Experiment No.1
Identify the Peas Description And Task Environment for a Given Real World AI Problem.
Date of Performance:
Date of Submission:

Aim: Provide the PEAS description and TASK Environment for a given real world AI Problem.

Objective: To analyze the Performance Measure, Environment, Actuators, Sensors (PEAS) and different categories of TASK environment for given problem before building an intelligent agent.

Theory:

The goal of AI is to build intelligent system which can think and act rationally. For each possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has. Rationality is relative to a performance measure.

Designer of rational agent can judge rationality based on:

- The performance measure that defines the criterion of success.
- The agent prior knowledge of the environment.
- The possible actions that the agent can perform.
- The agent's percept sequence to date.

When we define a rational agent, we group these properties under PEAS, the problem specification for the task environment.

Performance Measure:

If the objective function to judge the performance of the agent, things we can evaluate an agent against to know how well it performs.

Environment:

It the real environment where the agent need to deliberate actions. What the agent can perceive.

Actuators:

These are the tools, equipment or organs using which agent performs actions in the environment. This works as output of the agent. What an agent can use to act in its environment.

Sensors:

These are tools, organs using which agent captures the state of the environment. This works

as input to the agent. What an agent can use to perceive its environment.

TASK Environment:

The range of task environments that might arise in AI is obviously vast. We can, however,identify a fairly small number of dimensions along which task environments can be categorized. These dimensions determine, to a large extent, the appropriate agent design and the applicability of each of the principal families of techniques for agent implementation.

1. **Observable (Fully/Partially):** It is a partially observable environment. When an agent can't determine the complete state of the environment at all points of time, then it is called a partially observable environment. Here, the auctioneering agent is not capable of knowing the state of the environment fully at all points in time. Simply, we can say that wherever the agent has to deal with humans in the task environment, it can't observe the state fully.

2. **Agents (Single/Multi):** It is single-agent activity. Because only one agent is involved in this environment and is operating by itself. There are other human agents involved in the activity but they all are passing their percept sequence to the central agent – our auction agent. So, it is still a single-agent environment.

3. **Deterministic (Deterministic/Stochastic):** It is stochastic activity. Because in bidding the outcome can't be determined base on a specific state of the agent. It is the process where the outcome involves some randomness and has some uncertainty

4. **Episodic (Episodic/Sequential):** It is a sequential task environment. In the episodic environment, the episodes are independent of each other. The action performed in one episode doesn't affect subsequent episodes. Here in auction activity, if one bidder set the value X then the next bidder can't set the lesser value than X. So, the episodes are not independent here. Therefore, it is a sequential activity. There is high uncertainty in the environment.

5. **Static (Static/Semi/Dynamic):** It is a dynamic activity. The static activity is the one in which one particular state of the environment doesn't change over time. But here in the auction activity, the states are highly subjective to the change. A static environment is the crossword solving problem where numbers don't change.

6. **Discrete (Discrete/Continuous):** It is a continuous activity. The discrete environment is one that has a finite number of states. But here in auction activity, bidders can set the value forever. The number of states can be 1 or 1000. There is randomness in the environment. Thus, it is a continuous environment

PEAS Descriptors Examples/Problems

1. **PEAS descriptor for Automated Car Driver:**

Performance Measure:

- **Safety**: Automated system should be able to drive the car safely without dashing anywhere.
- **Optimum speed:** Automated system should be able to maintain the optimal speed depending upon the surroundings.
- **Comfortable journey:** Automated system should be able to give a comfortable journey to the end user.

Environment:

- **Roads:** Automated car driver should be able to drive on any kind of a road ranging from city roads to highway.
- **Traffic conditions:** You will find different sort of traffic conditions for different type of roads.

Actuators:

- **Steering wheel:** used to direct car in desired directions.
- **Accelerator, gear:** To increase or decrease speed of the car.

Sensors:

- To take i/p from environment in car driving example cameras, sonar system etc.

2. TASK ENVIORNMENT for automated car driver:

Fully observable vs. partially observable :

If an agent's sensors give it access to the complete state of the environment at each point in time, then we say that the task environment is fully observable. A task environment is effectively fully observable if the sensors detect all aspects that are relevant to the choice of action; relevance, in turm, depends on the performance measure. Fully observable environments are convenient because the agent need not maintain any internal state to keep track of the world. An environment might be partially observable because of noisy and inaccurate sensors or because parts of the state are simply missing from the sensor data.

For example: an automated taxi cannot see what other drivers are thinking.

Conclusion:

In conclusion, a Smart Home Automation System exemplifies a complex AI problem that integrates various elements of the PEAS framework and operates within a dynamic task environment. By focusing on performance measures such as energy efficiency, user comfort, security, and ease of use, the system aims to enhance the living experience in modern homes. The interplay between sensors, actuators, and user interactions creates a rich environment for AI algorithms to optimize and automate processes effectively. As the demand for intelligent home solutions grows, developing robust AI systems that can adapt to diverse needs and preferences will be essential in shaping the future of smart living.