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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.

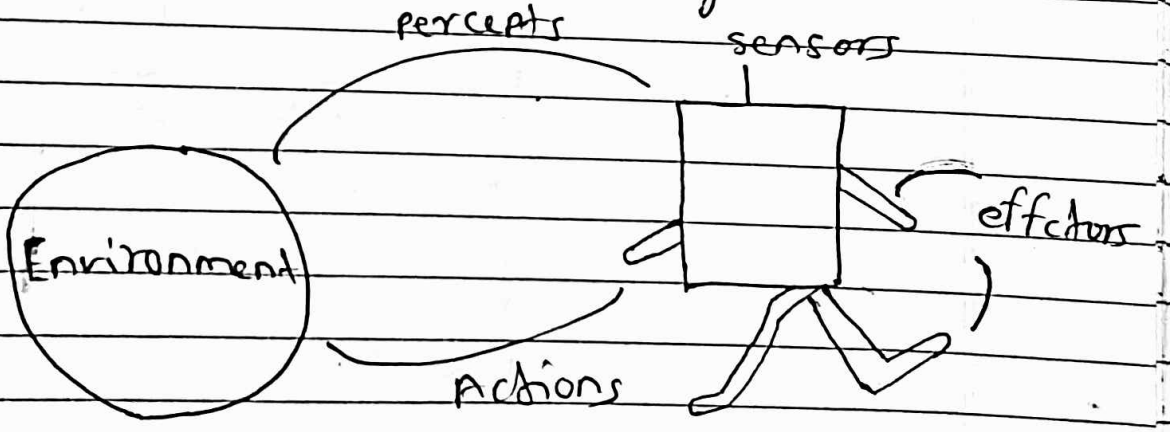

Fig. AI Agent with environment

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

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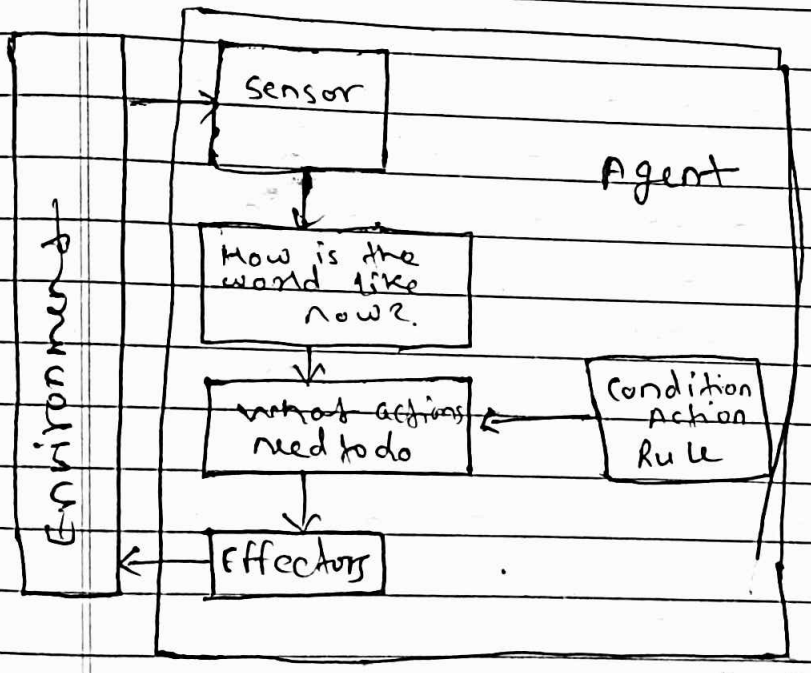
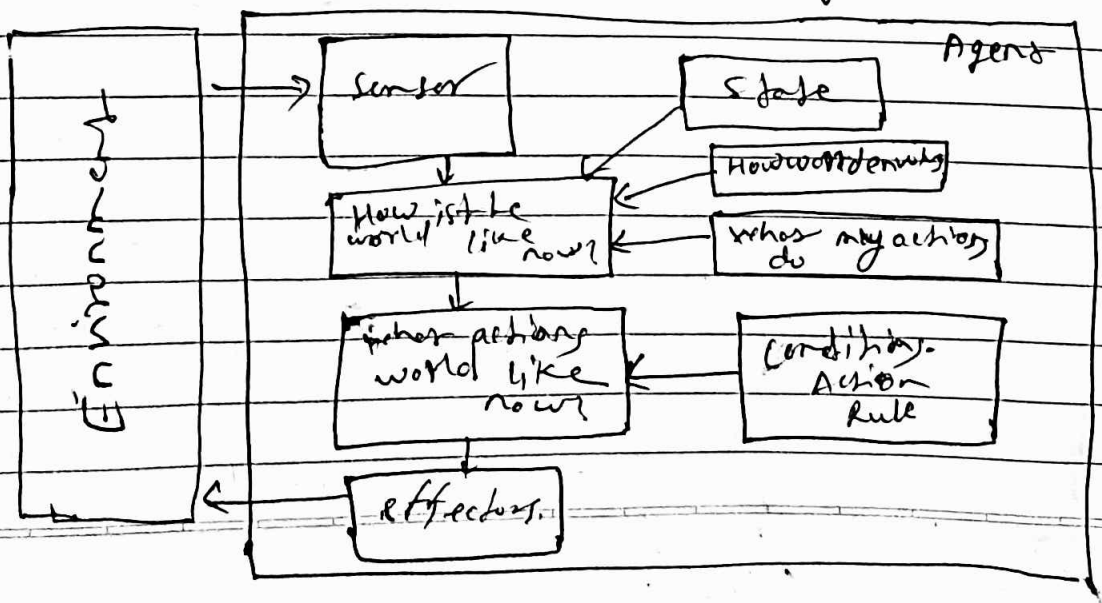
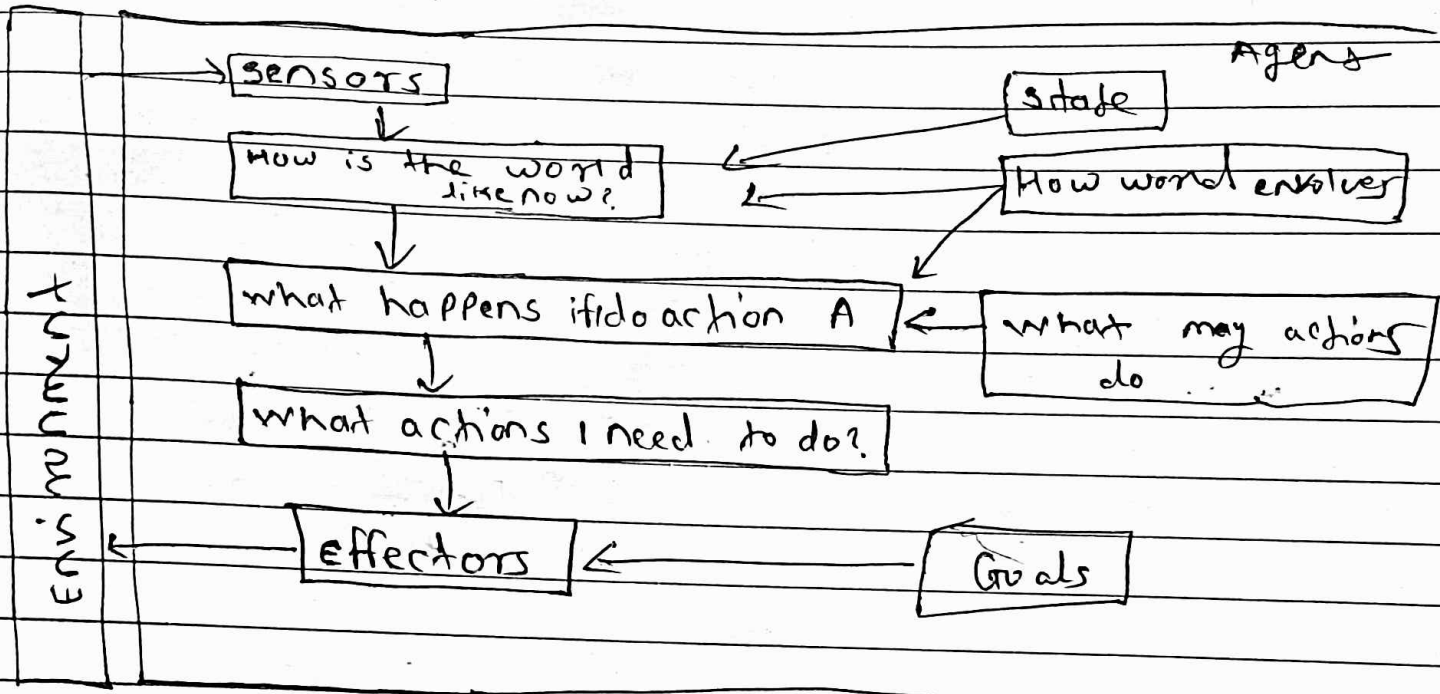
software agent has encoded bit strings as its programs and actions.

Agent structure can be viewed as a combination of Agent architecture & Agent program. Agent Architecture refers to the machinery that an agent executs on whereas Agent program is an important of an agent function.

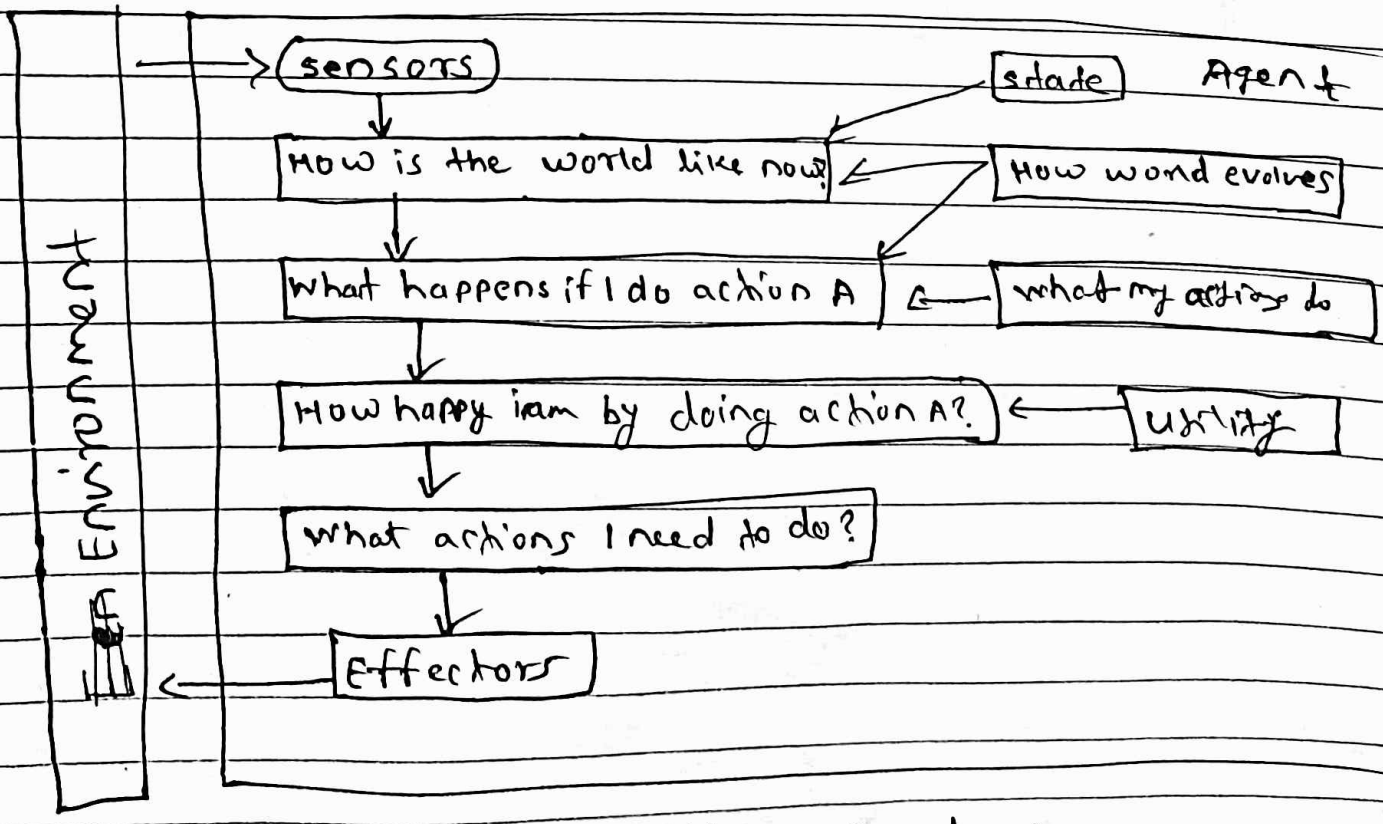


a) simple Reflex Agent





c] Goal Based Agent



d] Utility Based Agent

As seen in figure 2a. simple Reflex agents 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 figure 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 unobserved aspects of current state depending on percept history. Agent take into account how its actions effects the world. Goal based agents shown in fig. C. choose their actions in order to achieve goals. Goal-based approach is more flexible than reflex agent since the knowledge supporting a decision is explicity modeled, thereby allowing for modifications. Goal is the description of desirable situations. Goals are inadequate when there are conflicting goals, out of which only few can be achieved, goals have some uncertainty of ~~be~~ 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.

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

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

② 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 is 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.

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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.

⑦ Accessible or Inaccessible :- If the agent's sensory apparatus can have access to the complete state of the environment, then the environment with each other.

working search internet for AI based applications in following scenarios and identify who is agent for that application. Further list out PEAS descriptors for agent environment in each of the case.

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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 sources, CPU
Sensor :- chess set.
Task environment properties : Discrete, fully observable, static, Deterministic, sequential, single agent, Accessible.

② ELIZA, the computers program created from 1964 to 1966 at the MIT Artificial Intelligence Joseph weizenbaum.

performance measure :- understanding user, maintaining conversation
Environment :- user, program, keyboard, user text i/p, Eliza text, o/p window.
Actuator :- Texts.
sensor :- user texts i/p.
Task environment properties :- continuous, fully observable static, single agent, Accessible.

③ Sophia is a social humanoid robot developed by hongkong based company Hanson robotics

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performance measure :- understanding user maintaining conversation, facial expression.
~~environment :- user, program, keyboard, user text i/p eliza~~
environment :- Humans, objects ---
Actuators :- Arms, legs, mouth, speakers.
Sensor :- eyes, ears, mic, auto sensors.

Task environment properties :- continuous, fully observable, Dynamic, sequential, Accessible

(2) APPle's virtual assistant siri :-

performance measure :- understanding user text and speech, producing best results, sensor speed

environment :- user, speech, text
Actuators :- mobile source, speaker
Sensor :- mobile source, mic.

Task environment properties :-
Continues, fully observable, static, Deterministic, single agent, accessible

(8) Automated ~~password~~ crossword solver :-

performance measure :- understanding hints, analysis hidden & time to solve

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environment :- Hints, visible letters, crossword board

Actuators :- Desktop screen, program

Sensors :- crossword bord

Task environment properties :-

Discrete fully observable, static, Deterministic, episodic, single agent, Accessible