

Tutorial No. 1.

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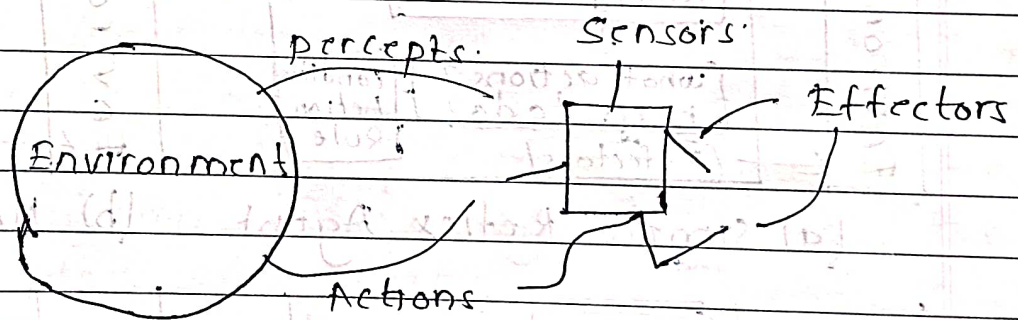
Subject : AI.

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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

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. 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 are 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. Fig 2 shows four important types of agent architectures.

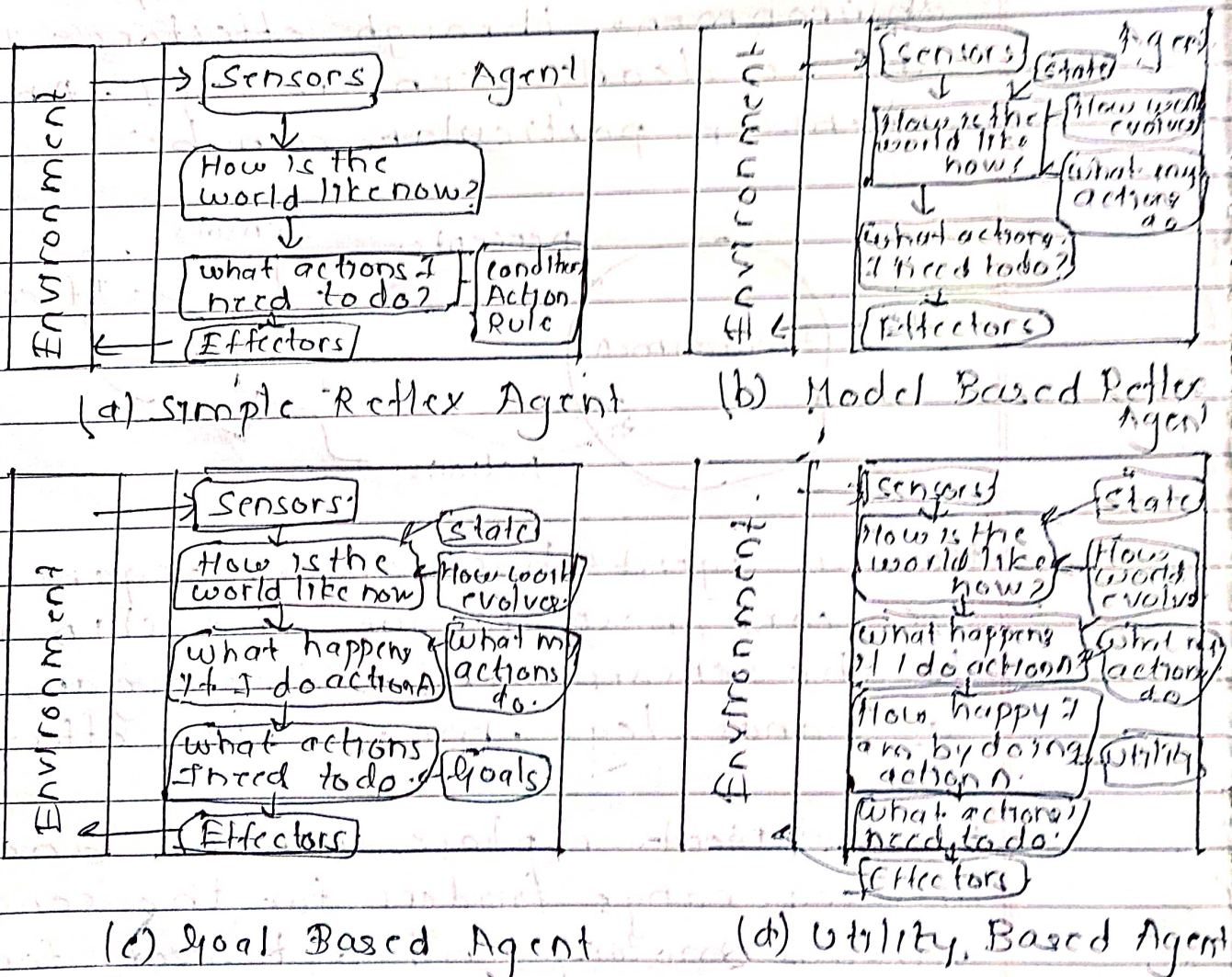


Fig 2(a): Agent Architecture Type

As seen in Fig 2(a), 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 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 happens 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 agents show in Fig choose the 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. Goals are inadequate where 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 perform 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 solve is characterized by Performance Measure, Environment, Actuators, and Sensors (PEAS). These are collectively referred to as PEAS description for the agent task environment. 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 need to consider following properties:

1. Discrete or continuous: If there are a limited no. of distinct, clearly defined, states of the environment, the environment is discrete, otherwise it is continuous.
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.

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.
eg. Mail picking robot.
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 is accessible to that agent.

Working :-

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

1. Autonomous Lunar Rover.
2. Deep Blue Chess playing computer system.
3. Eliza the natural language processing computer program created from 1964 to 1966 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 lab in London.
7. Apple virtual assistance Siri.
8. Endurance: A companion for Dementia patients.
9. Casper: Helping Insomniacs get through the night.
10. Marvel: Guarding the Galaxy with Night-Comic - Book Crossovers.
11. Automated cross word solver.

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