

Research on the Criminal Liability for Traffic Accidents of Autonomous Vehicles

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Abstract: In recent years, China's automobile industry has improved rapidly, in the premise of making great progress in the field of traditional fuel vehicles. With the development of artificial intelligence technologies such as cloud computing and big data, autonomous driving vehicles have come into being. As soon as it came out, it received strong support from the government. Various preferential policies have been issued, and all kinds of capital have also flocked to it. A number of emerging driverless car enterprises have emerged, represented by Xiaopeng, Nio, Ideal, and BYD, and the development momentum is strong. In the near future, people's traditional way of traveling will change. The purpose of the research and development of autonomous vehicles is to reduce the probability of traffic accidents due to drunk driving and fatigue driving, protect the safety of citizens' lives and property, bring convenience to people's travel, and improve the efficiency of social work. However, while autonomous driving cars bring convenience to people's lives, there are also unknown risks. When the autonomous driving car causes a traffic accident, the existing law is difficult to determine the division of responsibility subject, and the autonomous driving system does not have the criminal subject qualification, so there will be the lack of responsibility subject. The identification of criminal responsibility for this type of event has become a difficult problem at present.

Keywords: Criminal responsibility; Automatic driving; Responsibility subject; Traffic accident crime

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1. Introduction

Compared with traditional cars, self-driving cars have the advantages of being more convenient and faster. However, due to their own processing system, algorithm programming, and other factors, it is difficult for self-driving cars to guarantee absolute safety in the driving process. After accidents, they will face more complicated problems of criminal law than traditional cars. As for the responsibility subjects for the crimes of autonomous vehicles, they

should be distributed based on the theoretical basis of traditional criminal law and the classification of autonomous driving, so as to distinguish the criminal responsibilities of drivers and other responsible subjects [1]. The criminal responsibility of the driver mainly considers whether there is intentional negligence for the occurrence of the accident. Besides the development, production, and sales of autonomous vehicles, the criminal responsibility mainly analyzes whether there is a duty of care. According to the division of criminal responsibilities of different subjects, the corresponding responsibility-bearing system should be strengthened.

2. Concept and development status of self-driving cars

2.1. Concept of self-driving cars

Since the first industrial revolution, people's road travel mode has changed dramatically, from the steam locomotive at the beginning of the day to the later fuel cars to the hot new energy vehicles in recent years. In recent years, the development of artificial intelligence technology has led to the emergence of autonomous vehicles. A self-driving car, also known as a driverless car, is a kind of intelligent car. In order to facilitate the convenience of travel, it mainly relies on the intelligent driving instrument based on the computer system in the car to achieve the purpose of unmanned driving [2]. According to the different degree of automatic driving car automation, a total can be divided into L1–L5 five levels: in L1, L2 level, the two forms of automatic driving can only perform simple braking processing or deceleration operation according to the road condition, L3 is also known as conditional autopilot and L4 known as highly automatic driving, L5 for fully automatic driving. As the current research results are more focused on the L3 and L4 levels, this paper mainly discusses the identification of the criminal responsibility of these two levels after a traffic accident [3].

2.2. Development status quo of self-driving vehicles

2.2.1. Foreign development process and status quo

In most people's cognition, autonomous driving technology seems to have suddenly developed in recent years, but in fact, it has not. As early as 1970, the United States and other developed countries have been very interested in driverless cars [4]. It is divided into three main fields: military utilization, road environment, and urban environment. The 1985 prototype VaMoR car developed by the Deutsche Federal University was tested outdoors at 100 kilometers per hour.

Since Google announced the launch of a driverless car project in 2009, autonomous driving technology has slowly come into sight [5]. In 2016, Uber officially opened its driverless car travel service to the public in Pittsburgh. In 2016, Uber began to test roads for autonomous driving. In the same year, Tesla released the Autopilot2.0, paired with models such as the Model 3. In 2016, Waymo was independent from Google, technically based on a combination of lidar and high-precision maps. Since then, Tesla has become a leader in intelligent driving. In 2017, the introduction of intelligent driving accelerated evolution. In 2021, FSD V11 based on Transformer + BEV technology was launched to improve its perception ability. In 2023–2024, Tesla launched FSD V12, using a neural

network-based algorithm system to promote the further development of autonomous driving technology [6].

2.2.2. Domestic development process and current situation

Compared with foreign countries, China's autonomous vehicle was developed later, but it also achieved rapid development. In 2011, FAW Group and National University of Defense Technology jointly completed the 286 km high-speed unmanned driving experiment in Hongqi HQ 3. In 2015, Baidu conducted a full autonomous driving test in Beijing; in the same year, Yutong Bus, the leading enterprise in the bus field, completed the autonomous driving test on the fully open road; at the end of the same year, Baidu established the autonomous vehicle Division. In 2019, China's first batch of mass-produced L4 autonomous passenger vehicles, jointly built by Baidu and FAW, received five autonomous driving road test licenses in Beijing. In 2020, Beijing issued the first batch of unmanned road test notices, and in the same year, Shanghai issued a new plan to allow high-speed L3 autonomous driving. From 2023 to 2024, Baidu, Ma Zhixing, and other enterprises will carry out pilot commercial autonomous taxi operations in some cities and gradually explore business models and operation experience. From the perspective of the development history of autonomous vehicles, foreign countries have developed for a long time in China and have great advantages in the advanced fields. However, China has increased the research and development of autonomous vehicles in recent years and has made remarkable achievements in several years [7].

3. Challenges of autonomous driving in traffic accidents

3.1. Change in the subject of responsibility

Self-driving cars are in the development stage at present, there is still a higher risk of traffic accidents. In the event of a traffic accident, the responsibility is difficult to identify; in the traditional driving mode, according to the current criminal law and related specifications, the responsibility of the traffic accident generally falls on the driver, vehicle owners, vehicle competent unit, etc. With the opening of the autonomous driving function, the role of the driver of the autonomous car has been changed to the passengers to a certain extent. Obviously, the passenger cannot be the main body of responsibility for traffic accidents. Autonomous driving replaces the role of the driver. When the autonomous driving system faces sudden problems, once the decision-making mistakes occur, the consequences are severe. At this time, in a certain sense, the autonomous driving car itself is likely to become the main body of responsibility. Producers and developers can also be held responsible [8].

3.2. Difficulties in determining the causal relationship

Unlike traditional traffic accidents, automatic traffic accidents can directly determine damage behavior and consequences. In many cases, there is no fault on the part of the driver, as the accident is not caused by their actions, nor does it involve any intentional or negligent psychological attitude. This fundamental difference sets automatic traffic accidents apart from traditional ones [9]. Additionally, because obtaining evidence from autonomous driving systems is challenging, the police must determine whether the system was active and whether it malfunctioned. This

process is more complex than the traditional causal identification of traffic accidents.

3.3. Lack of relevant legal regulations on autonomous driving car accidents

The existing traffic regulations and criminal regulations mainly target the traffic accidents under the traditional driving mode. Due to the characteristics of self-driving vehicles, it is difficult to simply apply the existing laws and regulations accordingly. Other regulations have few rules for self-driving cars. Some laws do not even allow the production and use of self-driving cars, which fully reflects the lag of the law. Laws are urgently needed to adapt to the era of self-driving cars ^[10].

3.4. Uncertain mode of bearing criminal responsibility

First, a self-driving car does not fall under the category of either a natural person or a legal entity. However, when a traffic accident occurs, a corresponding subject must bear criminal responsibility. This creates an evident contradiction—since self-driving cars themselves cannot be held liable, and fines imposed on natural persons or legal entities do not fulfill the fundamental purpose of criminal punishment.

4. Identification of criminal responsibility subjects in autonomous driving traffic accidents

Self-driving cars provide significant convenience but also raise questions regarding the allocation of criminal responsibility in the event of an accident. The release of the recommended national standard, *Automobile Driving Automation Classification*, marks the official establishment of China's driving automation classification system. From the perspective of criminal law's attributes and practical significance, autonomous vehicles cannot be held criminally responsible. Instead, users who assume different roles in various driving scenarios and fail to fulfill their duty of safety care should be held liable for negligence. If product defects exist before entering the market, the manufacturer is not liable for negligence but bears strict liability for intentionally producing vehicles that fail to meet safety standards—constituting the crime of producing non-compliant products. If defects are discovered after a vehicle has entered the market due to the manufacturer's failure to fulfill its supervisory and management obligations, the manufacturer should be held criminally responsible for negligence by omission ^[11].

4.1. Whether autonomous vehicles can be used as the subject of criminal responsibility

4.1.1. Discussion on autonomous vehicles as the subject of criminal responsibility

The question of whether self-driving vehicles can bear criminal responsibility has led to two perspectives. The first view argues that after a traffic accident occurs, the responsible party must be identified to uphold legal dignity and social fairness. Since the driver cannot be held criminally liable, and in the absence of manufacturer fault, it is reasonable to consider self-driving cars themselves as legally responsible entities. The opposing view contends that

self-driving cars are products of algorithms and lack free will, making them incapable of assuming criminal responsibility like natural persons or legal entities. Instead, responsibility should be assigned through other means ^[12].

4.1.2. Self-driving vehicles cannot be the subject of criminal responsibility

As stated above, self-driving cars are ultimately products. First, they lack independent consciousness, cannot make autonomous driving decisions, and do not possess intent or negligence. Second, criminal penalties such as imprisonment or fines cannot be applied to self-driving vehicles. Therefore, the author agrees with the view that self-driving cars cannot bear criminal responsibility ^[13].

4.2. Automobile producers and developers can be used as the subject of criminal responsibility

Given that self-driving vehicles cannot bear criminal responsibility, their production quality must comply with relevant product standards. If a traffic accident occurs and authorities determine that a vehicle system failure caused the accident, the self-driving car may have product defects. Due to the nature of self-driving cars, such defects pose significant safety risks. According to relevant provisions of criminal law, automobile manufacturers may be held criminally liable for producing and selling products that do not meet safety standards ^[14]. A particularly exceptional case arises if a developer with malicious intent exploits vulnerabilities in the autonomous system to commit crimes. In such instances, the developer could be charged with offenses related to computer information system violations or specific types of intentional crimes.

4.3. The automobile user may act as the subject of criminal responsibility

As the primary individuals capable of directly controlling self-driving vehicles, users are responsible for ensuring driving safety, particularly in cases of system failure. If an autonomous driving system malfunctions, users must fulfill their duty of safe driving and traffic supervision. If a user knowingly or negligently fails to take necessary safety measures, or implements incorrect ones, they should bear corresponding criminal responsibility. However, if the user is unable to intervene in the driving system in time, or if the accident is primarily caused by the failure of the autonomous driving system, they should not be held criminally liable ^[15].

5. Conclusion

The emergence and development of autonomous vehicles can bring convenience to people's travel, improve the efficiency of social operation, and reduce the probability of traffic accidents. As the future development direction of the automobile industry, it also indicates a great change in the way people travel in the future. In the future, autonomous driving will develop in a more intelligent direction, but there is still the possibility of traffic accidents. It is inevitable to encounter problems such as the identification of the subject of responsibility and causality. According

to the existing traffic laws and criminal regulations, it is difficult to solve the existing problems. Therefore, from the perspective of the identification of criminal liability of autonomous driving vehicles, this paper put forward the problems facing the identification of traffic accident liability of autonomous driving vehicles. It can be concluded that the improvement of relevant laws is urgent, and the laws and regulations should have a certain forward-looking perspective to open up the way for the development of society.

A self-driving car, in its attempt to protect passenger lives, may engage in aggressive emergency risk avoidance, potentially causing the death of others. Such behavior meets the criteria for intentional homicide and constitutes an impermissible risk, as it exceeds necessary limits and does not qualify as a legally justifiable emergency measure. Since innocent pedestrians are placed in danger, this scenario does not meet the conditions for a conflict of obligations and, therefore, does not fulfill the constitutive elements of a lawful defense. Consumers are aware that self-driving cars are programmed with risk avoidance procedures, yet they still operate these vehicles on public roads, leading to the death of innocent pedestrians. In doing so, they exploit the pre-programmed emergency risk avoidance mechanisms of the vehicle. Given the standardized structure and implementation of emergency risk avoidance, consumers can be held accountable, as their actions leave no room for alternative expectations. Manufacturers, in pursuit of commercial interests, program vehicles to prioritize passenger safety over pedestrian lives. This establishes a direct causal relationship between their design choices and the deaths of pedestrians, thus making them complicit as accessories to intentional homicide. Until the ethical dilemmas surrounding self-driving cars are resolved, these vehicles should not be permitted on public roads; otherwise, their deployment would be unlawful.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Kong X, 2023, Research on the Legal Issues of Administrative Licensing for Autonomous Driving Road Test, dissertation, People's Public Security University of China, 28.
- [2] Zhu Y, 2023, Research on the Legal System of Autonomous Driving Liability Insurance, dissertation, East China University of Political Science and Law, 18.
- [3] Wu Y, 2023, Research on the Legal System of Compulsory Insurance Liability for Autonomous Vehicles, dissertation, Southwest University, 37.
- [4] Zheng L, Li M, 2023, On the Two-Layer Legal Barriers of Autonomous Vehicle Access and Their Overcoming. *Journal of Ocean University of China (Social Science Edition)*, (04): 61–70.
- [5] Zhang Y, 2023, Research on Legal Liability Regulation of Autonomous Vehicles, dissertation, Northwest A & F University, 18.
- [6] Ding Z, 2023, The Basic Logic and Main Approach of the Legal Regulation of Autonomous Driving. *Special Economic Zone Economy*, (04): 13–17.
- [7] Qian L, 2023, Autonomous Driving Data Security Risk and Legal Protection. *China Informatization*, (04): 65–67.

- [8] Liu H, 2022, Identification of Civil Liability and Legal Response Measures for Network Safety Accidents of Autonomous Vehicles. *Special Economic Zone Economy*, (11): 93–97.
- [9] Zheng Y, 2022, Algorithmic Justice and Legal Liability System for Autonomous Driving. *Legal System and Social Development*, (04): 145–161.
- [10] Ding Z, 2022, Research on the Legal Regulation of Low-Level Autonomous Driving. *Management of Transportation Enterprises*, (03): 50–52.
- [11] Sun M, 2021, Legal Issues in the Application of Autonomous Driving Technology and Its Regulatory Paths. *Journal of Management Cadre Institute, Ministry of Transport*, (04): 44–48.
- [12] Zhao S, Zhu T, 2021, Research on the Legal Responsibility of Autonomous Driving Road Traffic Safety under the Current Legal Framework. *Heilongjiang Social Science*, (06): 82–88.
- [13] Wang Y, 2021, Research on Legal Access to Autonomous Driving: Routes, Challenges and Solutions. *Journal of Renmin University of China*, (06): 141–154.
- [14] Bao X, 2020, Liability for Autonomous Driving Traffic Accidents in the Field of Interaction between Law and Technology. *Law Review of NPC*, (02): 67–83.
- [15] Pan K, Zhao Y, Li Y, 2020, Discussion on Autonomous Vehicle Technology and Related Legal Issues. *Legal System and Society*, (32): 29–30.

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