AIML PROJECT

**Title: Simulation of 8-Puzzle Game**

**Abstract:**

The 8-Puzzle game is a well-known problem in artificial intelligence that involves arranging eight numbered tiles on a 3x3 grid in sequential order by sliding them into an empty space. This project aims to simulate the 8-Puzzle game using various search algorithms, including uninformed techniques like Breadth-First Search (BFS) and Depth-First Search (DFS), as well as informed search methods such as A\* and Greedy Best-First Search. By converting the puzzle into a game tree, each node represents a possible tile arrangement, and the algorithms explore these nodes to find the optimal solution. Heuristic functions, such as the Manhattan distance and Misplaced Tiles count, are used to guide the search process efficiently, reducing the number of states examined and speeding up the solution discovery.

The project provides an in-depth analysis of each algorithm’s performance, comparing their efficiency in terms of time complexity, space usage, and solution quality. It highlights the effectiveness of heuristic-based searches in solving combinatorial problems by demonstrating how these methods outperform traditional exhaustive search techniques. This simulation serves as an educational tool for understanding the strengths and limitations of different search algorithms and offers insights into their practical applications in problem-solving tasks. The 8-Puzzle game is not only a stepping stone for learning search strategies but also a foundation for exploring more complex applications in areas such as robotics, optimization, and automated planning systems.

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