abhiyaan

B3 - 1

the main sensors used in autonomous vehicles are camera, radar, lidar, gyro, magnetometer, accelerometer

camera

the camera captures the 360° view of the surroundings of the car

advantages

3D cameras are used to accurately calculate and display the highly realistic images. some of these sensors can also identify specific objects in these images

disadvantages

do not work in rash weather conditions and bad quality images (ex - when the colour of the object is similar to the color of the background)

radar

they send radio waves which are used to find out the position and velocity of the objects around the car

advantages

no problem in finding the objects in bad weather conditions

disadvantages

improvement in pedestrian recognition algorithm

lidar

similar to radar but use laser instead of radio waves

advantages

lidar can be used to create a full 360° map around vehicle in 3D

disadvantages

lidar sensors are very expensive and they may not identify objects accurately in bad weather conditions

thermal sensors

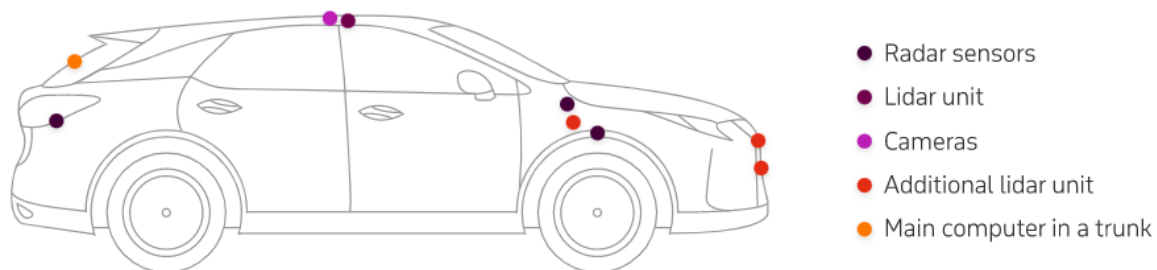thermal imaging can detect warm objects even with limited available data

advantages

thermal imaging can provide more information to improve existing sensors in autonomous driving

disadvantages

it is expensive when compared to other sensors

Autonomous vehicle components

Data source: nytimes.com

other sensors used in car engines are -

position sensors

- crankshaft position sensor
- camshaft posititon sensor
- throttle position sensor

air flow sensors

- mass air flow sensor
- vane air flow meter

pressure sensors

- manifold absolute pressure sensor
- oil pressure sensor
- fuel pressure sensor

temperature

- intake air temperature sensor

- coolant temperature sensor

- fuel temperature sensor

- oil temperature sensor

afr, emissions + others

- O_2 sensor

- exhaust gas temperature sensor

- nitrogen oxide sensor

- knock sensor

sensor fusion can help in increasing the efficiency and accuracy of the data provided by the different sensors individually

B3 - 2

the paper deals with an algorithm to predict the intersection type using lidar sensors. the lidar point cloud-based images

steps -

Image – binary image of bird's eye view
All structures with 1 are connected and checked whether it is pedestrian or vehicle
If pedestrian or vehicle, clear and use the rest of the grid map to find intersection type

this method can have high accuracy if the training set is large and diverse with multiple complicated scenarios

resources used for all the questions

http://wiki.ros.org/

https://www.youtube.com/playlist?list=PLLSegLrePWgIbIrA4iehUQ-impvIXdd9Q

https://www.itransition.com/blog/autonomous-vehicle-sensors

https://www.youtube.com/watch?v=2Fcmh7SLPBI

https://www.youtube.com/watch?v=dK4mb1yS0dY