

# ASSIGNMENT

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Section: 6

## Answer to the Question 1

I believe the most dangerous job for humans in our country is driving vehicles. Every year, a large number of people die in our country due to road accidents. Bad driving has the potential to cause harm to a huge number of human life in our country, because everyone has to use some form of transportation in their everyday life. So it is safe to say that driving is the most dangerous job in our country, both for the drivers as well as the passengers. And it affects almost the entire population of our country.

The robot that I will build to save human lives from ~~that~~

I am going to build ~~a~~ autonomous vehicles to save human life from the consequences of bad driving.

Autonomous vehicles can be trained to make it drive better and safer than humans, for this reason it is and unlike humans autonomous vehicles are not affected by fatigue, ~~human error~~ and they

have superior processing power which ~~can give~~ gives them better reaction time. So I believe that autonomous vehicles

are an adequate solution for the problem at hand.

The features that I want to implement in my robot are:-

- ① The robot should be capable of creating a model of its environment by using input from sensors like ~~laser~~ digital camera of LIDAR etc. And then it should identify things like pedestrians, other vehicles, walls, non living objects etc and assign appropriate behaviour to them.  
For example if the robot identifies a human in the world model, it should assign the behaviour that a human can move in any direction.  
Similarly if the robot detects an ~~object~~ a wall, it should assign the behaviour that a wall is not

going to move.

(ii) The robot should always follow traffic law. For example the robot would always stop at red light, the robot will always drive in the ~~for~~ correct lane. It will never cross the speed limit. The robot is always going to make way for emergencies vehicles like ambulance, police car etc.

(iii) The robot should follow additional safety protocols. For example, the robot should always maintain a predefined amount of distance from other vehicles in the road. The robot should move

to the side of the road and become  
~~inoperable~~ inoperable if any crucial component  
of ~~the~~ the car such as the engine  
or the brakes start to malfunction.

- (iv) ~~The robot should have~~
- (iv) The robot should ~~have~~ know where all  
the nearby hospitals are and should  
be capable of calculating the  
shortest route from its current  
location to the nearest hospital.  
In case of emergency, the robot  
should be capable of driving itself  
to the nearest hospital with  
~~suitable~~ suitable hospital with the ~~necessary~~  
suitable equipment for handling the  
emergency.

The above mentioned features will be beneficial to human in the following ways.

- ① By creating a model of the environment and by classifying the elements within that environment, the robot can make better decisions based on the behaviors assigned to ~~the~~ any object around the vehicle. This will improve safety and efficiency of the robot. For example if the robot determines that it is surrounded by a crowd of people, it can decide

to travel very slowly. On the other hand if it's surrounded by fast moving cars on the road, it can decide to move very fast.

- ii) By having the feature of always following the traffic law will be beneficial for reducing ~~traffic~~ accidents and improving safety in the process. Moreover following traffic laws will result in less confusion and subserviently, less traffic jam. Reduction of traffic jam will directly ~~result~~ result in the reduction of loss of time and money, thus it will ~~be~~ also be helpful for the economy.

- iii) By following additional safety protocols, the robot will greatly reduce risk<sup>of an accident.</sup> and it will save money and human life as a result.
- iv) ~~By being capable~~ The feature of being capable of driving to the nearest ~~hospital~~ suitable hospital in case of an ~~emergence~~ emergency can be vital for saving human lives. In addition to that, this feature can be used in a non emergency scenario to save time and money. For example the robot can determine the shortest route ~~to~~ for driving to a destination.

this will save time and cost less fuel and  
thus it will also cost less money.

### Answer to the Question 2

The three required Scenarios are given below.

#### Hierarchical /deliberative paradigm

For example: Lets consider a robot that has the entire map of its environment. The robot listens for a signal that ~~sends~~ gives ~~it~~ it a certain co-ordinate within the map. After receiving the co-ordinate, the robot plans a route from its location to the target location received from

the signal, after receiving the planning the ~~path~~ path, the ~~robot~~ robot follows the ~~path~~ path, but it does not react in any way to the environment or any event that might occur in the environment or ~~in the robot~~ anywhere else. i.e the robot is not reactive.

Hence the robot can do the following things:-

Sense: receive signal

Plan: Plan a suitable path

Act: Follow the determined path.

but this system is not reactive to its environment. The robot follows a sequence where it has to sense plan and then act, but it can't

~~for~~ immediately react to the environment without planning. For this reason the robot ~~is~~ follows hierarchical paradigm and not reactive or hybrid paradigm.

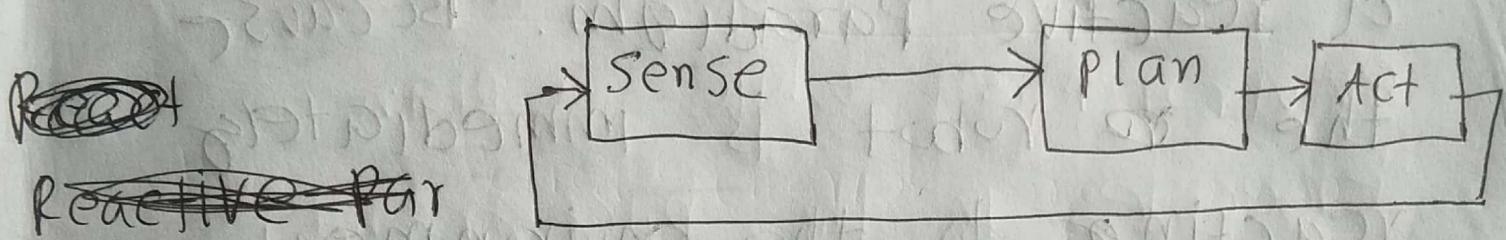


Fig: Hierarchical paradigm

Reactive paradigm:

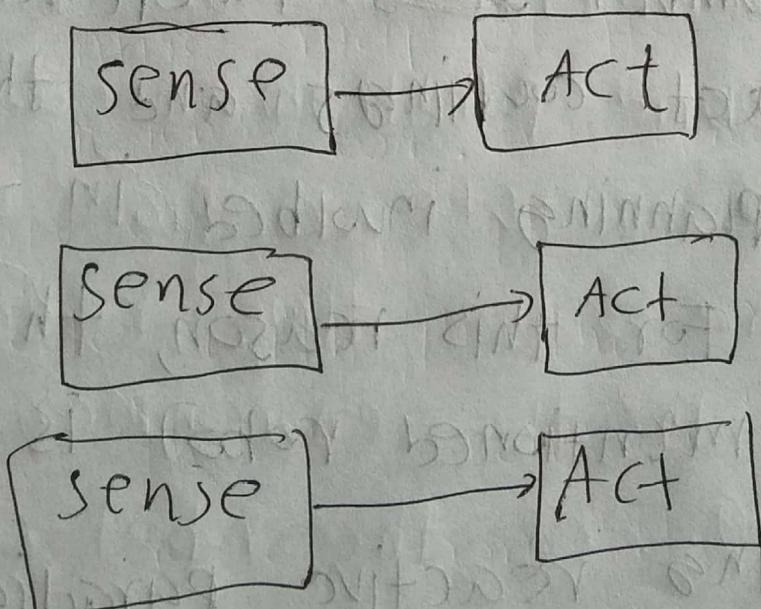


Fig: reactive paradigm.

Let's consider a robot that moves North when it sees red light and South when it sees blue light. Here the robot is following a reactive paradigm. Because the ~~robot~~ robot is immediately reacting to the environment.

~~After sensing something~~ with out any planning. Here the behaviour of the robot is governed by a number ~~of~~ independent sense act couplings and there is no planning involved in the process. For this reason, the above mentioned robot is ~~reactiv~~ following reactive paradigm

## Hybrid paradigm

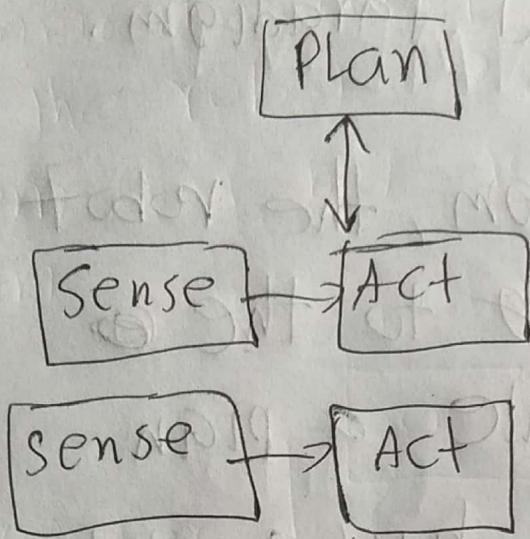


Fig: Hybrid Paradigm

Lets for example consider a robot that can fly from one location to another, the robot is capable of planning a path from its current location to any other given location. Now lets consider if the robot immediately ~~lands~~ plans a path to the nearest airport and lands there if the wind speed exceeds 150 kmph. Th

this scenario the robot is following  
~~at~~ ~~but~~ the hybrid paradigm.

In hybrid paradigm, the robot can keep reacting to the environment while a plan executes in the background. The robot can also modify or change its plan according to the changes in the environment.

The robot mentioned above is following the hybrid paradigm because it can execute a plan and at the same time react to events in the environment without planning. And the robot can modify its ~~plan~~ or change its

Plan according to the changes in the environment if necessary.

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