Practical 1: Write a Program to Conduct Uninformed and Informed Search

Understanding the Concepts: Before performing this practical, let's understand the key concepts of informed and uninformed search.

1. Uninformed Search

- Uninformed search is when you have no additional information or clues about where the goal might be.

- The search is conducted blindly, exploring all possible paths until the goal is found.

- **Analogy:** It's like searching for hidden treasure on an island with no map or hints—you wander around randomly until you (hopefully) find it.

2. Informed Search

- Informed search leverages additional information, such as hints or guiding estimates (known as heuristics), to narrow down the search efficiently.

- **Analogy:** It's like searching for hidden treasure on an island, but you have a partial map or clues guiding you to the right location, saving time and effort.

Examples of Uninformed and Informed Search

Uninformed Search (BFS/DFS):

- **Breadth-First Search (BFS):** Expands nodes level by level, ensuring all nodes at the current distance are visited before moving to the next.

- **Depth-First Search (DFS):** Explores one branch deeply before backtracking to explore others.

Informed Search (A Search Algorithm):*

- *A Algorithm:** Combines:

   o The cost from the start node to the current node (known as path cost).

   o An admissible heuristic that estimates the cost to the goal.

- **Result:** Guides the search towards the goal more directly and efficiently.

Graph Example for Demonstration

Graph Setup:

- The graph consists of nodes connected by edges. Each edge has a cost, and the goal is to find the shortest path to a target node.

Search Behavior:

1. **BFS (Uninformed Search):**

   o Explores all nodes level by level without any additional guidance.

2. *A (Informed Search):**

   o Uses the heuristic function to prioritize the nodes that are more likely to lead to the goal, saving time by avoiding unnecessary paths.

Prerequisites for This Practical

Before writing the program, ensure you understand:

- **Data Structures Used:**

  o **Stack:** Used in DFS for maintaining nodes to explore next.

  o **Queue:** Used in BFS for level-by-level exploration.

- **Search Algorithms:**

  o **DFS:** Depth-First Search

  o **BFS:** Breadth-First Search