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IT 104-001

Autonomous Cars

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Introduction

Over the years, the idea of cars driving themselves is fascinating. The driver would be able to relax as a computer took over control. Someone could walk into their car, sit down, and wake up at the destination that they were going. Decades ago, this idea would have been out of this world. With all progress in technology there are some benefits and downsides. This paper discusses the legal, ethical, and security aspects of self-driving cars. After evaluating all of the aspects, autonomous cars are a wonderful new invention, but they should be further tested before going public.

Background

Many companies are competing to build the best self-driving car. One of these companies is Google. They have built the first car without a steering wheel, accelerator, or brake (Gibbs, 2014, para.1). The purpose of the car is to allow people to go from one destination to another without the user having to actually drive. Gibbs (2014) explained

It ferries two people from one place to another without any user interaction. The car is summoned by a smartphone for pick up at the user’s location with the destination set. There is no steering wheel or manual control, simply a start button and a big red emergency stop button.

However, this is only how the Google car operates as it travels around California picking up people.

Other companies have made their own self-driving cars and they operate much differently than the Google car. Since the Google car is the first to not have a steering wheel or other controls that would allow a person to take over the car, the other self-driving cars that exist work
in a different way. Rogers (2015) said that people “will be able to program their autonomous, self-driving vehicles by simply speaking the desired destination into an in-dash microphone” (para. 1). The person would be able to sit back and relax while the car drove, but if the car is unable to handle a certain situation, then the driver can take over. This is drastically different from the Google self-driving car.

**Potential Benefits**

There are many potential benefits to autonomous vehicles. The benefits range from safety for humans to animals. Kirkpatrick (2015) said

The driverless cars of the future are likely to be able to outperform most humans during routine driving tasks, since they will have greater perceptive abilities, better reaction times, and will not suffer from distractions (from eating or texting, drowsiness, or physical emergencies such as a driver having a heart attack or a stroke) (p. 19). Since most accidents are due to human error, then these vehicles would help reduce the amount of accidents on the road. Having an autonomous vehicle drive might be the safest option.

Animals may even benefit from self-driving cars. Every year, many animals die or are wounded because they get run over. Bendel (2016) says these vehicles may respond better if an animal was to jump in the road because they have a faster reaction time than a human (Self-driving cars section, para. 2). Since autonomous vehicles are trying to avoid collisions, then animals would benefit from this technology. Humans make many driving errors and sometimes animals can be impacted by this. If autonomous vehicles were used by the public, then the animals would be safer while crossing the street.

**Legal and Ethical Issues**
One of the biggest legal concerns with autonomous vehicles is liability. When a car does not have a human driver, the lines of fault are blurred. Now, there can be accidents between “human driver vs. semi-automated driver, human driver vs. fully-automated driver, semi-automated driver vs. semi-automated driver, semi-automated driver vs. fully-automated driver, and driver fully-automated vs. fully-automated driver” (Rogers, 2015, para. 15). There are laws that regulate who is at fault for a human to human car accident, but now, there are questions about who is at fault when a car is driving rather than a person. Rogers (2015) says that there will be product liability claims rather than the person being at fault (Assessing liability in autonomous vehicle accidents, para. 1). This might be because when the car was made, there might have been a defect, and the accident would be due to a defect in the product rather than human error in driving; therefore, the manufacturers or anyone else involved in the sale and reproduction of these cars would be held responsible.

A huge ethical concern would be decision making. Kirkpatrick (2015) said “the most difficult part is deciding what that response should be, given that in the event of an impending or unavoidable accident, drivers are usually faced with a choice of at least two less-than-ideal outcomes” (p. 19). Humans have to process this information, but the computer might do something different. The decisions between a human and a machine are vastly different because the vehicle will not have emotions attached to their decision. If there was an animal crossing the road, then the vehicle might decide to hit the animal if swerving would cause the car to collide with another car; however, a person might decide to swerve because they do not want to hit the animal. The choices are different, but the situation is the same. The question is whether the self-driving car would be able to assess this situation the same way as a human.

Security Concerns
Hacking is a big problem in any technological device. Autonomous vehicles are no different. Amoozadeh et al. (2015) said

To achieve automated cooperative driving, vehicles need to have access to each other's information. Such information enhances the ability of the autonomous vehicle to plan ahead and make better decisions to improve the overall safety and performance of the vehicle” (Introduction section, para 2).

Since all of this information is being processed, it is susceptible to hackers getting this information and possibly messing with the vehicles. There are two types of security attacks that can happen to an autonomous vehicle: application layer and network layer.

A security attack that can happen is called application layer attacks. Amoozahdeh et al (2015) said that “application layer attacks affect the functionality of a particular application” (Application Layer Attacks section, para. 1). If an application is not able to function properly, then this could cause a collision. Another attack is network layer attacks which “have the potential to affect the functioning of multiple user applications” (Network Layer Attacks section, para. 1). This attack is different from the application layer attack because it deals with multiple applications instead of just one. Since it deals with more applications, this would be a more malicious attack with greater repercussions.

However, Amoozahdeh et al (2015) hoped that “autonomous cars are equipped with a tamperproof hardware security module (HSM), which is responsible for storing digital keys as well as performing all cryptographic operations, such as message signing/verification, encryption, and hashing” (Network Layer Attacks para. 2). If this security measure was installed in the vehicles, then there would be a greater chance for them to be safer. Applications would not be able to be hacked into and the chance of an accident happening may be drastically reduced.
Safety is a number one priority. Since security is a huge factor, these precautions would ease people’s minds about the dangers of self-driving cars.

**Social Problems**

One of the biggest social problems would be the interaction between humans and self-driving cars. People that are driving are used to either driving themselves or being driven by someone else, but when a computer is driving around people, then there are some concerns. Some people might not adapt well to having technology control where they are going; others might enjoy this luxury. This technology might make the roads safer, but there are some flaws with autonomous vehicles.

Another social problem are the consequences of what would happen when the vehicle needs the user’s help. When the vehicle knows that it would not be able to handle a certain situation, it will let the human have control. Stewart (2015) said “Until we reach a point where cars are self-driving 100% of the time, humans are going to have to resume control in extreme circumstances, when the computer encounters things it can't cope with” (para. 5). Even though the technology should be in control, there are some flaws. When this happens, humans have to take over the wheel; therefore, this presents some challenges to autonomous vehicles.

A consequence of the user having to take control would be the dangers of distraction. Since humans may have to take control, they have to be prepared at any time to take over the vehicle. Stewart (2015) brought up a good point when he said

The danger comes when the human is not concentrating on the road, and the vehicle suddenly wants them to take over. The driver, who has been looking at their phone, may not know where they are, what is around him, or what is happening. He will have to
assess all that in seconds and take appropriate action. The irony is that that is only likely to happen in extreme events – in emergencies (para. 8).

The problem would be if they would be able to process all the situation and make a quick decision about how to handle it. This could also lead to others getting hurt if the driver is not able to effectively handle the situation.

**Further Required Research**

Even though there is research going on, there needs to be more in all of these areas. From the legal standpoint, there should be more information about who is at fault when these cars get into an accident. There should be laws that are dependent on the situation. If an autonomous vehicle gets into an accident with another autonomous vehicle then there should be a different law than if the autonomous vehicle got into an accident with a human driver. There also needs to be more research on how this would impact society. Would there be some kind of law that would require people to own these vehicles or to have some kind of device in their old car that would communicate to the autonomous vehicles? How would society progress if this technology was allowed to exist? Also, it would be interesting to look at it from a global perspective. Would other countries have this same technology?

**Conclusion**

In conclusion, autonomous vehicles still have to be researched further before they are allowed to be used by the public. Google already has a self-driving car that picks people up in California and drops them off at their destination. The biggest benefit would be a dramatic decrease in the amount of accidents with cars and animals. There are also some downsides to autonomous cars. The legal issues dealt with liability when there was an accident and an ethical concern was decision making. All of the security concerns were about hacking and how this
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would potentially cause accidents; however, they would install a device that would make the technology secure. Some social problems were about distraction and how people would react to this technology. As with all technology, there should be further research on liability and how these vehicles would affect society. Autonomous vehicles are a huge step in societal progression and when these flaws are corrected, it will be interesting to see its effects.
References


This article is about the different aspects of security with autonomous vehicles and communication. It discusses the possibilities of what could happen if hackers were to mess with the various programs associated with these cars. However, they also present some technology that could help combat some of these security concerns. This source is reliable because it is an article that discusses the research that the writers conducted on this topic and they also listed references. Throughout the article, technology jargon is used which implies that people in the technology field would be reading this magazine.


This article is about every relationship possible that exists between humans, animals, and machines. Oliver Bendel attempts to link technology and animals. Although he discussed different technology such as anthropomorphous agents, chatbots, service robots, animal robots, and military unmanned aerial vehicles, he also addressed self-driving cars. He believes that animals would have a better chance at survival if
autonomous vehicles were on the road which would be a benefit to autonomous cars.

This source seems reliable because it is an article from a scholarly journal. Also, at the end of the article, there is a long list of references.


http://www.theguardian.com/technology/2014/may/28/google-self-driving-car-how-does-it-work

This article gives background on Google’s self-driving car. It discusses how the car looks and how it operates when it drives around California. This article helps talk about what the car is and how it works so that if they were to become more common, then people would know some information about it. This source is reliable because it comes from a British newspaper. There are also pictures and statements from Google which implies that the information that is published came straight from the source.


http://web.a.ebscohost.com/ehost/detail/detail?vid=4&sid=486e1754-2e79-4255-837f-0a815e31af8%40sessionmgr4005&hid=4112&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=108508409&db=asf

This article addresses the moral aspects of autonomous vehicles. Some concerns were about the decision making process of vehicles. His view was that vehicles were not able to decide whether or not something should be avoided the same way as a human. This raises questions about the morale of a computer. He also addresses some of the
potential benefits of self-driving cars. This source is reliable because it comes from an academic journal.


This article in the magazine *Claims* looks at the legal issues associated with self-driving cars. Jeremy Rogers examines the issue of liability if these cars were to get into an accident with other cars that are either autonomous or not. He believes that the manufactures and others involved with the production and sale of these cars would be at fault. This source is reliable because it was published in a magazine that is known for only talking about claims such as insurance. Since autonomous vehicles are being tested and may become the future of driving, the magazine would be trying to examine these legal issues as they are a current topic.


This article discusses the social problems associated with autonomous vehicles. He emphasizes that since humans are used to being driven by humans, there might be some consequences. Since the vehicles will sometimes hand control over to humans, people need to be prepared to take over the wheel. However, some people will be distracted and have trouble reacting to the situation. This source is not as reliable as the other sources because it is a website rather than a scholarly journal; however, BBC is a trusted site.