Analysis of Autonomous Vehicles: Opportunities and Ethical Consideration

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Precious lives are lost in motor vehicle accidents every day. These tragedies stem from fatal crashes, a significant number of which can be attributed to human errors (Background). The toll is staggering, with thousands of Americans succumbing to such incidents annually, challenging the prevailing notion that human error is the primary cause of most vehicle accident (The Deadly Myth That Human Error Causes Most Car Crashes). Many of these accidents result from preventable human mistakes, such as excessive speeding, tailgating, texting while driving, distraction, and inattentiveness (Crashes are no accident). The crucial question arises: Is there a solution to preventing vehicle accidents caused by human errors? Leading automakers, including Tesla, Pony.ai, Waymo, Apple, Kia-Hyundai, Ford, Audi, and Huawei, are actively developing self-driving vehicles that have the potential to significantly reduce human errors on the roads (Top Self Driving Car Companies In 2022). This technological advancement may well be the key to preventing tragic and fatal car accidents.

Autonomous vehicles offer many benefits to societies. According to the Autonomous Vehicles Factsheet from the University of Michigan, driverless vehicles have potentials to reduce human error and could reduce accidents by 90% (Autonomous Vehicles Factsheet, 2022). The reduction will improve safety and public health. Other areas of improvement will be seen in productivity, quality of life, mobility, and travel. The elderly and disabled individual will greatly benefit as well since they can safely travel without potential harm (Autonomous Vehicles Factsheet, 2022). Moreover, the introduction of autonomous vehicles holds promises of reduced congestion, lower energy consumption, and decreased costs associated with public transportation (Autonomous Vehicles Factsheet, 2022). For individual commuters heading to work or school, the introduction of driverless vehicles is poised to streamline traffic flow, sparing them from enduring long hours of frustrating congestion (Autonomous Vehicles Factsheet, 2022).

The prospect of reducing the annual death toll on the roads becomes tangible with the integration of driverless vehicles. Gilles Duranton, the Dean's Professor of Real Estate at the University of Pennsylvania, Wharton School, underscores the staggering statistic of 30,000 Americans losing their lives on the road each year and suggests that driverless cars have the potential to reduce this number (Duranton, G., 2016). Duranton envisions a transformative shift from individual car ownership to subscription-based services, such as Uber, where vehicles are available on demand, presenting a potential solution to this pressing issue (Duranton, G., 2016). As a collateral benefit, this transition may reduce the expensive infrastructure of traffic lights and signals, currently maintained by the government for public safety. (Duranton, G., 2016). Duranton emphasizes that the advantages of driverless vehicles, such as smoother rides and enhanced intersection capacity, will come to fruition only when the entirety of the vehicle ecosystem is autonomous. Until such widespread adoption occurs, it remains challenging to fully comprehend how this innovative technology will impact and benefit society (Duranton, G., 2016).

Driverless vehicles are set to revolutionize the automotive landscape with a host of innovative features and a distinct design from the traditional vehicle designs on today's roads. Automotive Plastic stated, “Enabling seat belts, airbags, side-curtain bags, windshield inner-layers, pedestrian collision protection safety features, padded dashed, and plastics will continue to enhance safety in self-driving cars” (Autonomous Vehicles, 2022). Another safely feature is the integration of brake boosters, precisely programmed to decelerate a vehicle to a complete stop when necessary. Furthermore, these new vehicles will be built with lightweight multi-material composites instead of heavy metal structures prevalent in current vehicles (Autonomous Vehicles, 2022). This design shift aims to minimize the impact force in the event of a collision.

These autonomous vehicles will also come equipped with integrated sensors. These sensors serve as an important role of the vehicle, having the capability to see through the body panel materials, providing a comprehensive view of the vehicle's surrounding (Autonomous Vehicles, 2022). A Light Imaging Detection and Radar (LIDAR) feature is part of the new autonomous vehicles. This feature creates a 3D map of the surrounding area in real time. LIDAR excels in object detection, accurately determining shapes and sizes within and along the road (Autonomous Vehicles, 2022). With these cutting-edge advancements, the future of autonomous vehicles appears promising as they usher in a new era of safety and technological sophistication on the roads.

Some existing automation tasks are already around us, often going unnoticed. Features such as cruise-control, anti-skid braking system, lane changing assign, and automated freeway driving have already been utilized by many drivers. The incorporation of these existing automation features marks the initial phase of fully autonomous driving. As technology continues to advance, the capabilities of these features expand. This progression enables engineers to develop vehicles capable of navigating diverse environments and varying road conditions (Sparrow, R., & Howard, M., 2017).

Despite the added benefits and innovative features in autonomous vehicles, ethical consideration come to the forefront. Robert Sparrow, a Professor of Philosophy at Monash University, and his colleague Mark Howard assert that driverless vehicles will inevitably shape the future of transportation (Sparrow, R., & Howard, M., 2017). They advocate for the development of fully autonomous vehicles that can operate independently without human drivers, emphasizing the potential for increased safety. This proposition, however, raises ethical considerations, especially in scenarios where the vehicle must navigate complex decisions, such

as when a child crosses the road. Can the computer accurately calculate and determine the best solution? Is there a risk of the computer colliding with other vehicles, crashing into a building, or potentially harming bystanders instead of the child? Moreover, if the computer calculates that the best course of action is to prioritize passenger safety by hitting the child, will it proceed with that decision? These critical questions underscore the ethical implications of entrusting computers to make decisions in such situations. Both Sparrow and Howard acknowledge the imperfections inherent in autonomous systems, highlighting the challenge of determining the best course of action in critical situations. They argue that while perfection may be an unattainable standard, the crucial metric lies in the overall reduction of road accidents and fatalities compared to human-driven vehicles. If autonomous vehicles can achieve this outcome while maintaining comparable speeds, the benefits they bring to road safety become evident (Sparrow, R., & Howard, M., 2017).

While the grim reality of ongoing fatalities on our roads persists, the potential for positive change lies in the development of self-driving vehicles. Despite historical reliance on human control and skepticism toward autonomous technology, the benefits of these vehicles are numerous. Equipped with advanced computer systems and sensors like LIDAR, autonomous vehicles can make split-second decisions, detect hazards, and navigate efficiently, potentially saving countless lives. The integration of such technology could revolutionize transportation, reducing accidents, congestion, and energy consumption. While public acceptance may take time, the societal advantages of autonomous vehicles suggest a transformative future where road safety and efficiency are pivotal.

As I research into the complexities of autonomous vehicles and their potential impact on road safety and society, I gained a deeper appreciation for the complex balance between technological advancements and ethical considerations. The prospect of a future with driverless cars presents both promises and challenges, and my research has prompted me to reflect on the dynamic interplay between innovation and responsibility. As we navigate this uncharted territory, it becomes clear that the path to widespread adoption of autonomous vehicles requires careful consideration of not only technological advancements but also the ethical frameworks that guide their decision-making processes. In the end, the journey towards fully autonomous driving is not just a technological evolution but a societal transformation that demands our thoughtful engagement.

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