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Different Solutions to The Driverless Car Tram Problem

Ip Gao[1, *]

[1]Shenzhen Foreign Languages School, Shenzhen, China

*Corresponding author: jasonipgao@outlook.com

Abstract:

This review discusses the approaches taken by autonomous vehicles to resolve moral dilemmas, drawing upon a range of theories including zero-sum game theory, morality as cooperations (MAC), and deontological ethics. It also considers factors such as personality, cognitive styles, and risk sensitivity. The conclusion drawn is that each theoretical framework provides a distinct viewpoint on moral issues, underscoring the imperative for sophisticated algorithms within emergency systems to ensure ethical decision-making. This article introduces a comprehensive theoretical framework that aims to guide ethical decision-making processes and meticulously outlines a structured approach to ensure that the intricate algorithms and artificial intelligence systems governing these self-driving cars are not only technologically advanced but also deeply rooted in the moral and ethical principles that are valued by society at large. This includes proposing a set of guidelines and ethical principles that developers and policymakers should consider when designing, testing, and deploying autonomous vehicles on public roads. This paper emphasizes the importance of striking a balance between innovation and ethical responsibility, advocating for a collaborative approach that involves stakeholders from various sectors such as technology, ethics, law, and public policy.

Keywords: Moral dilemmas; zero-sum game theory; morality as cooperation; decision-making.

1. Introduction

Morality is a code which regulates people's behavior and thus ensures the common good. A system of cooperative guidelines known as ethics aids people in maintaining harmony and advancing the common good [1]. Morality is also the set of rules and standards that govern human behavior in society and impose restrictions on social interactions based on public opinion based on social classes [2, 3]. Despite the fact that morality improves harmony in our lives, moral quandaries occasionally arise and leave people unsure of how to proceed. Thus, the well-known expression "moral dilemmas." Studying moral dilem-

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mas has long been a part of philosophy, ethics, psychology, and biology. In a moral dilemma, the subject has to choose between two options that they both feel are morally right but they are incompatible, therefore they have to pick one. The idea behind moral dilemmas is that the subject is viewed as morally repugnant regardless of the their decision. When examining moral issues, academics from a variety of nations have recently put forth utilitarianism, the impact of language on morality, and the importance of human intuition and emotion on moral judgment [4-6]. As anticipated, the legalistic network theory of construction deontology, evolution, human reason (The Moral Instinct, 2008), and moral identity [7]. These studies offer a crucial theoretical foundation for comprehending how people behave when presented with moral dilemmas.

There are theoretical and practical benefits to studying moral dilemmas. On the one hand, it helps us comprehend people's beliefs and viewpoints regarding various possibilities. Expose people's underlying reasoning, the reasons behind their actions, and the biological factors that influence their decision-making. This enables people to make more moral decisions in the future when they encounter difficulties [8, 9]. However, this work might also offer theoretical backing for earlier research and tests. In order to handle moral dilemmas in real life more effectively, this article carried out an objective analysis of the numerous elements that influence people's decisions when they are presented with moral difficulties, drawing on prior theories to help people understand the particular factors that influence people's decisions in diverse moral situations. This covers deontology, utilitarianism, human intuition and feeling, and cultural impact.

In order to analyze people's reactions to unexpectedly dangerous situations while driving and what they believe an autonomous vehicle should do in such situations, this article will draw on prior theories. The predicted and actual results will then be compared in order to identify the previous studies' limitations and opportunities for future improvement.

2. Method

In this review, the literature research was conducted by utilizing the extensive database provided by Google Scholar. The keywords provided include "moral dilemma," "moral development," "decision-making," and the concept of "morality as cooperation." Studies were considered eligible for inclusion in this article provided they fulfilled the following criteria: (1) the study must be empirical, which means it is based on observable evidence rather than theoretical work; (2) the research must refer to or discuss at least one aspect related to the analysis of moral dilemmas; and (3) the study must have been published in the year 2000 or later, ensuring that the research is relatively recent and takes into account contemporary perspectives and findings.

3. Literature Review

3.1 Introduciotn of typical moral dilemma

A moral dilemma is a difficult situation that regardless of the decision being made, it appears as if the proper action is being taken while the choices are inherently contradictory that arises when a car's driver encounters a potentially fatal circumstance will be discussed:

Due to uneven road conditions, the cargo truck ahead of the driver's car (Car A) slides off the roadway and is going to strike it in a matter of seconds. The motorcycle (B) is on the driver's left side of the vehicle, and the driver is not using a safety helmet. There is a motorbike (C) on the driver's right side of the vehicle, but the driver is also not using a safety helmet. So, what should automobile driver do? Should he sacrifice himself and keep the car going in the same direction, or should he hit the unhelmeted driver on the left or the unhelmeted driver on the right to save his own life?

The problem is complicated for a variety of reasons. A similar predicament with self-driving cars and how people believe the vehicles should make decisions presents another ethical conundrum. In this instance, the seven universally unified morals identified by Curry are to assist others, be a hero, be fair, and respect property [10, 11]. Hyde introduced social intuitionism, which holds that moral judgment is first made by quick moral intuition and then, if required, by slow moral reasoning based on the impact of human intuition and emotion on moral judgment [12]. Moral intuition and aesthetic judgment are similar in that an individual will instantly agree or disagree with something they hear or see in society. People's social and cultural surroundings have an impact on their moral perceptions. Thus, it will differ.

3.2 Three Theoretical Approach of Moral Dilemma

In accordance with Zero-Sum Game theory and utilitarianism,the option that maximizes happiness and benefits is favored. People carrying high-value things are examples of low-probability items excluded from the study's predictions [13, 14]. In the first scenario, (1) If car A continues on its original course, a car will be lost, the driver may suffer a major injury or lose their life, and other lives will be lost if the driver's family members are in the vehicle; (2)

If car A makes a left turn, it will lose the motorcycle since the owner does not wear a helmet, increasing the likelihood of death compared to the owner who does. 3. The motorbike owner is not wearing a helmet. Therefore, the likelihood of death is higher than it would be if the owner were wearing a helmet, so if car A turns to the right, it will lose the motorcycle. Because the risk is equal for both, the owner should turn to the left or right of the motorbike owner who is not wearing a helmet in order to minimize the consequent loss based on benefit maximization.

Based on theory of Morality as Cooperation proposed by Curry, driver A will act heroically in this scenario if he decides to maintain the current direction [10, 11]. This suggests that the social milieu in which driver A resides encourages bravery. "A" made the decision to give up his life to ensure others' safety. Owner A decided to put the group's interests ahead of his own in order to assist others. It is also possible to follow local laws and driving regulations, show respect for authority, and refrain from changing lanes on the highway. Respecting one's own property as well as the property of others is another option. The owner may feel that fairness is the most equitable option. Driver A may have decided that it is most fair to smash with B if he swerves to the left and does so. Turning to the right is equivalent to turning to the left for driver A. According to Oliver's Global Ethical MAC principles, the optimal course of action for these ethical standards is to keep on track and avoid colliding with others, .

Kant's deontology holds that only actions motivated by a feeling of duty are morally valuable, emphasizing that an action's motive—its actor's intention—rather than its outcome determines its moral worth [15]. Thus, he developed the concept of the categorical imperative, which is the unwavering moral requirement that our standards of behavior be applied to everyone. (1) From a deontological perspective, driver A does not choose to intentionally damage others if he decides to maintain the same direction, which is consistent with the deontological perspective. (2) Should motorist A choose for a left turn, collide with B. Even if he chooses to crash into B, which has a lower death rate, this still goes against the deontological precept of purposefully injuring others. (3) Driver A intentionally chooses to injure another person by turning to the right, which likewise goes against the precept of not harming others. Therefore, deontology holds that the only action that respects others is staying in the same direction.

3.3 The role of personality traits in moral decision-making

Different people judge moral dilemmas differently. For example, the Big Five personality traits (neuroticism, extraversion, openness, agreeableness, and conscientiousness [16, 17], studies show that agreeableness is a positive predictor of moral sensitivity, while conscientiousness, agreeableness, and openness are positive predictors of moral identity. Neuroticism is a negative predictor of moral identity and moral courage. Therefore, agreeableness people are relatively more likely to choose self-sacrifice (not changing the direction of the car) to protect other motorcycles. And people with higher neuroticism may choose decisions that are more risky for others because of stress and anxiety. Because they present negative predictors of moral courage.

3.4 Correlation between cognitive style and decision-making model

Additionally, it makes sense to draw moral conclusions about people based on their cognitive styles [18]. The study found that when faced with moral quandaries, distinct brain regions—such as the prefrontal cortex and the amygdala—correspond to analytical and emotional reactions, respectively. This suggests that moral decision-making is significantly influenced by cognitive style, and that moral decisions will vary depending on one's cognitive style. While intuitive thinkers might rely on instinctive reactions, analytical thinkers might be more likely to approach moral quandaries with reason and regulations. Thus, in the case of autonomous vehicles, rational thinking could analyze the benefits and drawbacks from a utilitarian standpoint and determine what is best for society as a whole or for individuals. Because they are motivated by urgent social standards or personal values, intuitive thinkers will make decisions based on the emotions they feel in this situation. They can rely their choices on gut feelings or initial perceptions rather than doing a thorough cost-benefit analysis. He was severely injured in a car accident in his past life, for instance, and as a result developed a fear of getting hurt in one. Hence, rather than deciding to respect other people's lives and give up its own, the intuitive mind will decide to drive in the direction of the motorcycle (both left and right). Since this conclusion is based on a snap decision, it cannot be rationally analyzed.

3.5 The moderating effect of risk sensitivity on moral choice

Research finds that individuals with higher risk sensitivity are more inclined to make moral and ethical choices; on the contrary, people with low risk sensitivity pay more attention to short-term interests, so they make self-serving and unethical decisions, and take radical or unusual actions in moral decisions [7]. In a self-driving car ethi-

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cal dilemma, individuals with higher risk sensitivity will therefore be inclined not to change direction and sacrifice themselves. People with low-risk sensitivity will drive to the left and right to save their lives.

4. Future Implications

4.1 Applied to the Ethical Decision-Making System Used in Autonomous Driving

In the realm of autonomous driving, the integration of an ethical decision-making system is of paramount importance. This system is designed to navigate the complex moral dilemmas that self-driving cars may encounter on the road. As these vehicles become more prevalent, the need for a robust and reliable framework to guide their actions in critical situations becomes increasingly urgent.

The ethical decision-making system employed in autonomous driving is tasked with making split-second decisions that align with human values and ethical standards. This involves programming the vehicle to respond appropriately to a variety of scenarios, such as avoiding collisions, minimizing harm, and respecting traffic laws while considering the well-being of all road users.

Applying this research to the rational decision-making process of future autonomous vehicles will enable automakers to utilize a more morally and humanely based decision-making approach as opposed to a conventional one. Because of this, they are able to combine several models to create systems that help autonomous cars make tough judgments, which raises the cars' acceptance in society.

4.2 Provide Guidance for Policy Making

This study examines moral decisions made by individuals with various traits from a variety of angles. In a similar vein, public policy formulation can also benefit from this research. For instance, the government can create appropriate policies and systems that take into account the various cultural backgrounds and overall social quality level in different cities or neighborhoods, particularly when it comes to public security, resource allocation, social equity, and other issues. This reduces social contradictions and irrationality. Reach outcomes that satisfy the expectations of society.

4.3 Future Research Directions

This work offers several avenues for further investigation. First, further research on the elements and forces that shape people‘s decisions regarding moral quandaries can be done. For instance, how different cultural moral quandaries present opportunities for personality traits and risk sensitivity to emerge. Furthermore, to draw stronger conclusions and expand on the results of this study, future research can make use of larger sample sizes and a wider range of ethical conundrums. Ultimately, through research discoveries, artificial intelligence will be able to make more logical decisions in difficult settings and environments when it comes to future robots.

5. Conclusion

In the study, the decision-making of driverless cars in the face of ethical dilemmas was analyzed. Decisions made by driverless cars are inferred through zero-sum theory, MAC theory, and deontology. They also considered people‘s personality traits, cognitive styles, and risk sensitivity when making decisions about driverless cars. After analyzing different kinds of theories, the research finds out that each theory has a deviation in the perception of specific moral dilemmas. For example, utilitarianism emphasizes the choice of maximum happiness, while deontology holds that only morally suitable actions are correct. The diversity of different theories suggests that more complex, diverse, and comprehensive algorithms and models are needed for emergency systems in driverless cars to arrive at the best ethical choices.The diversity of different theories suggests that more complex, diverse, and comprehensive algorithms and models are needed for emergency systems in driverless cars to arrive at the best ethical choices. To sum up, this research has bridged the gap on the ethical decision-making process in the context of autonomous vehicles and offered a theoretical framework that helps think about new technology development. Further, the results of the present study can be carried forward to practice in the future, where these two conflicting aspects of technology and society would be sought to be reconciled.

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