

AI Assignment -1 HauchParman 9163

1. Rationality in Intelligent Agents:-

① Rationality in the context of intelligent agents refers to the ability of an agent to make decisions that maximize its expected utility or achieve its goals in a given environment.

② A rational agent is one that acts in a way that is most likely to achieve its intended objectives, given its perception of the world & its internal knowledge & capabilities.

For example:-

① In a chess playing agent, rationality would involve selecting moves that maximize the probability of winning the game.

② In a self-driving car, rational behaviour would entail following traffic rules & avoiding accidents to reach the destination safely & efficiently.

① Environments in which intelligent agents operate can vary widely in their characteristics which significantly influence the design & behaviour of agents.

② Key characteristic defining environments includes:-

① Observable vs partially observable: An environment is observable if an agent can directly observe the complete state, while it is partially observable if the agent has limited or complete information.

② Deterministic vs stochastic: Deterministic environment have outcomes completely determined by their current state & the agent choices.

While stochastic environments involve randomness

③ Episodic vs sequential: In episodic environments, each action's outcome depends only the current episode, whereas in sequential environments, action affect future states.

④ Static vs dynamic: static environments do not change while the agent is deliberating, while dynamic environments may change unpredictably.

Examples:-

① A chess is a deterministic, fully observable, & sequential environment.

② A stock market is stochastic, partially observable & dynamic.

③ A maze solving robot operates in a partially observable, deterministic & sequential environment.

Intelligent agents typically consist of several components:-

① Perception: Gathering info about the environment through sensors.

② Knowledge-base: Internal representation of the world, including past experiences & domain-specific knowledge.

③ Decision-making: Process of selecting actions based on available information & goals.

④ Actuators: Mechanisms through which the agent interacts with the environment.

Types of agents

- ① Reactive agents: React to the current state of the environment without maintaining an internal state or memory.
- ② Deliberative agents: Use internal representation to plan actions based on anticipated future states.
- ③ Learning agents: Improve their performance over time through experience & adaption.

Examples:-

- ① A reactive vacuum cleaner that responds to dirt detection ^{immediately} without planning.
- ② A deliberative route-planning system that considers traffic condition & long term goal.

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- ⇒ ① Problem solving agent analyse problems by defining states, actions.
- ② They employ various search algorithm to explore the space of possible solution & find.

Steps in problem solving by searching.

- ① Formulation:- Defining the problem by specifying the initial state,
 - ② Search Exploring the state space to find a sequence of action leading from the initial state to a goal state.
 - ③ Solution: Extracting a solution path from the search tree or ^{graph.}
- Strategies employed:-

- ① Breadth-first search:- Expands all nodes at a given depth before moving to the next level.
- ② Depth-first search: explores as far as possible along each branch before ^{backtracking.}
- ③ Heuristic Search: Uses domain-specific knowledge to guide the search towards promising areas of state space.