident liability is based on the above judgment standard of "integration of vehicle and person". If it fails to reach the "rational car standard" or "rational person standard", it can be determined that there is a fault on one side of the motor vehicle. When determining the proportion of internal responsibility, each subject should consider the cause of the accident differently, mainly considering the following factors: the control power of human drivers, the fault of drivers and producers, and the possibility of avoiding results. First of all, the driver's control ability varies according to the intelligence level of the system, and the corresponding duty of safety care is also different. In the conditional autopilot stage, in addition to the risk prevention obligation, the driver should also fulfill the obligation to take over at the right time; in the highly autopilot stage, the driver only has the usual risk prevention obligation. Secondly, the producers of self-driving cars mainly have the obligation of safety in production. If the damage caused by the accident is caused by the common fault of each subject, the liability shall be determined according to the offset of the fault. Finally, if the subject of one party can prove that he can not avoid the accident even if he has fulfilled the corresponding obligations, then the subject does not have to bear the responsibility. For example, even if the driver does not take the initiative to intervene or has taken over properly, the damage result will still occur, or the producer will prove that there is force majeure caused by hacking into the system.

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