End of Non-Autonomous Cars

Fazel Banouei

Department of Mechanical Engineering

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Dr. Philip McCarthy

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Abstract

In this paper, I argue that non-autonomous cars should be phased out of the market. I support my position with the following three arguments. First, I posit that non-autonomous vehicles have a higher rate of traffic fatalities. Second, the transition to self-driving vehicles would be beneficial to senior citizens and people with disabilities. Finally, non-autonomous vehicles cause lesser to no traffic congestion. I also consider alternative grounds for phasing out non-autonomous cars, such as the argument that non-autonomous cars are less expensive than autonomous cars, autonomous cars are vulnerable to hacking, and autonomous technology cannot be implemented everywhere. This paper is important because it emphasizes the community's gains from the transition to autonomous cars. I conclude my paper by advocating for a faster change from non-autonomous to autonomous cars and solutions for infrastructures that are currently unable to handle autonomous technology.

Keywords: Autonomous cars, Vehicle industry, Car market, Future public transportation, Road safety, Road traffic

End of Non-Autonomous Cars

In this paper, I argue that non-autonomous cars should be phased out of the market. While non-autonomous cars require human focus and interaction, autonomous cars, also known as driver-less cars, do not necessarily require human intervention as they function by using sensors, actuators, and complex algorithms to create a virtual map of their surrounding (Ondrus et al., 2020). This technology will have a great impact in the field of transportation.

I support my position on phasing out non-autonomous cars with the following three arguments. First, transitioning to autonomous cars will eliminate the human factor in driving, which accounts for more than 90% of on-road accidents (Haghi et al., 2014). Thus, adapting to autonomous cars will make our roads safer for everyone. Second, for senior citizens who lose their ability to drive because of weakening in their physical and cognitive strengths, autonomous cars would seem to be a perfect alternative. According to Metz (2000), many senior citizens who cannot drive and normally depend on friends or public transport, usually express their desire for independence. Finally, autonomous cars will reduce traffic congestions and traveling time as they can calculate the best possible route to produce the optimal velocity and traffic current (Lu et al., 2019). This smoother traffic flow will aid in drastically reducing harmful emissions to the atmosphere.

I also consider alternative views towards phasing out non-autonomous cars. These views include arguments claiming that non-autonomous cars are cheaper than autonomous cars, non-autonomous cars are less prone to being hacked, and that some roads may not be suitable enough to accommodate autonomous technology.

This paper is important because it highlights the evolution of the transportation system from non-autonomous to autonomous technology and the benefits that it brings to the community in terms of traffic, safety, and caring for the senior citizens. I conclude my paper by recommending an acceleration in the transition from non-autonomous to autonomous cars and suggesting solutions towards infrastructures that cannot yet accommodate autonomous technology.

Issues and Solutions of Eliminating Non-Autonomous Cars

Similar to any emerging technology, autonomous cars also have their drawbacks. First, autonomous cars are comparatively expensive because of their advanced gears and software. Second, since autonomous cars operate almost entirely on software, they are prone to being hacked. Finally, autonomous cars depend on inputs from their surroundings to calculate their navigation path. This dependence raises the possibility that some countries' road infrastructure would not be able to support autonomous technology. While all these points have merit, the overall concern around autonomous cars does not seem to be impeding the demand and progress of this technology.

Non-Autonomous Cars Are Cheaper Compared to Autonomous Cars

Autonomous cars are infamous for being expensive. According to LeVine (2017), an autonomous car’s main components are laser imaging, detection, and ranging (LIDAR), which is a susceptible laser sensor. LeVine also explains that the LIDAR component alone costs up to $85,000. The author argues that an autonomous car’s total cost can grow up to $250,000 per vehicle. In comparison, the average cost of a non-autonomous car in the US is around $30,000 (Ritchie, 2019). Thus, the issue arises that even though evidence suggests that autonomous cars are safer than non-autonomous cars, people in the low to middle class will not be able to afford an autonomous car (Nunes & Hernandez, 2019). Therefore, non-autonomous cars are preferred over autonomous cars, especially by people of lower to middle classes.

While it is true that autonomous cars are expensive, it is predicted that the current prices will drop. This drop is a result of increasing supply while the demand stays comparatively stagnant through the years (Whelan & Msefer, 1996). One of the main reasons for autonomous cars being expensive is that they are often required to be exported because of their limited availability (Zhu, 2013). This unavailability in production results in a lack of supply while demand stays comparatively high. However, as we phase non-autonomous cars out of the market, more countries will start manufacturing autonomous vehicles, thus increasing the supply.

In addition to supply change, Lienert (2017) explains that autonomous cars are currently being re-modeled to use fewer hardware components and rely more on the software programming. The author posits that data collection firms are receiving more funds so that autonomous cars can be better understood and thus reworked to reduce component usage. Meanwhile, Hayed (2020) reports that Tesla, one of the leading companies in autonomous car technology, is manufacturing a ten-million square foot factory in California. Hayed posits that this factory will innovate battery cells that are more efficient and have lower wastage. Furthermore, the author explains that since all parts of the car will be produced at the exact location, it will cut down on the transportation cost required to relocate car body parts to be assembled elsewhere. Therefore, this innovation in battery cells and single location manufacturing will drastically reduce Tesla’s autonomous car prices.

In addition to cheaper parts, transitioning to autonomous public vehicles will reduce the total government expenditure. Bosch et al. (2018) report that this transition can reduce government expenditure in public transportation by 88%, as a result of a drastic reduction in drivers. While this reduction can also raise the issue of job loss, Pettigrew et al. (2018) posit that this transition will vastly reduce the public transportation fee. The authors also report that this reduction of fees will primarily benefit lower-income people who use public transportation in their everyday commutes. Adding weight to this position, Ongel et al. (2019) explain that even though autonomous public transportation has high purchasing cost, the total cost of ownership (TCO), which includes the maintenance cost, is near 75% to 60% lower. Therefore, in the long-term, it is more profitable to transition to autonomous public vehicles.

Autonomous Cars Are Unreliable

Autonomous cars have different levels of automation, and human interaction decreases as the level of automation increases. The most common type of autonomous cars in the market are at level 2 automation, which can accelerate and steer automatically but requires human monitoring and intervention (“The Future of Self-Driving Cars,” 2020). However, Cunningham and Regan (2015) explain that this current automation level is not reliable as it is highly dependent on human interference in cases of unforeseen situations. The authors explain that the driver may not always be alert when their interference is required, which may result in a fatal accident. Furthermore, Fleetwood (2017) raises ethical concerns related to autonomous technology. The author suggests that the public is not comfortable with submitting their lives to the hands of a computer. In addition, the hardware and software behind autonomous cars are prone to being hacked, which makes the autonomous system more unreliable (“How to hack a self-driving car,” 2020).

Like level 2 automation, level 3 automation also requires a certain degree of human intervention, which requires the driver to be attentive. In addition, Alvarez et al. (2020) articulate that companies such as Toyota and Ford are working on directly transitioning to level 4 automation, which is considered to be fully autonomous. At this level of automation, although the driver is given an option to control, it is not required. However, the ethical concern grows even more significant when it comes to level 4 automation since the computer now has complete control. With this argument in mind, Fleetwood (2017) explains that autonomous cars do not elicit ethical concerns, nor do they leave room for ethical decisions.

The author further explains that autonomous cars will be precisely well-programmed and will be able to predict any danger far ahead to avoid any accidents.

Many critics are still not satisfied with autonomous cars having the power to make ethical decisions. As a solution, Gogoll and Muller (2016) explain the concept of mandatory ethics setting (MES), a set of ethical rules that would benefit every member of the society. While this idea will solve the ethical dilemma by taking the ethical decisions into our own hands, many argue that ethics setting should be personalized and not mandated to everyone by the government. In contrast, Gogoll and Muller posit that making ethics setting personalized will result in a prisoner's dilemma. The authors further explain that the government intervention is required to set ethical standards so that an ethical equilibrium can be obtained, which is fair to everyone.

In the matter of cybersecurity and hacking, engineers and data scientists are yet to create an autonomous system immune to getting hacked, which would then make autonomous cars fully reliable (Shaikh & Cheah, 2017). With this argument in mind, there are several different strategies to reduce the chances of getting hacked, which include setting a personalized password, regularly updating your car's software, and shutting off your GPS when not used ("Protection Against Cyber Attack," n.d.). Significantly, transitioning to autonomous cars is predicted to decrease accident fatalities up to 90% ("Could Driverless Cars Reduce Traffic Fatalities?," n.d.). Thus, compared to the trivial chances of getting hacked, this percentage makes it worth transitioning for the sake of public safety.

Autonomous Cars Are Not Accessible Everywhere

Road infrastructure plays a vital role in autonomous car navigation and feedback. Vehicle to Infrastructure system (V2I), is a system of hardware and software that specialize in planning autonomous car's navigation by receiving feedback about the surrounding from each respective sensor (Milanes et al., 2010). However, many countries still do not meet the required road infrastructure to accommodate this navigation technology of autonomous cars. Critics also argue that investing in repairing the road infrastructure of a country will be costly. They further argue that adapting to the current road system with non-autonomous cars is simply a cheaper option.

Although many countries still do not have the road infrastructure to accommodate autonomous technology, it is predicted that it is well on its trajectory to improve. This trajectory is evident by looking at the budget invested by both developed and developing countries in their road infrastructure projects. Smith (2020), Reay (2020) and Ho (2021) discuss the recent budgets of some of the developed countries have put into road infrastructure. The authors explain that Norway has allocated $3.51 billion to road infrastructure, while Germany and Singapore have invested $3.64 billion and $90 billion, respectively. Moreover, it is more crucial for developing countries with larger populations to accommodate autonomous cars. To illustrate, Chatzky and McBride (2020), Chakravarty (2021) and Woof (2020), explain the budgets of developing countries in the recent years. The authors discuss that Russia will be investing more than $72 billion, while India and China have allocated $45.14 billion and $200 billion in road infrastructure, respectively. With these allocations in mind, we can observe that the future of road infrastructure will soon be able to accommodate autonomous technology everywhere.

Benefits of Eliminating Non-Autonomous Cars

While autonomous cars do have some disadvantages, their benefits out-weigh their drawbacks. For example, it has been shown that there is a positive correlation between the increasing population density and the frequency of on-road accidents (Sun et al., 2019). As such, there is a higher demand for safer alternatives more than ever. This need can be met by transitioning to autonomous cars. In addition, many senior citizens and those with disabilities usually rely on others or public transport because of their inability to drive. This issue can also be solved by using autonomous vehicles, which require little to no driving and give senior citizens and people with disabilities a sense of independence. Furthermore, since autonomous vehicles rely heavily on computers and sensors while driving, they can calculate the best routes with the optimal velocity (Hutson, 2018). This precise calculation will significantly contribute to having a smoother traffic flow and lower noise pollution.

Autonomous Cars Are Safer

The most effective way to end or reduce road accidents is to eliminate human error factor in driving. According to Wenwen et al. (2011), more than 80% of road accidents are caused by human error. The authors explain that the leading causes of human error usually arise because of psychological, physiological, and external factors, such as loud noise and poor visibility. Meanwhile, Bucsuhazy et al. (2020) further report that human error can be divided into two categories: long-term and short-term. Bucsuhazy et al. illustrate that lack of experience and old age are considered long-term factors that can also represent the driver's behavioral and biological issues. The authors further explain that physiological and environmental factors fall under short-term factors. Given this information, it is evident that the majority of human error factors mentioned can be avoided by transitioning to autonomous cars.

In addition to eliminating reliance on human attention, autonomous cars can navigate without relying on surrounding visibility. According to Walker (2020), autonomous cars are capable of forming a clear map of their surroundings using sensors. Walker also reports that radar sensors installed in autonomous cars can precisely calculate the velocity and size of incoming objects, which is critical when a pedestrian suddenly crosses the road. The author further posits that the high-definition cameras installed in autonomous cars can identify road signs. This feature allows autonomous cars to comply with all driving rules and regulations even in poor visibility.

One of the reasons for safer travel with autonomous cars is their superior reaction speed compared to humans. Hammershmidt (2019) conducts an experiment in which an autonomous car's reaction speed was tested against human reaction speed. Hammershmidt reports that in a scenario where a child suddenly runs on the road, humans had a reaction speed of 1.6 seconds, while autonomous cars had a reaction speed of 0.5 seconds. The author further explains that more advanced radar sensors are being developed that will reach up to 160 times faster than humans, thus making autonomous driving a much safer option. Furthermore, test drives and analysis are crucial in the development of autonomous technology. Etherington (2019) explains that around 1400 autonomous vehicles were tested in the US in 2019. As a result, Wang et al. (2020) report that other (non-autonomous) parties caused 94% of on-road accidents associated with autonomous vehicles. The authors further report that the statistical findings obtained from on-road testing will significantly help researchers develop safer algorithms for autonomous technology.

Autonomous Cars Are Ideal for Senior Citizens and People With Disabilities

There is a direct relationship between age and hindered driving ability. To explain, Adabag et al. (2010) illustrates that senior citizens are more at risk of cardiac arrest than any other age group. Such incidents during driving can be very dangerous, not only for the senior person but also for others nearby. This incident is dangerous because having a cardiac arrest during driving will completely put the driver out of the state to drive and possibly crash into pedestrians. Arthritis, which a disease most common among senior citizens, stiffens the joints and weakens the muscles (Kidd et al., 2007). This disease can hinder the ability of the driver to steer the wheel properly or brake securely. Dementia is another common disease in senior citizens that can hinder decision-making skills while driving because of memory impairment ("Older Driver," n.d.). This disease can cause the driver to forget basic driving skills and traffic protocols, which can result in fatal accidents. To address these diseases, senior citizens are often put under medications, however, these medications can cause other issues while driving, such as drowsiness and headaches. Therefore, given the challenges mentioned above, there is a need for an alternative solution.

Autonomous cars are an ideal solution for senior citizens who find difficulty in driving. According to Faber and Lierop (2020), most senior citizens have their license taken because of their inability to drive, and they are forced to resort to public transportation. Faber and Lierop explain that senior citizens living in urban areas reported feeling dissatisfied while using public transportation because of a lack of freedom in their mobility. The author further posits that providing autonomous transportation for senior citizens would allow them to be more involved in society, giving them higher employment opportunities. This involvement can give them more independence and an overall boost to their morale, enhancing their psychological and physical well-being.

The isolation of people with disabilities because of the inability to drive can also cause health problems. These problems can arise because of unemployment or lack of interaction with the outside world. Shen et al. (2017) explains that there are over one billion people in the world with disabilities. The authors posit that in normal adults the prevalence of depression is 22.8% to 27.5%, while in people with disabilities it is 24.9% to 41%. This difference is mainly because of lack of freedom in transportation for people with disabilities. In addition, Hernandez (2020) reports that people with disabilities are twice as likely to be unemployed because of lack of transportation compared to people without a disability.

An autonomous car is one of the easiest solutions to the problem of transporting people with disabilities. To explain, Wiggers (2020) reports that many autonomous car companies have specially designed vehicles to accommodate people with disabilities, such as Renault and Volkswagen, in addition to the autonomous features. Wiggers reports that these cars have an extendable ramp for wheelchair access that can be lifted up or down depending on the difference in height between the car and the ground. The author further reports that many autonomous cars have an in-built speech operator that can identify speech commands and execute them accordingly. This feature is especially useful to people with vision impairment and people who have a severe disability. In addition, Herriotts (2020) posits that engineers are currently working on developing 360-degree door handles that allow the door to be easily opened from the outside using the entire arm and hand, instead of pull-up handles, which require the fingers and wrist to operate. Thus, while non-autonomous firms are stagnant in innovating features to aid people with disabilities, we can observe that autonomous cars are an excellent alternative.

Autonomous Cars Have Lower Travelling Time

Getting stuck in traffic can be hectic for any driver. According to Bradford (2019), an average American spends up to 97 hours per year behind traffic. The author also uses another statistic, stating that, a person spends 210 hours yearly behind traffic in Moscow. Stromberg (2016) reports that traffic jams could also occur even in the absence of construction or accident. Stromberg explains that this situation happens because drivers are unable to calculate when they should break adequately. The author further illustrates that if one driver breaks slightly because of miscalculation, this break can result in a chain reaction of cars behind the driver to break slightly as well, which can disrupt the overall traffic flow. When this unnecessary breaking is repeated multiple times by inattentive drivers, it can form a chain reaction that results in a significant congestion.

Autonomous cars do not depend on humans to calculate if breaking is required or not. Vehicle-to-vehicle communication (V2V) allows autonomous cars to communicate with each other and thus exchange information about their speed, position, and navigation plan (“Driverless Vehicles Could Reduce Traffic,” n.d.). In agreement with the previous study, Nguyen et al. (2019) illustrate that autonomous cars can form platoons using vehicle-to-vehicle communication. They would travel as close to each other as possible with minimum gaps. The author further argues that platooning can significantly increase road capacity and decrease fuel consumption because of more efficient traveling. Therefore, resulting in smoother traffic flow and lower commute duration.

Autonomous cars are now equipped with tools to easily avoid or smoothly handle any incoming traffic. To explain, Kesting et al. (2008) discusses Adaptive Cruise Control (ACC), which is a navigation feature in autonomous cars. Kesting et al. posit that this feature allows autonomous cars to sense the traffic flow and automatically adjust their velocity and position without driver interference. The authors explain a study where traffic congestion was entirely eradicated by applying ACC only to 25% of the traffic vehicles. This study demonstrates that ACC in autonomous cars can improve traffic current and form a stable flow. Meanwhile, Heckmann et al. (2017) illustrate the advantages of an Intuitive Automotive Assistant (IAA), an inbuilt assistant that informs the driver about the incoming traffic and suggests alternate routes. Heckmann et al. explain that as more drivers decide to select alternate routes, the overall traffic will reduce. The author further explains that this feature regularly updates the driver on traffic conditions. Furthermore, since this feature is hands-free, the driver can stay updated while on a call, texting, or even eating.

Conclusion

As humans, we have gone through multiple transportation evolutions, from carriages to manual cars and from manual cars to automatic cars. It is now time for us to step into the next evolution stage: autonomous cars. In this paper, I argued that non-autonomous cars should be phased out of the market. The paper is important because it highlighted the benefits of transitioning to autonomous cars in terms of safety, congestion, and benefits for people with hindered driving ability.

Some people have argued against transitioning to autonomous cars. First, critics argued that autonomous cars are more expensive compared to non-autonomous cars. While this claim is currently true, autonomous cars are expected to drop in price after greater mass production is introduced in the market and the vehicle's components are made more cost efficient as a result of evolving technology. Second, it is argued that not every road can accommodate autonomous technology. However, we can observe that our roads are within the trajectory of accommodating autonomous cars. This trajectory is evident by observing the budget many countries are investing into enhancing road infrastructure. Finally, many argued that autonomous cars are not immune to hacking or glitches. While this claim is true, studies have shown that the chances of getting cyber attacked are trivial compared to having a fatal accident as a result of human error.

Autonomous car technology surpasses the driving skills of any ordinary human, which makes autonomous cars a safer alternative. The technology is equipped with millions of radars and sensors that can precisely map its surrounding. This feature allows the car to navigate through conditions that is challenging for humans. Furthermore, autonomous cars have much quicker reaction times compared to humans. As such, autonomous technology is the perfect alternative for people who are unable to drive because of hindered cognitive or physical abilities, such as senior citizens or people with disabilities. In addition to quicker reaction speed, autonomous technology is equipped with multiple features that can help reduce traffic congestion and improve overall traffic current. These features include vehicle-to-vehicle communication (V2V) and platooning, which allows autonomous vehicles to communicate with each other, exchange information, and travel as a fleet in the most efficient way. More features include the Adaptive Cruise Control (ACC) and Intuitive Automotive Assistant (IAA), which allows the car to predict the incoming traffic and suggest the driver an alternative route.

The transition to autonomous technology is inevitable, as there is a demand for change. First, the public demands for solutions to on-road accident and fatalities, and they ask for safer roads for themselves and their future generation. Second, senior citizens and people with disabilities express their need for independence from others for transportation. Finally, the motorists have grown weary of everyday traffic congestions. The solution to all these problems points towards transitioning to autonomous cars. We can accelerate this transition by considering purchasing an autonomous car next time we visit a car dealership or investing in government or private projects that aim to enhance road infrastructure.

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