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Self-driving Cars

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Self-driving cars (autonomous cars) - are vehicles capable of sensing its environment and navigating without human input. There are two definitions which describe this type of vehicles: "autonomous" (which is more widespread) and "automated" (which is more accurate). "Automated" connotes control or operation by a machine, while "autonomous" connotes acting alone or independently. Most of the vehicle concepts (that we are currently aware of) have a person in the driver's seat, utilize a communication connection to the cloud or other vehicles, and do not independently select either destinations or routes for reaching them. Thus, the term "automated" would more accurately describe these vehicle concepts. There are 2 most widespread classifications of autonomous cars. The NHTSA (National Highway Traffic Safety Administration) classification which varies from regular vehicles to fully-automated. Another classification was created as alternative for the first one, but have the same scale. The main difference between them is strict division between automated and non-automated vehicles.

There are certain countries and states which allow public road testing of automated vehicles or conjugate technologies such as: UK, Switzerland (Swisscom, Volkswagen Passat, Zurich), France (2000 km).

There are no fundamental innovations in the internal structure of autonomous cars. All devices are highly developed versions of their predecessors.

Lidar gives the vehicle 360 degree understanding of its environment so the car can sense objects in front of, beside, and behind itself at the same time, all the time. The laser also helps the vehicle to determine its location in the world.

Information from the sensors is cross-checked and processed by the software so that different objects around the vehicle can be sensed and differentiated accurately, and safe driving decisions can then be made based on all the information received.

Position sensor, located in the wheel hub, detects the rotations made by the wheels of the car to help the vehicle understand its position in the world.

Radar detects vehicles far ahead and measures their speed so that the car can safely slow down or speed up with other vehicles on the road.

Still, with the development of self-driving car technologies major problems of further development appeared.

1 Human interaction

Autonomous cars struggle to recognize humans alongside the vehicle or walking in front of it.

Pedestrians, cyclists and construction workers in the road could all be put at risk of collision.

Let's say an autonomous car was travelling along a road:

- A police officer is stood by the roadside signalling for traffic to stop
- The car fails to recognize him
- It carries on driving and causes an accident

When will this be solved?

- Unknown**: Testing human/robot interaction properly is difficult due to limited interactions.
- SCANNING... HUMAN NOT FOUND**: Developers still need to solve the autonomous cars difficulty in recognising pedestrian hazards and small animals.

2 The weather

Poor weather leaves most automated vision-systems in the dark and unable to see.

Snow and ice are unexpected hazards for self-driving cars, and vehicle performance is uncertain.

It's unknown how autonomous cars will handle:

- Avoiding ice
- Detecting lanes under snow
- Driving in wet conditions

The car might well detect snow as an obstruction and refuse to move.

When will this be solved?

- 2020**: By this time, \$20 billion will have been spent on adding sensors to smart cities.
- Increasing the number of embedded sensors in the environment to guide the car – and including more sensors in the vehicles themselves – could solve the problem.**

First two problems are connected with future development of autonomous vehicle technologies. One way of solving these issues is creating "smart cities" systems. These

systems include sensors installed on the streets of cities, which would be sent in the vehicle and processed, so that the car can assess the situation around it more precisely and make right decision.

These two issues are based on problem of choice. Sometimes violation of the law is a necessity if you want to save human live. Currently the way of cars behavior in this kinds of situation is unpredictable and there are no way how to solve this problem.

3 Morality and ethics	4 The law
 <p>The law and ethics The law and ethics can conflict with one another in dangerous situations – the right choice might require illegal acts.</p>  <p>Legalist safety directives could lead autonomous cars to make poor decisions in emergencies.</p> <p>It's unknown how autonomous cars will handle:</p>  <p>An emergency stop would cause a fatal collision with those behind</p>  <p>Carrying on would run down the child</p> <p>What choice would the car make?</p> <p>When will this be solved?</p>  <p>Robot ethics is still in its formative stages, and focuses primarily on military drones</p>  <p>As autonomous cars get closer to our roads, the ethical question will also gain more coverage.</p>	 <p>Safety testing must be completed outside of the R&D environment in a statistically significant way.</p>  <p>Legal theorists will need to account for the new problems raised by autonomous cars.</p> <p>Suppose the car detects the child suddenly appearing in its path:</p>  <p>The car performs an emergency stop</p>  <p>The child is still hit – but the car had performed exactly as it was programmed to</p> <p>What choice would the car make?</p> <p>When will this be solved?</p>  <p>The date by which the Department of Transport has promised a review.</p>  <p>Until comprehensive feasibility and safety reports have been made, autonomous vehicles could be limited to freight and goods.</p>

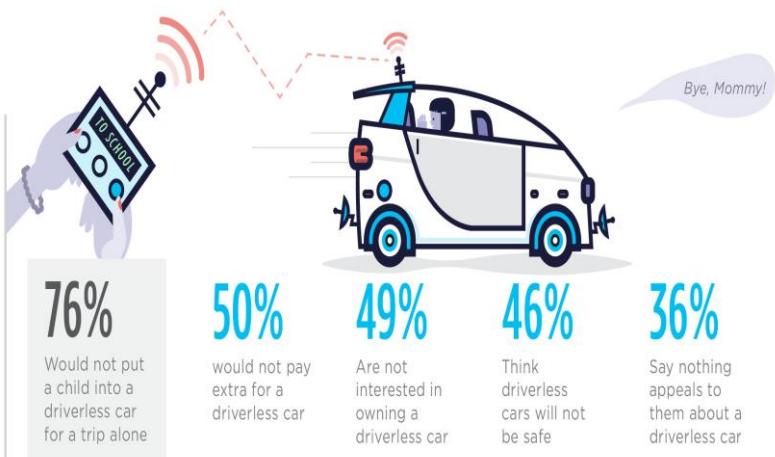
With new technologies being implemented new safety issues appear. Large variety of sensors can break down and cause an accident. This equipment is also extremely expensive, due to its hi-tech nature. These takes us to issue number 6. Of course the price tag will drop in future, but nowadays it is what it is.

Despite the development and improvement of existing technologies public trust ratings are still very low. As you can see almost half of the respondents are not interested in owning a driverless car, which shows that consumers are not ready for

pervasion of automated cars in everyday life of society.

1. Overall, consumers are skeptical about driverless cars:

nerdwallet



The fact that forecasts and predictions are extremely optimistic may surprise ordinary viewer, but there are certain factors which cause this bright prospects. Firstly, development of driverless technologies and their practical implementation is a great chance for to take the lead in the market. This causes major corporations to invest large amount of resources in evolving industry. For example 2020 is the year by which BMW, Nissan, GM, Mercedes and Cadillac plan to offer mostly self-driving cars. BMW predicts that fully-autonomous commercial vehicle will become available in 2025. Mercedes announced concept of automated truck which is planned to be released in 2025

Implementing of these technologies can be compared to invention of an assembly lane. Autonomous car is very promising project and can turn automobile industry upside down. Future development can lead us to complete remaining car concept.