Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

AY: 2025-26

Class:	**TE**	**Semester:**	**V**
Course Code:	**CSL502**	**Course Name:**	**Artificial Intelligence Lab**

Name of Student:	**Shravani Sandeep Raut**
Roll No. :	**51**
Experiment No.:	**1**
Title of the Experiment:	**Identify the Peas Description And Task Environment for a Given Real World AI Problem.**
Date of Performance:	**08/07/2025**
Date of Submission:	**15/07/2025**

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Performance	5	
Understanding	5	
Journal work and timely submission	10	
Total	20	

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations (BE)
Performance	4-5	2-3	1
Understanding	4-5	2-3	1
Journal work and timely submission	8-10	5-8	1-4

Checked by

Name of Faculty : Mrs. Rujuta Vartak

Signature :

Date:

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.

1. Smart Home Assistant
PEAS :
· Performance
User comfort, energy eU̓iciency, timely response, security, user satisfaction
· Environment:
Home appliances, human users, temperature, lights, doors, weather
· Actuators
Speakers, HVAC systems, lights, door locks, smart plugs
· Sensors
Microphones, motion sensors, temperature sensors, light sensors, cameras
Environment Types:
· Fully vs. Partially Observable: Partially Observable (cannot sense every event or user intention)
· Single vs. Multi-agent: Multi-agent (users, smart devices, assistants interacting)
· Episodic vs. Sequential: Sequential (past actions aU̓ect future states, e.g., turning oU̓ heater)
· Static vs. Dynamic: Dynamic (environment can change while the agent is thinking)
· Discrete vs. Continuous: Continuous (temperature, voice commands)
· Deterministic vs. Stochastic: Stochastic (unpredictable human behavior or network issues)
· Known vs. Unknown: Partially Known (device specs known, user intentions often unknown)

2. Robot Assembler
PEAS :
· Performance
Assembly speed, accuracy, reduced error rate, maintenance cost
· Environment
Assembly line, parts, tools, other robots
· Actuators
Robotic arms, grippers, wheels
· Sensors
Vision cameras, pressure sensors, object detectors
Environment Types:
· Fully vs. Partially Observable: Fully Observable (everything in assembly line is usually sensed)
· Single vs. Multi-agent: Multi-agent (collaborating with other robots/humans)
· Episodic vs. Sequential: Sequential (each step aU̓ects the next)
· Static vs. Dynamic: Static (usually doesn't change unless unexpected interference)
· Discrete vs. Continuous: Discrete (assembly steps and states are usually defined)
· Deterministic vs. Stochastic: Deterministic (same input = same result under ideal conditions)
· Known vs. Unknown: Known (design, parts, and outcomes are predefine

4. Shopping Website
PEAS :
· Performance
Click-through rate, conversion rate, customer satisfaction
· Environment
Product catalog, user profiles, purchase history, website traU̓ic

· Actuators
Display engine, recommendation widgets
· Sensors
Click data, search input, user history, cookies
Environment Types:
· Fully vs. Partially Observable: Partially Observable (cannot fully know user intent)
· Single vs. Multi-agent: Multi-agent (many users interacting)
· Episodic vs. Sequential: Sequential (past behavior aU̓ects future suggestions)
· Static vs. Dynamic: Dynamic (products, trends, and user interests change)
· Discrete vs. Continuous: Discrete (items, categories) and Continuous (user scroll, time)
· Deterministic vs. Stochastic: Stochastic (user behavior is unpredictable)
· Known vs. Unknown: Partially Known (products known, user behavior unknown)

5. Image Analysis System
PEAS :
· Performance
Detection accuracy, false positives/negatives, processing time
· Environment
Image data (medical scans, surveillance feeds)
· Actuators
Labels, alerts, visual output
· Sensors
Image files, camera input, scanners
Environment Types:
· Fully vs. Partially Observable: Partially Observable (hidden features not always visible)
· Single vs. Multi-agent: Single Agent (usually analyzing input independently)
· Episodic vs. Sequential: Episodic (each image can be processed independently)
· Static vs. Dynamic: Static (image is fixed when analyzed)
· Discrete vs. Continuous: Continuous (image pixels are continuous)
· Deterministic vs. Stochastic: Stochastic (image noise, uncertain patterns)
· Known vs. Unknown: Partially Known (image format known, content unknown)

Conclusion:
Comment on importance of PEAS properties and TASK Environment in terms of design of intelligent agent.
PEAS properties and the Task Environment play a vital role in the design of intelligent agents by clearly specifying the agent's objectives, the environment it operates in, the actions it can take, and the information it perceives. These factors help define the agent's capabilities and constraints, ensuring it can adapt to various conditions, make informed decisions, and perform tasks effectively. By modeling both the agent and its environment, designers can ensure optimal performance and scalability across different scenarios.