Definition:

- A problem-solving technique that utilizes heuristics (rules of thumb or educated guesses) to guide the search process towards a solution.
- Aims to find a good solution efficiently, but not necessarily the optimal one.

Types of Heuristic Search:

1. Direct Heuristic Search:
    - Has knowledge of the goal state.
    - Uses this knowledge to estimate the distance or cost to the goal.
    - Examples:
        - A* Search: Combines cost to reach the node (g) and estimated cost to goal (h') to find the shortest path.
        - Greedy Best-First Search: Expands the node closest to the goal based on the heuristic.
2. Weak Heuristic Search (Uninformed Search):
    - No additional information about the goal state.
    - Explores the search space systematically.
    - Examples:
        - Breadth-First Search (BFS): Explores layer by layer.
        - Uniform Cost Search (UCS): Expands the node with the lowest cost.
        - Depth-First Search (DFS): Explores as deeply as possible along each branch.
        - Iterative Deepening Depth-First Search (IDDFS): Combines DFS with iterative deepening.
        - Bidirectional Search: Searches from both the start and goal states

simultaneously.

Key Concepts:

- Heuristic Function: Estimates the cost to reach the goal from a given state.
- Admissibility: A heuristic is admissible if it never overestimates the actual cost to the goal.
- Efficiency: Heuristic search aims to find a good solution quickly.
- Completeness: A search algorithm is complete if it is guaranteed to find a solution if one exists.

Advantages of Heuristic Search:

- Can be more efficient than uninformed search.
- Can find good solutions even for complex problems.

Disadvantages of Heuristic Search:

- May not always find the optimal solution.
- The effectiveness depends heavily on the quality of the heuristic function.

Applications:

- Robotics
- Pathfinding and navigation
- Game playing
- Machine learning
- Optimization problems

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