

Tutorial No.1 01

Design of Intelligent Agent

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Class - BE - IT

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Subject - AI

Aim

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

Theory

An Artificial 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 effectors sensors and acts upon that environment through effectors.

This can be clearly seen in Figure 1.

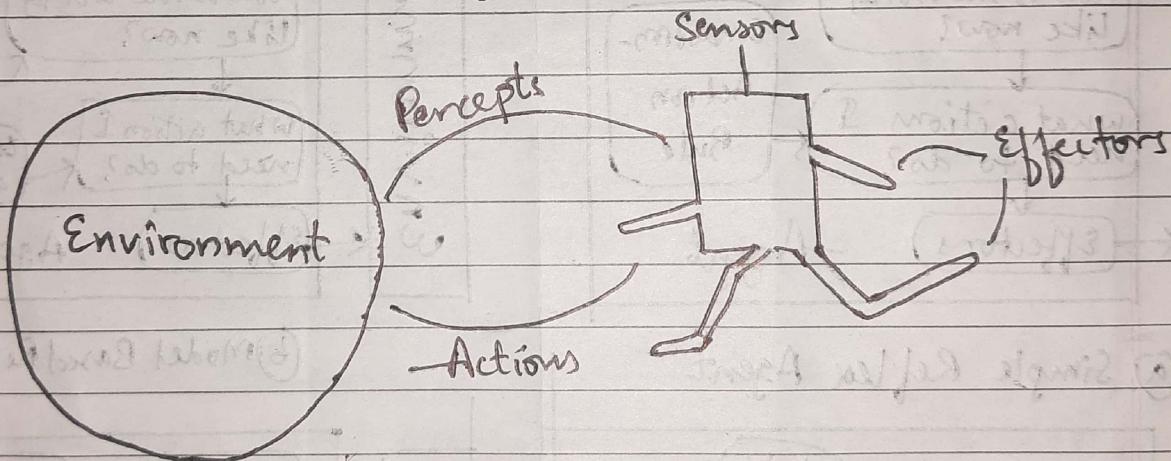


Figure 1 : AI Agent with Environment

An agent in particular can be:

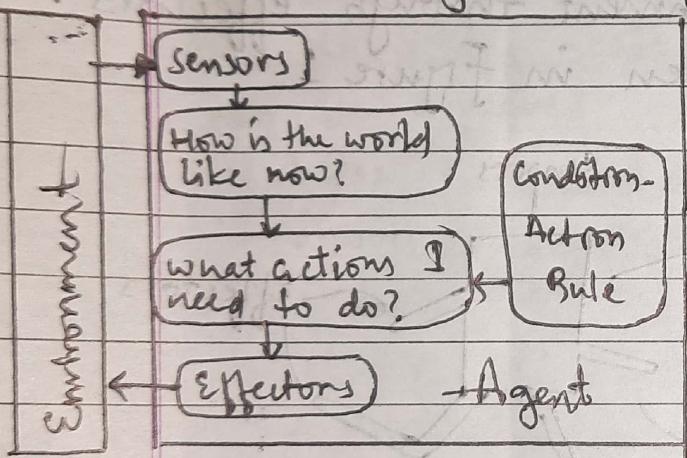
Human Agent: has sensory organs such as eyes, ears, nose, tongue and skin parallel to the sensors, and other organs such as hands, legs, mouth, for effectors.

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

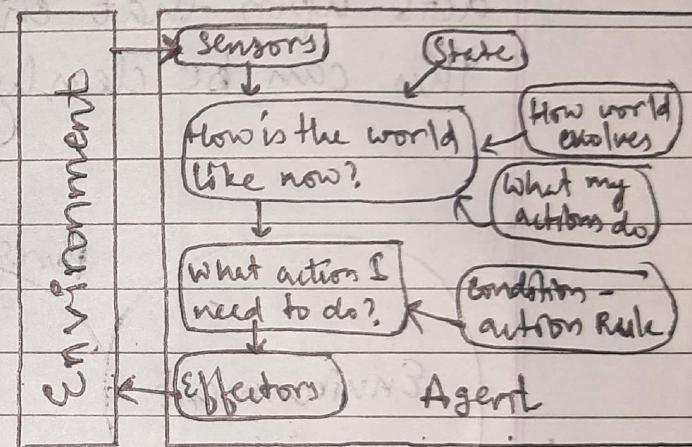
Software agent has encoded bit strings as its programs and agents.

- Agent structure can be viewed as a combination of Agent architecture and agent program.
- Architecture refers to an implementation of an agent function. Figure 2 shows four important types of agent architectures.

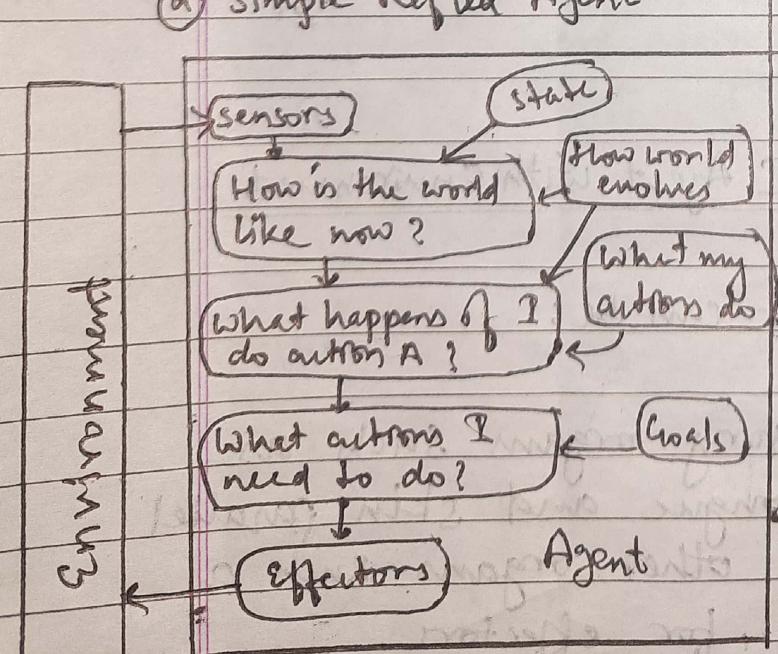
Figure 2: Agent Architecture Types



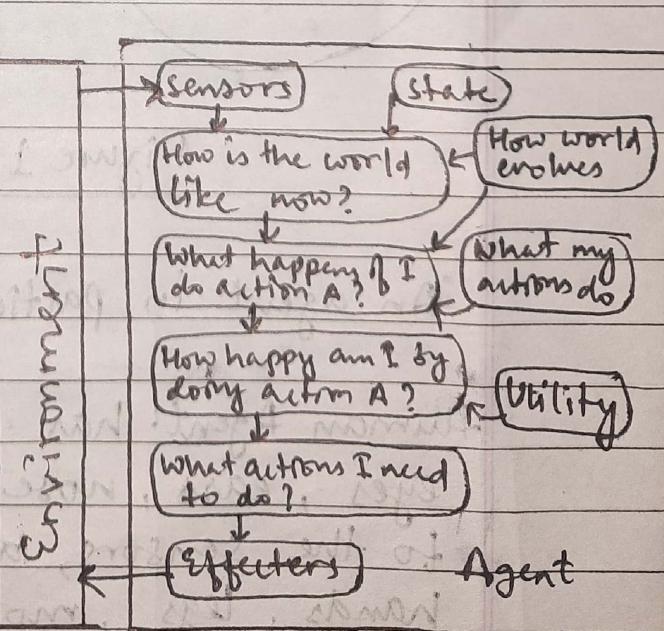
(a) Simple Reflex Agent



(b) Model Based 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. Figure 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 choose actions based on a preference (utility) for each state. Goals are inadequate when there are conflicting goals, out of which 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. 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 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 descriptors for the agent task environment. PEAS descriptions 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 it operates in. These insights are very useful in agent design. following properties:

1. Discrete or Continuous:-

If there are a limited number of distinct, clearly defined, states of the environment, the environment is discrete (For example, chess); otherwise it is continuous (For example, automated driving).

2. Observable or Partially Observable

If there are a limited number of precepts. 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 any 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 consist of the agent perceiving and then acting. The quality of its action depends just on the actions on the episode itself.

Subsequent episodes do not depend on the actions in the previous episodes. Part Playing robots are the example.

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 that agent.

Workshop

Search internet for AI based applications in following scenarios & identify who is agent for that application. Further list out PEAR descriptors for agent env. in each of the case.

1. Autonomous Lunar Rover
2. Deep Blue Chess Playing Computer Program.
3. Eliza the NLP computer program created from

1964 to 1966 at the MIT AI Laboratory by Joseph W.

4. Automatic Portfolio Management.
5. Sophia is social humanoid robot.
6. AlphaGo is comp. program that play the board game Go.
7. Apple assistance Siri.
8. Endurance: A companion for Dementia Patients
9. Casper: helping Insomniac get through the night
10. Marvel
11. Automated Crossword Solver.

Resources

The above diagrams are taken from online tutorials available at tutor@abointo on topic AB-agent & environment.