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Research on improvement of law for invigorating autonomous vehicle

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Abstract

The Korean government announced its goal of commercializing autonomous vehicle by year 2020. With such changes, it is expecting to decrease car accident mortality by half. To commercialize autonomous car, not only worries on safety of autonomous vehicle has to be solved but at the same time, institutional system has to be clear to distinguish legal responsibilities in case of accident. This paper will present the legal improvement direction of the introduction of autonomous vehicles as follows. First, it is necessary to re-establish concept of 'driver' institutionally. Second, it is appropriate to focus on Level 3 autonomous vehicle which is about to be commercialized in year 2020 and organize legal responsibility. Third, we should have a clear understanding on how level 3 autonomous vehicle will be commercialized in the future. Fourth, it is necessary to revise The Traffic Law, Act on Special Cases concerning the Settlement of Traffic Accident, and Automobile Accident Compensation Security Law in line with level 3 autonomous vehicle. Fifth, it is necessary to review present car insurance system. Sixth, present Product Liability Law is limited to movable products (Article 2), however, it is necessary to include intangible product which is software. Seventh, we should review on making special law related to autonomous car including civil, criminal, administrative, and insurance perspectives.

▸Keyword: autonomous vehicle, Development of autonomous driving technology, Criminal Responsibility, Civil responsibility, Insurance system, improvement of law

Ⅰ. Introduction

The Korean government announced its goal of commercializing autonomous vehicle by year 2020. With such changes, it is expecting to decrease car accident mortality by half. However, as cause and types of car accidents are so different that there is still possibility of occurrence of accident related to autonomous vehicle. To commercialize autonomous car, not only worries on safety of autonomous vehicle has to be solved but at the same time, institutional system has to be clear to distinguish legal responsibilities in case of accident. Under the current driver-oriented law, there will be issues arising in regards to the accident of autonomous vehicle. There is no legal institution related to this and such discussion is still at very starting stage. If driver should be responsible for the accident as what present law says, then the driver will not be able to have any trust on safety and convenience of autonomous car, in result, will refrain from purchasing. In contrast, if manufacturer shall take responsibilities, those manufacturers will not actively participate in commercializing autonomous car. As this is the case, as legal responsibilities in terms of accident of autonomous vehicle is unclear, this will be one of the barriers for commercialization. Therefore, this research looks into concept of autonomous vehicle and driver, current legal status on autonomous car, legal

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responsibility and limit of accident by autonomous vehicle and any available institutional improvement.

II. Concept of autonomous vehicle and driver

1. Concept of autonomous vehicle

Self-driving car or autonomous vehicle means vehicle which drives to the final destination by itself by directing, controlling, accelerating and changing speed in consideration to surrounding road and environment, recognizing potential danger around the car. In accordance to 「Automobile Management Act」 "autonomous vehicle means car which drives itself without any control of driver of passenger (Article 2, Clause 1-3).

In other countries, various terms are used such as unmanned vehicle, autonomous vehicle (car), or "self-driving car[1]." National Highway Traffic Safety Administration (NHTSE) has categorized different phases of development of autonomous driving technology as shown in table. Such categorization is accepted by many countries including Korea.

Table 1. Development of autonomous driving technology

Level	Definition	Description
Level 0	No automation	- No automated driving factor
Level 1	Function-specific Automation	- Limited to certain functions such as direction, controlling, accelerating, etc. - Under control and inspection of driver
Level 2	Combined Function Automation	- Automation of more than 2 functions such as direction, controlling, accelerating, etc. - Under control and inspection of driver
Level 3	Limited Self-Driving Automation	- All automated including direction, controlling, and accelerating - Under control and inspection by vehicle - Driver control in case of unexpected emergency situation
Level 4	Full Self-Driving Automation	- All functions are inspected and controlled by vehicle

In <Table 1>, level 1 and 2 is automated driving technology with low level of assistance for the driver and level 3 and 4 is high automated driving technology where car drives itself without driver's support. In case of level 3, this allows driver's involvement in case of unexpected emergency, which makes it distinguished from level 4. In contrast to 'fully automated driving' level 3 is sometimes referred to as 'partial automated driving.' For level 3, it drives by itself if ordered by driver, which makes it same with fully automated driving, however, as driver can be involved in case of unexpected emergency case, it can be referred to as 'limited automated driving' or 'conditional automated driving.' In case of 'partial automated driving' it is appropriate to refer to it as level 1 and 2 where automated driving provides support to the driver.

The automated vehicle defined in 「Automobile Management Act」 is closer to level 3 and 4. The one Korean government announced to commercialize by year 2020 is more similar to level 3. Such definition of concept of automated car is approached from technical side. In general, if definition of autonomous car is made as level 4 of full self-driving automation from technical perspective, it will be very confusing to define legal responsibilities. In terms of autonomous car as defined in level 4, different from technical development, it is unclear to make the exact commercializing period before legal and ethical issues are negotiated.

On the other hand, driverless car or unmanned vehicle which is usually confused with autonomous car is vehicle which carries out a certain mission without having a driver in case of war or catastrophic situation, there are some opinions that this is different from autonomous car as it does not consider convenience and safety of driver during its development process[2]. At least, from legal perspective, this can be said to be a negotiated autonomous car which is totally similar to full self-driving automation defined in level 4.

2. Concept of driver

In case of autonomous car where it is unmanned when driving, replaced by artificial intelligence as well as actual unmanned car without human from the beginning, the definition of driver shall be changed in regards to legal responsibilities. If driver is defined as a human being as it is, it will be unfair to lay all legal responsibilities on the driver who actually did not drive the autonomous car. What is more, in case of unmanned car, as there is no actual driver inside the car, it is totally impossible to ask for any legal responsibilities. Hence, as defined in 「Automobile Management Act」, autonomous car is a vehicle which drives itself 'without the control of the driver' such definition requires lot more improvement in respect to legal side.

Therefore, it is urgently required to have social agreement on whether artificial intelligence in car should be considered as driver or not. NHTSE has insisted that if artificial intelligence is proven to make determination similar to the man driver, artificial intelligence system of unmanned car of Goggle can be defined as a driver. In Google unmanned car, there was no traditional concept of driver which existed for more than 100 years of time in car. If there is no actual person driving the car, driver should be defined as a person or a thing that actually drives the car, in this case, is the artificial intelligence driving the car, it added. This delivers a huge implication to our society[3]. In other words, unmanned car is a car which does not have any man inside but does not mean that there is no driver.

Ⅲ. Civil and criminal responsibility and insurance in case of car accident

In May 2016, there was an accident where autonomously driving 'Tesla model S' hit tractor trailer crossing the highway and the driver died. In accordance to NHTSE, there was no defect found in 'Tesla model S' and no recall to be made. It interpreted this accident from the perspective of technical restriction rather than the defect. On the other hand, NHSTA pointed out that the driver failed to make an appropriate reaction although he/she has recognized possibility of the accident. It explained that at least, the driver should be able to see the truck 7 minutes before the crush but did not do anything. Even before this, in February 2016, one Google autonomous vehicle had an accident with a bus but this case was different from the fact that Google has the responsibility for such accident. In case of Tesla model S, where human driver had the responsibility but this Google case, Google was recognized for the fault.

One reason for having such a different decision is that level of technology applied to those two cars for autonomous driving is different. Currently, the most commonly used definition for explaining technical level is level 0 to 4, total 5 different levels suggested by NHSTA. Tesla belongs to level 3 which had limited self-driving automation, allowing driving without hand and foot but always had to keep an eye. The point of self-driving automation has to be decided by the driver. However, for level 4, this is full self-driving automation where Goggle is undergoing the test and its car belongs to this level.

In case of the State of California, it officially announced regulations on public driving. This regulation designates the person in charge in consideration to level, condition, and operational design domain of the autonomous vehicle. That is, in case of level 3 where driver has the control over the car, if car is out of ODD, driver shall take responsibility for safe driving and driving regulations. However, within the boundary of ODD, under the autonomous driving mode, manufacturer takes responsibility for safety driving-driving regulation during the driving. In case of level 4 and 5 where involvement of driver is not required, if the car is driving within the boundary of ODD, all the responsibilities are laid on the manufacturer. We should also take into consideration of such level, condition, and ODD of automated vehicle into our regulations[4].

1. Criminal Responsibility

It is not clear whether it is possible to lay criminal responsibility on the owner of autonomous vehicle or not for any damage of human life and asset occurring during driving. For criminal responsibility, there should be intention or mistake, however, such damage is caused by automation system for autonomous car and it is not possible to impose any criminal responsibility on the driver if he/she does not have intention or mistake. Furthermore, this responsibility cannot be laid o the manufacturer. In accordance to product liability law, this law does not include any definition on criminal punishment. What is more, it is also inappropriate to find the person involved in a certain manufacturing process to impose all the responsibilities, it will be legally inappropriate. Therefore, under current law, regulation on criminal punishment on driver is in reality, meaningless. One exception would be, if any mistake or intention of the driver is involved, the person using autonomous car or ordering the system should take criminal responsibilities. In case of having multiple persons in the car, there should be a review on who shall take the responsibility. For instance, in case of potential error in the system, one should change to manual driving or stop driving. In such cases, there should be clear definition on who should take responsibilities, one certain person or all the passengers have the responsibilities[5].

An alternative is related to making a new legislation, which is to consider asking for criminal responsibilities to both manufacturer and creator who made the artificial intelligence by revising double punishment system in Article 47 and 48 of 'development and promotion of intelligent robot.' Surely,

it is true that there is more homework to be solved in the future, improving problems in Article 48 where exemptions are made and other issues rising from double punishing manufacturer and creator[6]. Referring to the new legislation system in England, it has Corporate Manslaughter and Corporate Homicide Act 2007, asking for responsibility for serious human life damage caused[7]. We could also consider adopting similar law in consideration to serious risk caused to life of human being from mal-functioning of artificial intelligence. One of the features of this law is that it does not impose all the responsibilities on a certain person for the death caused but all the responsibilities belong to management and operation of corporate, allowing imposing fine without any limitation. If Korea adopts this system, it will simpler than asking criminal responsibility to the manufacturing company[8].

2. Civil responsibility

2.1. Compensation for damage in accordance to Automobile Accident Compensation Security Law

In case of death or injury from car accident, the driver takes responsibility of compensating such damage in accordance to the Automobile Accident Compensation Security Law, which is a special law under Civil Law. In accordance to Automobile Accident Compensation Security Law, it imposes liability without fault on the driver based on the risk of car driving. In case of damage is caused on the passenger, regardless of the intention or mistake, driver cannot be exempt from this unless it is proven that the passenger committed suicide or killed oneself by his/her own intention. If victim is the third person other than the passenger, driver can be exempt only if he/she proves one of the following; driver made a full attention to the driving, mistake or intention is on the third person, or there was structural defect of functional damage to the car. This law asks car owners to have responsibility insurance under compulsion for safe compensation of the victim (Article 5).

In case of death or injury of a person from driving of autonomous vehicle itself, in accordance to judical precedent, the person in charge is “for whom the autonomous car is driving itself” in accordance to Automobile Accident Compensation Security Law. This also includes not only the actual person controlling the driving but also includes indirect control over the driving. This law in fact imposes liability without fault (Article 3). Based on the fact that this law forces drivers to have liability insurance, there is a possibility of asking for responsibility for level 3 (potential possibility of driver driving in case of emergency) and level 4 (driver placing the driving order only), however, it could be still very controversial.

In case of level 3 and level 4, the actual driver is artificial intelligence, it is not the person. Hence, it could be highly controversial to impose responsibility on the driver based on the fact that the person simply made order to the AI. Furthermore, it is unfair to deliver all the responsibility of compensation to the driver based on Automobile Accident Compensation Security Law without considering manufacturer, software company, and server controller, as driver has limited or no permission to drive in autonomous vehicle.

Then, can we ask manufacturer, software company, and server controller for compensation? It is difficult to say that they get the benefit of driving (“for themselves)” in accordance to Automobile Accident Compensation Security Law and also, driver is considered as a human being. It would be difficult to ask for damage compensation in regards to the fact that liability insurance is forced on the car owner only.

In accordance to Automobile Accident Compensation Security Law, another way is to ask for damage compensation caused by illegal action based on Civil Law (Article 750). However, as principle of mistake responsibility is applied, the person will have more intense responsibility for proving. In this case, manufacturer and software company will be asked for less intense responsibility which is responsibility for manufactured good.

2.2 Warranty against defect in Civil Law and compensation for damage in Product Liability Law

In case of car accident caused by defect in software of autonomous vehicle, compensation for the damage can be asked to the manufacturer from the perspective that the good sold has defect in accordance in Article 580 of Civil Law ‘warranty against defect.’ However, if it happened after purchasing and updating software, this argument can be very controversial.

In case of damages caused by defect in software other than death, injury, or car, in accordance to Product Liability Law, this product is defined as movable products and in case of intangible product such as software, it does not belong to the product, hence, it is difficult to ask software company for responsibility under this law. If such software error has occurred after selling the car as well as updating the software, this issue will be more controversial. Furthermore, to lay Product Liability on the company, such defect has to be proved,

which will be in reality extremely difficult for individuals to prove defect in this highly modern technology-centered autonomous car.

2.3. Review on legislation

For autonomous vehicle, the driver is away from one's right to drive under his/her own responsibility and advanced the level of automation, the car does not require the driver while driving. Due to this reason, responsibility for most of potential accident related to autonomous vehicle is laid on manufacturer[9]. That is, any accident caused during automation mode or during driving of autonomous car itself, principally, liability is more on the manufacturer than the driver. However, different from responsibility based on Product Liability Law, those accident caused by defect in software can be liable to the manufacturer. This means that new law should be made on autonomous vehicle and this can be in an independent law or by revising present law on Automobile Accident Compensation Security Law or Product Liability Law.

3. Insurance system

It is necessary to review present vehicle insurance system in general as subject of driving accident can be changed from a person to automatic system. Under present insurance system, it is difficult to distinguish responsibility among passenger, insurance company, and manufacturer if any accident happens. What is more, it is not easy to identify who should take responsibility for the evidence in general accident. The present Automobile Accident Compensation Security Law states it is necessary to have responsibility insurance for all vehicle owners (Article 5), however, for autonomous car driven by artificial intelligence, it is also necessary to legally obligate manufacturers to have responsibility insurance. Once legal responsible person is confirmed, insurance cost will be charged to the same person. If having car insurance is made to be compulsory in accordance to Automobile Accident Compensation Security Law, one can have protection security on damage caused, however, responsibility for damage caused by autonomous car driving can be charged too much to the manufacturer, delivering more burden on them.

Therefore, in the future, making law related to calculating insurance rate and Product Liability as well as designing insurance product which are different from the present responsibility system will be a hot issue. First of all, there should be a clear differentiation on interest parties for responsibility by making separate insurance for autonomous vehicle. If autonomous vehicle is commercialized, this will not only bring a huge influence on our daily life but also on insurance industry[10]. For now, insurance rate for determining insurance fee is made very driver-centered, however, if autonomous vehicle becomes commercialized, this rate system, will be change to vehicle-centered. There will be new insurance product and contract for this. Recently in England, there were new car insurance product launched for autonomous vehicle and in Japan, there were compensation insurance product for autonomous vehicle in test. In a long term, there is also opinions that commercialization of autonomous vehicle will reduce car insurance business and on the other hand, increase the competition. As types of automation are different, partial and fully automation, the boundary of insurance product will be diverse, however, at the end, if full automation is commercialized, this will help decrease accident caused by mistake of drivers, hence, there is possibility that this will result in reduction of capacity of insurance market.

Ⅳ. Institutional improvement

First of all, it is necessary to re-define 'concept of autonomous vehicle' from legal perspective. The present definition of autonomous vehicle is made from technical side and is very much focused on level 4 full automation-driving which is not certain whether it will be commercialized or not and when. Therefore, it will be very confusing to discuss legal responsibility based on this.

Second, it is necessary to re-establish concept of 'driver' institutionally. It is required to re-define concept of driver in consideration to opinion of NHTSE, which says that artificial intelligence can be a driver as well by reflecting concept of autonomous vehicle.

Third, it is appropriate to focus on Level 3 autonomous vehicle which is about to be commercialized in year 2020 and organize legal responsibility.

Fourth, we should have a clear understanding on how level 3 autonomous vehicle will be commercialized in the future. From technical perspective, level 3 vehicle is viewed as a car allowing limited control of driver in case of emergency case, however, similar to airplane, it is difficult to exclude the fact that 'selective driving' is possible, where driver can select manual or automation.

The legal responsibility and its range will vary depending on in what level autonomous vehicle is commercialized.

Fifth, it is necessary to revise The Traffic Law, Act on Special Cases concerning the Settlement of Traffic Accident, and Automobile Accident Compensation Security Law in line with level 3 autonomous vehicle. In detail, present driver license system has to be re-organized, revise The Traffic Law so that autonomous vehicle can be driven in regular road. What is more, expand concept of driver in the Traffic Law as well as Act on Special Cases concerning the Settlement of Traffic Accident and Automobile Accident Compensation Security Law so that one can ask legal responsibility to manufacturer, software company, and server manager for artificial intelligence.

Sixth, it is necessary to review present car insurance system. It is needed to develop insurance product specialized for autonomous car. With the expansion of autonomous vehicle, car accident caused by mistake of driver will dramatically decrease, hence, in a long term, vehicle insurance will change from driver-centered to manufacturer-centered.

Seventh, present Product Liability Law is limited to movable products (Article 2), however, it is necessary to include intangible product which is software. It is required to relieve proof responsibility on defect of autonomous vehicle or transferring responsibility to manufacturer or software company.

Eighth, we should review on making special law related to autonomous car including civil, criminal, administrative, and insurance perspectives.

Ⅴ. Conclusion

Keeping law system for responsibility in case of accident of autonomous vehicle is one of the difficulties not only Korea is having but also all other countries as well. This maintenance shall take place when there is different accident cases accumulated upon social agreement, however, autonomous vehicle is something that we rarely experience so far. What is more, the cause of accident can be varied from driver, manufacturer, software company, communication company, and MAP service company. Hence to commercialize autonomous vehicle, safety worries on autonomous vehicle has to be solved and at the same time, clearly organize legal responsibility in case of accident. If this is unclear, it will be one of the big barrier for commercializing autonomous vehicle.

In fact, it is urgently required to organize legal responsibility based on level 3 autonomous car which is about to be commercialized and this can be done by revising present law or making special law. At the same time, if safety issues related to the development of autonomous driving technology is solved, commercialization of level 4 full automation-driving vehicle will be a big issue in the future. Surely, we should put our best effort to prepare for legal responsibilities in terms of commercializing full automation-driving vehicle.

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