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TUTORIAL NO: 1

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Sem : 7 / I.T.

Subject : AI

DOA	DOP	REMARK	SIGN.

TUTORIAL 1: Design of Intelligeng Agent

AIM : To understand the concept of Agent by studying definition of Rational Agent, Agent environment, Task Environment Descriptions, 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 & acts upon that environment through effectors. This can be seen in figure.

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 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.

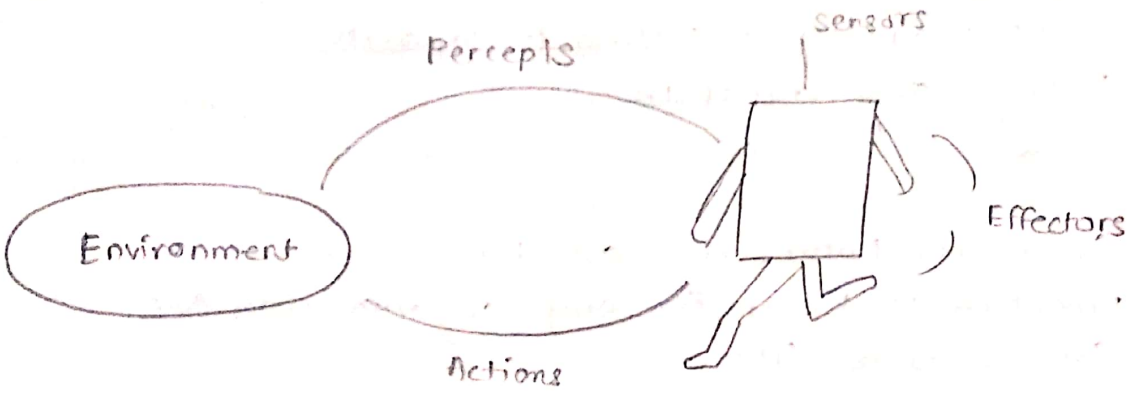

Figure 1 : AI Agent with Environment

whereas Agent Program is an implementation of an agent function. Figure 2 shows four important types of agent architecture

As seen in figure 2a, simple Reflex agents actions only if a correct dicision is made on the basis of current precept. Agent take into account how its actions in order to achieve goals. Goal-based approach is more model based reflex agents as shown in figure 2b use a model of the world to choose their action. Goal based agent shown in 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 explicity modeled thereby allowing for modifications. Goals are Inadequate when there are conflicting goals. out of which only few can be achieved, goals have some uncertainty of being achieved & you need to weigh likehood 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. 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 decriptors provide important

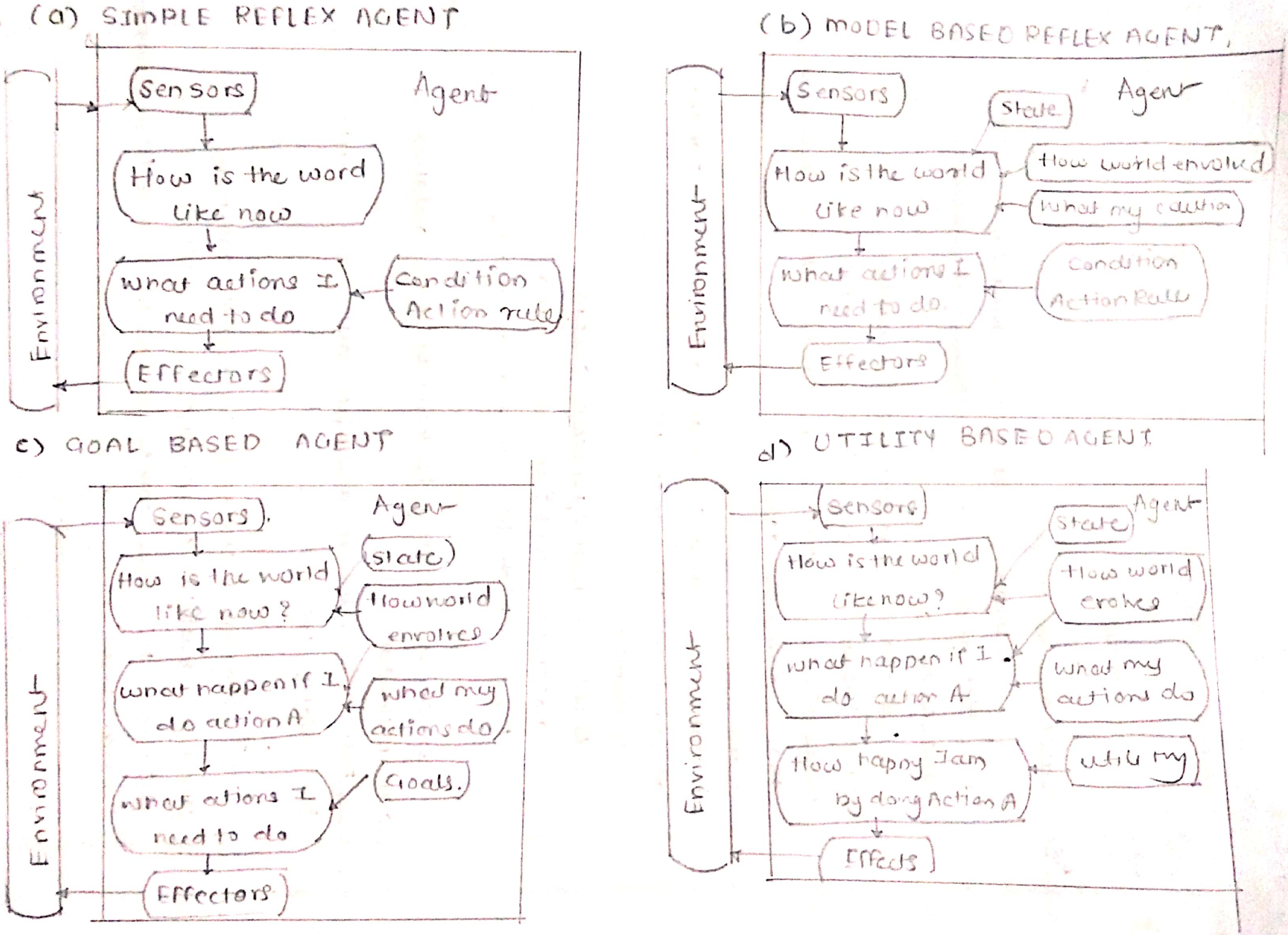

Figure 2: Agent Architecture type

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 number of distinct, clearly defined, states of the environment, the environment is discreate (for example, chess); otherwise it is continuous (e.g. automated driving)

2) Observable or Partially Observable Possible to determine the complete state of the environment at each time point from the percepts it is observable. otherwise it is partial

3) Static or Dynamic If environment does not change while an agent is acting, then the environment is deterministic; otherwise it is not deterministic

5) Episodic or Sequential In an episodic environment, each episode of events consists of the agent perceiving & then acting Episodic environments are much simpler because the agent does not need to think ahead. e.g. part Packing robots. Complementary to this is sequential environment where current action detates the future action.

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 acce to the complete state of the environment, then the environment is accessible to the agent

WORKING: Search Internet for AI based applications in following scenarios & identify who is agent for that application. Finally try to classify task environment properties like a list of attributes from above list of 7 task environment properties

- Autonomous Lunar Rover
- Deep Blue chess playing computer program
- Eliza the natural language processing computer program created from 1964 to 1966 at the MIT. AI Laboratory by Joseph Weizenbaum
- Automatic Portfolio management.
- Sophia is a social humanoid robot developed by Hong Kong based company Hanson Robotics
- Apples virtual Assistant Siri
- Cooper : Helping Insomniacs
- Marvel : Guarding the Galaxy with comic Book
- Automated Cross Word Solver.

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*) 1) Deep Blue chess playing computer program.

Performance measure : Win / Lose / draw, safety of chess piece safety of king piece, no of moves, time for each move

Environment : chess board, chess piece

Actuators : Desktop source, CPU

Sensors : chess sensor

Task environment properties : Discreate, Fully observable, static, Deterministic sequential, single agent, Accessible.

*) Apple is with virtual assistant Siri.

Performance measure : Understanding user text & speech producing best results, summoning (trigger), response speed.

Environment : User, speech, text.

Actuators : mobile screen, speaker

Sensors : mobile screen, mic, & inputs

Task Environment properties.

continous fully observable, stare Deterministic, Episode single agent, Accessible

*) Automate Crossword Solver

Performance measure : Understanding hints, analyzing, hidden & visible letters, time to solve.

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Environment : Hints, visible letters, or crossword, board
Actuators : Desktop screen, program
sensors = crossword board
Task Environment properties
Discrete, Fully observable, static, deterministic, Episodic
single agent, Accessible

*) Sophia is a social humanoid robot developed by
hong kong based company Hanson Robotics.

Performance measure : Understanding user, maintaining
conversation, social expressions,
response time
Environment : Humans, objects
Actuators : Arms, mouth, legs speaker
Sensors : Eyes (cameras) ears, mic : audio sensors

Task environment properties : Continous, Fully
observable, Dynamic,
Deterministic, Sequential, single Agent, Accessible

* ELIZA, the NLP computer program created from 1964 to 1966.
Environment → User, program, keyboard, user text inputs,
Eliza texts, alp London
Actuators → Texts
Sensors = User texts inputs
Task environment properties ⇒ continuous, Fully observable
static, Deterministic, sequential, single agent.
Performance member : Understanding user, maintaining
conversation.