

AI

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ASSIGNMENT-1

Rationality refers to the ability of an agent to make decisions that are expected to maximize its chances of achieving its goals given the available info and resources. A rational agent is one that chooses consistently, actions that are optimal or near optimal.

Here's how rationality relates to agent behaviour:

1) Goal directed behaviour. Rational agents are driven by goal or objectives they aim to achieve. Their actions are selected based on their assessment of how likely those actions are to bring them closer to their goals.

2) Decision making under uncertainty. In many real world scenarios agents don't have complete information about their environment or the outcomes of their action. Rational agents make decisions by weighing the available evidence and assessing the probabilities of different outcomes.

3) Adoption to changing environment. Environments are often dynamic and rational agents need to adapt their behaviour accordingly. This adaptation involves continuously updating their beliefs and strategies based on new information and strategies.

4) Trade off and resource constraints. Rational agents must often make trade off due to limited resources such as time, energy or expected yield, highest utility or payoff.

- Rationality
- Goal directed behaviour
- Decision making under uncertainty
- Adoption to changing environment
- Trade-off and resource constraints

Q2) The nature of environment in which intelligent agent operate varies widely depending on application domain. However there are several key characteristics that define an environment and significantly influence the design and behaviour.

Characteristic	Description	Example
Observable	Whether agents have access to complete information about state of environment	chess (fully observable) self-driving cars (partially observable)
Episode	Whether each interaction between agent and environment is self contained or if there is a sequence of action and states	chess (episodic) maze navigation (sequential)

Dynamic	Whether the environment changes over time with response to agent action or external factors	Financial market (dynamic) Robotics (dynamic)
Discrete	Whether the state & action spaces are finite or count infinite	Board game (discrete) Robotic (continuous)

Example of different types of environment & challenges they present

Environment type	example	challenges for agent
Board games	chess, go	vast search space, optimal decision making uncertainty
Robotics	manufacturing floors	Sensor perception, path planning, object manipulation
Natural language processing	Text/speech recognition	Contextual understanding, ambiguity resolution

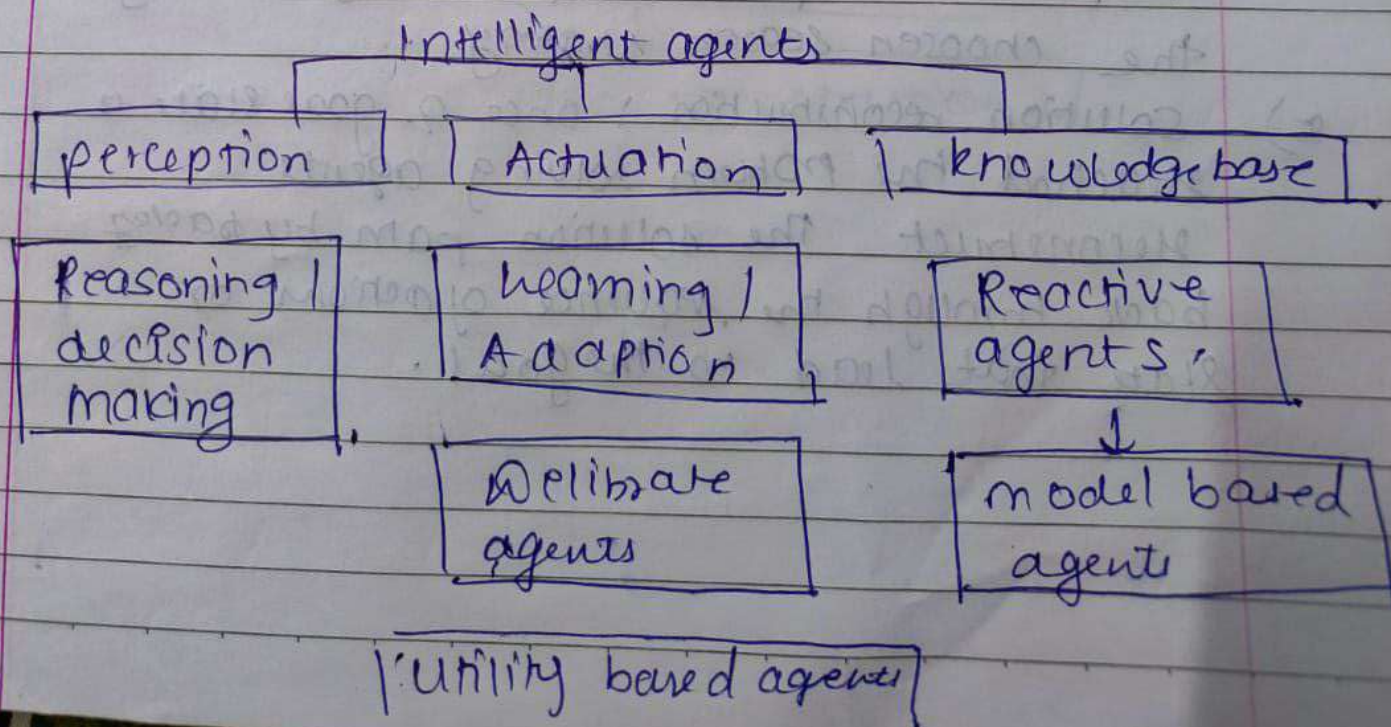
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Q3) The typical components of an intelligent
include

- 1) Perception:- This component is responsible for sensing and perceiving the environment. It gathers information from sensors which could be physical sensors like cameras and microphones in robotics or abstract sensors like data input in software agents.
- 2) Actuation:- The actuation component stores the agent to interact with environment. It consists of effectors which are mechanisms through which the agent can exert control over influence its surrounding.
- 3) Knowledge base: This component stores the agent's internal representation of the world including its beliefs, goals, plans, and past experiences.
- 4) Reasoning:- The reasoning component processes information from the perception module and the knowledge base to make decisions and choose decisions base to make expected to achieve the agent's goals.
- 5) Learning (Adoption): Intelligent agents can learn from experience and adopt their behaviour. Some common types of agents can learn from experience and adopt their behaviour over time.

Some common types of agent used in AI with their applications.

- 1) Reactive agents: These agents make decisions based solely on the current percept. They don't maintain an internal state or model.
- 2) Deliberate agents: Deliberate agents maintain an explicit model of the environment which they use to simulate possible future state and outcomes.
- 3) Model based agents: Model based agents maintain an explicit model of the environment, which they use to simulate possible future state and outcomes.
- 4) Utility based agents: These agents make decisions by evaluating the utility or desirability of different actions and selecting the one that maximizes expected utility.
- 5) Learning agents: Improve their performance over time by learning from experience.



Qn) Outline of process of problem solving by searching.

- 1) Problem formulation : Problem solving agents begin by defining the problem they need to solve this involves identifying the initial state, possible actions or operators available to the agent - the goal state or state that the agent aim.
- 2) problem representation : once the problem is formulated problem solving agent represent it in a suitable formalism such as a state space a graph or a set of logical propositions.
- 3) Search strategy selection : problem solving agents then choose a search strategy to explore the problem space and find solution.
- u) Search process : - Begins the search process from initial state and systematically explore the problem space by applying the chosen search strategy ..
- e) solution reconstruction : once a goal state is reached the problem solving agents reconstruct the solution path by tracing back through the sequence of actions or state that lead to the goal.

example :-

1) Path finding in maze.

problem formulation:- Initial state (starting position in the maze) actions (movement in four directions up, down, left, right) goal state destination in the maze.

2) problem Representation:- state space representation where each state corresponds to a position in the maze.

3) Search strategy:- Depth first search or breadth first search to explore the maze by moving from one position to another, avoiding obstacles until it reaches the goal position.

