



The Ethical Implications of Autonomous Vehicles

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1. Introduction

- The development of AVs won't be immediate, it will take a couple of decades
- The process requires massive investments in infrastructures and people's behavior and attitude.
- Challenges and opportunities that can be resulted from the introduction of AVs
- Even when AVs are allowed on public roads, there will be restrictions on how they will be implemented such as on designated highway lanes and parking facilities where velocities will be kept low



2. Responsibility for safety

+Current ongoing tests on public roads consist of “safety driver” who is prepared to take control when it is needed. But this is only temporary, the industry plans on releasing the drivers to achieve automatic driving. But when there is no driver, who is then responsible for the safety of its passenger and the surrounding? The vehicle’s owner’s? Its manufacturer? The owner and manager of the road system?who?

Traditionally,



A New Vision for Safety

TRADITIONAL APPROACH

Traffic deaths are **INEVITABLE**

PERFECT human behaviour

Prevent **COLLISIONS**

INDIVIDUAL responsibility

Saving lives is **EXPENSIVE**

VS

VISION ZERO

Traffic deaths are **PREVENTABLE**

Integrate **HUMAN FAILING** in approach

Prevent **FATAL AND SEVERE CRASHES**

SYSTEMS approach

Saving lives is **NOT EXPENSIVE**

Safe Systems = Safe Mobility



System Planners & Policy Makers

Responsible for prioritizing safety in designs, policies



If road users make mistakes

Designs & policies analyzed for safety improvements



Individual Road Users

Responsible for following rules



So why was Vision Zero mentioned?

- It puts much more emphasis on road builders, managers, vehicle manufacturers, and others who contribute to creating and maintaining the road system and the road users.



Two fundamental types of responsibility

Task responsibility: to be obliged to do something

Blame responsibility: to be blamed if something goes wrong


For example:

- A motorist drives too fast and kill a child. He will be held (blame) responsible for the act. And obviously, he is (task) responsible for not driving like that again.

(Continued)...But this is not enough



And....what now?

- 
- With driverless car, it'd be difficult to hold the users responsible because they have no control over the vehicle's choices(other than the destination) for both types of responsibility.
 - Here are the alternatives:
 1. Hold the manufacturers and the road system managers(most probable and for example: aviation accidents), or
 2. Hold the AI built into the vehicles responsible
 3. Treat AVs' accidents as we treat natural accidents such as tsunamis, earthquakes, in which no one is held responsible(in Matthias' (2004) terminology, this is called a “responsibility gap”)



So everything is unclear.

Yes! Assigning responsibility on a mass scale seems out of reach. Moreover, for AVs, some even say human interventions can worsen rather than improve the safety of themselves and their surroundings.



3. What can and should be accepted?

Public's attitudes:

- Some are positive (but be careful, since not many have experienced AVs)
- Some are not so positive

The public's attitudes will be, perhaps, the deciding factor for the introduction of AVs into regular traffics.

A study in China: “AVs would have to reduce current fatalities by 75-80% to be tolerated.”





So what must be done to appease the publics?

The “obvious” answer: AVs
manufacturers need to meet the set
bar. But why such high demands?

Some reasons...

- Improvements in technology are much more generalizable than improvements in human behavior.
- Fear of a particular revulsion of being killed by a machine.





Continued...

- They are worried about the psychological effects of dependence on AI and,
- Risks of sabotage or large accidents due to a breakdown of the AVs system

And there are signs that all these reactions may arise, according to a study conducted by the AAA(American Automobile Association):

“ 3 out of 4 are afraid of riding autonomous vehicles “

But all of the above can delay the introduction of AVs system





BUT, what will happen when AVs prove us wrong?

- Insurance will become more expensive for conventional vehicles than for AVs
- There may be proposal to exclude human-driven vehicles from the road net altogether, that is

At that point, “it should be illegal to drive them , since human drivers will be the moral equivalent of drunk robots.”

So what are the results?

- A war between parties with impassioned and uncompromising positions







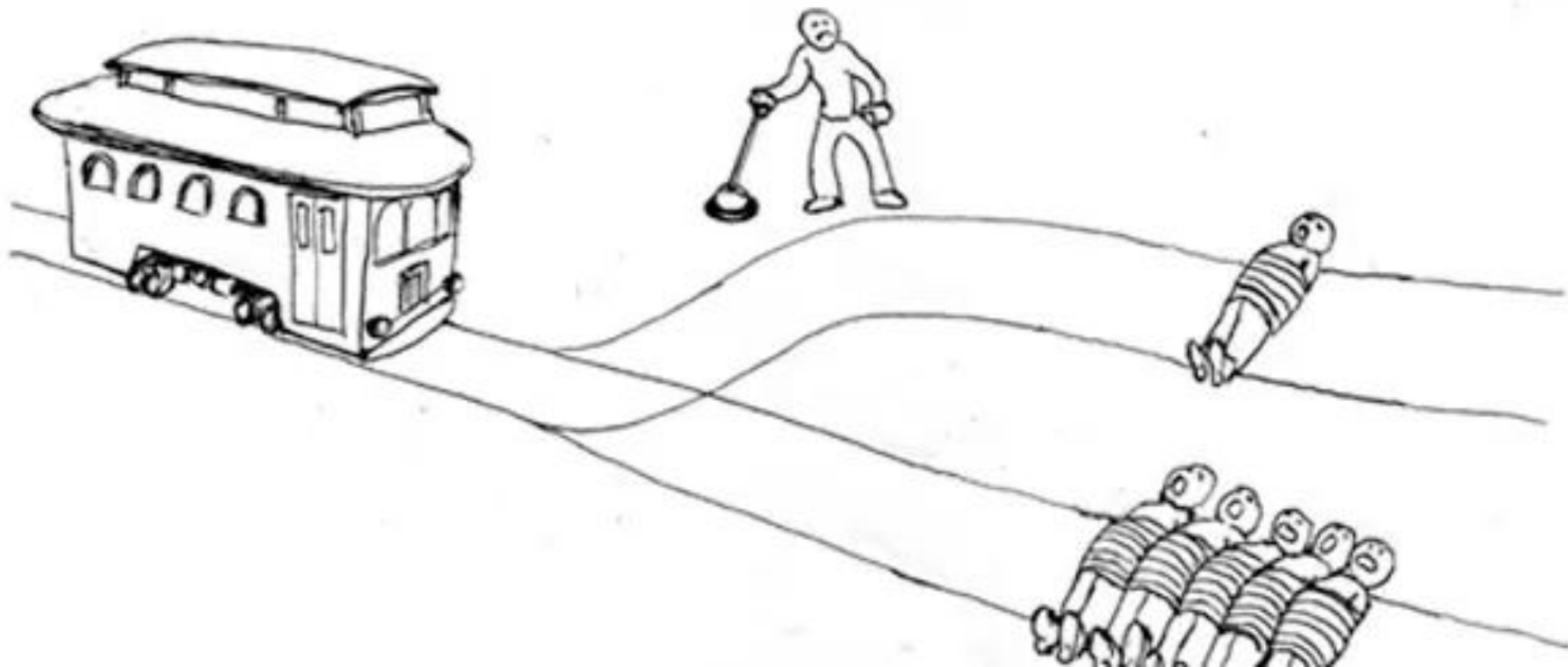
A law has been passed in California stating that AVs beyond 10,000 lbs have to accompanied with human operators.



4. Safety and trade-offs of constructing a traffic system

- Speed-safety trade-off
- Economy-safety trade-off
- Accessibility-Safety trade-off
- Small-vs-large-accidents trade-off
- Equity-safety trade-off
- Privacy-safety trade-off
- Freedom-safety trade-off

Trolley dilemma





5. External Control of Driverless Vehicles

- Driverless vehicles can be redirected: Such automatic redirection will be much more efficient than sending messages to the passengers who will then have to choose whether or not to follow the recommended new route.
- The ability of emergency service: external control of vehicles can be used for various law enforcement purposes, such as stopping a car at the roadside in order to arrest a traveller or to search for drugs, contraband or stolen goods. It has been predicted that such remote seizure can decrease the risk of deadly violence when a car is stopped by the police.

However, as the risks involved in stopping a vehicle become smaller, there may be moves to use the method for many more purposes than what traditional car chases are used for (namely, to capture persons trying to escape law enforcement).



6. Information Handling

The potential advantages of self-driving vehicles can only be realized with well-developed communication systems.

- Vehicle-to-vehicle (inter-vehicle) communication can be used to avoid crashes and organize platooning.
- Vehicle-to-road-management communication systems can provide updated local information on traffic and accessibility. If vehicle-to-road-management systems are interconnected on a large scale, then they can also be used for optimizing the traffic flow but it can lead to privacy intrusions as well.
- Self-driving vehicles will depend on geopositioning transponders operating in a highly standardized fashion and possibly on centralized communication systems that keep track of each vehicle's planned route and destination.
- Geopositioning of persons can be highly sensitive. The disclosure of travel destinations can be equally dangerous for a person who has obtained a new identity
- Geopositioning data can also potentially be used for commercial purposes
- An obvious solution to this would be for non-autonomous vehicles, pedestrians etc. to carry a transponder that communicates with motor vehicles in order to avoid collisions



7. Effects on health and the Environment

- There will no longer be a need to walk to and from a bus stop or a train or subway station. Reducing the amount of exercise can have negative health effects
- For air-trips, then this will have positive environmental and climate effects.
- If it replaces rail traffic, then the effects may be reversed.
- It is expected that AVs will have better energy efficiency than conventional vehicles. It has also been proposed that electric vehicles will be more attractive if they are self-driven so that they can “recharge themselves” when they are not needed. However, it is also plausible that the total mileage will increase.
- A routing system for automatized traffic can be constructed to ensure that each vehicle reaches its destination as soon as possible through platooning.

(Continued) Noise pollution due to the increased in road traffic rather than on the energy source. And the reduction of lighting.



8. Social and labour market conclusion



The introduction of self-driving vehicles will have important social consequences.

Positive effects:

- Disabled people, children and people who cannot travel alone on roads today will be able to do so.
- Their mobility will rise as a result, and it may also benefit their wellbeing and social connections.
- The positive effect on supply side of the labour market since workers will be more willing to take on occupations farther away from their homes.

Negative effects:

- Social division among travellers
- Sensors are less reliable in detecting dark-skinned than light skinned pedestrians which puts dark-skinned pedestrians at higher risks
- localization decisions made by businesses, such as stores and entertainment venues, may be impacted.
- Social segregation could be affected by changes in how urban space is used.
- The decrease of drivers' jobs

9. Criminality

- Illegal transportation (smuggling, delivery of drugs, stolen goods.....)
- Unauthorized access to data (hacking, blackmailing, kidnapping,)
- Sabotage (criminal and terrorist attacks, carrying a bomb,)
- New forms of auto theft



10 Conclusion



CONCLUSION



10.1 Responsibility

- Most of the responsibility probably will be given to the constructor, maintainers of vehicles, roads, and communication system.



10.2 Public Attitudes

- The concerning of people over the domination of autonomous technology over the world can lead to the contrast against autonomous vehicle.
- The requirement of high safety may postpone the introduction of self-driving system.



10.3 Safety

- The difficulty of ensuring safety for children without the control of adults
- Over-reliance on driverless intelligent system can lead to a dangerous situation.



10.4 Control

- (+) Easier control and safer for police to stop autonomous car
- (-) can lead to a new type of digital criminality



10.5 Information

- Collecting informations about routes and destination is necessary
- Authoritarian state can use these informations to be aware of criminality
- We can improve the safety of pedestrians, cyclists, and people travelling in a conventional cars by letting them carry transponder.



10.6 Social Justice

- Newer and more expensive models will have better systems than the old one.
- The decrease of drivers problem can be solved by providing training schemes and other of labour market policies.
- The decision should be made based in the public interest and through investigations.





Thank you.