Assignment - 1
AI

(Q1)

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

Here's how rationality relates to agent behaviour.

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

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

3) Adaption to changing environments. Environments are often dynamic and rational agents need to adapt thier behaviour. accordingly. This adaption involves continuously updating their beliefs and strategies based on new infomation and strategies.

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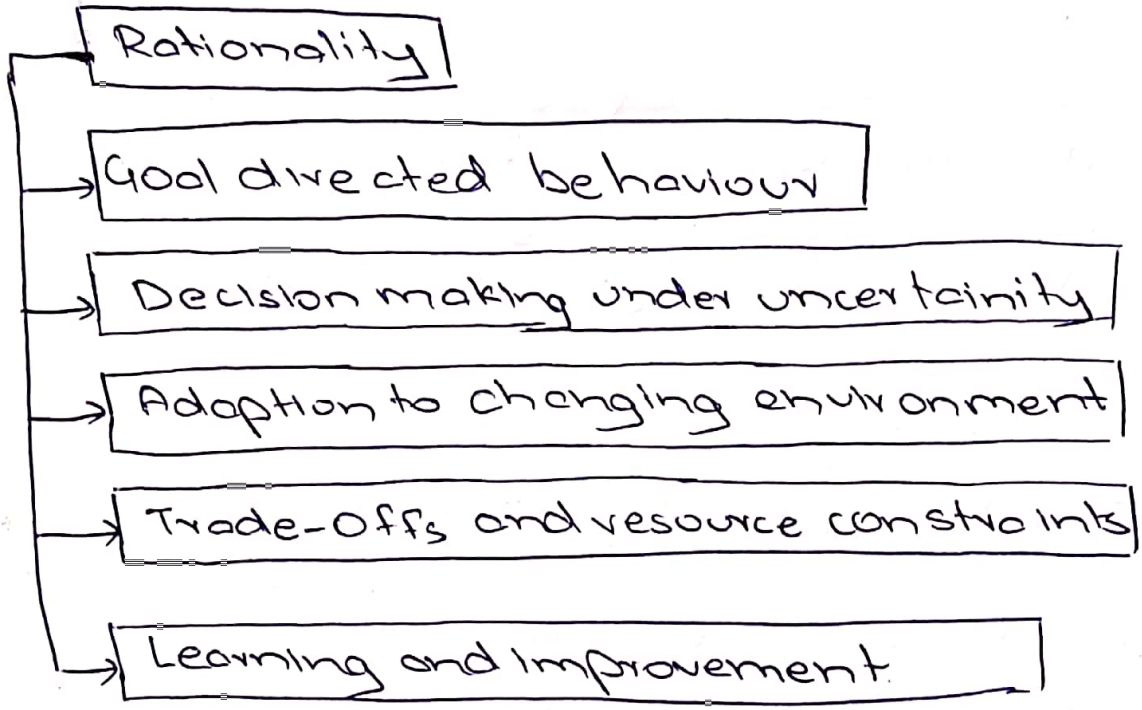
4) Trade offs and resources constraints: Rational agents must often make trade offs due to limited resources such as time energy or expected to yield highest utility or payoff

5) Learning and improvement: Rational learn from past experiences to improve their future decision making. This learning process involves identifying patterns in data adjusting strategies and refining the models of the environment



Q2)

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

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of agents

CHARACTERSTICS	DESCRIPTION	EXAMPLES
Observable	Whether agents have access to complete information about the state of environment	Chess (fully observable) self driving cars (partially observable)
Deterministic	Whether the outcome of action is entirely predictable or if there is randomness or uncertainty in the outcomes	Chess (deterministic) weather forecasting (stochastic)
Episode	Whether each interaction between the agent and the environment is self contained or if there is a sequence of actions and states	Chess (episodic) Maze navigation. (Sequential)
Dynamic	Whether the environment changes over time with response to agent actions or external factors	Financial markets (dynamic) Robotics (dynamic)
Discrete	Whether the state and action spaces are finite or count infinite	Board games (discrete) Robotics (continuous)

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Examples of diff types of environments and challenges they ~~presis~~ present ~~challenges for agents.~~

ENVIRONMENT TYPE	EXAMPLE	CHALLENGES FOR AGENTS.
Board games	Chess, go	Vast search, space, optimal. decision making uncertainty
Robotics	Manufacturing floors	Sensor preception, path. planning, Object manipulation
Natural language processing	Text/speech recognition	Contextual understanding ambiguity resolution

Q3)

The typical components of an intelligent ~~t~~agent include:

1) Perception: This component is responsible for sensing and precieving 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 the environment. It consists of effectors which are mechanisms through which the agent can exert control over influence its surroundings.

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3) knowledge base: This component stores the agent. internal represention of the world including its belief, goals, plans and past experiences. The knowledge base is essential for decision making and guiding the agents behaviour

4) Reasoning: The reasoning component processes information from the preception module and the knowledge base to make decisions and choose decisions that are expected to acheive the agents goals.

5) Learning/Adaption: Intelligent agents can learn from experience and adapt thier behaviour over time. Some common types of agents can learn from experience and adapt their behaviour over time

→ Some common types of agents used in AI with their applications

1) Reactive agents:- These agents make decisions based solely on the current precept. They don't maintain an internal state or model of

2) Deliberate agents: Deliberate agents maintain an explicit model of the environment which they use to simulate possible future states 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

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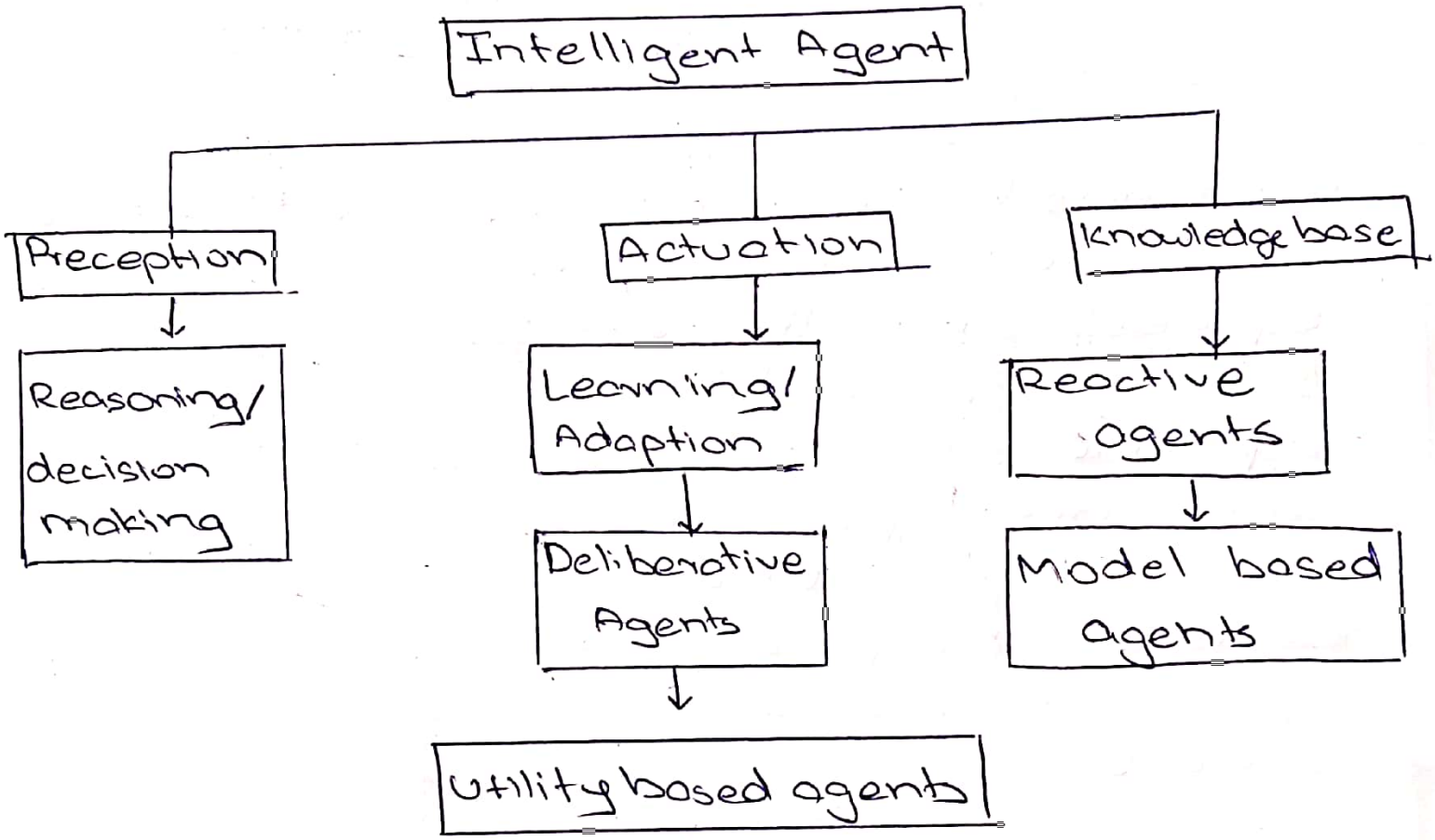
by evaluating the utility or desirability of different actions and selecting the one that maximizes expected utility.

5) Learning agents: Improve their performance over time by learning from experience



Q4)

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, the possible actions or operators available to the agent. the goal state or state that the agent aim.

2) Problem stat representation:- Once the problem is formulated problem solving agents represent it in

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a suitable representation 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 a solution

4) Search process:- Begins the search process from the initial state and systematically explores the problem space by applying the choosen search strategy.

5) 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 states that lead to the goal.

Illustrative 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)

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

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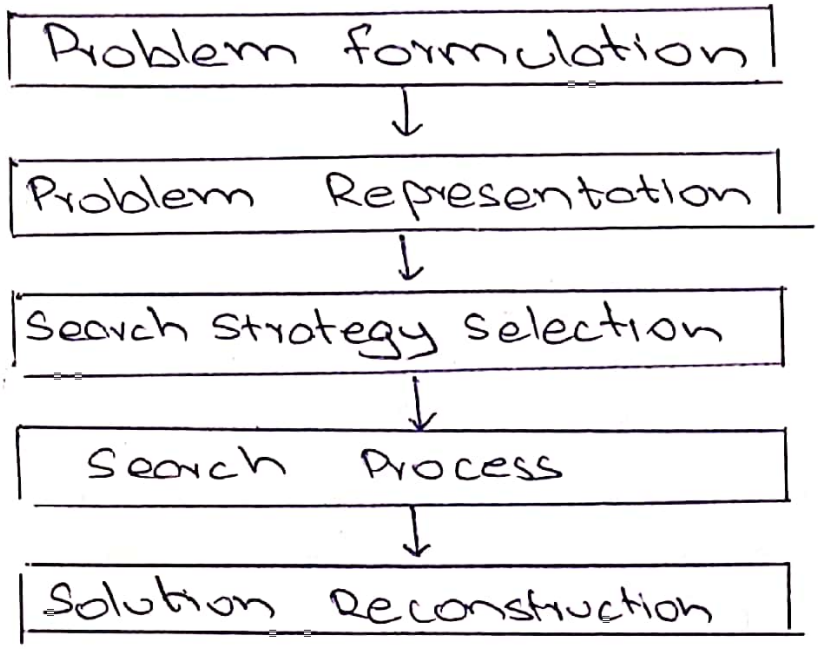

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