AI assignment 1

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① Rationality in Intelligent Agents: Rationality in context of intelligent agents refers to the ability of an agent to make decisions that maximize the expected utility to achieve its agents goals given the available information and resources. A rational agent is one that consistently chooses the best action or sequence of actions from among the available options to achieve its objectives.

② Relation to Agent Behavior: Rationality is closely related to the behavior of agents in their environments in the sense that rational agents will adapt their behaviour based on feedback from their enviroment to improve their decision making process past experience, updating beliefs based on new information, and adjusting strategies to better align with goals.

eg: Chess playing AI: In chess game an AI agent aims to win the game. It evaluates different possible moves based on factors like the current board state, opponent's potential responses, and its own long-term strategy. The agent selects the move that it believes maximizes its chances of winning, demonstrating rational behaviour.

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① Percept: An environment provides perceptual input to the agent, which includes any information the agent can obtain through its sensors.

② Actions: Agents interact with their environment by executing actions. The set of possible action an agent can take depends on the environment dynamic.

③ State space: The state space represents all possible configurations of the environment.

④ Dynamicity: Environment can be static or dynamic, meaning they may or may not change over time.

⑤ Determinism Vs Stochasticity: Environment can be deterministic (where actions leads to predictable outcomes, or stochastic, where outcomes are influenced by random factors.

⑥ Accessibility of Information: Some environments provide agents with complete information about their state and the consequences of actions, while others only offer partial or incomplete information ~~transient~~

⑦ Spatio-temporal characteristics: Environments can have spatial and temporal attributes that influences agent behaviour.

eg-> Stock Market: The stock market is a dynamic, stochastic environment with partial observable information. Agents must analyze market trends, news and economic indicators information about buying, selling or holding stocks.

(3) Structure of Intelligent Agent

(a) Perceptual Component - This component enables the agents to percieve its enviroment through sensors, capturing relevant information

(2) Knowledge :- The agent possesses a knowledge base or memory where it stores information about the enviroment, past experience and learned behaviour

(3) Decision Making component - This component processes perceptual input and knowledge to make decisions and select actions

(4) Action Component - Based on the decision made, the agent executes actions in the enviroment through actuations or effectors

Types of Intelligente agent :-

(1) Reactive agents - These agents responds directly to enviromental stimuli without maindaining an indernal state or memory

(2) Deliberative Agents - These agents employ indernal models of the enviroment, reasoning, and planning to make decisions

(3) Learning Agents - These agents improve their performance over time through learning the experimence

(4) Hybrid Agent - These agents combine characteristics of multiple types, leveraging reactive, deliberative and learning approaches as needed.

(4) (a) Role of Problem-Solving Agents.

1) Problem Solving agents identifying and solve problems do acheive their goals

2) They analyze the current state, goal state, and possible actions to reach the goal.

3) Problem-solving agents employ various search algorithm to explore the space of possible solutions efficiently

(b) Foundation of problem

1) This formation provides a structural representation of the problem enabling agents to analyze and solve it systematically

2) Problems are formulated by defining the initial state, goal state, actions, and condaints

(c) Analyzing and Approaching Problems :-

1) Problem solving agents analyze the problem space to understand its structure, constraints, and possible solutions.

2) They employ heuristics, domain knowledge and problem-specific strategies to guide the search process effectively

3) Agents may decompose complex problems into smaller sub-problems to easier resolution

(d) Methods used for searching solution:-

1) Unidormed Search :- Agents explore the problem space systmac cally without considering domain-specifi c Knowledge.

2) Informed Search :- Agents use domain-specific knowledge or heuristics to guide the search towards promising solutions

3) Local search :- Agents : Iteratively improve candidate solutions by making small modifications.

(e) Illustrative Examples

1) Routing Planing :- In navigation systems, problem-solving agent search for the shortest path betwe two locations on a map.