

Aim:- To understand the Concept of Agent Abstraction by studying definition of Rational Agent, Agent environment, task Environment Descriptions environment types.

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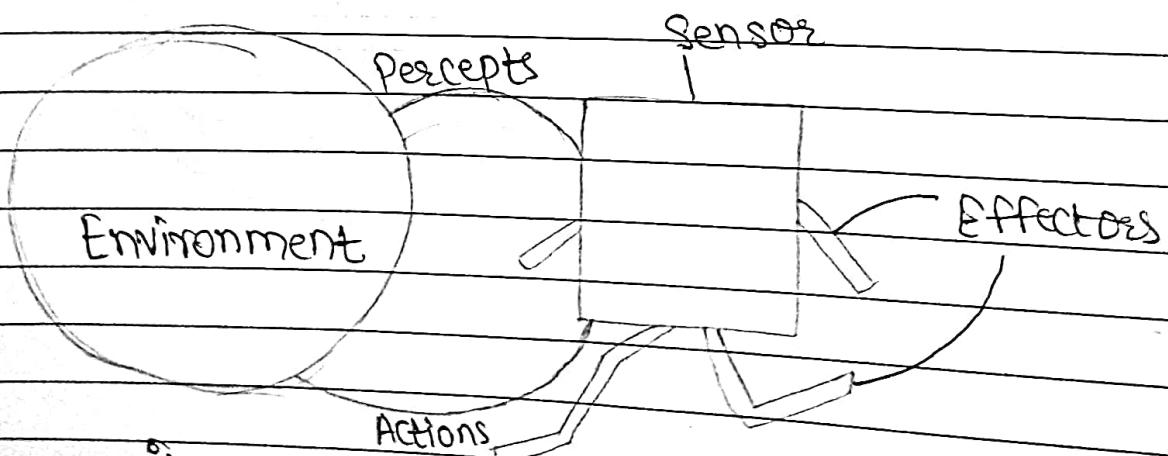
Sub:- IS LAB

Tutorial 1: Design of Intelligent Agent.

Aim:- To understand the concept of Agent Abstraction by studying definition of Rational Agent, Agent environment, Task Environment Descriptors environment types.

Theory:- An Artificial Intelligent (AI) System is composed of an agent and its environment. The agents act in their environment. An agent is anything that can perceive its environment through sensors and acts upon that environment through effectors. This can be clearly seen in fig 1.

fig 1: AI Agent with Environment



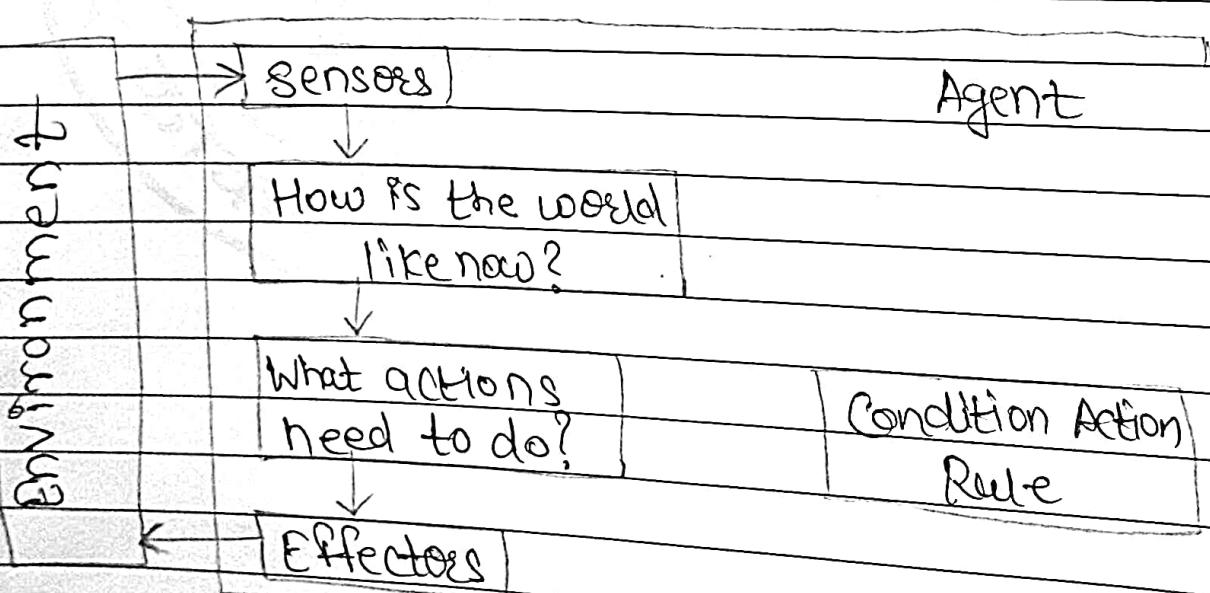
An agent in particular can be:

Human agent has sensory organs such as eyes, ears, nose, tongue and skin parallel to the sensors and other organs such as hands, legs, mouth for effectors.

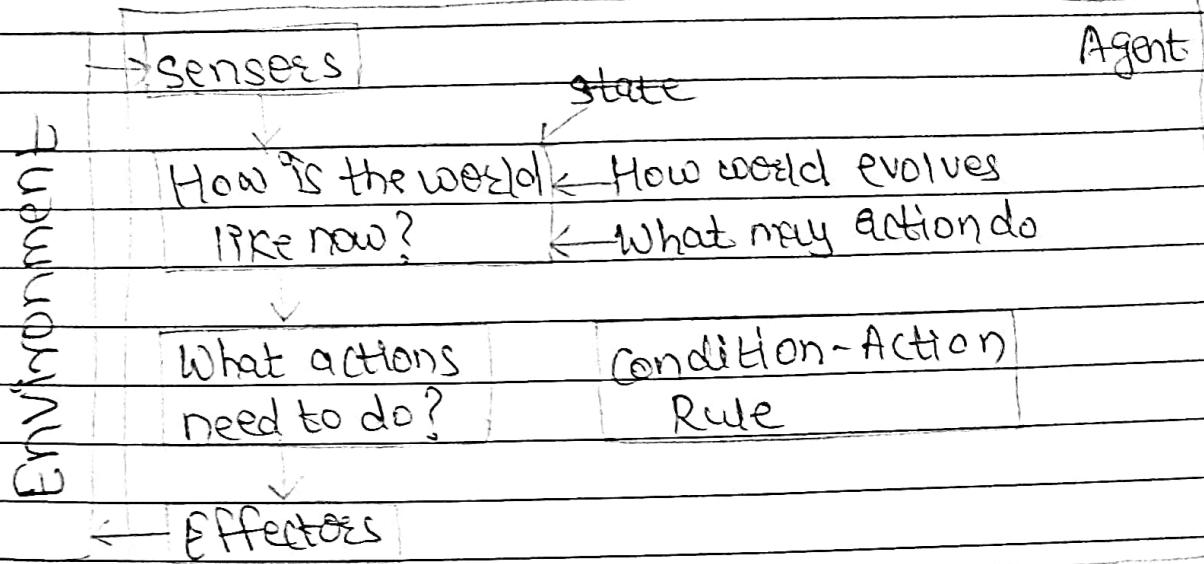
Robotic agent replace cameras and infrared range finders for the sensors, and various motors and actuators for effectors.

Software agent has encoded bit strings as its programs and actions.

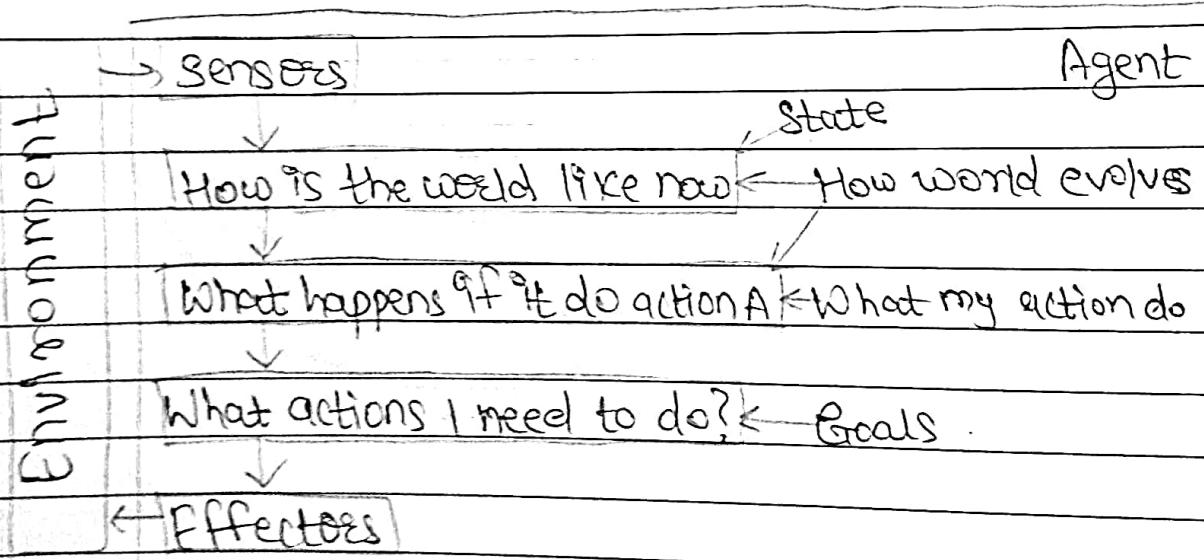
Agent structure can be viewed as a combination of agent architecture and Agent Program. Agent Architecture refers to the machinery that an agent executes on whereas Agent program is an implementation of an agent function. Figure 2 shows four implement types of agent architecture.



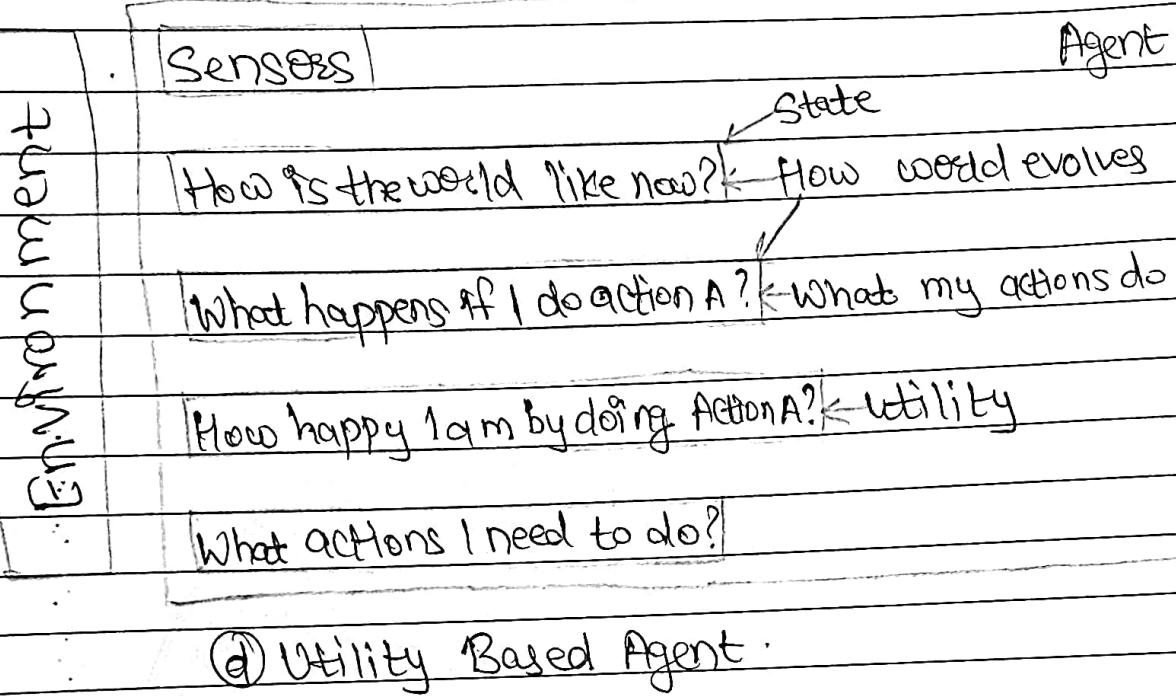
(a) Simple Reflex Agent



(b) Model Based Reflex Agent



(c) Goal Based Agent



As seen in fig 2a simple reflex agent choose actions only based on the current percept only. They are rational only if a correct decision is made only on the basis of current percept. Agent environment for such agents is fully observable. Model Based Reflex Agents as shown in fig 2b use a model of the world to choose their actions. They maintain an internal state as a persistent information. Here the model means knowledge about how the things happen in the world that is representation of an observed aspect of current state depending on percept history. Agent take into account how its chosen action affect the world. Goal based agents shown in fig 2c, choose their actions in order to achieve goals. Goal based approach is more flexible than reflex agent since the knowledge supporting a

decision is explicitly modeled, thereby allowing for modifications. Goal is the description of desirable situations. Finally, the utility Based Agents shown in figure 2nd choose actions based on a preference (utility) for each state. Goals are in adequate when there are conflicting goals or uncertainty of being achieved and you need to weigh likelihood of success against the importance of a goal. On the other hand utility function objectively map how much being in a particular state is desirable.

An AI agent is referred to as Rational Agent. A rational agent always performs eight action, where the eight action means the action that causes the agent to the most successful in the given percept sequence. The problem the agent solves is characterized by performance measure, environment, actuators and sensors (PEAS). These are collectively referred to as PEAs descriptors provide important insight into agent and the task environment it operates in. These insights are very useful in agent design.

Another important piece of information is task environment properties. While analyzing task environment the agent architect needs to consider following properties:

1. Discrete or Continuous: If there are a limited number of distinct, clearly defined, states of the environment, the environment is discrete. Otherwise it is continuous (for example, automated driving).
2. Observable or Partially Observable: If it is possible to determine the complete state of the environment at each time point from the precepts it is observable; otherwise it is only partially observable.
3. Static or Dynamic: If the environment does not change while an agent is acting then it is static; otherwise it's dynamic.
4. Deterministic or non-deterministic: If the next state of the environment is completely determined by the current state and the actions of the agent then the environment is deterministic; otherwise it is non-deterministic.
5. Episodic or sequential: In an episodic environment, each episode of events consists of the agent perceiving and then acting. The quality of its action depends just on the episode itself. Subsequent episodes do not depend on the actions in the previous episodes. Episodic environments are much simpler because the agent does not need to think ahead of part picking robots. Complementary to

this is sequential environment where current actions dictates the future action.

6. Single agent or multiple agents: The environment may contain single agent or other agents which may be of the same or different kind as that of the agent. These agents may be co-operating or competing with each other.
7. Accessible or Inaccessible: If the agent's sensory apparatus can have access to the complete state of the environment, then the environment is accessible to the agent.

Working: Search internet for AI based applications in following scenarios and identify who is agent for that application further list out PEAS descriptions for agent environment in each of the case. Finally try to classify task, environment properties like a list, of attributes from above list of 7 task environment properties.

1. Autonomous Lunar Rover.
2. Deep Blue Chess playing Computer program
3. Eliza the natural language processing computer program created from 1964 to 1968 at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum.
4. Automatic Portfolio Management.

5. Sophia is a social humanoid robot developed by Hong Kong based company Hanson Robotics.
6. AlphaGo is a computer program that plays the board game Go. It was developed by Alphabet Inc Deepmind lab in London.
7. Apples virtual assistance Siri.
8. Endurance! A Companion for Dementia Patients
9. Casper; Helping Insomniacs Get Through the Night.
10. Marvel; Guarding the Galaxy with Comic-Book Crossovers.
11. Automated Cross word Solvers.

Resources; The above diagrams are taken from online tutorial available at Tutorials point on topic AI - Agents and Environment.