Department of AI & DS

23AD2001O - Artificial Intelligence and Machine Learning

2024-25 Even Sem

ALM-2 One Minuet writeup

1. Write bi-directional search algorithm with advantages and disadvantages with this model.

Bi-Directional Search Algorithm

Bi-directional Search is a graph search algorithm used to find the shortest path from a start node to a goal node. It works by simultaneously searching forward from the start node and backward from the goal node, trying to meet in the middle. The algorithm reduces the time complexity of the search by effectively halving the search space.

Steps:

1. **Initialize:**

    • Start and goal nodes, two queues (one for each direction), and sets for visited nodes.

2. **Search:**

    • Expand nodes from the start and goal simultaneously, marking visited nodes.

3. **Meeting Point:**

    • If both searches meet at a common node, reconstruct the path from start to goal.

Advantages:

- **Time Efficiency:** Reduces time complexity from $O(b^d)$ to $O(b^{d/2})$.

- **Effective for large graphs** with a known goal.

Disadvantages:

- **Space Complexity:** Requires storing two sets of visited nodes.

- **Implementation Complexity:** More complex than unidirectional search.

- **Limited Applicability:** Works best with known goals and unweighted, undirected graphs.