290COM – Coursework 1 (9195071)

Autonomous vehicles are not safe enough to be the solution for the future.

Autonomous vehicles could be the solution to the dangers of the road. Though so many different issues relating to morals, ethics and the law stand in its way that it is likely never to come into fruition. It’s important to differentiate between autonomous and automated vehicles for this argument. Autonomous vehicles are the utopian idea of zero human interaction, a car that will take you from A to C whatever is happening at B. These would be classified as level 5 on the SAE levels of vehicle automation scale (**SAE International**, 2018). Automated vehicles are closer to what you’d see on the road today, a Tesla on the motor way changing lanes on its own but the driver in the vehicle is the main fall back for the system when unexpected events occur. These vehicles are considered level 2 on the SAE vehicle automation scale.

Cars on the road today could be said to be operating in their own bubble, other than GPS or radio signals nothing gets sent to servers or analysed in order for the car to get from A to B. Imagining the autonomous future where every car on the road is level 5, its obvious that each vehicle would have to communicate with those around it in order to determine routes and safe paths, a much more advanced version of someone putting their indicators on to communicate with others around them. This essentially creates a network of cars, with unique addresses, specific global position information and I assume many more pieces of personal information. This ‘Network of cars’ will undoubtably open up numerous vectors of attack for bad actors to not only steal the data, but to alter it, delete it or whatever they please. Thought you were taking your autonomous car to the shops? No, a hacker has just sent you to a town 300 miles away. While I’m sure there would be mechanical backups like an emergency stop switch, that’s up to the designers and engineers of the distant future. It’s already happening to level 2 cars today, one of Tesla’s chief concerns are that a fleet wide hack could be catastrophic (**Lambert**, 2017).

Tesla offered half a million dollars bounty at the Pwn2Own event for anyone that could hack a Tesla vehicle. Security researchers managed to make a Tesla Model three accelerate to 85mph in a 35mph speed limit zone, not through hacking into the vehicle and sending an acceleration command, but through exploiting a vulnerability in the Mobileye EyeQ 3 camera which is a product made by Intel (**Winder**, n.d). They used a 3-inch piece of electrical tape to extend the ‘3’ on the 35mph sign, making the system recognise it as ‘85’. This simple hack shows how vulnerable these systems are to manipulation and attack.

While it’s true that autonomous cars would solve the problem of human error in many crashes, it introduces new avenues for human error to occur. Errors in coding, networking or hardware become more prominent as these vehicles become increasingly complex. According to the National Highway Traffic Safety Administration, 94% of serious road collisions are caused by human error (**Lynberg**, 2018). What’s to say that that number would decrease? In a system this huge, that’s never been tried before, small errors in code or hardware could be fatal to a great number of people.

This brings in one of the most pressing issues, who is responsible when an autonomous car causes damage to people or property? This issue gets blurrier the further we progress towards level 5 vehicles. Currently in level 2 cars we can blame the driver as they are still the back up for the driverless system, if they’re not paying attention it is negligence and they’re liable. As we bring out vehicles where the system has complete control and anyone in that car could be described as a passenger, making them not liable for any accident taking place, who gets the blame? Instinct tells us it’s the person behind the wheel, but there is no wheel anymore. If the cause of the accident is a fault in connectivity, is it the manufacturer of the part that malfunctioned or the car manufacturer who installed it at fault? If we apply the product liability law (**Pinsent Masons,** 2011) to this scenario there is very little room for the vehicle manufactures to avoid prosecution, meaning the most likely solution would be some terms of use you’d have to accept when purchasing the vehicle. When only ‘3% of people aged 18-34 will ever read the terms of service’ (**Cakebread**, 2017) and realise what they’re signing up for, the future of transportation would involve the same method of hiding responsibilities in documents that no one reads, the ideal of autonomous vehicles starts to look less ethical.

Can we effectively code morals and ethics into autonomous systems? Let’s take the trolly problem (**Thomson,** 1985) and make a fully autonomous car the trolly, presenting it with a situation where stopping safely is impossible and the only two routes available are occupied by a single pedestrian on the left and five pedestrians on the right. There are now three options: The car carries on its original heading thus killing or seriously injuring five pedestrians, the car changes direction and kills the single pedestrian or finally the car could swerve into a wall saving all pedestrians but most likely killing the occupants of the car. For humans this is an immensely complex situation that is almost impossible to solve. We could try and assign values to individuals involved, resulting in the single pedestrian looking like the lowest value due to the total loss of life being minimal compared to the other options. If this was the case, we are saying that saving the five pedestrians is more ethically and morally sound than killing an individual, but the system in the vehicle will have actively made the choice to end an individual’s life, making liability issues immense. In the situation where the car continues its original heading and kills five pedestrians, it seems to be the scenario with the least amount of legal issues. As the vehicle is just doing what it is meant to do the blame could easily be rested on the five pedestrians being where they are not supposed to be, but this implies that letting the five people die is better than killing an individual purely because the first five made an error in judgment. While the third situation is possible where the passengers are sacrificed in order to save all six pedestrians, I would call it highly unlikely as no manufactures are going to sell cars that will actively make the choice to kill its occupants. This endless complexity is why humans cannot come up with a conclusive answer to this thought experiment, with moral, ethical and legal issues arising at every juncture. How can we ever hope to create autonomous systems that can tackle this problem when we can’t answer it ourselves? Assuming manufactures take the path of minimising liability the car would kill five people in this situation, if this were to come to fruition, I do not think the population would react positively and the future of autonomous travel would be in peril.

We are living in a period of history where we are seeing huge societal change in the way we travel due to economic and environmental concerns. The UK is preparing to phase out the purchase of all new cars powered entirely by petrol by 2030 (**Harrabin,** 2020). This is a huge change that will face push back from fans of internal combustion and people on lower incomes. As stated earlier for an autonomous road network to work it would almost certainly have to be exclusively composed of autonomous vehicles. This means in the future we would see a similar ban on the sale of new non-autonomous cars, undoubtably raising even more pushback from fans of driving in general. We could say it would be taking away an essential freedom from the people, if routes are controlled by corporations with governmental guidelines, it really isn’t that much of a step to seeing routes being off limits to individuals based on class, status or any other characteristic the government decides to measure us by. Could the minister of transport clear their route to work each morning with an admin command, effectively controlling the masses for their own gain?

As it stands today with level 2 autonomy in vehicles, we appear to be progressing towards a future where we will achieve full autonomy. But when we consider the ethical, legal and moral issues raised by this future, the global society would have to undergo such a monumental change to tackle them that I cannot see it happening even within the next 200 years. As time passes and the technology advances, the methods of attack and manipulation will always advance to challenge it; making any attempt to implement an autonomous road network increasingly dangerous for the population.

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