

Tutorial 1

Name : Jyoti Sharma

Class : BE IT

Roll No : 60

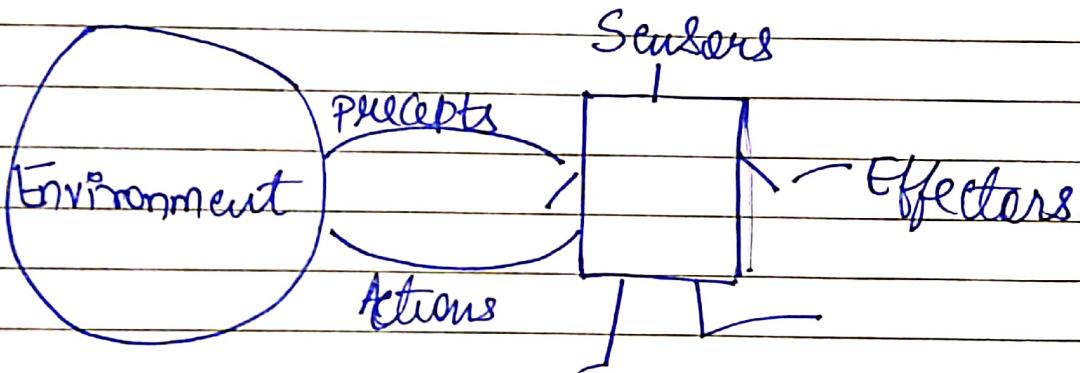
Batch : I₃

Sub : AI

1.1. 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 agent 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.



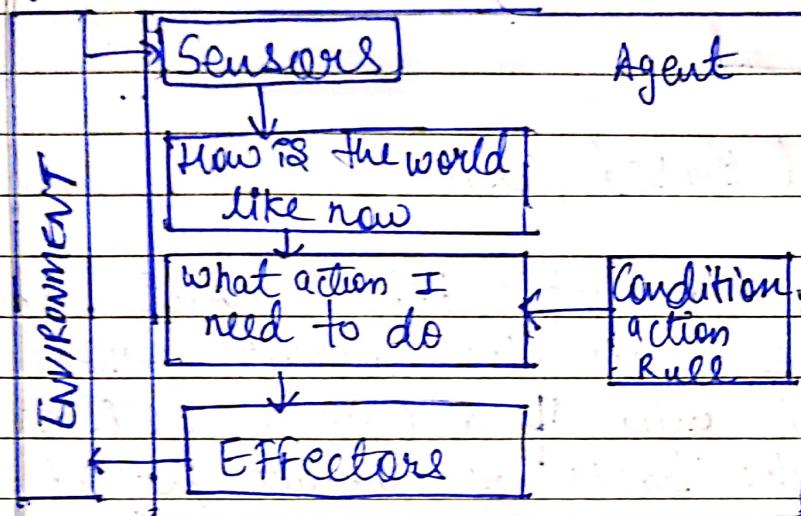
An agent in particular can be :

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

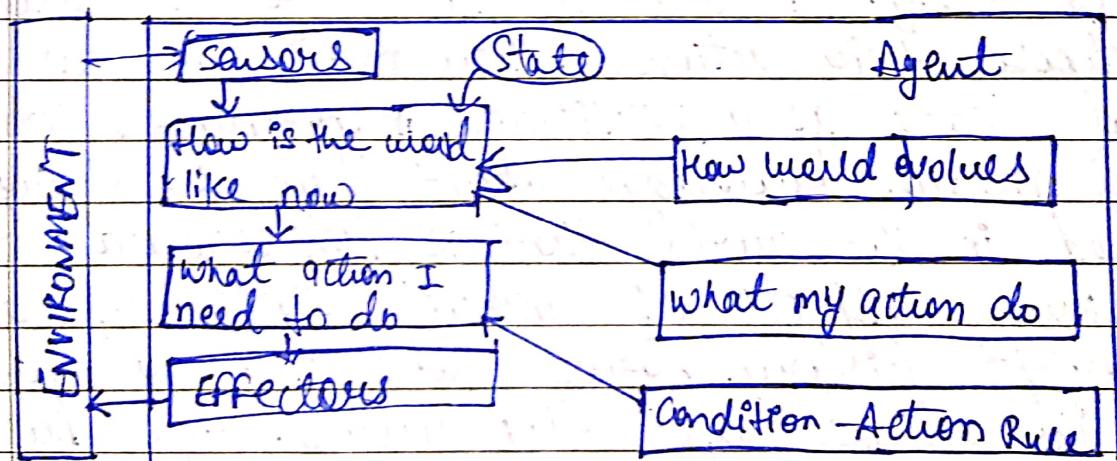
Robotic agent replaces cameras and infrared range finders for the sensors and various motors.

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

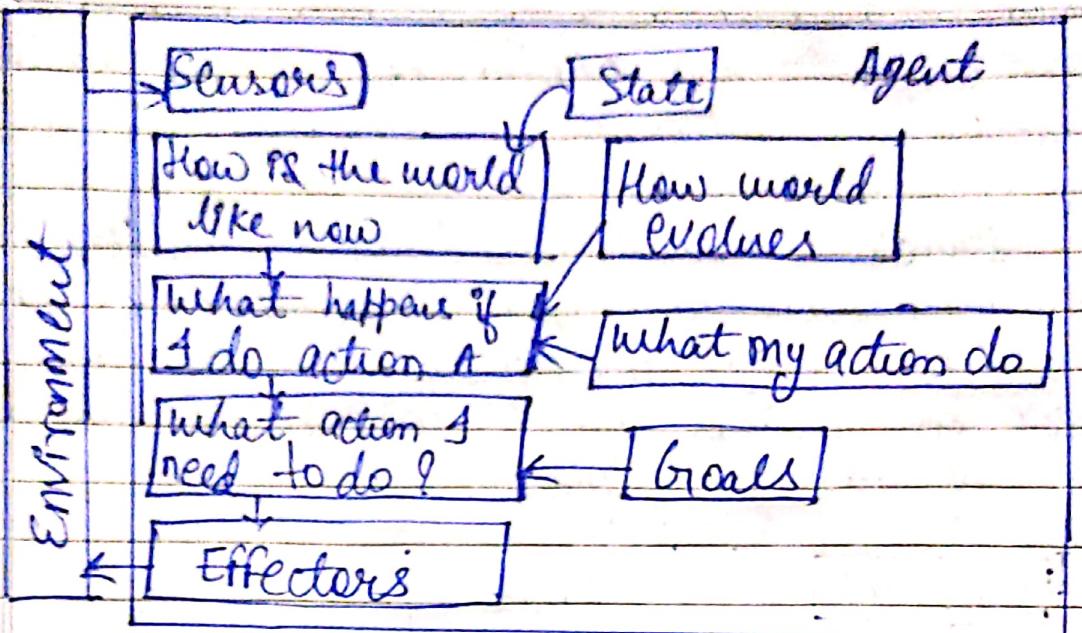
Agent structure can be viewed as a combination of agent architecture and agent program. Agent architecture refers to the machinery that an agent executes on whereas agent program is an implementation of an agent function.



(a) Simple Reflex Agent



(b) Model Based Reflex Agent



(c) Goal Based Agent

As seen in fig 2(a) 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 are 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 happened in the world, that is representation of unobserved aspects of current state depending on percept history. Agent take into account how its actions affect the world. Goal based agent choose their action 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 the modifications. Goal is description of desirable situations. Goals are inadequate when there are conflicting goals, out of which is only few can be achieved, goals have some uncertainty of being achieved and you need to weigh likelihood of success against the importance of a goal.

An AI agent is referred to as Rational Agent. A rational agent always performs right action, where the right action means the action that causes the agent to be 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 descriptor for the agent task environment. PEAS descriptors provide important insight into agents and the task environment it operates in.

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 of distinct, clearly defined, states of the environment, the environment is discrete (e.g. chess); otherwise it is continuous (automatic car)

2. Observable or partially observable : If it is possible to determine the complete state of the environment at each time point from the percept it is observable, otherwise it is only partially observable.
3. Static or Dynamic : If the environment does not change while as an agent is acting, then it is static ; otherwise dynamic.
4. Deterministic or Non-deterministic : If the next state of the environment is completely determined by the current state and the action of the agent , then the environment is deterministic , otherwise non-deterministic.
5. Single agent or Multiple agent : 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.
6. 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 that agent

Working

Search internet for AI based applications in following scenarios and identify who is agent for that application. Further list out PEsas descriptors for agent environment in each of the case. Finally try to classify task environment properties like a list of attributes from above list.

1. Deep Blue Chess Playing Computer program
Performance Measure = Win / lose / draw, Safety of chess pieces, Safety of King piece, no. of moves, time for each move
Environment = chess board, chess pieces
Actuators = Desktop screen, CPU
Sensors = chess board
Task Environment properties = Discrete, fully observable, static, deterministic, sequential, single agent, Accessible.

2. ELIZA, the NLP Computer program Created from 1964 to 1966 at the MIT AI laboratory by Joseph Weizenbaum.

Performance Measure = Understanding user maintaining conversation

Environment : user, program, keyboard, user text input, Eliza texts, output window

Actuators : texts

Sensors : user texts inputs

Task Environment properties : Continuous, fully Observable,
Static, Deterministic,
Sequential, Single agent, Accessible

3. Sophia is a social humanoid robot developed by Hong Kong based company Hanson Robotics.
- Performance Measure = Understanding user maintaining conversation, facial expression in response time
- Environment = Humans, objects, ---.
- Actuator = Arms, mouth, legs, speaker
- Sensors = Eyes (Cameras), ears, mic, audio sensors.
- Task environment properties = Continuous, Fully observable, dynamic, deterministic, sequential, Single agent Accessible

4. Automated Crossword Solver

Performance Measure : Understanding hints, analyzing hidden and Visible letters, time to solve

Environment = Hints, visible letters, crossword board

Actuators = Desktop Screen, program

Sensors = crossword board

Task Environment properties : Discrete, Fully observable, static, Deterministic, Episodic, Single agent, Accessible.