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Rationality refers to ability of an agent to make decisions that maximize its expected utility or achieve its goals given available info & resources

② Rationality is about making best possible decisions given circumstances even if those decisions are not always perfect

③ Rationality refers to behaviour of agents in env by guiding them to select actions that lead to desirable outcomes/goals

④ An agent is considered rational if consistently chooses actions that expected to max utility or attain obj

⑤ Eg:- A chess-playing agent

A rational chess playing agent would choose moves that are expected to lead to victory or at least avoid defeat

It evaluates potential moves based on its understanding of game state & selects to one that maximizes its chance of winning.

- In a self-driving car rationality involves making decisions that prioritize safety & efficiency. The car must navigate through traffic, obey traffic rules & avoid accidents

- Reach destination in timely manner. A rational self-driving car would choose routes & driving behaviours

0.2]

- The nature of environments in which intelligent agents operate is diverse & can vary greatly depending on factors such as complexity, dynamics, observability
- Complexity :- Environments can range from simple, deterministic env with a few states & actions to complex stochastic env with countless possible states & actions
 - Dynamics :- Env may be static, where the agents' actions do not change the state or dynamic, where the env involves
 - Observability :- Env can be fully observable where agents have access to complete info about current state or partially observable where agent has limited or incomplete info
 - Determinism :- Env may be deterministic where the outcome of an action is fully determined by current state & action taken or stochastic where there is uncertainty
 - Episodicity :- Env may be episodic where each action leads to immediate reward & resets env to initial state

Eg :- Stock Market :-

A stochastic partially observable sequential env with high complexity. Agents may analyze historical data & predict future.

2) Robot nav :- A dynamic observable sequential env with moderate complexity. Agents need to perceive surrounding through sensors.

Q.3]

→ Intelligent agent in A.I typically consist of 5 main components

- i) Perception : This component involves sensing the environment using sensors to gather info. It's about how an agent perceive surrounding
 - ii) Reasoning : Agents use reasoning mechanism to make decisions & plan actions based on info they have gathered. This involves processing & analyzing data to come up with solutions or responses
 - iii) Actuation
Actuation : Once a decision is made the agent must act upon. Actuators are mechanisms through which agent interacts with env to carry out actions
 - iv) Knowledge : Agents possess knowledge or info about environment themselves & the tasks, they need to perform. This knowledge can be pre-defined learned or inferred.
 - v) Learning : Intelligent agents can improve their performance over time through learning mechanisms. This involve acquiring good knowledge adapting strategies or optimize
- Types of intelligent agents include
- Simple reflex agents : These agents take actions based solely on current percept without considering history of past percepts. An eg is thermostat
 - Model Based Reflex :- They maintain an internal model of env & use it to make decisions. For eg vacuum cleaner robot that use a map of room to decide where to clean.

- 3) Goal Based Agents - These agents have goals or objectives that they aim to achieve & take actions to move towards goals.
- 4) Utility Based Agents - They evaluate desirability of various actions based on utility function & choose the actions that maximizes expected utility. A personal assistant app that schedules tasks based on user preferences.
- 5) Learning Agents :- These Agents improve performance over time through learning from exp. Eg include recommendation systems that learn user preference from interaction.

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→ A Role of p.s agents

- ① Problem solving agents operate independently making decisions & taking actions to achieve desired goals without human.
- ② These agents are designed to efficiently explore & navigate problem spaces to find optimal solutions.
- ③ P.S agents can adapt to changes in their env or domain adjusting strategies to accommodate new info or constraints.
- ④ They can handle a wide range of problem types & complexities from simple puzzles to complex real-world scenarios.

2) Formulation of problems

- ① It involves abstracting real-world scenarios into formal rep that can be understood & processed by p.s agents.
- ② Problems are rep in way that captures essential elements such as initial states, goal states action.
- ③ Formulating problems provides a structured approach to p.s,

3) Methods used for searching solutions

① Uninformed search: Agents explore the problem space systematically without consideration of domain specific knowledge.

eg BFS, DFS

② Informed search Agents use domain specific knowledge or heuristics to guide search towards promising solutions

eg A^* search

③ Local search agents - Agents iteratively improve candidate solutions by making modifications

4) eg

- Routing Planning: In navigation systems, p.s agents search for shortest path b/w two locations & analyze road network consider traffic conditions & employ algo like A^*

- Puzzle Solving: In games like sudoku or Rubik's cube agents aim to find solutions satisfying certain constraints. They analyze initial state explore moves

⑤ Automated planning: In robotics or automated systems p.s agents plan seq of actions to achieve desired outcome. They analyze env consider constraints & employ planning algo like POA to generate actions sequences