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9S27 TE COMPS - A

ASSIGNMENT - I AZ

Q1. Rationality in the context of intelligent agents refers to the ability of an agent to make decisions that maximize its expected utility based on available information and its goals.

An agent is considered rational iff it chooses actions that lead to the best outcomes given its knowledge and objectives. Rational behaviour doesn't necessarily guarantee optimal results but rather aims to achieve the best possible outcomes given the constraints and uncertainties of the environment.

For Example:- consider a self-driving car navigating through traffic. A rational self-driving car would make decisions such as changing lanes or slowing down based on traffic conditions, road rules, etc. It's objective of reaching the destination safely and efficiently. Even though it may not always choose the perfect action, it can still select actions that improve its chance of reaching the goal.

Rationality

- Good directed behaviour
- Decision Making under uncertainty
- Action changing environment
- Trade-offs and resource constraints
- Learning and Improvement

Q2 Environments which intelligent agents operates can vary widely in terms of complexity, determinism, observability, determinism. However there are several key domains that define an environment and 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 (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 (episode) Maze navigation (sequential)
Dynamic	Whether the environment changes overtime with response to agent actions or external factors.	Boat Financial markets (dynamic) Robotics (dynamic)

Discrete	Whether the state and action spaces are finite or countless	Board games (discrete) Robotics (continuous)

Examples of diff types of environments and challenges they present.

ENVIRONMENT TYPE	EXAMPLES	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

(3) The typical components of an intelligent agent include:-

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 the environment. It consists of effectors which are mechanisms through which the agent can exert control over influence its surroundings.

3) Knowledge base :- This component stores the agent internal representation of the world including it's beliefs, goals, plans and past experiences. The knowledge base is essential for decision making and guiding the agent's behaviour.

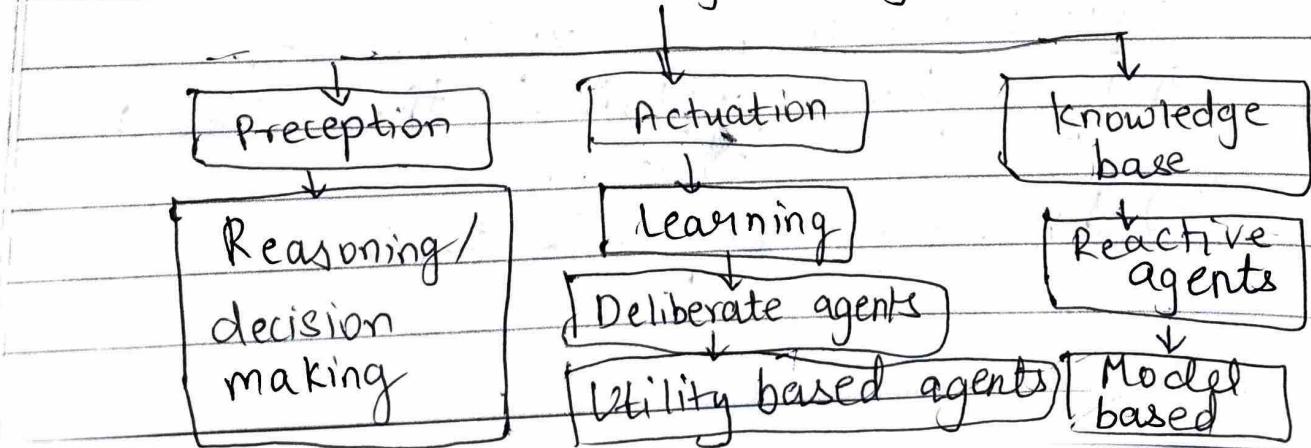
4) Reasoning :- The reasoning component processes information from the perception module and the knowledge base to achieve the agent's goals.

5) Learning / adaptation :- Intelligent agents can learn from experience and adopt their behaviour over time.

→ Some common applications of agents are 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.
- 2) Deliberate agents :- Deliberate agents maintain an explicit model of the environment which they use to stimulate possible future states and outcomes.
- 3) Model based agents :- Model based agents maintain an explicit model of the environment which they use to stimulate possible future states and outcomes. These agents make decisions by evaluating the utility or desirability of different actions and selecting the one that maximises expected utility.
- 5) Learning agents :- Improve their performance overtime by learning from experience

Intelligent agent



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 aims.
- 2) Problem representation :- Once the problem is formulated problem solving agents 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 a solution.
- 4) Search process:- Begins the search process from the initial state and systematically explores the problem space by applying the chosen search strategy
- 5) Problem representation:-

| Illustrative Example:-

- 1) Pathfinding in maze
- 2) Problem formulation:- Initial state (Starting position in the maze), actions (movement in four directions - up, down, left, right), goal state (destination in the maze)
- 3) Problem representation: State space representation where each state corresponds to a position in the maze.
- 4) 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

