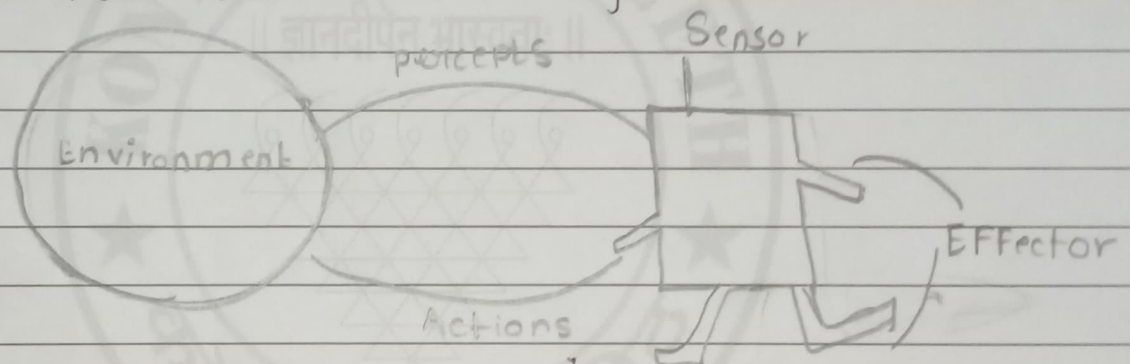


[illegible][illegible]

1.1 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 acts in their environment through sensor and act upon that environment through effectors.



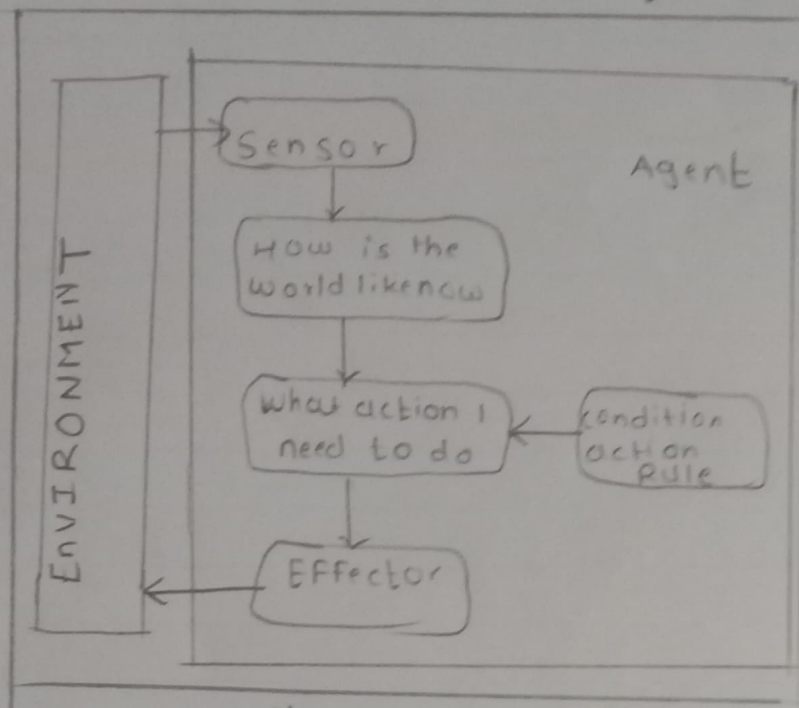
An agent particular can be

Human Agent :- It has sensory organs, such as eyes, ears, nose, tongue and skin parallel to sensor and other organs such as hands, legs, mouth for effector.

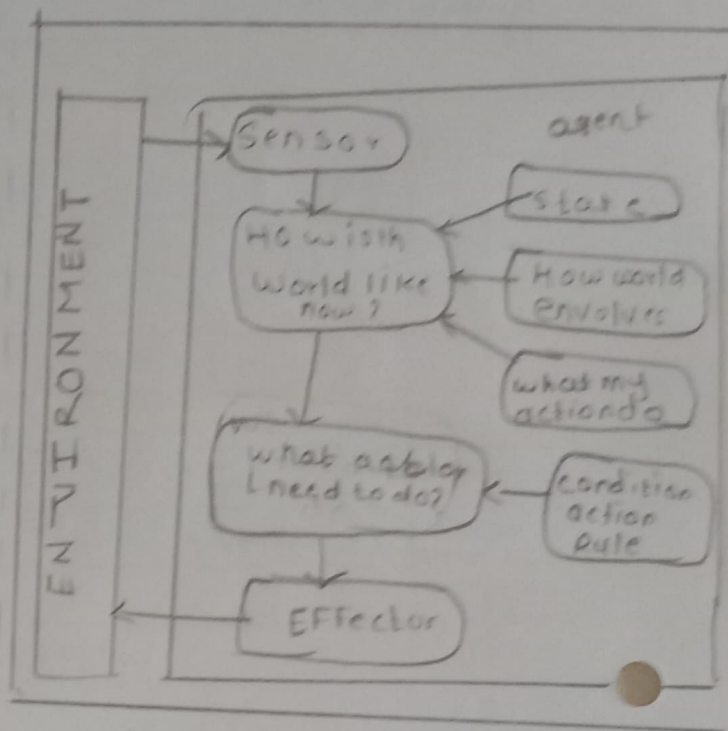
Robotic agent :- It replaces and infrared range finders for the sensors and various motors and actuators for effectors.

Software Agent :- It has encoded bit strings as it programs and action

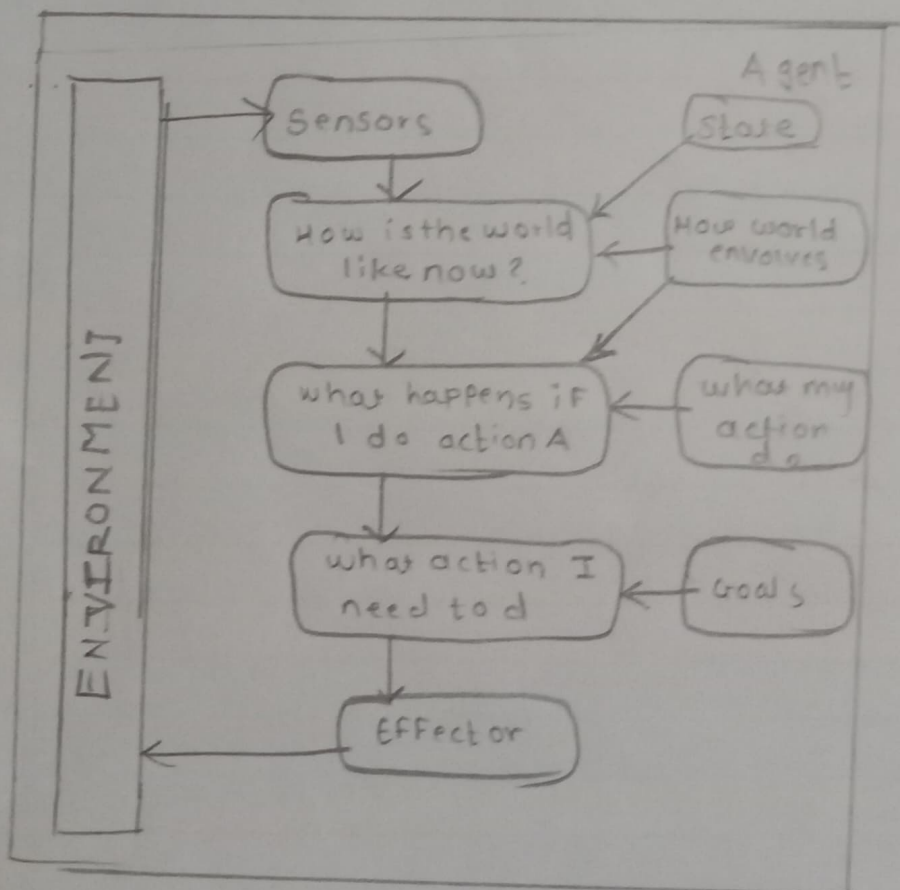
Figure (2) Agent Architecture



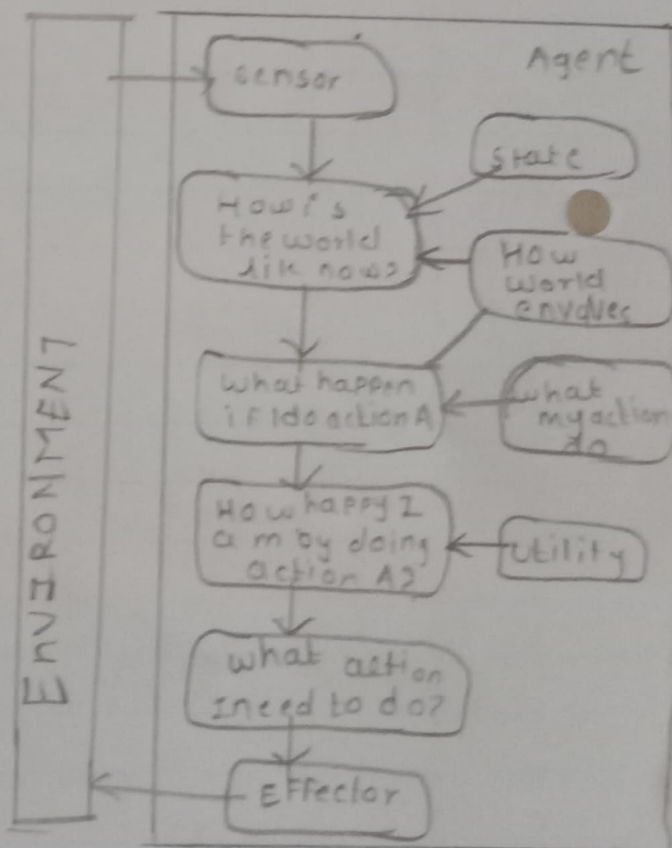
(a) Simple Reflex Agent



(b) Model Based Reflex



(c) Goal Based Agent



(d) Utility Based Agent

Agent Architecture refers to the machinery that an agent executes on whereas Agent Program is an implementation of an agent function.

an agent executes an whereas Agent Program is an implementation of an agent function

Figure(2) Agent Archi

As seen Fig. 2a Simple Reflex agents choose action 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 agent is fully observable. Model Based Reflex Agent as shown in Figure 2b uses 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.

Global based agents shown in Fig 2c choose their actions in order to achieve goals. Global-based approach is more Flexible than reflex agent Since the knowledge supporting a decision is explicitly modeled, thereby allowing for modification. Goal is the description of desirable situation. Finally, the utility Based Agent shown in Figure 2d choose action based on a preference for each state. Goals are inadequate when there are conflicting goals have some uncertainty of being achieved and you need to weight 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 is referred to as Rational Agent. A rational agent always performs right action, where the right action means the action causes the agent to be most successful in the given percept sequence. The problem the agent solves is characterized by performance, measure, Environment, Actuator and sensor (PEAS). These are collectively referred to as PEAS descriptor for the agent task environment. PEAS descriptor provide important insight into agent and task environment it operates in. These insights are very useful in agent design.

Another important piece of information in task environment properties while analyzing task environment the agent architect it need to consider following

Properties :-

1) Discrete or continuous :- If there are a limited number of distinct, clearly defined, state of the environment, the environment is discrete otherwise it is continuous.

For example :- automated driving

ii) Observable or Partially Observable:- IF it is possible to determine the complete state of the environment at each time point from the precepts it observable; otherwise it is only partially observable.

ii) Static or dynamic :- If the environment does not change while an agent is acting then it is static, otherwise it is dynamic.

iv) Deterministic or Non-deterministic :- If the next state of the environment is completely determined by the current state and the actions of agent, then the environment is deterministic. Otherwise it is non-deterministic.

V) Episodic or Sequential :- In an episodic environment, each episode of event consist of the agent perceiving and then acting. The quality of its action depends just on the episode itself. Subsequently episodes do not depend on the action in the previous episodes. Episodic environment are much simple.

because the agent does not need to think ahead
e.g. part picking robots complementary to this
is sequential environment where current action
dictates the future action.

vi) Single agent or Multiple agents :- The environment
may contain
Single agent or other agent which may be of the
same or different kind as that of agent. These
agent may be co operating or competing with-
each other.

vii) Accessible or Inaccessible :- If agent's sensory
apparatus can have access to the
complete state of environment, then the environment
is accessible to that agent.

Working :-

Search internet for AI based application
in following scenarios and identify who is agent
for the application. Further list out PEAs descriptor
for agent environments 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

[illegible]

Program created From 1964 to 1966 at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum.

4. Automatic ~~port~~ portfolio management.
5. Sophia is social humanoid robot developed by Hong Kong based company Hanson Robotics.
6. Apples AlphaGo is computer program that plays the board game Go. It was developed by Alphabet Inc. DeepMind lab in London.
7. Apples ~~virt~~ 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 solver.

~~Resources :- The above diagrams are taken from online tutorial available at Tutorials points on topic AI Agent and Environments.~~

13. 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 Artificial Intelligence Laboratory by Joseph Weizenbaum.

Performance Measure :- Understanding User maintaining Conversation.

environment - User, keyboard, user text input, Eliza text, output window.

Actuators : Texts.

Sensors : User text Inputs.

Task environment properties :- Continuous, Fully observable,
static, deterministic, sequential, single agent,

Accessible Sophia is a surgical humanoid robot developed by

3) Sophia is social humanoid robot developed by Hong Kong based company Hanson Robotics.:-
performance Measure :- Understanding user maintaining conversation facial expression, response time

Environment = Humans, Objects, ...

Actuator : Arms, Mouth, legs, speaker

Sensors : Eyes (cameras), ears, mic, audio sensor.

Task environment properties = Continuous, Fully observable, dynamic, deterministic, sequential, single agent accessible

4) Apple's virtual assistant Siri

performance Measure :- understanding user text and speech, providing best result, summoning

(bigger), response speed.

Environment : User speech, text

Actuator : Mobile screen, speaker

sensor : mobile screen, mic button.

Task Environment properties :- Continuously, Fully observable, deterministic, episodic, single agent, accessible.

5). 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.

Sensor = crossword board

Task environment properties :- Discrete, Fully observable,
Static, Deterministic, Episodic, Single agent,
Accessible.