GRMI | GLOBAL RISK MANAGEMENT INSTITUTE

TOPIC- Autonomous Vehicles And Risks | Date-01-09-2021

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What Are Autonomous Vehicles?

1. Autonomous vehicles are those that can drive themselves.

2. To do so, the vehicle must be able to perceive its surroundings, make choices about where it is safe and desirable to travel, and then move there.

3. It's also possible for a vehicle to be just partially self- driving, with certain choices made by a human driver and others made by the machine.

Different types of autonomous vehicles

1. Autonomous Spacecrafts
2. Specialized Industry Usage
3. Trains
4. Autonomous Cars

Marine

Autonomous and unmanned technologies can be employed in both undersea and surface boats in marine environments.

Applications-

1. Scientific study, such as monitoring ocean elements like coral reefs, is one of the major areas where these can be employed.
2. for commercial purposes, such as in the oil and gas industry.

Spacecraft

Spacecraft include autonomous technology for a number of purposes. This technology can either control the whole spacecraft's operation or operate in collaboration with a human operator.

Applications-

1. Mars exploration rover
2. Lunar probes
3. supply ships going to space stations

Specialised Industry Usage

Unmanned and autonomous vehicles are used in factories and warehouses for specialized industry operations.

Applications-

1. Rio Tinto, a massive mining corporation, utilizes tens of driverless trucks to carry iron ore, as well as autonomous trains on several of its sites.

2.Robots with mechanical arms have been built that can recognize items and detect how much power they are applying on them, allowing them to choose the optimum method of assembling and transporting products.

Trains

Autonomous trains are capable of operating automatically at all times, including door closing, obstacle detection and emergency situations.

Applications-

1. Trains are automatically positioned for service prior to the initiation of normal operation.

2. aids in addressing the issues of growing demand for safety, the need to reduce operational costs, passenger expectations for more frequent service, and shorter travel times.

Autonomous Cars

A completely autonomous automobile is one that is capable of seeing its surroundings, deciding which route to take to its destination, and driving itself.

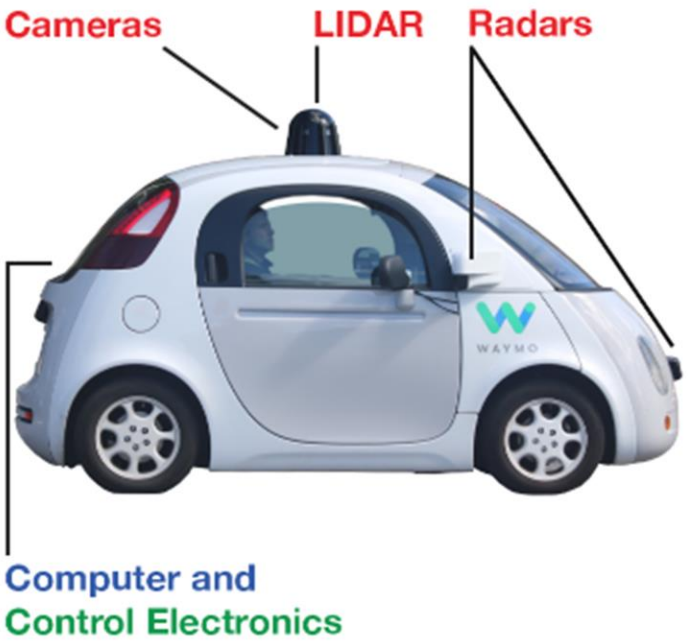
Levels Of Autonomy

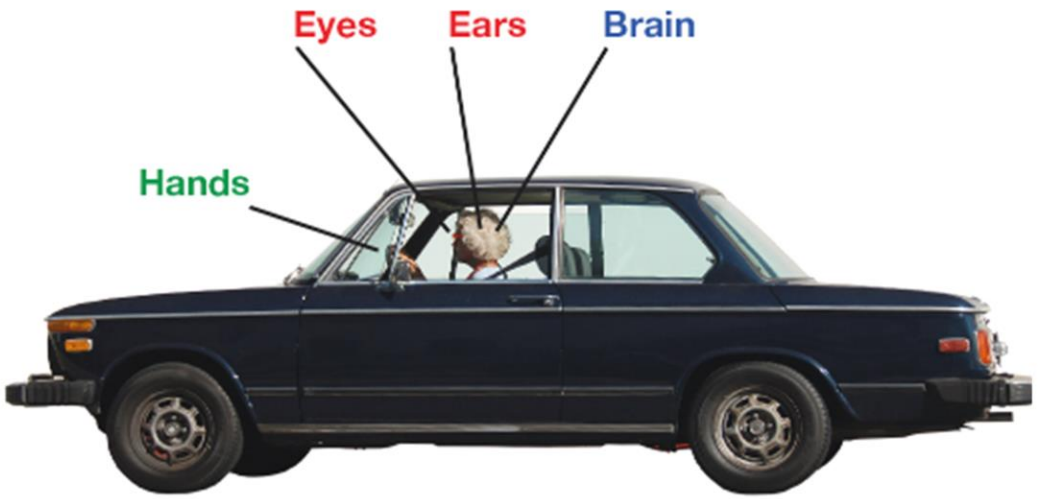
	Levels of Autonomy	Existing Examples
1 Driver only	The vehicle is entirely under human control but may have some automated systems.	Cruise control, electronic stability control, anti-lock brakes
2 Driver assistance	The steering and/or acceleration are automated but the driver must control the other functions.	Adaptive cruise control: distance to car in front maintained. Parking assistant: steering is automated, driver controls accelerator and brakes.
3 Partial autonomy	The driver does not control steering or acceleration but is expected to be attentive at all times and take back control instantaneously when required.	Adaptive cruise control with lane keeping. Traffic jam assistance.
4 High autonomy	Vehicles are able to operate autonomously for some portions of the journey. Transfer of control back to the human driver happens with some warning.	Prototype vehicles.
5 Full autonomy	The vehicle is capable of driving unaided for the entire journey with no human intervention – potentially without a human in the car.	None

Table 1: Adapted from Autonomous Road Vehicles - POSTnote 443, September 2013, Dr Chandrika Nath, Parliamentary Office of Science and Technology, Parliamentary Copyright 2013

How Does It Work?

	Perception	Computing	Control
Self-Driving Car	Camera LIDAR Radar	Computer	Control Electronics
Human-Driven Car	Eyes Ears	Brain	Hands Feet





LIDAR (or "Light Detection and Ranging") is a device with a constantly rotating laser beam. It sends invisible light pulses all around it.

Radars helps in detecting moving objects.

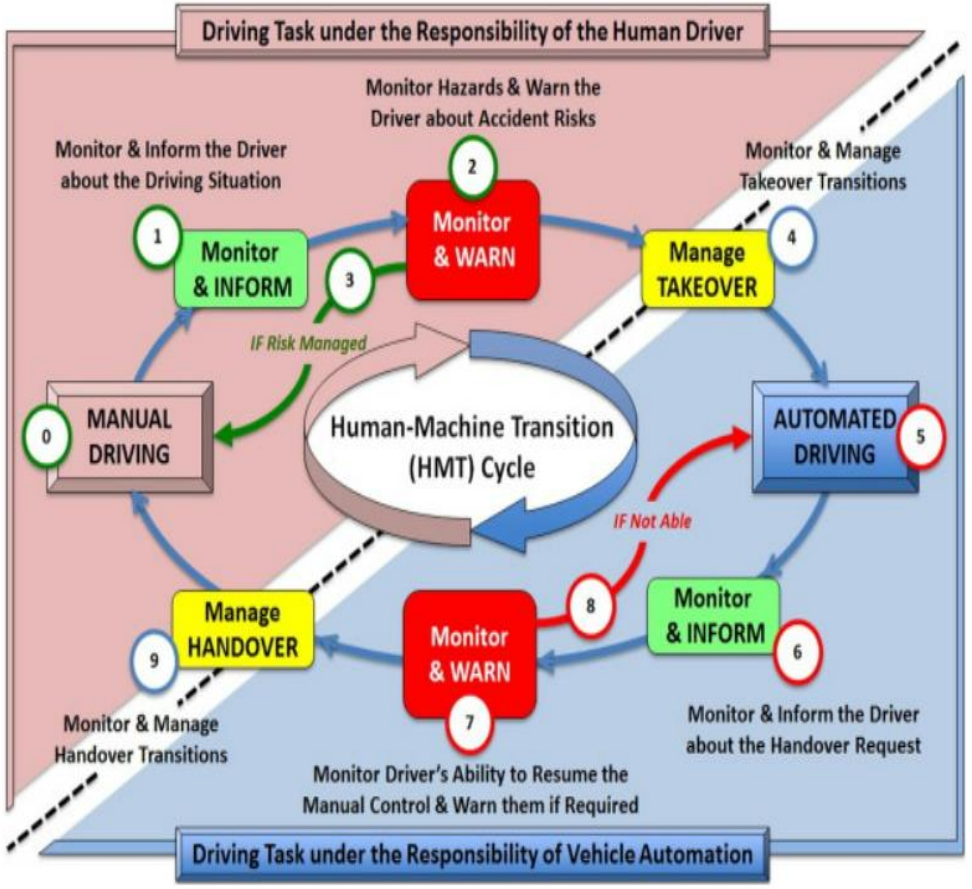
Advantages Autonomous Cars

1. Reduced Collisions on the Road
2. Fewer Traffic Jams
3. Decreased Emissions
4. Reduced Fuel Consumption
5. Great Benefits for Seniors and disables
6. Fast and Affordable
7. Lower Taxi Fares
8. Better Parking Opportunities

Legal issues and challenges related to AV

Legalities related to AV

- The driving task generally falls under the full responsibility of the human drivers. (for information or warning systems).
- German Road Traffic Act - ensures third party access to certain defined recorded data of the vehicle (human or ADAS error).
- Human drivers still bear the duty to monitor all types of ADAS with the exception of evident technical failure of the vehicle or of the ADAS algorithms.



Challenges introduced

- New set of challenging paradoxes arise concerning both Human-Machine Interaction and legal aspects which are intrinsically linked to the "liability question".
- The Human-Machine Transition (HMT) cycle, supports the joint conceptual analysis articulated around the "liability issue" (i.e. responsibility in the vehicle control):

Few ethical dilemmas

1) The **continuous supervision and evaluation** (in terms of risk taking, for instance) of driver behaviours, and the potential use of this type of data by insurance companies to support Pay As You Drive (PAYD) logic.

2)Vague and ambiguous regulations

- In Germany, for example, the recently amended law stipulates that the driver should be able to stay "alert" in order to resume "timely" control
- How much takeover time is expected by regulators or what drivers are permitted to do in automated mode: the arguably critical point, especially in those instances where the takeover is unplanned and has to be virtually instantaneous.
- Is it ethically right to charge the human driver with responsibility for monitoring and spontaneous handover situations
- Whether the final decision about handover or takeover initiation lies with the human driver or the machine.

Two extreme scenarios may demonstrate this asymmetry more clearly :

Scenario A: Automated mode detects difficulty and wants to handover control to the human driver. If the driver does not react fast enough or does not feel capable and refuses to take over control, and an accident occurs, the driver is liable

Scenario B: The driver feels uncomfortable with the driving situation or tired and wants to switch to automated mode. If the machine then refuses or is not capable to take over and an accident occurs, the driver is again liable.

Risks

1. Cyber Risks

1)As cars grow more linked, hackers may be able to gain access to personal information such as usual travels or where a person is at any particular time.

-> allow a thief to figure out when a homeowner isn't home

-> It's also possible that driving might be hampered deliberately, putting passengers at risk.

2)There is a risk of cyber terrorism.

->a largescale immobilisation of cars on public roads could throw a country into chaos.

2. Danger Of Fire

Lithium-Ion (LI) batteries are known for being highly volatile.
There's a risk of "uncontrolled rises in temperature and pressure, known as thermal runaway...“ if a battery is damaged in a crash.
This can result in a poisonous gas explosion, projectile discharge, and fire, posing an extra threat to emergency personnel.

3.Increased Exposure To Radiation

Autonomous cars are designed to function through the use of different electronic devices – all emitting EMF radiation.

- **Constant exposure to EMF leads to health problems like headaches, migraines, inner agitation, chronic fatigue, insomnia, and infection susceptibility.**
- **Some people develop electromagnetic hypersensitivity where they experience sudden shortness of breath and fluctuating blood pressure.**
- **People also develop eye problems from constant electromagnetic exposure.**

4.Inadequate Infrastructure

- **Our present infrastructure is not designed for the usage of autonomous vehicles, and as a result, accidents may occur.**
- **Self-driving cars may be unable to navigate under heavy rain or snow, which may conceal or distort painted lines on roads and highways. This can render autonomous navigation systems unreliable, if not unusable.**

5.Increase Demand For Power

- **The shift toward autonomy may increase (rather than decrease) a vehicle's energy requirements.**
- **From oil temperature to engine timing to brake action, modern automobiles keep track of everything. This requires processing gigabytes of data every hour.**

6. Transferring risk from the driver to the machine

A computer error or a bad sensor reading might cause a car to perform something that a human driver would immediately recognise as inappropriate. This might lead to unexpected and more severe sorts of accidents, the nature of which is difficult to foresee.

7. Residual Driver Risk

By gradually transferring responsibility from the driver to the automobile, there is a possibility that a driver will misinterpret the level of responsibility they now have or will be unable to grasp how to select various modes of operation for their vehicle.

8. Reputational Risk

The failure of an autonomous automobile has severe consequences for human safety, the manufacturer of a car or component that is involved in an accident may face serious reputational risk.
Such as- explosion of lithium battery, failure of sensors and many more.

9. Risk To Economy

1. Those who rely on driving for a job may find their profession outdated if self-driving cars become more common.

2. Those in the trucking business, as well as bus and taxi drivers, will need to find other jobs.

3. Autonomous vehicles would also eliminate the need for fast food delivery and Uber driver.

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