

TOPIC OF CURRENT INTEREST

Date : Sep. 2021

## ARTIFICIAL INTELLIGENCE

AGENT:-

An agent is anything i.e. human, machine which perceives input and acts accordingly to perform given task. When I take input, it means the input is always taken from environment. We take decisions through actuators.

For example:-

An agent wants to cross a road, it takes input by seeing and hearing and act accordingly by perceiving input

For driving car  
environment → roads

input → rules, other vehicles  
position, road sense, direction

action → speed up / slow down, reverse,  
break, take over.

percepts → inputs

percepts are usually perceived through sensors.

- percepts can be changed, we need to

take action according to percepts.

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✓ whatever agent you design, it will require domain knowledge.

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## Broker agent (for investing money).

Environment → stock Exchange

Input → trends, information related to the company / percept

Action → decision for picking shares.

Agent → Traffic sergeant

task → to direct the traffic smoothly to avoid deadlock and traffic jam

Input → taking rough estimate of no. of vehicles on a lane to allow movement of vehicle according

Action → stop and move instructions according to the traffic flow

Actuators :- Hands

Environment → Road, footpath, highway, crossings

• Road sensor count the no of vehicle by real time entry and manage the flow of traffic accordingly

Environment is something where agents have to act.

Defining boundaries of agent



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→ you can to the given according +

• Jese hi a wahan teh → we have

Performance

We need

measures

→ kisi bhi example 1:-

we need

maintaining the destination disrupting

Example 2:-

Agent →

Action →

2 Rooms

3 Rooms

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→ you can consider environment according to the given problem but we can't change it according to our needs.

• Jese hi agent design hua, environment wahan tak hoga.

→ We have to describe the environment

### Performance Measure:-

We need to identify certain performance measures for the agents. Performance measures can be more than one.

→ Kisi bhi ~~agent~~ agent ki performance ko measure kita hai.

Example 1:-

We need to drive safely but still maintaining appropriate speed to reach the destination on time without disrupting traffic.

Example 2:-

Agent → Vacuum Cleaner

Action → to clean two rooms (or more than two rooms)

$$2 \text{ Rooms} \rightarrow 2^2$$

$$3 \text{ Rooms} \rightarrow 3^2$$

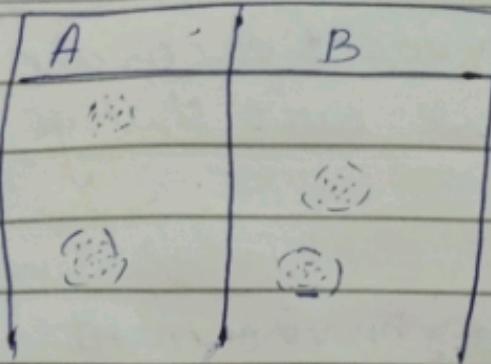
$$4 \text{ } " \rightarrow 4^2$$



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- Another possibility is that vacuum cleaner is in room A.

Percept : mai khud khn hun (agent),  
or dirt hai yaa nhi hai.

Action → clean, move, no action / rest

- Harr problem mai number of states determined nahi hain

### problem

fully/complete observable

Deterministic: Jhn phele se conditions known hain or unk conditions k against ap actions define kren. Jhn problem determined ho. • comparatively easier.

### Non-deterministic problem :-

partial observable

- uncertain Environment
  - states can't be determined beforehand
- Example: playing football is uncertain,  
driving car

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Big O' Notation:

Stochastic/ stochastic environment

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possible number of states in chess.  
 $10^{60}$  possibilities.

- To make a non-deterministic problem deterministic, we need to fix states.

possible words → possible states

Things to determine while designing agent -

- Environment
- Performance measure
- actuators
- sensors

Stochastic environment. mai values with respect to time badal jati hain or queues pattern bhi change hokte.

- Environment can be fully observable.  
The whole environment can be viewed at a time.

→ Partially observable } Types of environment

→ sequential

→ Discrete

→ fully observable



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partially observable  
some part of environment is known  
viewable  
e.g. football field

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- Environment can be single agent and multiple agent. For example: while driving a car, there are other vehicles as well on the road. Vacuum cleaner will be a single agent.

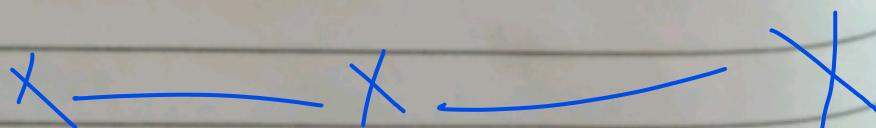
## Types of Agents:-

Actuators:-

How agents act in a environment

sensors:-

What information agent needs to perform a task



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## Lecture # 02

Types of Environment / Agent -  
Different Environment have different agents

### 1. Simple Reflex Agent :-

- We take input from environment
- We perform task without thinking but out of reflexive actions
- worlds/states, (When we toss a coin we get worlds/states)

What is the world now → state  
coin has two world/head/tail

For every problem we have different percept

→ We call it simple because it is not much problematic. We know what outcome we will get, and what will be next action.

What is the worldflow

Condition action rule set

↓ exist where  
Jhn  
conditions known  
hoti hai

↓ What action we do should

act

environment

Input through sensors → What is the world now



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(percept)  
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Structured / deterministic :-

We know the outcome when we perform an action.

Uncertain / problemistic :-

We don't know the outcome when we perform an action.

We don't know what will happen when we perform an action.

State space :-

All the possibilities of outcome when we perform a task.

2. Model based :-

Here model means situation.

- It needs input in the form of percepts / percept sequence

Difference :-

When we receive an input, we judge the situation and then decide what should we do

→ How world is evolved

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→ Here we have to analyze the situation and then take decision whereas in simple reflex we don't have to think, we just work on our reflex.

→ It reflects the situation and then perform task

### 3. Goal based :-

Any agent that is working in a environment, it should perform the specific task.

→ It will also be model based as well as goal based.

#### Types:-

1. Explicit :- Goal is explicitly defined.

→ We need to reach the end line in a race.

2. Implicit, goal is implicitly defined

→ We need to clean all broofs.

#### Difference from Model based,-

We have to judge that if my action is taking closer to the target's goal or far away from the goal.

<sup>eg</sup> We need to achieve target in

a cricket match.



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→ There can be multiple states.

of winning

→ We have to check if my action is taking me closer to win or loss.

→ We have to analyze performance by checking that if the goal is achieved optimally.

#### 4. Utility based :-

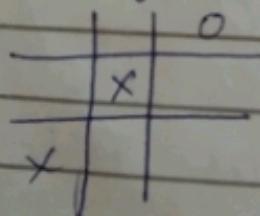
Here utility refers to function.

It calculates the value. This value check how happy (how little effort) an agent is performing with less effort) an agent is performing the action in certain way.

→ We can calculate the value of utility.

- more change hoga tou utility values change hoga engi.

Example:-



→ Utility are values that we have to calculate.



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- state of world
- How happy an agent is based on utility values performing a task
- Utilities are calculated differently for different problems

### 5. Learning based agent:-

It takes input and takes the decision itself based on the input.

- The ability to learn in agent
  - learning to cross the road.
  - learning to ride a bicycle.
- Brain have the ability to learn
 

Important traits :-

  - Repetition of task
  - consistency
  - critical error (finding faults/errors in performance in itself and improving it)
- We have to make the machine learning.



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update information before

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## Input → critic

- Input jese hi milta hai wo ek component (k ps chali jati hai) jo se critic kehte hain.

Critic → specialized/experienced person in a field so that he can find the errors in the action.

### Example :-

For writing a poetry as a newbie we have to take guidance from the profession poet.

→ Critic checks if the existing rules hain wo mai esa hua hai ya nahi.

• On the basis of given, rules, situations, it suggest changes and a knowledge set is developed.

→ It requires training to learn more and more to develop more

→ Whenever we make a machine to



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P E A S → sensor  
↓  
performance      ↗ ACTuator  
                    Environment

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learn, we will require training set.

- We need training sets and what should be size of training set depending on
- What type problem we are solving
- What is the size of data.

→ learning mai hmesha knowledge update hoti rehti hai.

→ When we design an agent we should decide off what type of task it will perform.

Q. We have to develop a tictactoe agent.

i. We have to define it in peas format

Q2 English tutor



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Q1

Ticktacktoe agent

→ 2 player game

Performance :- At a time one person will act, The agent can act anyway if he has the first turn then he will check if the 3 moves are in sequence

Environment :- uncertain, fully observable

Actuator :- Hand

Sensors :- move of the opponent

Input :- move of the opponent

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Person  
1.  
2. TH  
→

Pefo

En

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person  
anyway  
will  
in sequence  
observable

Performance:-

1. 2 Player game
2. There are 8 conditions for winning



English tutor

Q2 Teacher is teaching online.

Input:- keyboard / voice

Performance:- To check the result / score  
of student if he is learning  
or not

pponent  
ent

Environment:- Multi user, agent, dynamic,  
~~structured~~ uncertain

sensors :- English Grammar, Keyboard  
traits / abilities of students, voice

Actuator:- soft board, screen  
display or voice display



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## Logic

- 1) Syntax (Grammarly, structure)
- 2) Semantic (relative meaning, logic)

Logic is a language that we use to reason.

There are various forms of knowledge.

→ We are going to focus propositional form of knowledge. It is the simplest and historic form of knowledge.

knowledge base - comprises of sets of sentence/ knowledge/facts/rules.

→ we convert knowledge base/set of sentences into a formal language.

→ we will use logic to create knowledge base

→ we will use inference engine to derive knowledge base.

→ Inference engine consist of certain algorithms.

Declarative approach - We have to write/declare the facts

E.g Fatima is the sister of Ali

Muhammad is father of Ali



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There are two components of knowledge base

1) Tell

2) Ask - To make query

### Tell-Ask Relationship

- percept is input to the system  
sequence of input and it returns  
an action

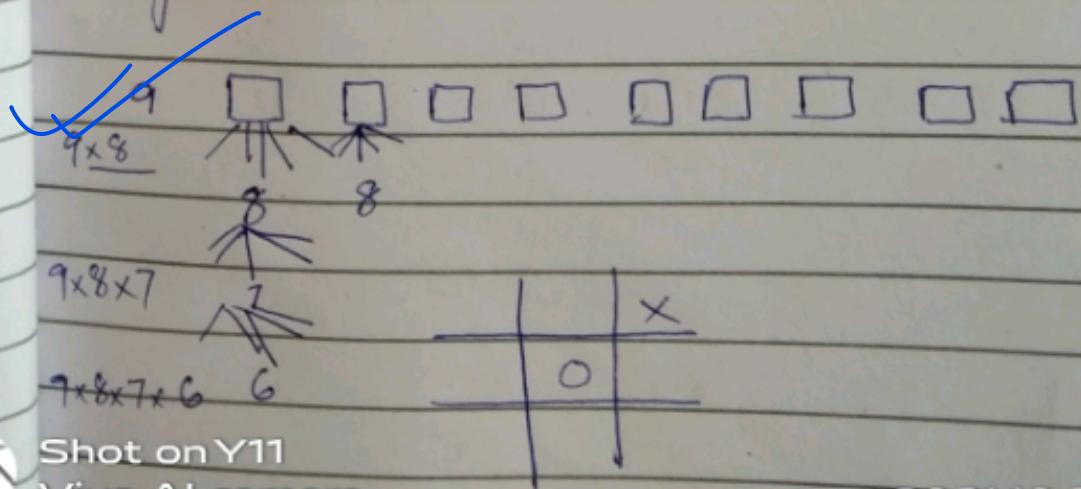
→ Whenever there is an input there  
is an action and action ask what to do

• Tic tac toe mai phete 9 possibilities

hongi

• Duswai mai har k lye 8 possibilities

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- Propositional logic is based on symbols
- Every symbol ( $P_1, P_2$ ) is true or false

Test in next class



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