Experiment No.1
Identification of the problem and Determination of its PEAS Descriptor.
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Aim: Identification of the problem and Determination of its PEAS Descriptor.

Objective: To analyze the Performance Measure, Environment, Actuators, Sensors (PEAS) 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 is 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

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 input from environment in car driving example cameras, sonar system etc.

2. **PEAS descriptor for playing soccer.**

   Performance Measure: scoring goals, defending, speed

   Environment: playground, teammates, opponents, ball

   Actuators: body, dribbling, tackling, passing ball, shooting **Sensors:**

   camera, ball sensor, location sensor, other players locator

3. **PEAS descriptor for Exploring the subsurface oceans of Titan.**

   Performance Measure: safety, images quality, video quality

   Environment: ocean, water

   Actuators: mobile diver, steering, break, accelerator
   Sensors: video, accelerometers, depth sensor, GPS

4. **PEAS descriptor for Shopping for used AI books on the Internet.**

   Performance Measure: price, quality, authors, book review

   Environment: web, vendors, shippers

   Actuators: fill in form, follow URL, display to user

   Sensors: HTML

5. **PEAS descriptor for playing a tennis match.**

   Performance Measure: winning

   Environment: playground, acquet, ball, opponent

Actuators: ball, raquet, joint arm

Sensors: ball locator, camera, racquet sensor, opponent locator

6.   **PEAS descriptor for practicing tennis against a wall.**

Performance Measure: hit   speed, hit

accuracy **Environment:** playground, racquet, ball,

wall **Actuators:** ball, racquet, joint arm

Sensors: ball locator, camera, racquet sensor

Question:

1. Chess Playing Agent

- **Performance Measure**: Win rate, number of moves to checkmate, strategic accuracy, opponent's rating (if playing against real opponents)
- **Environment**: Chessboard, chess pieces, time control, opponent
- **Actuators**: Move chess pieces (physically or on-screen)
- **Sensors**: Piece position on the board (via a camera or virtual input), game state (board configuration, clock)

2. Stock Market Trading Agent

- **Performance Measure**: Profit/loss, portfolio return, number of successful trades, risk-adjusted return
- **Environment**: Stock market, stock exchange platforms, market news, historical data

- **Actuators**: Buy/sell orders, trading strategies

- **Sensors**: Market data, news feed, company financial reports, sentiment analysis tools

3. Online Shopping Recommender System

- **Performance Measure**: Click-through rate, conversion rate, customer satisfaction, revenue per recommendation

- **Environment**: Online shopping platform, product catalog, user data

- **Actuators**: Recommend products, display suggestions on the website

- **Sensors**: User behavior, user profile data, interaction with products

4. Smart Traffic Light System

- **Performance Measure**: Traffic flow efficiency, waiting times, accident reduction, energy consumption, user satisfaction

- **Environment**: Intersection, vehicles, pedestrians, road conditions, weather

- **Actuators**: Traffic lights

- **Sensors**: Vehicle presence detectors, cameras, traffic flow data, pedestrian signals

5. Library Management Agent

- **Performance Measure**: Book availability, checkout accuracy, time for finding and reserving books, user satisfaction, system efficiency

- **Environment**: Library, bookshelves, library catalog, users

- **Actuators**: Book catalog , book reservation system

- **Sensors**: Book inventory system, RFID or barcode scanners, user inputs

Conclusion:
The PEAS (Performance Measure, Environment, Actuators, Sensors) framework is critical for analyzing and designing an intelligent agent. The **Performance Measure** defines how the agent's success is evaluated, such as efficiency or goal achievement. The **Environment** encompasses the world and conditions the agent interacts with, like a game board or a physical space. **Actuators** are the tools the agent uses to perform actions in the environment, such as making a move in a game or moving a robot's arm. **Sensors** provide the agent with information about the environment, enabling it to make informed decisions. By analyzing each PEAS component, we ensure the agent is well-equipped to perform its tasks effectively and adapt to dynamic conditions.