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PEAS stands for performance measure, environment, actuators, and sensors. PEAS defines AI models and helps determine the task environment for an intelligent agent.

Performance measure: It defines the success of an agent. It evaluates the criteria that determines whether the system performs well.

Environment: It refers to the external context in which an AI system operates. It encapsulates the physical and virtual surroundings, including other agents, objects, and conditions.

Actuators: They are responsible for executing actions based on the decisions made. They interact with the environment to bring about desired changes.

Sensors: An agent observes and perceives its environment through sensors. Sensors provide input data to the system, enabling it to make informed decisions.

Examples

Agent	Performance measure	Environment	Actuators	Sensors
Vacuum cleaner	Cleanliness, security, battery	Room, table, carpet, floors	Wheels, brushes	Camera, sensors
Chatbot system	Helpful responses, accurate responses	Messaging platform, internet, website	Sender mechanism, typer	NLP algorithms
Autonomous vehicle	Efficient navigation, safety, time, comfort	Roads, traffic, pedestrians, road signs	Brake, accelerator, steer, horn	Cameras, GPS, speedometer
Hospital	Patient's health, cost	Doctors, patients, nurses, staff	Prescription, diagnosis, tests, treatments	Symptoms

Advantages

PEAS offers several advantages in the development and implementation of intelligent systems.

- **Clarity:** PEAS helps define the performance measure clearly, allowing developers to establish specific goals and objectives for the AI system. It ensures system performance evaluation and measurement effectively against predefined criteria.
- **User experience:** PEAS creates AI systems that provide user experiences by considering the performance measure and designing the system. Whether it's accuracy, efficiency, or personalized interactions, the system meets user expectations and provides value by focusing on performance.
- **Evaluation:** PEAS provides a basis for evaluating the performance of AI systems and identifying improvement areas. Developers measure the system's performance, gather feedback, and make informed decisions for enhancing the system's capabilities and addressing shortcomings by defining clear performance measures.

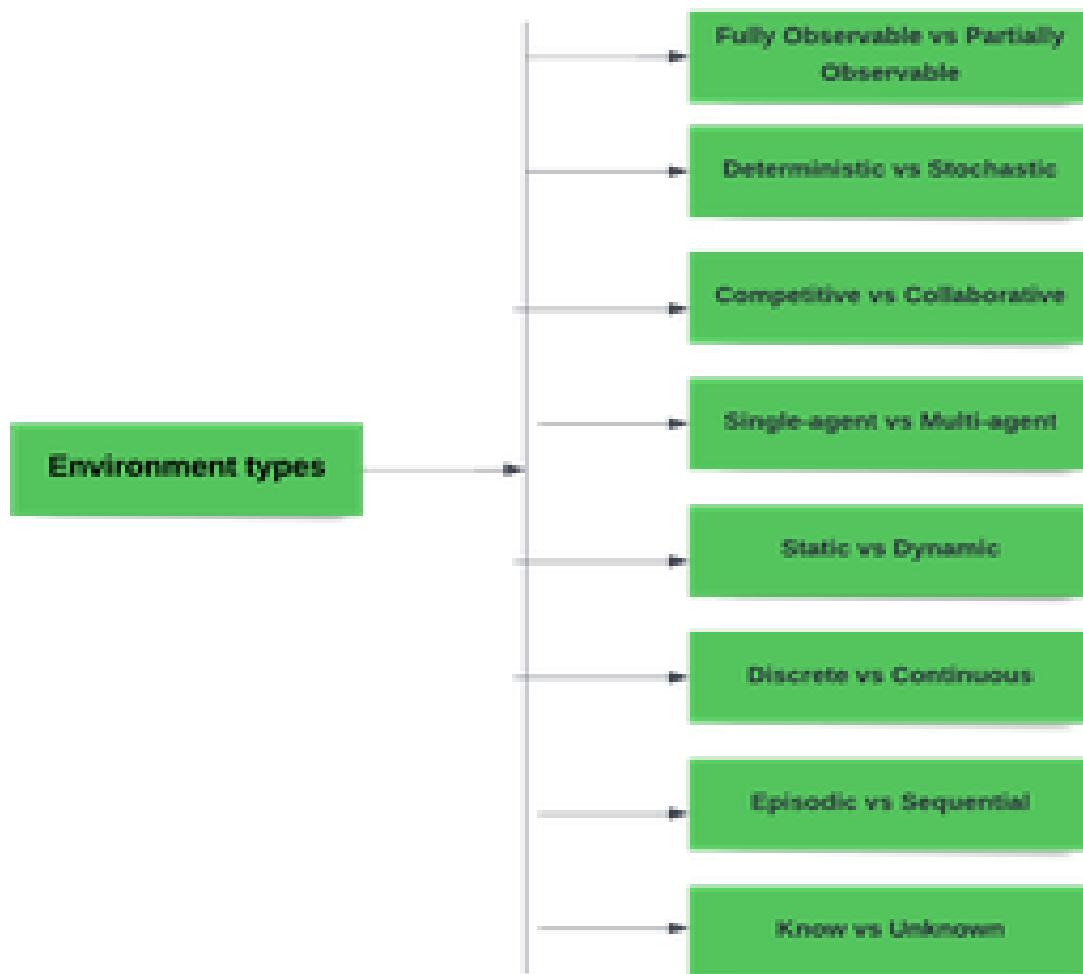
Conclusion

In conclusion, PEAS plays a significant role in designing and analyzing intelligent systems in artificial intelligence. By considering the performance measure, environment, actuators, and sensors, AI developers can effectively define the objectives, operating context, actions, and perception mechanisms of an AI agent.

Environment :

An environment in artificial intelligence is the surrounding of the agent. The agent takes input from the environment through sensors and delivers the output to the environment through actuators. There are several types of environments:

- Fully Observable vs Partially Observable
- Deterministic vs Stochastic
- Competitive vs Collaborative
- Single-agent vs Multi-agent
- Static vs Dynamic
- Discrete vs Continuous
- Episodic vs Sequential
- Known vs Unknown



Environment types

1. Fully Observable vs Partially Observable

- When an agent sensor is capable to sense or access the complete state of an agent at each point in time, it is said to be a fully observable environment else it is partially observable.
- Maintaining a fully observable environment is easy as there is no need to keep track of the history of the surrounding.
- An environment is called **unobservable** when the agent has no sensors in all environments.
- **Examples:**
 - **Chess** – the board is fully observable, and so are the opponent's moves.
 - **Driving** – the environment is partially observable because what's around the corner is not known.

2. Deterministic vs Stochastic

- When a uniqueness in the agent's current state completely determines the next state of the agent, the environment is said to be deterministic.
- The stochastic environment is random in nature which is not unique and cannot be completely determined by the agent.
- **Examples:**
 - **Chess** – there would be only a few possible moves for a coin at the current state and these moves can be determined.
 - **Self-Driving Cars**- the actions of a self-driving car are not unique, it varies time to time.

3. Competitive vs Collaborative

- An agent is said to be in a competitive environment when it competes against another agent to optimize the output.
- The game of chess is competitive as the agents compete with each other to win the game which is the output.
- An agent is said to be in a collaborative environment when multiple agents cooperate to produce the desired output.
- When multiple self-driving cars are found on the roads, they cooperate with each other to avoid collisions and reach their destination which is the output desired.

4. Single-agent vs Multi-agent

- An environment consisting of only one agent is said to be a single-agent environment.
- A person left alone in a maze is an example of the single-agent system.

- An environment involving more than one agent is a multi-agent environment.
- The game of football is multi-agent as it involves 11 players in each team.

5. Dynamic vs Static

- An environment that keeps constantly changing itself when the agent is up with some action is said to be dynamic.
- A roller coaster ride is dynamic as it is set in motion and the environment keeps changing every instant.
- An idle environment with no change in its state is called a static environment.
- An empty house is static as there's no change in the surroundings when an agent enters.

6. Discrete vs Continuous

- If an environment consists of a finite number of actions that can be deliberated in the environment to obtain the output, it is said to be a discrete environment.
- The game of chess is discrete as it has only a finite number of moves. The number of moves might vary with every game, but still, it's finite.
- The environment in which the actions are performed cannot be numbered i.e. is not discrete, is said to be continuous.
- Self-driving cars are an example of continuous environments as their actions are driving, parking, etc. which cannot be numbered.

7. Episodic vs Sequential

- In an **Episodic task environment**, each of the agent's actions is divided into atomic incidents or episodes. There is no dependency between current and previous incidents. In each incident, an agent receives input from the environment and then performs the corresponding action.
- **Example:** Consider an example of **Pick and Place robot**, which is used to detect defective parts from the conveyor belts. Here, every time robot(agent) will make the decision on the current part i.e. there is no dependency between current and previous decisions.
- In a **Sequential environment**, the previous decisions can affect all future decisions. The next action of the agent depends on what action he has taken previously and what action he is supposed to take in the future.
- **Example:**
 - **Checkers-** Where the previous move can affect all the following moves.

8. Known vs Unknown

- In a known environment, the output for all probable actions is given. Obviously, in case of unknown environment, for an agent to make a decision, it has to gain knowledge about how the environment works.