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How Does the Auto-Driving Vehicle Bear the Ethical Responsibility?

--From the perspective of Chinese Philosophy

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Abstract

Nowadays the Auto-Driving Vehicle (ADV) has become the frontier domain that AI penetrates into daily life. While bringing safety and convenience, ADV are also be questioned on its ethical identity and contradictory ethical standard swing between consequentialism and deontology. Those are the obstacles should overcome before we enter into the ethical responsibility of ADV. When Western ethics is invalid, we choose Chinese philosophy as the key to solve problems: First, smart machines that drive cars, according to "Human is not machine", replaces people who drive, not people who act as moral actors. Second, human's dominance in ritual activities can be extended to automatic driving situations. Human can control the ADV in emergencies so that intelligent machines do not have to make a choice between consequentialism and deontology. Further, the principle of Jing and Quan helps us analyze the ethical responsibility of ADV: drivers are responsible for automobiles, which is the eternal Jing. Responsibilities of drivers, traffic participants, designers, producers and other relevant parties should be coordinated according to specific circumstances, which is the changing Quan. The combination of Jing and Quan may create a more optimized solution to the ethical responsibility of ADV.

Keywords

Auto-Driving Vehicle; Moral Actor; Ethical Standard; Ethical Responsibility; Chinese Philosophy.

1. Introduction

On September 15, 2020, Baidu released Apollo's "5G cloud driving", and self-driving cars entered the parallel driving stage. Entering 2021, Baidu's Apollo autonomous driving fleet is about to be commercialized. This is just two years after Baidu announced that it would promote Apollo's layout in autonomous driving, intelligent networking, and intelligent transportation in Cangzhou, Hebei Province, and obtained the world's first commercial license for autonomous driving. As an intelligent machine for autonomous driving, the promotion of Baidu Apollo is the epitome of the rapid development of global artificial intelligence in the field of autonomous driving, such as Google, Tesla, Ford in the United States, Bosch, Audi, BMW in Germany, and Nissan, Toyota, Honda and other companies in Japan are wrestling with the development, testing and promotion of autonomous vehicles. This kind of autonomous intelligent machine can simulate humans through learning, and make corresponding decisions and operations for different situations in the cooperation of visual computing, radar, monitoring devices and global positioning systems, so as to realize intelligent driving of vehicles.

While the global push for autonomous vehicles is being promoted, there are considerable concerns in the academic community, mainly focusing on ethical aspects, such as the ethical responsibility of autonomous vehicles. In fact, the solution to this problem depends on the

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clarification of two ethical dilemmas: is the self-driving car a moral actor, and what ethical standards should be followed in its decision-making? In this regard, the relevant academic discussions have involved the autonomy and consciousness of intelligent machines, and the conflict between consequentialism and deontology as ethical standards. While it is undeniable that these studies are instructive, this kind of research centered on Western ethics makes the ethics of self-driving cars focus more on machines than people, and it seems difficult to conclusively conclude that the ethical issues of self-driving cars are more focused on machines than humans. From a different perspective, from the perspective of Chinese philosophy, it may be possible to "untie" self-driving cars that have encountered ethical dilemmas.

2. The ethical dilemma of self-driving cars

As an important means of transportation, automobiles not only facilitate people's daily life, but also bring a certain degree of accident risk to passengers and others involved in transportation. In the era of autonomous driving, the driver of the car has changed from a human to an intelligent machine, although from the data point of view, autonomous driving is safer than human driving, but some accidental accidents also greatly magnify the potential problems of automatic driving. At present, the ethical dilemma of autonomous vehicles focuses on two main aspects:

(1) The identity of the moral actor of the autonomous vehicle. Autonomous vehicles make decisions and actions based on road conditions, which inevitably involve the lives of passengers and other traffic participants. When it is entrusted to an autonomous vehicle to make such a big decision and operation, can it always make ethical decisions and actions?

There are three main principles to determine whether an autonomous vehicle is a moral actor: autonomy, intentionality, and responsibility. In other words, autonomous vehicles that act ethically must: 1) be able to make decisions and operate autonomously without relying on the programs implanted by the designer, which is the principle of autonomy, 2) have the intention of moral action, that is, the decision and operation have a legitimate reason for ethical action, which is the principle of intentionality, and 3) have the responsibility to consider when making decisions and operations, which is the principle of responsibility. In this regard, the academic community has formed two camps with opposite attitudes. Among other things, opponents argue that intelligent machines cannot be moral actors, such as Deborah G. Johnson, who points out that intelligent machines are incapable of moral action because they lack internal psychological provisions,[1](p195-204) John R. Searle states that machines that follow a program to simulate their thinking are not intentional,[2](p417-458). Lei Ruipeng and Feng Junyan believe that the current intelligent machines are only programmable machines, not moral actors,[3](p133) Su Lingyin said that ethics cannot be embedded in intelligent machines,[4](p42) Lan Jiang pointed out that intelligent machines cannot reach the complete level of practical ethics due to the limitations of Polanyi's paradox. [5] (p43-46) However, there are also scholars who believe that intelligent machines can be moral actors. Luciano Floridi and J. W. Sanders revised the anthropocentric concept of ethical agents and proposed ethical standards for intelligent machines as ethical subjects,[6] (p349-379).Zhang Zhengqing and Huang Xiaowei oppose the use of traditional responsibility ethics to dissolve the ethical subjectivity of intelligent machines, they criticize various doubts about the moral autonomy and intentionality of intelligent machines, and then propose that intelligent machines can be regarded as new moral agents of other expectations from the perspective of the moral responsibility of others. [7](P26-32)

(2) Ethical standards for autonomous vehicles. If the identity of the moral actor is a theoretical dilemma for self-driving cars, then the choice of ethical standards is the practical dilemma it faces. So, what are the ethical standards that should be followed in the decision-making and

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operation of autonomous vehicles? To some extent, the tram puzzle can be an entry point for exploring this issue.

There are two versions of the tram puzzle, the first of which was proposed by Philippa Foot, in which a traveling tram has five workers on the main road and one worker on the feeder line. [8] (p152-161) When making decisions, many people will choose to steer the car to the feeder, which follows the utilitarian ethical standard, that is, the loss of hitting five people on the tram is greater than if it hits one, which is a consequentialist ethics that seeks to maximize the benefits of the outcome. Version 2 is constructed by Judith Thomson: a moving tram with five workers in front of it, and a footbridge between cars and people, on which there is a fat man weighing enough to block the tram. [9] (p204-217) When making decisions, many people do not choose to push the fat man down in order to save five people, because they have no reason to deliberately murder an innocent person in order to save five people, which embodies the Kantian deontological ethics.

Six studies conducted by Jean-François Bonnefen's group from June to November 2015 revealed that the problems of traditional electric vehicles are becoming more intractable in the era of autonomous driving. [10] (p1573-1576) In the context of autonomous driving, a small number of people in the traditional tram problem are transformed into passengers in the autonomous car, so that the "tram problem" of the autonomous car becomes a contradiction between a few passengers and a large number of traffic participants. If the utilitarian consequential ethics are followed, in order to minimize the damage caused by the collision with the majority of people, the self-driving car will make decisions and actions that sacrifice the vehicle itself and its passengers, which may lead to the consequences of car destruction and death. It can be seen that in the era of autonomous driving, the moral decision-maker who appears as a bystander in the traditional tram problem is transformed into an intelligent machine driving the car, which makes moral decisions between a few passengers and a large number of others. Therefore, whether self-driving cars follow utilitarian ethical standards involves a game of rights between a few passengers and a large number of others. If self-driving cars follow consequential ethics, few people will be willing to buy and ride in such cars at their own expense, and if they do not follow consequential ethics, people will be willing to buy and ride in cars that protect passengers, but it is difficult for transportation participants and regulators as the majority of others to accept such intelligent machines that may endanger public safety.

In general, self-driving cars are developing rapidly in the era of artificial intelligence, but they are also suffering from ethical dilemmas from both theoretical and practical aspects due to their deep involvement with safety issues. As for the identity of moral actors and their ethical standards for self-driving cars, the academic community has been discussing enthusiastically but conflicting from the perspective of Western ethics, and there is still no conclusive conclusion.

3. How do you view the ethical role of autonomous vehicles?

Before addressing the issue of ethical responsibility for autonomous vehicles, it is necessary to clarify two major ethical dilemmas. Here, we break away from the central perspective of Western ethics and try to analyze the identity of moral actors and the choice of ethical standards for autonomous vehicles from the perspective of Chinese philosophy.

(1) Questioning the identity of the moral actor of autonomous vehicles. When it comes to self-driving cars, the academic community seems to have struggled over whether and how they can be considered moral actors. Why do people expect to think of self-driving cars as moral actors with some kind of ethical concept? Maybe it's because there is a hidden concern in people's

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minds: If self-driving cars cause accidents or even casualties, can such intelligent machines be held responsible?

This concern may stem from the fear of damage, injury, and loss without a place to make a claim. As a result, people are thinking about how to make intelligent machines become ethical actors who can take responsibility. In the vast majority of modern societies, people are, to some extent, the subject of other's expected responsibility, just as people do not pay attention to the internal moral state of assembly line workers in a state of production, but focus on whether workers can perform the operations required by their positions. In this regard, intelligent machines can replace people in specific situations and do what they need to do. Therefore, some scholars have proposed that the expectation bias, intelligence bias and status bias can be abandoned, and intelligent machines can be regarded as moral actors of the expectation of others. [7] (p29-32) It is undeniable that intelligent machines in production situations perform the same functions as humans, and from the perspective of the expectations of others, intelligent machines are the same existence as humans, but can it be judged that intelligent machines are moral actors?

From the perspective of Chinese philosophy, although an intelligent machine performs the same function as a human, it cannot be a moral actor. In terms of the relationship between people and instruments, Confucius advocated that "a gentleman is not a weapon", and Zhu Xi explained that "the instrument is suitable for its own use but cannot be communicated." A person of virtue has no body, so he is thoughtful, not a special talent and an art. [11] (p57) Here, Zhu Xi clearly reveals the difference between human beings and objects: objects have specific uses, and their functions are limited by specific circumstances, while people with the capacity for moral responsibility are not limited by specific circumstances and are complete moral subjects in any case. That is to say, compared with the limitation of utensils that are "suitable for their own use but cannot be communicated", as a person of virtue, "the body is all possessed, so the use is all thoughtful", and there is no restriction on specific situations. If we look at self-driving cars from this perspective, we will find that in the driving state of the car, the intelligent machine of the self-driving car is equivalent to the driver of the car. At this time, intelligent machines can indeed replace people, but they do not replace people who are moral agents in the full sense of the word, but "people" who perform specific driving functions in the specific context of driving a car. This kind of "human" is equivalent to the "instrument" in Chinese philosophy, which is "suitable for its own purpose but cannot be communicated", that is, in the driving state of the car, the person as the moral subject is alienated as a part of the driving car, and the self-driving intelligent machine replaces the driving function of the person as the "instrument". Therefore, although intelligent machines can drive cars independently, they are not equivalent to people and cannot be moral actors.

(2) Questioning the ethical standards of autonomous vehicles. Since self-driving cars are not moral actors, what kind of ethical standards should cars follow when they encounter emergencies in the process of autonomous driving, especially in extreme situations where intelligent machines need to make choices between passengers and other traffic participants? For this practical problem, academics often debate between utilitarian consequentialism and Kantian deontology, and at the same time, they are also troubled by the problem of how to algorithmize human ethical concepts and implant them into intelligent machines.

Before discussing what ethical standards should be followed by self-driving cars, it is necessary to understand the classification of autonomous driving. According to the standards of the International Society of Automata Engineers (SAE), autonomous driving is divided into six levels: L0 to L5, and many cars currently have L2 autonomous driving, and some cars have reached L3, such as Tesla, Audi A8, etc. Level 3 is a restrictive autonomous driving in which an autonomous intelligent machine can drive a car in a specific scenario, but still requires the driver to be attentive and manually operated if necessary. Renault's Symbioz concept, Baidu's 2019 bus Apollon, and Hongqi EV, all of which have reached Level 4 autonomous driving. This

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level of automation allows for a fully autonomous driving car that eliminates the need for the driver to keep an eye on the driving process, but this autonomous driving still needs to be carried out in specific scenarios. Scenario-agnostic and adaptable to any road condition is Level 5 autonomous driving, which is fully automated and can be intervened manually if necessary. However, there are currently no Level 5 autonomous vehicles.

From a Chinese philosophical perspective, self-driving cars don't seem to need some kind of ethical standard to guide decision-making, at least at the current level of self-driving cars. For example, Confucianism focuses on daily ritual and music life and sacrificial activities, and when these activities are carried out, people form a symbiotic relationship with the norms of sacrifice and ritual music, and generate an ethical situation in which a person and the norms of ritual and music complement each other, and the etiquette norms of human and other natures occupy different positions and play different roles in them. However, Confucianism advocates that "sacrifice is like being there, and worshipping the gods is like being there"[11](p64), and "people are not benevolent, such as courtesy, and people are not benevolent, such as pleasure"[11](p61).It emphasizes that if people do not have a sincere and benevolent heart, activities such as sacrifice and ritual music will become meaningless performances, and the generation and maintenance of the ethical situation of people and ritual music depends on people's wholehearted devotion to uphold sincerity, respect and benevolence. It can be seen that Confucianism emphasizes that human beings have the right to dominate and decide in ethical situations. To some extent, this Confucian perspective can be used to dissect the ethical dilemmas of self-driving cars. At present, autonomous vehicles span five levels, from the lowest level of L0 autonomous driving to the highly automated level of L4 autonomous driving, in fact, all require the participation of drivers, but as the level increases, the demand for driver participation gradually decreases. In a sense, self-driving cars are a special ethical situation of car driving formed by the cooperation between humans and self-driving intelligent machines. In the normal driving state, intelligent machines can replace humans to drive, and when there are extreme situations that are difficult to choose, intelligent machines will remind the driver to take over, and humans can make corresponding decisions according to the specific situation. Similar to the Confucian ethical situation of people and etiquette, the driver can make decisions when encountering extreme situations, that is, when major decisions related to life, intelligent machines can hand over control of the vehicle to people, and it is people, not intelligent machines, who have the leading and decisive power in the ethical situation of autonomous driving. Therefore, in autonomous driving, intelligent machines are responsible for driving in normal situations, and humans are responsible for supervision and decision-making in times of crisis. In this way, the need to "embed" human values, moral norms, and ethical norms into intelligent machines with the help of algorithms" [12] (p34) does not seem necessary. In today's self-driving cars, the driver is basically responsible for taking over the ethical decision-making in critical moments, so there is no question of how to choose and implant ethical standards for self-driving intelligent machines.

At this point in the discussion, we have used Chinese philosophies such as "gentlemen do not use instruments" and "sacrifice is like being" to highlight the dominance of humans in the context of autonomous driving in collaboration with intelligent machines, thus untying the question of the identity of moral actors and the setting of ethical standards for autonomous vehicles. After clarifying the ethical dilemmas encountered by autonomous vehicles from the theoretical and practical levels, the next step will be to discuss the ethical responsibility of autonomous vehicles.

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4. Why do self-driving cars have ethical responsibility?

As a means of transportation, cars will inevitably cause accidents when driving on the road, and self-driving cars seem to be no exception, such as Tesla Model S, Google Lexus, Uber and other cars have been killed and injured while driving themselves. So, how will self-driving cars be held ethically responsible when a casualty accident occurs?

At the current state of development of intelligent machines, it is impossible for people to embed ethics into AI machines, and self-driving cars cannot be used as moral agents with ethical responsibilities. In this way, there are two main views on the liability of autonomous vehicles: (1) The responsibility of autonomous vehicles is divided into stakeholders such as car producers, car users, and regulators. For example, while emphasizing the responsibility of car producers, Moolayil also argues that autonomous vehicles tend to maximize the protection of passengers, so passengers as car users should also bear corresponding responsibilities. [13] (P1-32) Yan Kunru and Ma Shaoqing, in accordance with international norms such as the Asiloma Principles for Artificial Intelligence and the Guidelines for the Ethical Design and Application of Robots and Machine Systems, also believe that human beings, especially designers, users and other stakeholders, should bear the responsibility of intelligent machines. [14] (P334-336) (2) Autonomous driving is seen as a collective act, so that the collective should also bear part of the responsibility for the autonomous vehicle. In this regard, He Hongpeng believes that unmanned driving should not be regarded as an individual behavior, but a collective behavior under a certain rule. [15] (P61) Sun Baoxue further pointed out that autonomous driving as a collective behavior should be legislated by the state, and the government should formulate relevant rules and regulations. [16] (p37) In addition, Su Lingyin also emphasized the importance of relevant technical regulatory agencies. [4](P42-44)

To a large extent, the above research reflects the current consensus in the academic community: the responsibility of self-driving cars cannot be borne by intelligent machines themselves, but by humans. In other words, although intelligent machines can complete decision-making and operation during autonomous driving, they are still actually a tool, which replaces only the mechanized functions of people while driving. Therefore, the ethical responsibility of intelligent machines should be classified as the ethical responsibility of people. In this regard, He Huaihong pointed out that before establishing a safe and reliable value system for intelligent machines, we should limit the capabilities of intelligent machines to the field of simple calculations or algorithms, and to the field of tools and means. [17] (P34) Since autonomous vehicles are an instrumental existence in traffic accidents, and their responsibilities should be borne by people, then with autonomous vehicles as the intermediary point, designers, producers, distributors, consumers, passengers, other transportation participants, governments and insurance companies and other regulatory authorities are all stakeholders, and who should bear the main responsibility? What is the order of responsibility of these stakeholders? The main responsibility of the distributor is emphasized, while the responsibility and importance of the legislative and regulatory authorities are emphasized, followed by the responsibility of the driver. However, this distribution of responsibilities does not seem to be fair, as it reinforces the objective responsibility of others and weakens the subjective responsibility of the driver. So, how do we properly distribute the ethical responsibilities of those involved in autonomous vehicles?

In the face of ethical dilemmas, Chinese philosophy attaches great importance to the idea of economic rights. For example, Mencius "Men and women do not give and receive kisses, and courtesy, and those who dow in the help of sisters-in-law are also powerful"[11](p284), and "The Legend of the Ram in the Spring and Autumn Period" "Those who are in power are contrary to the scriptures, and then there are good ones." Where the right is set, there is nothing to set up at the expense of death. There is a way to exercise power, self-deprecation is to

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exercise power, and it is not harmful to others to exercise power"[18](p16), and Zhu Zi's "those who have the scriptures are always the way, and those who have the right are also the changes of the way"[19](p989).and so on, all of which are the embodiment of the idea of economic power. Among them, "Jing" represents the moral code of natural justice that people should generally abide by, reflecting the characteristics of deontology and motivation of Confucian ethics, while "quan" is a kind of contingency that conforms to the special ethical situation, reflecting Confucianism's recognition of utilitarianism and effect. From the perspective of economic authority, Confucianism neither advocates deontological ethics that ignores specific situations, nor does it recognize completely utilitarian consequentialism that is divorced from deontological ethics, but advocates that "in the process of concrete practice, ordinary ethics such as etiquette norms should be adapted to the changes of time, place, and scene according to the changes in time, place, and scene" [20] (p32). In this way, Confucian ethics of economic authority is an ethical concept that integrates deontology and consequentialism and coordinates them according to specific situations.

From the perspective of economic ethics, the distribution of ethical responsibilities for autonomous vehicles can be reduced to two levels: first, the level of "economy". This level aims to identify the direct bearers of ethical responsibility for autonomous vehicles. In the case of a traffic accident, the ethical responsibility for the autonomous vehicle should be shifted to the driver, that is, the driver should bear the part of the responsibility caused by the autonomous vehicle. Because the current L0to L4 cars cannot achieve full autonomous driving without the limited situation, the autonomous car can alert the driver in an emergency, and the driver has the right and obligation to take over the car and make decisions. Even though it is the most advanced Level 5 autonomous vehicle, there will be a design where the driver will take over the decision-making of the car in an emergency. It can be seen that at present, the terminal control of technology cannot be separated from human operation, which shows that the driver enjoys the ultimate dominance and decision-making power in the process of automatic driving of the car. Therefore, the driver should be the direct bearer of the part of the ethical responsibility of the autonomous vehicle, which is the eternal level of "meridian" in the allocation of responsibility for the autonomous vehicle;, the level of "right". This hierarchy is designed to fine-tune the order of responsibilities of the "Jing" hierarchy according to the specific context. Because the specific situation of automobile accidents is complex, the actual situation should be taken into account when discussing the allocation of ethical responsibilities for autonomous vehicles. Specifically, in the case of accidents caused by self-driving cars, the driver should bear the primary responsibility, followed by the designer, producer, distributor, and finally other traffic participants and regulators who have been injured. In the case of accidents caused by autonomous vehicles, such as accidents caused by collisions between other traffic participants and autonomous vehicles, the other traffic participants should bear the primary responsibility, the driver of the autonomous vehicle may bear secondary liability depending on the specific circumstances, and the designer, producer, distributor and regulatory authority shall bear minimal or no responsibility.

From the perspective of Chinese philosophy, when assigning ethical responsibilities for autonomous vehicles, "Jing" and "Quan" should be considered. At the level of "economy", the autonomous driving of the car does not mean that the driver is not responsible, but the part of the responsibility of the autonomous vehicle should be borne by the driver, and at the level of "right", the responsibility of the driver of the autonomous vehicle, other traffic participants and other accident stakeholders should be weighed according to the specific situation. The combination of "economy" and "rights" can basically optimize and rationally distribute the ethical responsibilities of autonomous vehicles.

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5. Conclusion

At present, self-driving cars are at the forefront of artificial intelligence entering daily life. While bringing safety and convenience, self-driving cars also suffer from ethical dilemmas. When it is difficult to reach a conclusion from the perspective of Western ethics, we can try to solve the problem from the perspective of Chinese philosophy. After clarifying the difficult problem of choosing the identity and ethical standards of moral actors of autonomous vehicles with the ideas of "gentlemen do not approve" and "sacrifice as in", we further analyze the ethical responsibility of autonomous vehicles from the perspective of economic rights: the driver bears the part of the responsibility of the autonomous vehicle, which is the unchanging "economy", and the corresponding "right" is to coordinate the responsibility order of the driver, other traffic participants, designers, producers and other relevant parties according to the specific situation. The combination of "economy" and "rights" may be able to "untie" self-driving cars that are plagued by ethical responsibility issues.

At the same time, with the popularization of self-driving cars as the starting point, artificial intelligence will penetrate into all aspects of daily life in the future. In the era of deep interaction and high integration with people, the ethical issues brought by intelligent machines will be further highlighted. In this case, it may not be sufficient to discuss it only from the perspective of Western philosophy and ethics, and it seems that Chinese philosophy should not be absent in the era of artificial intelligence. Not only do intelligent machines operating in the Chinese context need Chinese philosophy as their ethical escort, but intelligent machines that are widely used around the world can also gain certain ethical inspiration from Chinese philosophy.

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