

# AI Theory

## Assignment - No - 2

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# Types of AI Agents

AI agents are classified on their level of intelligence, decision-making process and how they interact with their surroundings to reach wanted outcomes.

There are 5 main types of AI agents.

## 1- Simple Reflex Agents

A simple reflex agent is the most basic type of AI agent.

It works by responding directly to the current situation it senses. It does not think about past or make plans for future. It uses predefine rules known as "condition-action rules".

### How it works:-

- The agent observes the environment through its sensors.
- It checks the observations against a set of stored if-then rules.
- It performs the action that matches the rule.
- It does not remember the previous actions. It treats every new input as a new situation.

### Example:-

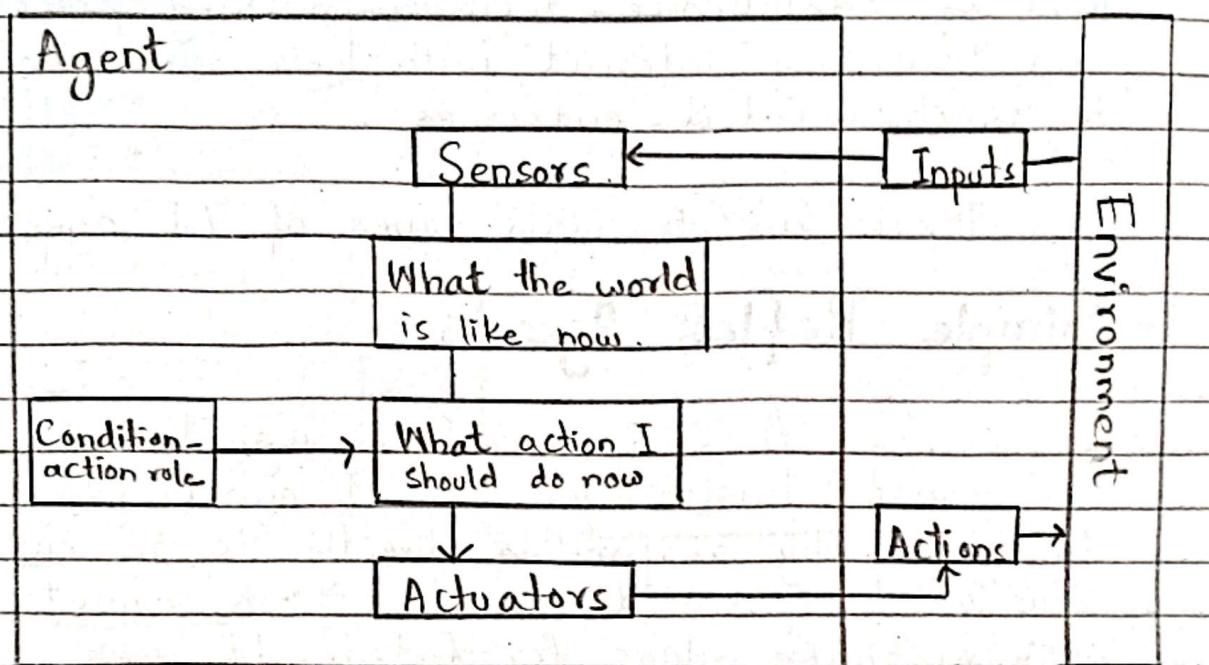
Automatic Street Light System.

If it is dark  $\rightarrow$  then turn on the lights.

If it is bright  $\rightarrow$  then turn off the lights.

The system does not store any previous data -  
System acts only on current situation -

## Diagram:



## Environment:

The world around the agent where it works.

## Sensor:

Collect information from the environment.

## Condition-Action Rule:

It is agent Brain - The decision making part contains simple if-then rules.

By using these rules it makes decision.

## Actuator:

These perform the actions decided by agents.

The agent looks at environment, what is happening, choose rule, acts and repeat.

## 2. Model-Based Reflex Agents:-

It is advance then simple reflex agent. It can handle partially observable environments, means it does not always see everything in the environment. Because it keeps track of past actions and inputs using an internal memory. This internal memory observed store what it has observed and done before.

### How it Works:-

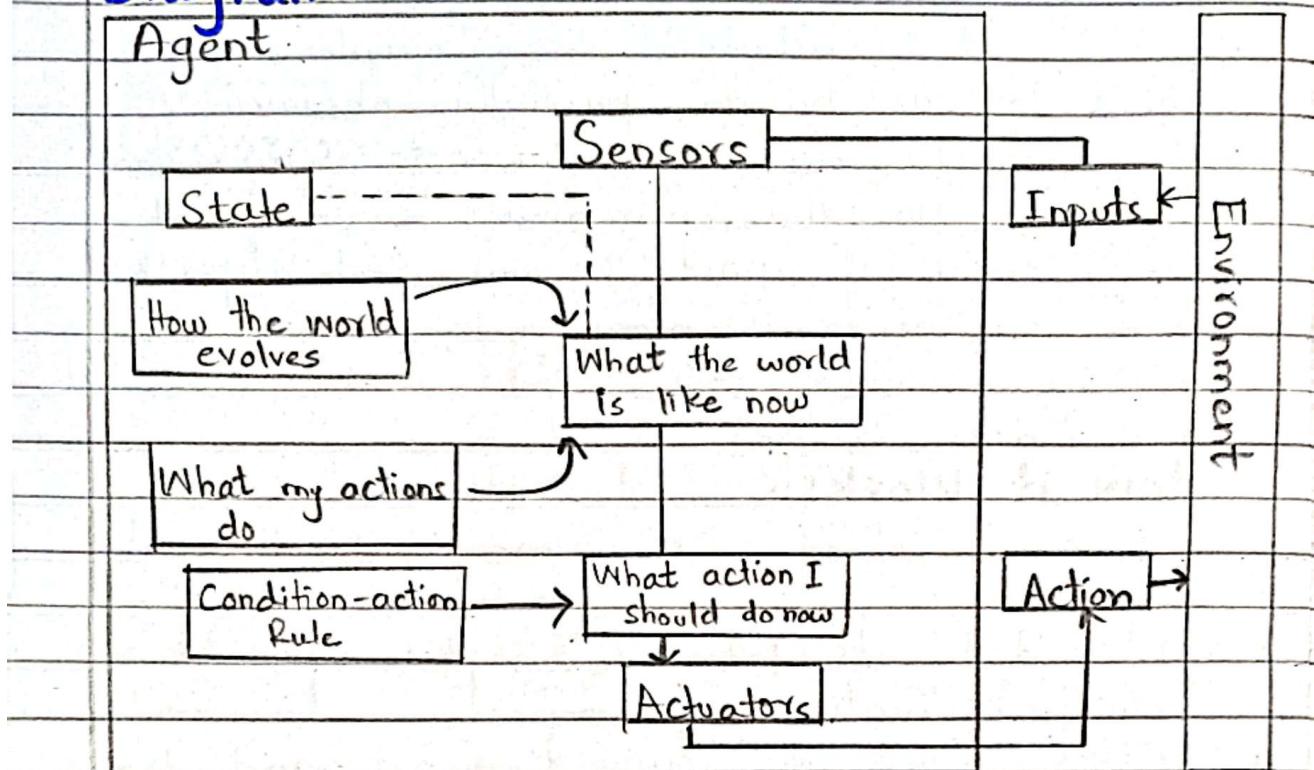
- The agent observe its environment through sensors.
- It update its internal model based on new observations.
- It uses both the current input and the internal model to decide what action to take.
- It applies condition-action rules, just like simple reflex agent but with extra information from memory.
- It acts and updates the model again after each action.

### Example:-

Robot Vacuum cleaner.

It built a small map of your home which is its internal memory. It remember which part of floor is already cleaned so it avoid cleaning same part twice. If it sense an obstacle, it update its model to avoid it next time.

## Diagram:-



## Environment:

The place the agent works in.

### Sensor:

Collect information from the environment.

### Internal Model:

The agent's memory or map of what it knows about the world. Keeps record of past inputs and understand how environment changes over time.

### Condition Action Rule:

The rules that decides what to do next, based on current input and stored memory.

### Actuator:

Perform the action.

Sensor collect data → agent updates memory → applies rules → acts.

### 3. Goal-Based Agents

A goal-based agent focuses on achieving specific goals. It not only reacts to the current situation but also plans its actions to reach a desired outcome.

#### How it works:-

- The agent senses the environment.
- It uses its internal model to understand where it is now.
- It has one or more goals that define the desired outcome.
- It searches and plans different actions to reach that goal.
- It chooses the best action that brings it closer to the goal.
- After acting, it updates its state and continues until the goal is achieved.

#### Example:-

Self-driving Car

Goal: Reach the destination safely and quickly.

It plans the route, avoids obstacles, and adjusts to traffic.

If the road is blocked, it changes the route to still reach the goal.

#### Environment:

The place agent works in.

#### Sensor:

Collect information from the environment.

### Internal Model:-

The agents memory what it knows about the world.

### Goal:-

The target or aim the agent wants to reach.

### Condition-Action Rule:-

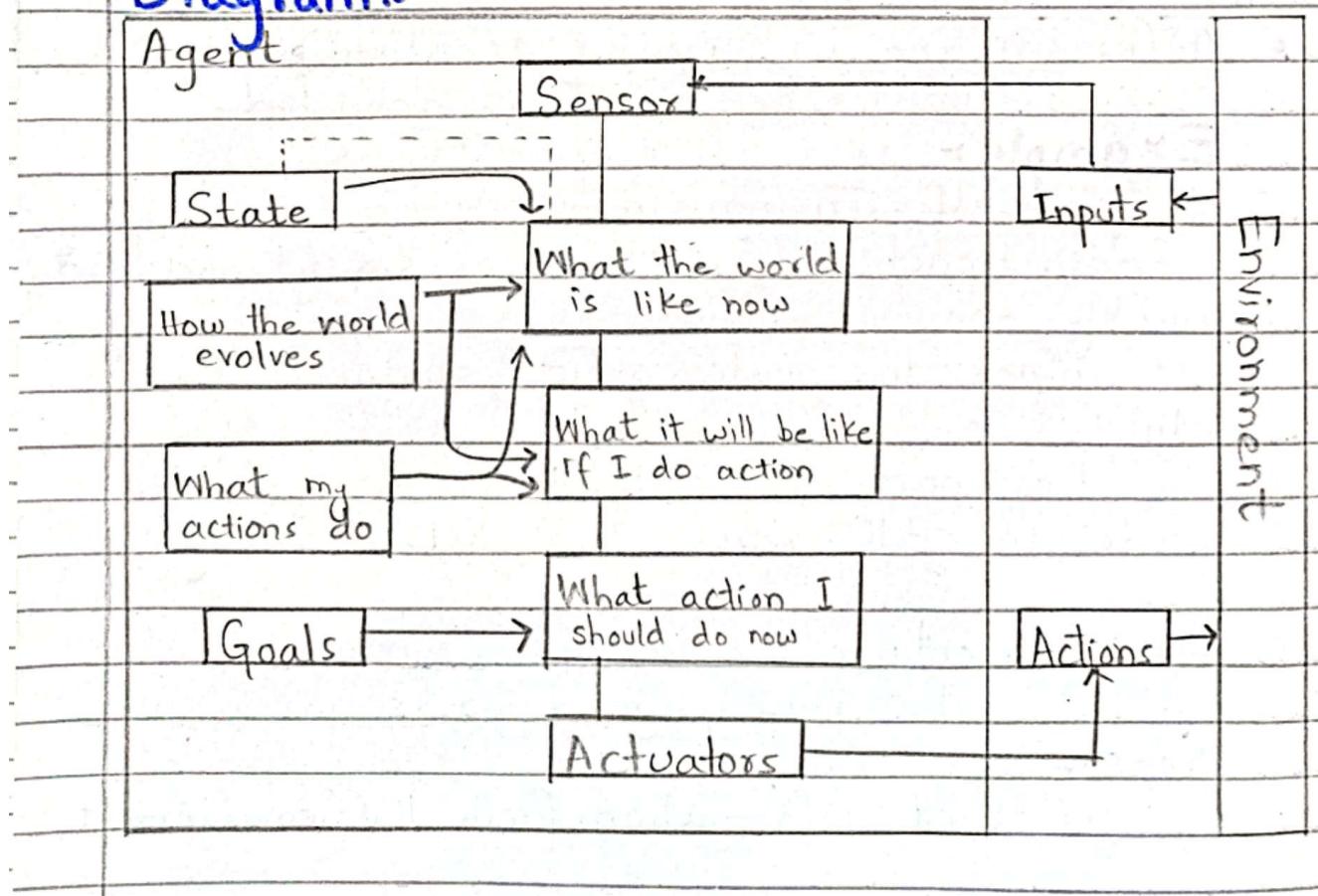
Think and choose which action helps reach the goal better.

### Actuators:-

Perform the action.

Agent see situation → check its goal → plan best action → acts → repeat until goal is reached.

### Diagram:-



## 4. Utility-Based Agents:-

It is like a goal-based agent but it is smarter.

Utility is a number that measures how good a particular outcome is. It uses chooses the action that gives the highest usefulness. It does not just achieve goal, it achieves in the best possible way.

### How it Works:-

- The agent observes the environment and possible actions.
- It calculate the utility value of each possible result.
- It compares the utilities and selects the action with the highest value.
- This makes the agent capable of handling situations with multiple or conflicting goals.

### Example:-

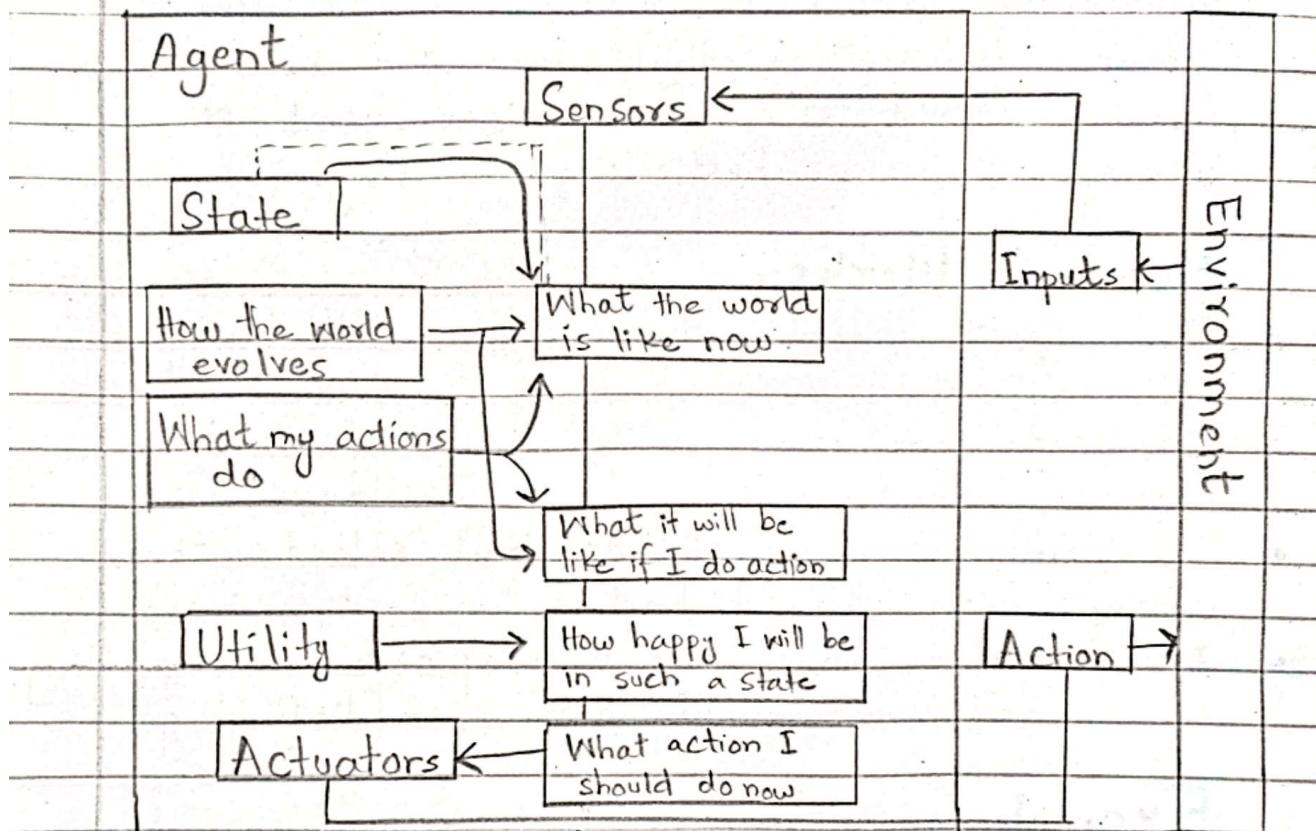
Online Movie Recommendation System.  
Utility = user interest and satisfaction.

It recommends movies that the user is most likely to enjoy based on viewing history.

This agent has environment, Sensor, Internal Model, Utility Function (A system that gives a value or score to each action or result), condition Action Rule and Actuators.

Agent observe → calculates utility for each choice → chooses highest → acts.

Diagram:



## 5. Learning Agent

Learning Agent improve its performance by learning from its past experiences. It has the ability to analyze feedback, learn new rules, and adapt changes in the environment.

It does not rely on fixed rules - it adapts and becomes smarter, the more it interacts with environment.

## How it works:-

It has four main components.

- Learning element: Learn from feed back and improves future performance.
- Performance elements: Choose actions using what it has learned-
- Critic: Observes the performance and gives feedback.
- Problem Generator: Suggests new actions to explore for learning.

It becomes better over time through trial and error and feedback.

### Example:-

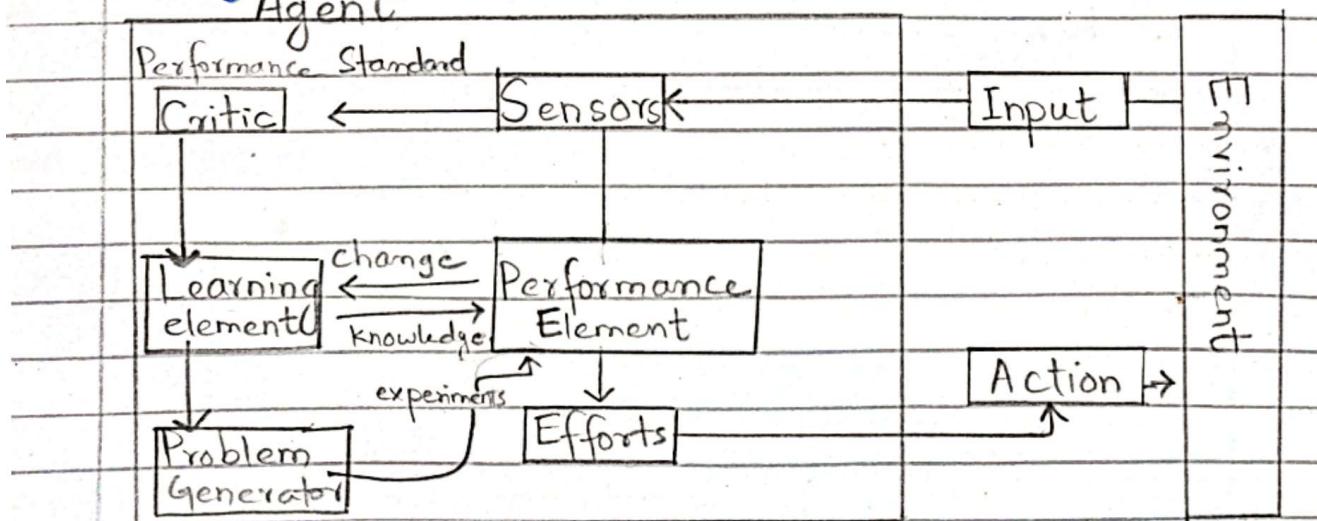
Email Spam filter learns which emails are spam based on what user marks.

Updates its model to better detect spam in the future.

The more data it sees, the smarter it becomes.

### Diagram:-

Agent



Environment  $\rightarrow$  sensor  $\rightarrow$  performance element  
 $\rightarrow$  Actuators  $\rightarrow$  Environment  $\rightarrow$  critic  $\rightarrow$   
Learning element  $\rightarrow$  Performance element

$\rightarrow$  Agent improves with experience.

