

Construction of a Tort Liability Allocation System for Autonomous Vehicles from the Perspective of “Liable Subjects”

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Abstract: With the continuous development of China’s autonomous vehicle industry, traditional tort liability allocation methods have become difficult to apply. The existing national and local classification standards struggle to correspond to appropriate liable subjects in practice. The current legislative approach, which prioritizes the driver or owner in the order of liability, is unreasonable. It increases the burden on consumers and reduces the likelihood of actual compensation being realized. At the same time, there is controversy regarding the subject of product liability, and the scope of producers remains unclear. Based on the realities of legal application, a new classification standard should be reconstructed by integrating theory with practice while adapting as closely as possible to the framework of existing laws. The order of liability should be changed so that the producer ranks first. It should be clarified that product liability for autonomous vehicles shall be borne by the producer, who is the sole subject in the identification system, thereby reasonably determining the liable subjects for torts involving autonomous motor vehicles.

1. Introduction

In recent years, autonomous vehicles have continued to iterate, and the integration of artificial intelligence with the automotive industry has gradually deepened, evolving from human-dominated driving to human-machine co-driving and then toward fully autonomous driving. The traditional legal liability system, which centers on the driver as the primary subject, can no longer fully adapt to the development of autonomous vehicles. In the trend where artificial intelligence gradually replaces traditional human driving, the mainstream subjects of liability discussed in academia include the driver, owner, manager, the intelligent vehicle itself, autonomous vehicle producers and manufacturers, system developers, data providers, and maintainers. However, with the rapid development of artificial intelligence, existing tort law rules are inadequate to address emerging issues. This is primarily reflected in the area of liable subjects for autonomous vehicles, including defects in existing classification standards, unreasonable order of liability in current legislation, and unclear definition of the scope of producers. Therefore, this paper redefines the categories of liable subjects in the field of autonomous vehicle torts in light of the current state of artificial intelligence development, and clarifies the scope of duty of care among various liable subjects.

2. Analysis of Defects in the Existing Classification Framework

2.1 Defects in Existing Classification Standards

In 2021, China's Classification of Driving Automation for Vehicles (GB/T 40429-2021) (hereinafter referred to as the National Standard), drawing on the classification standards of the Society of Automotive Engineers (SAE International), divides vehicle driving automation levels into six grades: No Automation (Level 0), Driver Assistance (Level 1), Partial Automation (Level 2), Conditional Automation (Level 3), High Automation (Level 4), and Full Automation (Level 5). Among these, only Level 4 (High Automation) and Level 5 (Full Automation) vehicles qualify as truly driverless autonomous vehicles [1].

The 2022 Regulations on the Administration of Intelligent Connected Vehicles in the Shenzhen Special Economic Zone (hereinafter referred to as the "Shenzhen Regulations"), China's first specialized local regulation targeting intelligent connected vehicles, does not fully adopt the SAE classification. Instead, combining local management practices, it divides autonomous driving into three categories: "Conditional Autonomous Driving," "High Autonomous Driving," and "Full Autonomous Driving."

2.1.1 Defects of the Shenzhen Regulations Compared to the National Standard

On the one hand, the Shenzhen classification of autonomous vehicle levels is incomplete. The "Conditional Autonomous Driving" in the Shenzhen Regulations corresponds only to SAE Level 3. Upon closer examination, it is evident that Levels 1 and 2 from the National Standard are absent in the Shenzhen Regulations. At the same time, the Shenzhen Regulations establish a system in which the driver first bears compensation liability and then seeks recourse from the producer. However, its three classification levels correspond only to L3, L4, and L5. This clearly indicates that, in current real-world traffic accidents, only when autonomous driving reaches Level 3 or above does it depart from traditional determination rules, expanding the scope of liable subjects to include the driver, owner, and product liability parties such as sellers and producers.

On the other hand, the Shenzhen three-tier classification standard is overly crude. For example, Conditional Autonomous Driving is defined as a situation in which the autonomous driving system can complete dynamic driving tasks under designed operating conditions, and when the system issues a request for takeover of the dynamic driving task, the driver shall respond to the request and immediately take over the vehicle [2]. However, the National Standard lists detailed technical requirements for each level one by one. For instance, the core requirements for Level 3 driving automation systems are: activation only within designed conditions, full execution of dynamic driving tasks; timely issuance of intervention requests to the user when situations arise that exceed the design scope, system failure occurs, or the user is about to be unable to take over; temporary assumption of driving after the request to allow the user sufficient takeover time; active risk mitigation if the user does not respond; and immediate return of control upon user request to exit [2].

2.1.2 Even the National Standard Cannot Accurately Correspond to Appropriate Liable Subjects

First, in practice, there is no distinction in liable subjects among L0, L1, and L2. Reviewing the National Standard, the core requirements for both L1 and L2 involve continuously performing lateral and longitudinal vehicle motion control, possessing corresponding partial target and event detection and response capabilities, and being able to exit immediately upon the driver's request. It is thus evident that there is little substantive difference between the two. According to the National Standard Classification of Driving Automation for Vehicles (GB/T 40429-2021), Levels L0–L2 all

fall within the category of “assisted driving,” where the system merely assists and the human driver remains the primary driving subject.

Second, the liable subjects for L4 and L5 are consistent. Under the requirements of the National Standard, neither L4 nor L5 mandates driver intervention, and autonomous vehicles at these two levels must automatically enter a minimal risk condition in dangerous situations. Although academic circles currently hold at least three views regarding the subjects of liability for autonomous vehicle traffic accidents—namely the driver, the autonomous vehicle itself, and the autonomous vehicle producer—with considerable theoretical controversy [3], under the application of the same liability standard, the liable subjects for L4 and L5 remain consistent. For example, when product liability is applied to accidents involving autonomous vehicles, it is justified for the manufacturer to bear liability [4]. At this point, L4 and L5 autonomous vehicles have no driver, and the National Standard does not mandate intervention. If a traffic accident occurs, it is naturally due to defects in the vehicle itself, making the manufacturer the liable subject. Of course, if the accident results from the manager’s negligence or other vehicle-related liabilities, the liable subject may vary; however, under identical circumstances, the liable subjects for L4 and L5 remain the same.

Clearly, discussing the identification of liable subjects for autonomous vehicles using the Shenzhen three-tier standard is not comprehensive, while using the National Standard leads to overlapping liable subjects across different levels (e.g., the liable subject for L0, L1, and L2 is uniformly the driver, and for L4 and L5 it is uniformly the producer), making the discussion overly cumbersome. Therefore, the author believes that the international six-level standard should be reclassified into three tiers—L0 to L2, L3, and L4 to L5—for discussing the identification of liable subjects for different types of autonomous vehicles.

2.2 Unreasonable Order of Liable Subjects in Current Legislation

Although many local laws and regulations have been issued across China, there is still no nationwide legal norm specifically addressing autonomous vehicles. In 2021, Article 155 of the Road Traffic Safety Law (Revision Draft) issued by the Ministry of Public Security regarding liability for autonomous vehicle traffic accidents merely stipulated in general terms that “where road traffic safety violations or traffic accidents occur, the liability of the driver and the autonomous driving system development unit shall be determined in accordance with the law, and liability for damages shall be determined in accordance with relevant laws and regulations.” It did not provide specific rules for autonomous vehicle traffic accidents in Article 84 (now Article 76) on traffic accident rules [5]. In this regard, after future revisions to the Road Traffic Safety Law, it is likely that an interpretive approach will continue to be used to regulate liability for autonomous vehicle traffic accidents. Most existing local legal norms in China establish the order of liability for traffic accidents involving autonomous vehicles with the driver or owner as the primary party; only if the producer or others are at fault may the driver then seek compensation. For example, Article 32 of the “Wuhan Regulations Draft” provides: “Where a traffic accident occurs and causes damage that should legally be borne by the intelligent connected vehicle party, the vehicle owner or manager shall bear the compensation liability. After fulfilling the compensation liability, the vehicle owner or manager may seek recourse in accordance with the law.” Article 54(1) of “Shenzhen Regulations” (effective August 1, 2022) stipulates: “Where an intelligent connected vehicle is involved in a traffic accident and damage is caused due to defects in the intelligent connected vehicle, after the vehicle driver, owner, or manager provides compensation in accordance with Article 53 of these Regulations, they may seek compensation from the producer or seller in accordance with the law.” Although local regulations on liability for autonomous vehicle traffic accidents also stipulate that producers and sellers shall bear product liability when the vehicle is defective, without exception

they all require the owner, manager, or even the driver of the autonomous vehicle to bear compensation liability first, and only afterward may they seek recourse from the producer or seller [5]. However, the author believes that this order of liability in current legislation is unreasonable.

It is more justified for producers and sellers of autonomous vehicles to bear compensation liability on a priority basis. Firstly, manufacturers are the greatest beneficiaries and should bear the obligation of warranty against defects. This facilitates the reasonable allocation of foreseeable potential costs, risks, and resources, as well as the spreading of damage costs, enabling injured parties to obtain compensation [6]. Conversely, requiring the manager or driver of an autonomous vehicle to bear compensation liability first, consistent with traditional traffic accidents, would undoubtedly discourage consumer enthusiasm for autonomous vehicles, as consumers purchase them precisely in the hope of sharing driving responsibility. Secondly, when both the producer/seller and the driver/owner are at fault, it is more feasible for the producer or seller to bear liability first and then seek recourse from the driver or owner. Although owners and managers may seek recourse from producers or sellers after bearing compensation liability, they must first assume the liability themselves and face the risk of being unable to recover. In contrast, when producers and sellers bear liability first, they can fully internalize expected costs by reflecting them in vehicle prices. In addition, manufacturers can utilize a reserve fund system to create an independent funding pool for the entire HAV industry to address related liability payments, which can be realized through additional insurance premiums or by apportioning supplementary fees at the time of sale [4]. Thirdly, prioritizing the driver in bearing compensation liability conflicts with existing legislation. According to the product liability provisions in Article 1203 of the Civil Code, producers and sellers are the first-order liable parties and bear priority liability in product liability cases. Designating the owner or manager of an autonomous vehicle—who bears no fault—as the first-order liable party in product liability while placing producers and sellers as second-order liable parties violates the product liability rules stipulated in Article 1203 of the Civil Code.

2.3 Uncertainty Regarding the Subject of Product Liability

China's current legal framework for product liability is primarily embodied in the Product Quality Law and the Tort Liability section of the Civil Code. Article 41 of the Product Quality Law and Article 1202 of the Civil Code both stipulate that producers shall bear compensation liability for tort damages caused by product defects. Article 1203 provides for the joint and several liability of producers and sellers. However, significant controversy exists in academic circles regarding the subject of product liability for autonomous vehicles.

Some scholars argue that this involves an expansive interpretation of the term “producer” in Article 1202 of the Civil Code, treating autonomous vehicle producers, system developers, software designers, maintainers, and others collectively as the producer party [7]. Victims may claim compensation from the producer, system developers, software designers, and maintainers, all of whom are treated as defendants in their capacity as product producers. The rationale is that defects in autonomous vehicles may originate from manufacturing, system development, software design, etc., and all parties bear responsibility for product risks. Including them collectively within the producer category aligns with the core principle of product liability that risk and responsibility should match, while also fully safeguarding the rights of victims.

However, the author believes that product liability for autonomous vehicles should be borne by the producer as the sole subject. System developers, software designers, and maintainers do not fall within the scope of “producer.” The producer should compensate for damages caused by defects and then seek recourse from any faulty system developers, software designers, or maintainers. The reasonableness of this approach lies in the following: On the one hand, from a technical perspective,

autonomous vehicles are products synthesized from multiple technologies. Their core systems include complex technologies such as intelligent sensors, map positioning, and intelligent chip decision-making. When a traffic accident actually occurs, it is difficult to identify which specific technology failed. Coupled with the “algorithm black box” problem, even the producer may find it difficult to fully reconstruct the machine’s decision-making process. In situations where the accident is difficult to reconstruct, the various technical subjects involved in the autonomous vehicle will shift responsibility among themselves, making actual compensation hard to realize. Designating the producer as the sole subject of product liability can prevent mutual buck-passing among liable subjects. On the other hand, from the perspective of burden of proof, a multi-subject liability model would lead to difficulties in proof, high litigation costs, and complex judgment enforcement. When the producer is the sole subject, the victim only needs to prove that the producer’s product is defective and that a causal relationship exists between the defect and the damage. When the liable subject is clear, technical appraisal can focus on the overall safety assessment of the product without delving into the details of each technical component. This greatly simplifies the appraisal procedure and reduces appraisal costs. Designating the producer as the sole subject of product liability can alleviate the victim’s burden of proof and simplify judicial appraisal costs.

3. A Three-Tier Classification Framework Centered on the “Liable Subjects”

In China’s current legal system, the determination of liability for autonomous driving torts has always revolved around two core rules: motor vehicle traffic accident liability and product liability. However, the national six-level automation standard leads to overlapping liable subjects. Therefore, the six-level standard should be further refined into a three-tier classification: the first tier covers L0, L1, and L2; the second tier is L3; and the third tier includes L4 and L5. This division is not a simple technical breakdown of standards, but is based on the core elements of the entity implementing the driving behavior, the boundary of human-machine rights and responsibilities, and the duty of care. It aims to resolve the issue of identifying the liable subject for different levels of autonomous vehicles, simplify the subject identification process, and clarify the burden of proof while adapting to the existing legal framework.

3.1 L0–L2 Level Autonomous Vehicles

L0 vehicles are non-autonomous vehicles and naturally follow the existing rules for handling motor vehicle traffic accident liability. When a traffic accident occurs between motor vehicles, the fault-based principle applies. When a motor vehicle collides with a non-motor vehicle or pedestrian, the no-fault liability principle applies.

Because L1–L2 autonomous driving systems only provide partial assistance in lateral or longitudinal vehicle motion control, at this stage the user (driver) remains the direct controlling subject of vehicle operation. The user possesses the ability to perceive, judge, and make decisions regarding the traffic environment and bears the direct duty of reasonable use and due care for vehicle operation safety [8]. The core responsibilities for target and event detection and response, as well as fallback for dynamic driving tasks, remain entirely with the human driver. The driver is still the sole entity performing the driving behavior, while the system serves merely as a driving assistance tool without any autonomous decision-making authority. For the liability of producers—such as manufacturers of autonomous motor vehicles and developers/designers of autonomous driving systems—liability arises only when they fail to adequately fulfill their obligation to inform users about the limitations of the automated driving assistance system’s algorithms and functions, as well as the correct methods of use, or when the autonomous vehicle

itself has defects. In such cases, the producer or seller shall bear product liability [9]. Therefore, L1–L2 level autonomous vehicles can fall within the scope of traditional motor vehicle traffic accident liability rules. The identification of liable subjects continues to follow the existing rules in Chapter V of the Tort Liability Section of the Civil Code and the Road Traffic Safety Law. There is no need for expansive interpretation or creation of new legal rules. The logic of legal application remains consistent with that of traditional motor vehicle driving.

When traffic accidents occur with L0–L2 level autonomous vehicles, traditional traffic accident handling procedures apply. The burden of proof follows the principle of “he who asserts must prove,” while the inversion of the burden of proof applies in specific circumstances. In the absence of special circumstances, the liable subject is the driver. In special cases, pursuant to Article 1209 of the Civil Code, in situations involving leased or borrowed motor vehicles, the user of the vehicle shall bear compensatory liability. If the owner or manager of the vehicle is at fault for the occurrence of the damage, they shall bear corresponding liability. If the accident is caused by quality defects in the vehicle itself, traditional methods still apply: victims may directly sue the producer or seller for compensation under no-fault liability. The scope of “producer” should be as analyzed above—the producer is the sole subject and does not include system developers, software designers, maintainers, etc. After the driver or insurer has paid compensation first, they have the right to seek full recourse from the producer.

3.2 L3 Level Autonomous Vehicles

L3 level autonomous vehicles can independently complete all dynamic driving tasks—including sustained lateral and longitudinal vehicle control, as well as target and event detection and response—within their designed operational domain. In a human-machine co-driving mode, part of the human driver’s control authority is transferred to the autonomous driving system. The user still enjoys the convenience and benefits provided by the system and therefore bears the obligation to take over the vehicle in a timely manner under specific circumstances [10]. When the driver fails to fulfill this obligation, tort liability may be pursued against the driver based on the fault principle. When an accident is caused by product defects in the autonomous driving system, the no-fault liability principle shall apply, and the victim may pursue liability against the producer. If both the driver and the producer are at fault, the fault-based liability principle shall apply, and the victim may pursue corresponding liability from both the human and the machine separately in accordance with the “rules on tort liability among multiple persons without concerted intent” as stipulated in the Civil Code. If the actions of both parties are insufficient to cause the entire damage individually, then according to Article 1172 of the Civil Code, the human and machine parties shall bear proportional liability according to their respective degrees of fault. If the liability of either the human or the machine is sufficient to cause the entire loss, then joint and several liability shall apply pursuant to Article 1171 of the Civil Code.

L3 level autonomous vehicles adopt a cross-attribution model between the user and the producer for traffic accidents. The preceding section has already explained that the current order of liability is unreasonable and justified the rationale for having producers and sellers assume primary compensatory liability. At the same time, the cross-attribution model between users and producers faces practical difficulties: parties encounter challenges in providing evidence, factual determination prior to applying the fault principle is hard to achieve smoothly in practice, and judicial proceedings cannot proceed effectively. Therefore, when a victim claims compensation, the victim only needs to provide simple evidence of causation. The producer shall then assume compensatory liability first or apply the inversion of the burden of proof to demonstrate that it is not at fault. If the producer claims an exemption or that the driver is also at fault and should share

liability, it may provide evidence accordingly. If the driver or insurer has already paid compensation first and the producer is at fault, the driver or insurer may seek recourse from the producer.

3.3 L4–L5 Level Autonomous Vehicles

L4–L5 level autonomous vehicles independently complete all dynamic driving tasks and fallback takeover throughout the entire journey. In this automation level scenario, vehicle operation is almost entirely dependent on the autonomous driving system, and autonomous vehicles basically require no human intervention. When an autonomous vehicle is at L4 or L5 level, the driver has no duty of care. In the event of a traffic accident, product liability naturally applies, and the victim pursues liability against the producer. The scope of “producer” should remain as analyzed above—the producer is the sole subject and does not include system developers, software designers, or maintainers, etc. At the same time, the theory of risk creation further explains the reasonableness of the producer bearing liability: when an actor initiates a certain danger or creates a certain risk through its conduct, thereby increasing the likelihood that the risk will materialize into damage, the actor can hardly escape responsibility [11]. Therefore, traffic accidents involving L4–L5 level autonomous vehicles should be subject to product liability. In such cases, since the autonomous vehicle is fully in control with no human driver involved, the victim may directly claim compensation from the producer. The producer may raise exemption grounds or prove that it is not at fault.

4. Conclusion

In summary, the popularization of autonomous driving technology has brought significant challenges to the traditional motor vehicle tort liability system. The original approaches to liability determination gradually reveal application difficulties in intelligent driving scenarios, which are neither conducive to victims obtaining timely compensation nor beneficial to the standardized development of the industry. This paper reviews the pathways for determining liable subjects and proposes a three-tier liability system centered on the producer. It aims to provide ideas for improving relevant rules, clarify liable subjects, optimize the order of liability, safeguard the healthy development of the industry, and ensure uniformity in judicial adjudication.

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