PART A

Experiment No.01

A.1 Aim: Identify a problem statement relevant to AI and describe its PEAS Descriptors with its Properties.

A.2 Prerequisite: Software Engineering, System Analysis, Understand different types of agent.

A.3 Outcome:

After successful completion of this experiment students will be able to

- Understand, identify and analyse the problem, implement and validate the solution for the given task environment.
- Applying fundamental engineering concepts appropriate to the discipline.
- Potential to formulate and solve engineering problems in identifying the task environment.

A.4 Theory:

An agent is something that perceives and acts in an environment. The agent function for an agent specifies the action taken by the agent in response to any percept sequence. An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators.

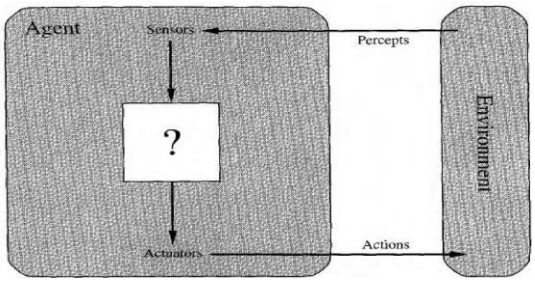

Figure: Agents interact with environments through sensors and actuators.

A performance measure embodies the criterion for success of an agent's behavior. When an agent is plunked down in an environment, it generates a sequence of actions according to the percepts it receives. This sequence of actions causes the environment to go through a sequence of states. If the sequence is desirable, then the agent has performed well.

A rational agent acts so as to maximize the expected value of the performance measure, given the percept sequence it has seen so far. A task environment specification includes the performance measure, the external environment, the actuators, and the sensors. In designing an agent, the first step must always be to specify the task environment as fully as possible. Task environments vary along several significant dimensions. They can be fully or partially observable, deterministic or stochastic, episodic or sequential, static or dynamic, discrete or continuous, and single-agent or multiagent.

The task environment for an agent is comprised of PEAS (Performance measure, Environment,

Actuators, Sensors)
PEAS specify the setting of an intelligent agent:
P: The performance measure defines degree of success.
E: What does the agent know about the environment?
A: The actions that the agent can perform.
S: Everything that an agent as perceived so far through its sensors.
Environment properties:
• **Fully (vs. partially) observable:** An agent's sensors give it access to the complete state of the environment at each point in time.
• **Deterministic (vs. stochastic):** The next state of the environment is completely determined by the current state and the action executed by the agent.
• **Episodic (vs. sequential):** The agent's experience is divided into atomic "episodes" (in which the agent perceives then performs one action), and the choice of action in each episode depends only on the episode itself.
Static (vs. dynamic): The environment is unchanged while an agent is deliberating. (The environment is semidynamic if the environment itself does not change with the passage of time but the agent's performance score does.)
• **Discrete (vs. continuous):** A limited number of distinct, clearly defined percepts and actions.
• Single agent (vs. multiagent): An agent operating by itself in an environment.

Procedure/ Program:
Example of Agent types and their PEAS (performance, environment, actuators, sensor) Descriptions.
1] **English Tutor Example: PEAS**
Agent: Interactive English tutor
Performance measure: Maximize student's score on test
Environment: Set of students
Actuators: Screen display (exercises, suggestions, corrections)
Sensors: Keyboard
English tutor: Observable: Partially Agents: Multi (why?) Deterministic: Stochastic Episodic: Sequential Static: Dynamic Discrete: Discrete
2] **Robot : PEAS**
Agent: Part-picking robot
Performance measure: Percentage of parts in correct bins
Environment: Convey p, or belt with parts, bins
Actuators: Jointed arm and hand
Sensors: Camera, joint angle sensors

PART B

(PART B : TO BE COMPLETED BY STUDENTS)

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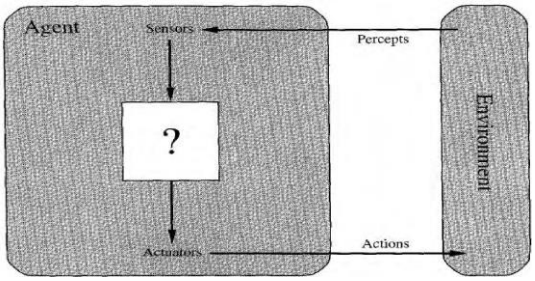
Date of Experiment:	Date of Submission:
Grade:	

B.1 Software Code written by student:

An autonomous delivery robot is designed to deliver packages from a central warehouse to customers' doorsteps. The robot must navigate a dynamic urban environment, avoid obstacles, and deliver packages to the correct locations.



Definition: The metric used to evaluate the robot's success. Properties:

Accuracy of delivery: The robot must deliver the package to the correct address. Efficiency: The robot should minimize time and energy spent while navigating. Safety: The robot must avoid collisions with obstacles (e.g., pedestrians, cars, etc.).

Reliability: The robot must complete deliveries without failure, even under challenging conditions (e.g., inclement weather, road closures).

Definition: The surroundings in which the robot operates. Properties:

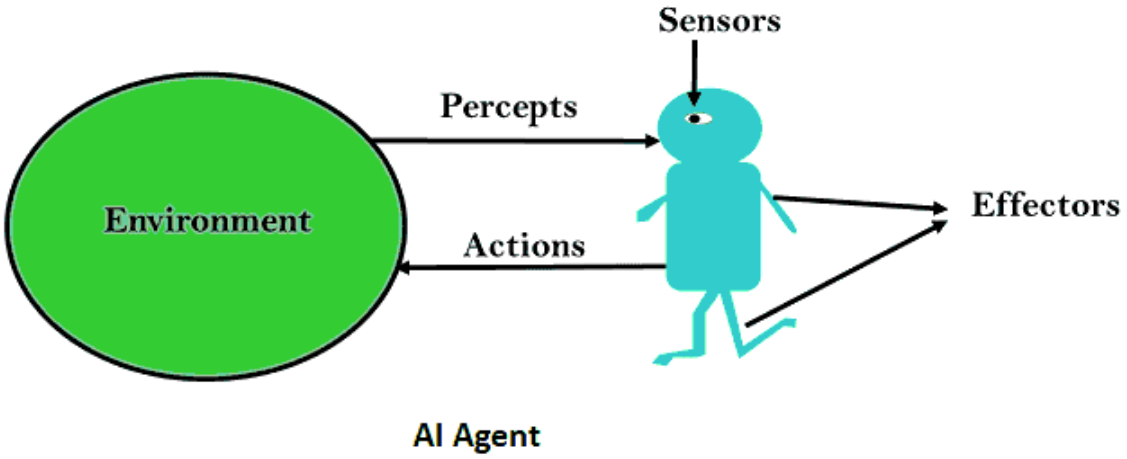
Urban setting: The robot operates in a city or metropolitan area with roads, pedestrians, traffic, and buildings.

Dynamic: The environment is ever-changing, with moving objects such as cars, people, and unpredictable events.

Uncertainty: There may be road blockages, bad weather, or other unforeseen changes that affect navigation.

Multimodal terrain: The robot must navigate various surfaces, including sidewalks, roads, and ramps.

Definition: The physical components that allow the robot to interact with the environment.
Properties:



Wheels or legs for movement: For navigating different terrains.
Arms or a robotic system for handling packages: To pick up and deliver packages.
Sensors for navigation: Cameras, LiDAR, or ultrasonic sensors to detect obstacles, road conditions, and precise location.
Communication system: To update the central system or receive delivery requests and updates.

Definition: The devices that allow the robot to perceive the environment and gather information for decision-making.
Properties:
Cameras: For visual recognition of surroundings and reading addresses. LiDAR or ultrasonic sensors: For detecting obstacles and measuring distance. GPS: For precise geolocation and mapping routes.
Infrared or temperature sensors: To detect environmental conditions such as weather. Accelerometer and gyroscope: For maintaining balance and detecting movement.

B.2 Input and Output:

(Not Required)

B.3 Observations and learning:

WE have learned about the PEAS Descriptor in detail through this experiment and about the tutor and robot PEAS.
The autonomous delivery robot's performance depends on its ability to adapt to dynamic environments, handle various obstacles, and ensure safe, reliable delivery. Sensor fusion and actuator reliability are key for efficient operation.

B.4 Conclusion:

To achieve successful delivery, the robot must integrate responsive decision-making, robust environmental perception, and reliable actuators. Continuous adaptation to real-world challenges is crucial for optimal performance.

B.5 Question of Curiosity

Q1) Explain PEAS Descriptors in detail

1.PERFORMANCE MEASURE(P):

Definition: The metric used to evaluate the success or effectiveness of the agent's actions. It defines what is considered "good" behavior and how well the agent is performing its task.

The performance measure can be a combination of several factors depending on the task, such as speed, accuracy, reliability, and safety. It should be aligned with the overall goal of the agent, ensuring that the agent is evaluated based on its ability to achieve the desired outcomes. For example, in an autonomous delivery robot, the performance measure might include the accuracy of delivery, time taken to complete the task, energy efficiency, and safety during navigation.

2.ENVIRONMENT(E)

Definition: The external context or surroundings in which the agent operates and interacts. It includes everything the agent needs to perceive and act upon.

The environment can be static or dynamic, deterministic or stochastic, and may include both controllable and uncontrollable factors.

It might include physical entities (e.g., terrain, weather) or abstract conditions (e.g., market conditions, social norms).

For instance, in an autonomous delivery robot, the environment is an urban area with pedestrians, traffic, weather conditions, and varying road conditions.

3.ACTUATORS(A):

Definition: The mechanisms through which the agent interacts with and changes the environment. These are the tools the agent uses to perform actions.

Actuators are typically physical devices that allow the agent to move, manipulate objects, or communicate.

Examples of actuators include wheels, arms, motors, or display screens. For an autonomous robot, actuators include wheels for movement, robotic arms for handling packages, and a speaker for communication.

4. SENSORS(S)

Definition: The devices through which the agent perceives the environment and gathers information. Sensors allow the agent to sense and understand the world around it.

Sensors gather data about the environment, which is then used by the agent to make decisions and choose actions.

They can be visual, auditory, tactile, or based on other physical principles like infrared or

pressure.

Q2) Explain Current trends in AI.

- 1.Ethical AI
  Regulatory agencies are lobbying to establish standards for how AI can be used responsibly, especially in the financial and health sectors.
- 2.Generative AI
  AI systems that can generate content like text, images, and audio in a human-like manner.
- 3.AI healthcare
  AI can help identify diseases, speed up drug discovery, and monitor patients through virtual nursing assistants.
- 4.Natural language processing (NLP)
  A field that focuses on the interaction between humans and computers through natural language.
- 5.Multimodality
  AI models that can take many types of data as input, which can lead to better interaction with virtual agents.
- 6.AI for cybersecurity
  AI can help cybersecurity software learn from past experiences to identify trends and connect incidents.
- 7.Agentic AI
  Autonomous systems that make decisions for users, such as taking on jobs proactively in banking and healthcare.
- 8.AI democratization
  Making AI available to users without specialized AI or technical knowledge.