Lab Task # 03

Instructor: Muhammad Ismail   Marks: 10 marks

Instructions:
1. Deadline **2:20 pm, 06-02-2025**.
2. No task will be accepted after deadline.
3. Plagiarism will result in zero marks.
4. Task submission and demo are compulsory, otherwise zero marks will be given.
5. If there is an issue with the file, such as it being empty or corrupted, it will result in zero marks.

Simple Reflex Agents

Task 1:

Marks: 5

Design a simple reflex agent, that waters plants efficiently in a greenhouse.

Task Description:

- **Environment**:
  - A 3x3 grid where each cell contains plants (Dry/Wet).
- **Percepts**:
  - The agent senses the soil moisture level of the cell it is currently in.
- **Actions**:
  - Move in four directions: Up, Down, Left, Right.
  - Water the plant in its current cell if the soil is Dry.
- **Goal**.
  - Make each plant Wet.

Model Based Agents

Task 2:   Marks: 5

Implement a model-based agent for an autonomous cleaning robot that navigates a 5×5 room, cleans dirt, and avoids obstacles. The robot maintains an internal model of the environment, updates its knowledge dynamically, and optimizes its cleaning path.

Task Description:

- **Environment**:
  - The warehouse is represented as a 5×5 grid, containing:
    - **Dirt (D):** Locations that need to be cleaned.
    - **Obstacles (#):** Fixed furniture that the robot must avoid.
    - **Empty Spaces (.):** Areas where the robot can move freely.
    - **Robot (R):** The agent navigating the room.
  - **Dynamic Changes in the Environment:**
    - The robot remembers which locations have been cleaned.
    - The internal model updates after each cleaning action.
- **Percepts**:
  - The grid layout (Dirt, Obstacles, Free Spaces).
  - The current location of dirt (dirty or already cleaned).
  - The robot's current position in the room.
- **Actions**:
  - **Move (Up, Down, Left, Right):** Navigate through empty spaces.
  - **Clean (C):** Remove dirt from the current position.
  - **Update Internal Model:** Mark cleaned areas to avoid unnecessary revisits.
- **Goal**:
  - **Maintain an Internal Model:**
    - Store the room layout, including dirt, obstacles, and empty spaces.
    - Update the model when a dirt spot is cleaned.
  - **Adapt to Changes:**
    - Avoid revisiting already cleaned areas.
    - Optimize movement using *BFS* for efficiency.
  - **Complete All Deliveries:**

- Navigate to all dirt locations using the shortest path.
- Clean all dirty spots and update the internal model dynamically.