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Project Proposal: 8-Puzzle Problem

1. Selected Problem

The selected problem for this project is the 8-Puzzle problem. It consists of a 3x3 grid containing tiles numbered 1 through 8 and one empty space. The goal is to reach a predefined target State by sliding tiles into the empty space.

2. Planned Algorithms

Breadth-First Search (BFS)

Guarantees the shortest path but may require significant memory due to storing many states.

Depth-First Search (DFS)

Very memory efficient but does not guarantee finding the optimal solution. May go deep into irrelevant paths.

Uniform Cost Search (UCS)

Explores nodes based on path cost and guarantees optimality when costs are uniform.

Iterative Deepening Search (IDS)

Combines the optimality of BFS with the memory efficiency of DFS by gradually increasing depth.

A* Search with Manhattan Distance

Uses heuristic-based evaluation. Expected to be the most efficient algorithm for this project.

Hill Climbing

A heuristic-based method that moves toward better states but may get stuck in local optima.

3. Initial Thoughts and Expectations

- Algorithms like BFS, UCS, and A* are expected to produce optimal solutions.
- A* with Manhattan distance will likely outperform the other algorithms in both speed and efficiency.
- DFS and Hill Climbing may fail to find a solution or get stuck depending on the configuration.
- IDS is a good compromise between BFS and DFS but may still require more time due to repeated deepening.
- The project will use these algorithms to solve the mentioned problem.