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9631 TE COMPS-A

AI

Assignment - 1

Q1] 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 & resources. A rational agent is one that chooses consistency, actions that are optimal or near optimal.

Here's how rationality relates to agent behaviour

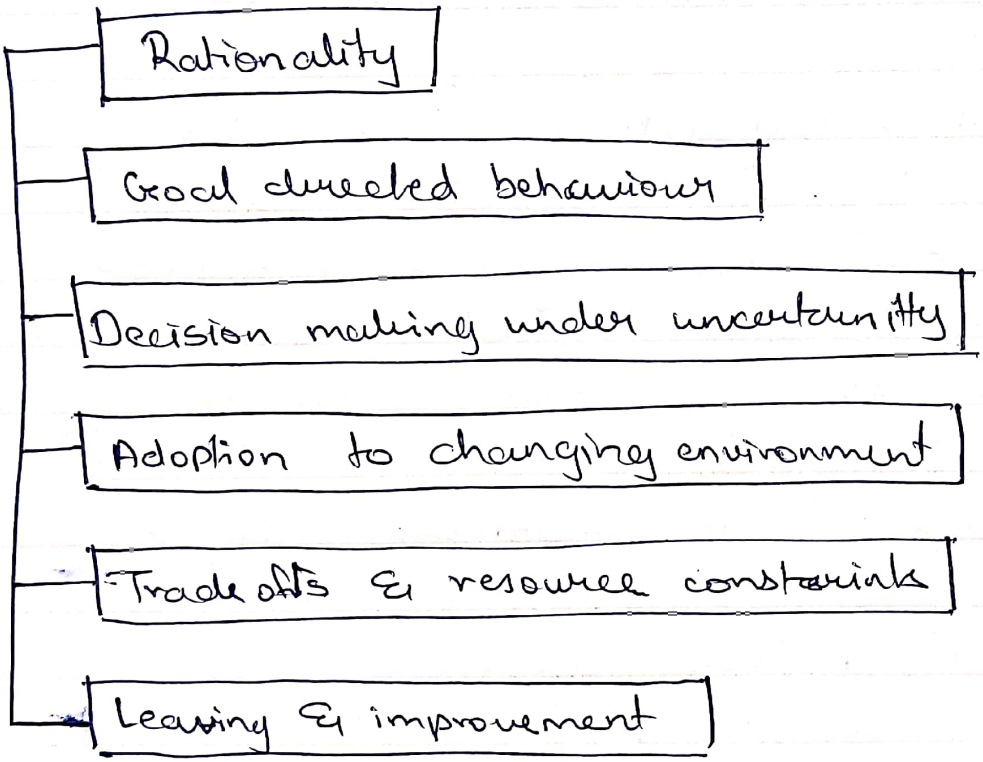
1) Goal directed behavior. Rational agents are driven by goals or objectives they aim to achieve. Their actions are selected based on their assessment of how likely those actions are to bring them closer to their goals.

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

3) Adaptation to changing environments. Environment are often dynamic & rational agents need to adapt their behaviour accordingly. This adaptation involves continously updating their belief & strategies based on new information & feedback etc.

4) Trade offs & 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 & improving : Rational learn for past experiences to improve their future decision making. this learning process involves identifying patterns in data adjusting strategies & refining the models of the environments



Q.2] The nature of environment in which intelligent agents operate varies widely depending on application domain. There are several key characteristics that define an environment & significantly influence the design and behaviour of agents.

CHARACTERISTICS	DESCRIPTION	EXAMPLES.
Observable	whether agents have access to complete information about the state of environment	Chess (full observation 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)
Episodic	whether each interaction between the agent & the environment is self contained or if there is a sequence of actions & states.	chess (episodic) maze navigation (sequential).
Dynamic	whether the environment changes over time with response to agent actions or external factors.	financial markets (dynamic), Robotic (dynamic)
Discrete	whether the state & action spaces are finite or cant infinite	Board games (discrete etc) Robotics (continuous).

Example of diff types of environments & challenges they present

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 understanging ambiguity resolution.

Q.3)

The typical components of an intelligent agent includes:-

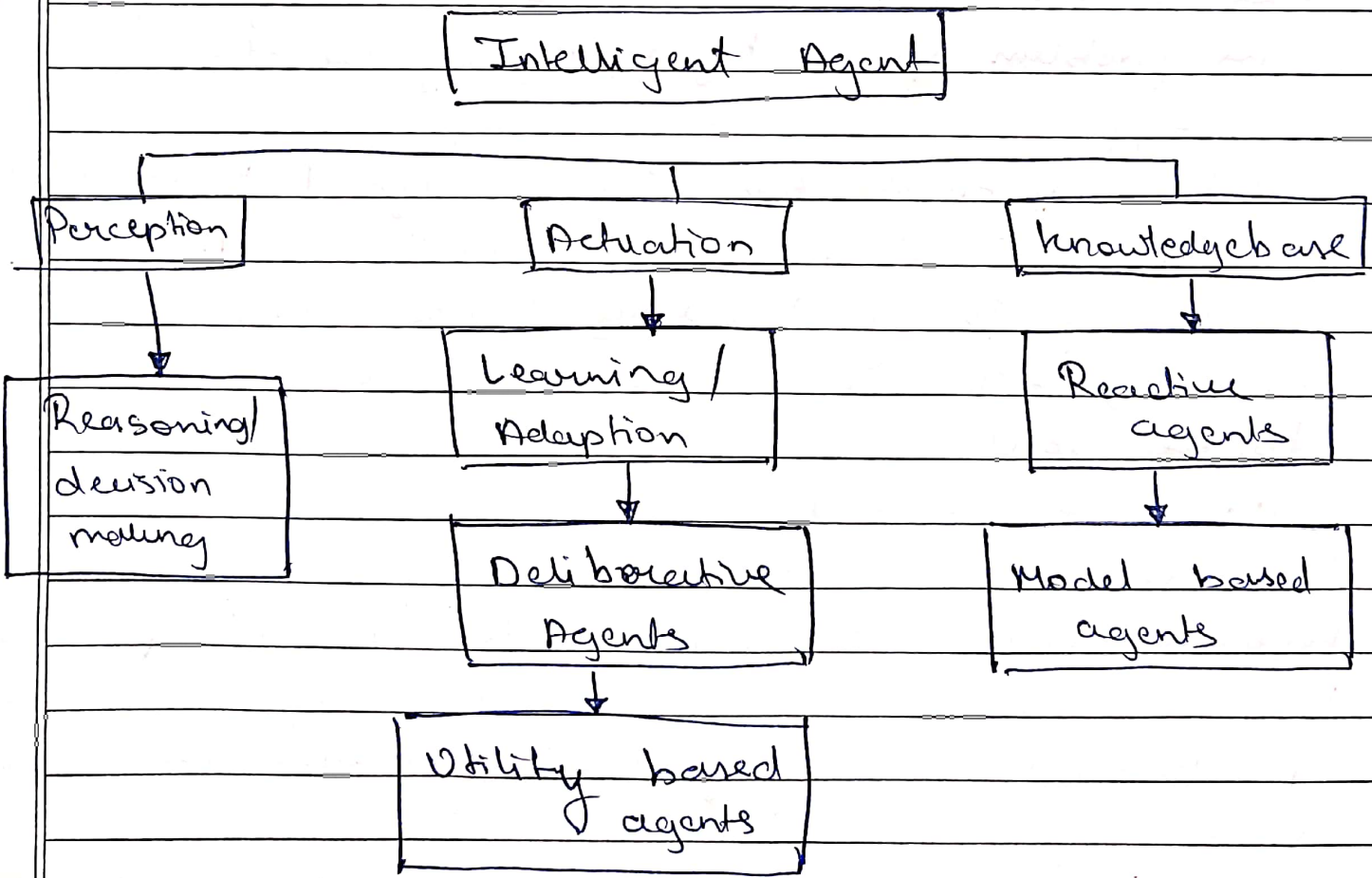
1) Perception:- This components is responsible for seeing & precieving the environment. It gathers information from sensors which would be physical sensors like camera & microphones in robotics or abstract sensors like data input in softwares agents.

2) Actuation :- The actuation components stores the agents to interact with the environment. It consists of effects which are mechanisms through which the agents can exert control over influence its surroundings.

3) Knowledge base:- This component stores the agent internal representation 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 components processes info from the perception module & the knowledge base to make decisions and choose decisions that are expected to achieve the agent goals.

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



Q.4) 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 aims.

(2) Problem representation: Once the problem is formulated problem solving agents represent it with 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 & find a solution

(4) Search process. Begins the search process from the initial phases & systematically explores the problem space by applying the chosen search strategy.

(5) Solution reconstruction: Once a goal is reached the problem solving agent reconstructs 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 (movements in four direction up, down, left, right) goal state destination in the maze)

problem representation : state space representation where each state corresponds to a possible 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 positions.