**Session 2025-2026**

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| **Vision:** Dream of where you want. | **Mission:** Means to achieve Vision |

**Program Educational Objectives of the program (PEO):** (broad statements that describe the professional and career accomplishments)

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| PEO1 | **Preparation** | **P: Preparation** | **Pep-CL abbreviation**  **pronounce as Pepsil easy to recall** |
| PEO2 | **Core Competence** | **E: Environment (Learning Environment)** |
| PEO3 | **Breadth** | **P: Professionalism** |
| PEO4 | **Professionalism** | **C: Core Competence** |
| PEO5 | **Learning Environment** | **L: Breadth (Learning in diverse areas)** |

**Program Outcomes (PO):** (statements that describe what a student should be able to do and know by the end of a program)

**Keywords of POs:**

Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

**PSO Keywords:** Cutting edge technologies, Research

“I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life.” *to contribute to the development of cutting-edge technologies and Research*.

**Integrity:** I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

**Name and Signature of Student and Date**

(Signature and Date in Handwritten)

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| **Session** | **2025-26 (ODD)** | | **Course Name** | **AI Lab** | |
| **Semester** | **5** | | **Course Code** | **23ADS1502** | |
| **Roll No** | **36** | | **Name of Student** | Chaitanya Awale | |
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| Practical Number | | **03** | | | |
| Course Outcome | | CO1: Develop an understanding to identify appropriate performance measures and environment models for intelligent agents.  CO2: Apply various search algorithms for goal-based problem solving and planning in deterministic and non-deterministic environments.  CO3: Construct and apply appropriate knowledge representation models for logical inference.  CO4: Analyze and solve problems under uncertainty using probabilistic models and decision-theoretic reasoning | | | |
| Aim | | Shortest Path Using Greedy Best-First Search | | | |
| Problem Definition | | An AI agent must reach the goal cell on a grid as fast as possible. The agent uses a Greedy Best-First Search strategy — always choosing the cell that looks closest to the goal using a Manhattan distance heuristic. | | | |
| Theory  (100 words) | | Greedy Best-First Search (GBFS) is an informed search algorithm that expands the node that appears closest to the goal, using a heuristic function. The heuristic estimates the cost from the current node to the goal, without considering the cost already traveled. In this problem, we use the Manhattan distance heuristic, which is suitable for grid-based pathfinding since movement is limited to horizontal and vertical directions. GBFS is not guaranteed to find the shortest path because it does not consider past costs, but it often works faster than exhaustive searches by focusing directly on states nearer to the goal. | | | |
| Procedure and Execution  (100 Words) | | **Procedure**: The algorithm begins by inserting the start cell into a priority queue, prioritized by Manhattan distance to the goal. At each step, the cell with the lowest heuristic value is chosen for expansion. Its valid neighbors (up, down, left, right) are added to the priority queue if they are not visited and not obstacles. A dictionary tracks parent nodes for path reconstruction. When the goal cell is reached, the algorithm backtracks from goal to start using the parent map. Finally, the discovered path is marked on the grid to visualize the agent’s traversal guided purely by the heuristic. | | | |
| **Execution** : The 5x5 grid has start **S** at (0,0) and goal **G** at (4,4), with obstacles marked as **#**. The algorithm applies Manhattan distance to prioritize cells closer to the goal. It continuously selects the next cell appearing nearest to the goal until the destination is reached. Using the came\_from mapping, the path is reconstructed. The final path is displayed as a list of coordinates and visualized on the grid by marking traversed cells with \*. This demonstrates how GBFS quickly navigates toward the goal, though it may not always yield the globally shortest path compared to A\*. | | | |
| **Output:**  Path found by Greedy Best-First Search:  [(0, 0), (0, 1), (0, 2), (0, 3), (0, 4), (1, 4), (2, 4), (3, 4), (4, 4)]  Grid with path marked (\*):  S \* \* \* \*  # # . # \*  . . . # \*  . # # # \*  . . . . G | | | |
| Output Analysis | | The output shows the path discovered by Greedy Best-First Search (GBFS) on the 5x5 grid. The algorithm successfully guides the agent from the start cell S (0,0) to the goal G (4,4) by continuously choosing cells that appear closest to the goal based on Manhattan distance. The path traced is marked with \* on the grid, showing a direct top-row traversal and then moving downward along the rightmost column. While the solution reaches the goal efficiently, it is not guaranteed to be the shortest path in all cases. This highlights GBFS’s strength in speed but limitation in optimality. | | | |
| Link of student Github profile where lab assignment has been uploaded | | **https://github.com/23070962-Aman/AIDS\_5th\_Sem\_AI\_Lab/blob/main/Practical\_3\_AI%20(1).ipynb** | | | |
| Conclusion | | Greedy Best-First Search efficiently finds a path using heuristics, reaching the goal quickly, but it sacrifices guaranteed optimality compared to algorithms like A\*. | | | |
| Plag Report (Similarity index < 12%) | |  | | | |
| Date | | **24/09/2025** | | | |