ANALYSIS OF ASPECTS IN SELF DRIVING CAR

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ABSTRACT

It is great responsibility that auto business is heading towards new heights of progression and budgetary advancements. In case we discuss about some previous year growth, researches are at advanced level. Now the revolution in technology is "self driven cars" or "Auto-car". The main objective of this driverless cars or self driven cars is to take driving decisions without any interference of human being in decision making. The important factors of self driven car is the sensing device to acquire traffic related data, computer system to process the data, and actuator as controlling device.

Keywords: self driven car, Auto-car, sensing device, decision making

INTRODUCTION:

The main purpose of developing self driven car is to reduce the human efforts required in driving. According to survey of world health organization, the deaths caused are 1.24 millions in year 2010. Amongst this 7% deaths are due to car accidents which is mainly due to human errors[1]
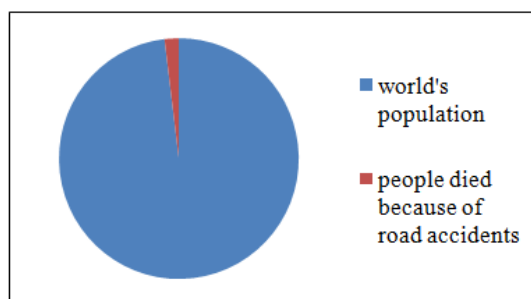

Figure 1: pi diagram representation of death rate

A.　　*Impact of Human faults:*

The factors which are responsible for the accidents are the human behaviour, alcohol consumption, violating traffic rules, avoiding use of helmets, decision making ability,reaction speed etc.87% accidents are only due to human errors and remaining accidents are due to vehicle factor. So practically, allowing a car to run automatically is much more safe and useful by taking safety factor in consideration.
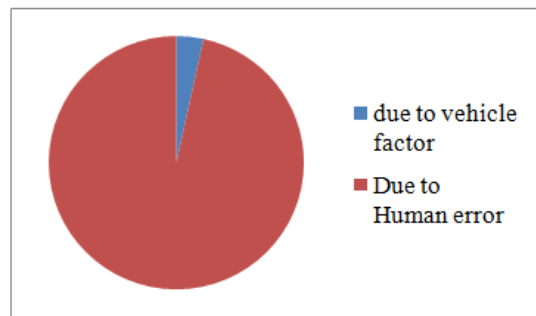
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Figure 2 : pi diagram representing accidents due to human error

B.   *Overview of Auto-car:*

There is huge advancement in transportation field because of the use of IT industry, Communication technology as well as sensor technology in it. These efforts are taken to increase the safety and comfort of the passenger. Many industrially strong countries are taking continuous efforts to promote the development and use of intelligent system in transportation. But there are some other factors which we have to take into consideration such as cost effectiveness of autonomous car and benefits obtained by it. This generates a need of separate industry which will study and examine these factors so that public can get better knowledge of cost and benefits because of IT industry[1].

The cost and benefits of autonomous system is decided by certain factors such as system performance, safety improvement, impact on economy and impact on environment. The system performance deals with the efficient driving and decision making without any human interference. Safety improvement deals with the reduced accident rate by using this car. Impact on economy deals with fruitfulness of the product in   market. The environmental impact mainly deals with noise and air pollution reduction[1].

C.   *Self Driven car:*

The main objective of self driving car is to keep human being out of the decision making process for driving. This arises many complexities in design and implementation of self driven car.
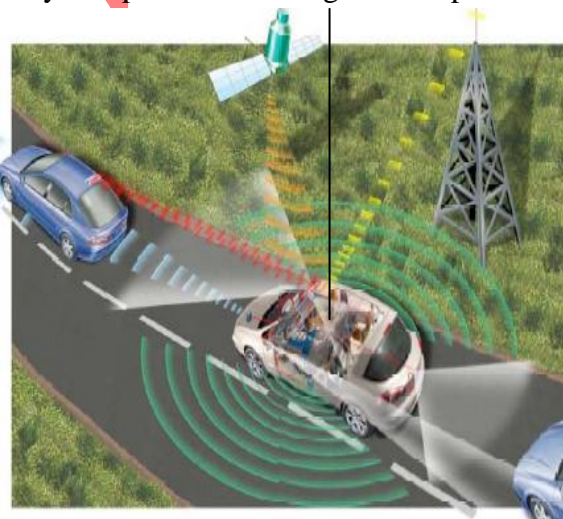

Figure 3: Self driven car diagram

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The driving decisions are solely taken by the self driven car such as taking turns, following lane, obeying traffic rules, follow the traffic signal lights. The self driven car can only be implemented by providing it an assisting system which will take decision in error prone situations such as driver is in high speed or caught in traffic jams etc. There are different ranges of speed such as low speed, high speed, in traffic jams, highway long stretch cruising. Then the system must be included with feature such as development environment recognition technology, navigation of system coordination, infrastructure coordination. For this an output from sensing devices is required so that the car will act according to the surrounding environment.

D.   *Sensing Devices in self driven car:*

Sensing devices play crucial role in self driven cars, because all the driving decisions can be made possible by using outputs of sensing devices which is taken from the surrounding of the car. But the sensing devises required for achieving 360^0 surrounding view can be costlier. There are some advantages and disadvantages of sensing devices used in self driven car.

Sensing devices	Advantages	Disadvantages
RADAR	Gives the efficient detection of speed, waves are not affected by any factor such as barriers in way, distance measurement is also accurate for short range.	If beam is blocked, the lane detection is bad, size is big
LASER	Barrier detection is good, detection of speed and distance are good	Range is Small Size is big
INFRARED	Best Used in night mode, detection of lane is good.	Detection of traffic signals and signs is

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		very poor
VISION	**Vehicle is small, detection of lane is good**	**Difficult to implement bad at detection vehicle speed or distance**

Table 1: Sensing devices

E.   Benefits of self driven car:

- Transportation cost is reduced
- Traffic casualties are reduced
- Beneficial for physically handicapped person
- Response to disasters is improved
- Greatly recombined as public as well as personal transport system

GOOGLE'S SELF-DRIVING CAR:

Google's self-driving car is the most coveted recent topic . Google put the objective of reducing accidents causing because of manual fault , decreasing use of fuel and safty while driving. To fulfill these objective google is launching a car which works with no manual interworks. It is nothing but self-driving car.

But other than google some private companies also put their design of self driving car listed bellow[2] :

Year	Company	Technology
2014	VOLVO	Control of adaptive cruise to follow the path
2014	National Telecommu nication	Design Broadband spectrum
2015	Audi	Design of vehicle for lower speed break
2015	Nissan	Self-parking
2017	Tesla	Auto pilot
2018	Google	Autonomous car
2020	Volvo	Injury immunity
2025	Ford	Expecting self-driving car on sell

Table 2: Expected arrival of cars

CLOUD COMPUTING IN SELFDRIVING CAR:

Self driving car is fully automatic system . To run such a "without human system" it has to deal with huge amount of data to run the codes, roadmaps and other data. Cloud Computing is the solution to reduce the data storage problem in self driving cars[6]. Car has to relay on the cloud infrastructure. Reports says that the car has to generate huge amount of data which is equals to one gigabyte per second[5]. The concept is to store whole code in the cloud and download is whenever needed.

A. Components of self-driving Car :

- Laser Range Finder : It is used to get the 3D view of the road which is in front of the car[4].
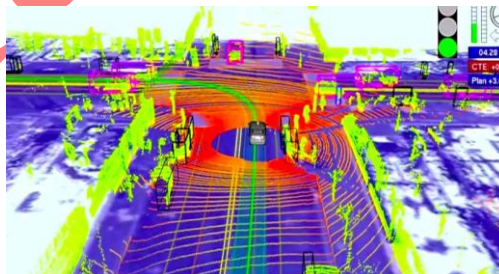

Figure 4 : View generated by Laser Range Finder.

- Four sensors : Sensors are mounted on both front and rear bumpers . These are used to sense the obstacles in the environment and according to that control the speed. It means that the car can speed up in area where there is no rush[4].

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B. *Working of self driven car:*

- Each and every data is stored on the cloud and it is downloaded with the help of software whenever it is required.

- External storage must be there to take care of situation of data connection failure. It is required to make the car work in offline mode also. Before going offline it downloads the required data and keep that data in external storage. Then external storage will utilize that data when there is data connection problem.
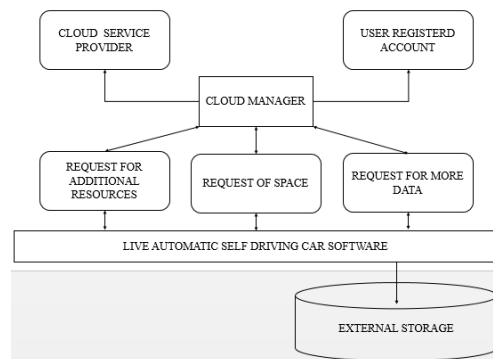
Figure 5 : Live working of self driving car

C. *Steps*

- Turn on the car
- Car gets connected with the available network. It can be 4G , 3G or WIFI
- User is asked for authentication
- Car downloads the code, makes the map using laser range finder, compares it with live images and starts to drive.
- After reaching the location data is taken off from the car back to the cloud. This ensures more security[3].
- Encryption is done on the data to prevent it from getting hacked.

D. *Features*

- **Web Closet** : The role of web closet starts after authentication. It asks to user about the destination . Web console dialogue box appears on the screen asking about destination [2]. It also asks whether the user is in emergency or not. If yes then it follows straight forward path or else it will ask for other paths which he had followed previously. For example If user has an habit of taking newspaper from particular shop then web console asks for the same.

- **Cisco module** : It is a type of network selector. Data entered from web closet now has to sent to the cloud .For this network connectivity is needed.

Many types of network connectivity are available.

for example 2G,wifi,3G . As continuous private WiFi is not available till now the network has to switch very fastly and efficiently through the networks available for continuous connection to the network. Cisco software helps us in such a situations . It is a good network selector giving realiablity of continuous network connection[2].
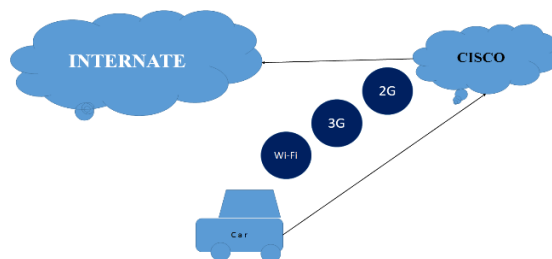
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Figure 6. CISCO

- **Authentication process** : To verify the user authentication is needed. This process is not limited to single car . User can do authentication of different cars also which he owns[2]. Suppose a user has two cars, currently he is in one car , now he wants the other car to drop his kids to playgroup then he can authenticate from his current sitting car to the car which is at home. After authentication the other car runs the prescribed program and takes kids to playgroup.

Figure 7 : Authentication

- **Secondary storage** : It is also called as external storage. If the user changes destination then cloud takes new destination and checks if continuous data connection is there on the new destination or not . If not then it downloads the data to secondary storage and uses it when car goes offline. It can be called as back up.

- **Encryption / Decryption** : If user don't want to take off data from the car at the end as he wants to go the same destination next day. In such a cases the data is kept in the car in encrypted form to prevent it from getting hacked. For the vehicle to drive safely on the road cryptography is required efficiently.

E. *Flow of work of self driving car :*

- Start car
- Do authentication
- Network will be selected amongst the available.
- profile login
- cloud connection
- Give location details
- With the help of GPS software forms a map to reach location .
- Start driving
- 3D view of map using laser range finder
- If request for change in location , checks for the connectivity to the new location and if it not there then download the data and store it in external storage.

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- After reaching location, stores data back the cloud and wifi disconnected.
- If user don't want to take off the data then it is stored in encrypted form to external storage.

CONCLUSIONS

From the above we get the knowledge of cloud technology in selfdriven car. Also we come to know about challenges faced by car. We come across the need of such car for reducing accidents. Official dates for release of cars in future are also seen. We have studied 'Cloud based computing ' as a solution to overcome the big challenge of data storage. With the help of this huge amount of data and software are stored on cloud and downloaded whenever required. Problem of continuous data connectivity and switching can be overcome by CISCO technology along with external storage. Also seen various features and safety measures provided by encryption and authentication technology.

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