**T.E. (Computer Sem VI)Assignment -1** Artificial Intelligence (CSC604)

 Student Name: _Gaurav Mishra          Roll No:9557

**CO  Addressed:–CSC604.1 -To conceptualize the basic ideas and techniques underlying the design of intelligent systems.**

## Assignment 1:

1.  Explain the concept of rationality in the context of intelligent agents. How does rationality relate to the behavior of agents in their environments? Provide examples to illustrate your explanation.

2.  Discuss the nature of environments in which intelligent agents operate. What are the key characteristics that define an environment, and how do they influence the design and behavior of agents? Provide examples of different types of environments and the challenges they present to agents.

3.  Describe the structure of intelligent agents and the types of agents commonly used in artificial intelligence. What are the components of an agent, and how do they interact to achieve intelligent behavior? Provide examples of different types of agents and their applications in real-world scenarios.

4.  Outline the process of problem-solving by searching, including the role of problem-solving agents and the formulation of problems. How do problem-solving agents analyze and approach problems, and what methods do they use to search for solutions? Illustrate your explanation with examples of problem-solving tasks and the strategies employed by agents to solve them.

## Rubrics for the  First Assignments:

| Indicator | Average | Good | Excellent | Marks |
|---|---|---|---|---|
| **Organization (2)** | Readable with some missing points and structured (1) | Readable with improved points coverage and structured (1) | Very well written and fully structured | |
| **Level of content(4)** | All major topics are covered, the information is accurate (2) | Most major and some minor criteria are included. Information is accurate (3) | All major and minor criteria are covered and are accurate (4) | |
| **Depth and breadth of discussion and representation(4)** | Minor points/information maybe missing and representation isminimal (1) | Discussion focused on  some points and covers themadequately (2) | Information is presented indepth and is accurate (4) | |
| **Total** | | | | |

|  |  |  |  |  |
|---|---|---|---|---|
|  |  |  |  |  |

**Signature of the Teacher**

while stochastic environments involve randomness.

3) Episodic vs. sequential: In episodic environments, each action's outcome depends only on the current episode, whereas in sequential environments, actions affect future states.

4) Static vs. dynamic: Static environments do not change while the agent is deliberating, while dynamic environments may change unpredictably.

Examples:

① A chess is a deterministic, fully observable, and sequential environment
② A stock market is stochastic, partially observable and dynamic.
③ A maze-solving robot operates in a partially observable, deterministic, and sequential environment.

3]

→ Intelligent agents typically consist of several components:
① Perception: Gathering information about the environment through sensors.
② Knowledge-base: Internal representation of the world, including past experiences and domain-specific knowledge.
③ Decision-making: Process of selecting actions based on available information and goals.
④ Actuators: Mechanisms through which the agent interacts with the environment.

② Types of agents:

① Reactive agents: React to the current state of the environment without maintaining an internal state or memory.
② Deliberative agents: Use internal representations to plan actions based on anticipated future states.
③ Learning agents: Improve their performance over time through experience and adaptation.

play the game

Gaurav Mishra 9557 AI - Assignment - 1

1]

→ 1. Rationality in Intelligent Agents:

(i) Rationality in the content of intelligent agents refers to the ability of an agent to make decisions that maximize its expected utility or achieve its goals in a given environment.

(ii) A rational agent is one that acts in a way that is most likely to achieve its intended objectives, given its perception of the world and its internal knowledge and capabilities.

For example:

(i) In a chess playing agent, rationality would involve selecting moves that maximize the probability of winning the game.

(ii) In a self driving car, rational behaviour would entail following traffic rules and avoiding accidents to reach the destination safely and efficiently.

2]

(i) Environments in which intelligent agents operate can vary widely in their characteristics which significantly influence the design and behaviour of agents.

(ii) Key characteristics defining environments include:

(1) Observable vs. partially observable: An environment is observable if an agent can directly observe the complete state, while it's partially observable if the agent has limited or complete information.

(2) Deterministic vs. stochastic: Deterministic environments have outcomes completely determined by their current state and the agents choices.

... nal play, the game will always

Examples:

① A reactive vacuum cleaner that responds to dirt detection immediately without planning.

② A deliberative route-planning system that considers traffic conditions and long term goals to find the most efficient route.

③ A learning algorithm that improves its chess-playing strategy by analyzing past games.

4]

① Problem solving agents analyze problems by defining states, actions, transition models and goals.

② They employ various search algorithms to explore the space of possible solutions and find an optimal or satisfactory solution.

Steps in problem solving by searching:

① Formulation: Defining the problem by specifying the initial state, actions transition model, goal test and path cost.

② Search: Exploring the state space to find a sequence of actions leading from the initial state to a goal state.

③ Solution: Extracting a solution path from the search tree or graph.

Strategies employed:

① Breadth-first Search: Expands all nodes at a given depth before moving to the next level.

② Depth-first Search: Explores as far as possible along each branch before backtracking.

③ Heuristic Search: Uses domain-specific knowledge to guide the search towards promising areas of state space.