SIIMA DIANA 2023-B291-12710

**Problem Solving with Algorithms**

**1. Maze Problem (5x5 Grid)**

**a) Problem Definition**

**Start State:** The agent begins at the top-left corner of the grid. And the cell is (0, 0).

**Goal State:** The agent must reach the bottom-right corner of the grid. And the cell (4, 4).

**Possible Actions:** From any given cell (x, y), the agent can attempt to move in the four primary directions, provided the target cell is not blocked and exists within the grid boundaries as shown below.

Move Up to (x-1, y)

Move Down to (x+1, y)

Move Left to (x, y-1)

Move Right to (x, y+1)

**b) Sample 5x5 Maze Diagram**

The maze is represented as a grid where:

S = Start

G = Goal

0 = Free cell (traversable)

# = Blocked cell (wall, non-traversable)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 |
| 0 | S | 0 | 0 | # | 0 |
| **1** | # | # | 0 | # | 0 |
| **2** | 0 | 0 | 0 | # | 0 |
| **C** | 0 | # | # | 0 | 0 |
| **4** | 0 | 0 | 0 | 0 | **G** |

#### ****c) BFS Solution****

**How BFS Works:**  
Breadth-First Search (BFS) is another fundamental search algorithm used to explore nodes and edges of the graph.it runs with a time complexity of 0(V+E) and is often used in the building block in other algorithm.

Where by It uses a **queue** (First-In, First-Out) data structure to track which node to visit next. up on reaching a new node the algorithm adds it to the queue to visit it later.

**Modeling the City as a Graph for Ambulance Dispatch**

**State Space**: Grid coordinates (x, y) representing intersections.

**Actions**: Move to adjacent grid points (up, down, left, right) if within bounds and not blocked.

**Goal State**: Specific coordinates of the emergency location.

**Path Cost**: Sum of edge weights (travel time in minutes), incorporating traffic multipliers.