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## AI 2002: Artificial Intelligence

### Assignment No. 1

Due Date: Thursday, 10 March 2022 (02:00 pm)

#### Instructions:

1. Submit your assignment with a **report (soft & hard)** within the due date and time. Late submission will result in a deduction of marks.
2. Mention your names and roll numbers clearly on your document.
3. Name your zip or other folder/file that you want to submit, according to the following format, **AI\_A1\_RollNo\_FirstName**
4. Try to solve each task of the assignment on your own in a group of a **maximum of two persons**.
5. No excuse or resubmission is permissible.
6. Soft form does **NOT** mean the photos of the hard copy.

#### Problem Description

Design and implement a **robot navigation system** where starting state and the goal state have been given which are basically the coordinates of the grid of size 15x15 as shown in Figure 1. For example, the start state has the coordinates is (1,2) and the goal state has the coordinates (15,14).

Consider the **following assumptions** during the implementation of the robot navigation system:

- The robot can only **move**,
  - **Up** one cell with step cost 2,
  - **Right** one cell with cost 2,
  - **Diagonally Up** towards the right with cost 3.
- The robot cannot move downward one cell.
- The obstacles are color-coded and the robot cannot be in those cells.
- The system will take a text file as input having information for the provided grid.

#### Algorithms

Your task is to implement the following algorithms,

1. Breadth-first search
2. Uniform cost search
3. Depth-first search
4. Iterative deepening search

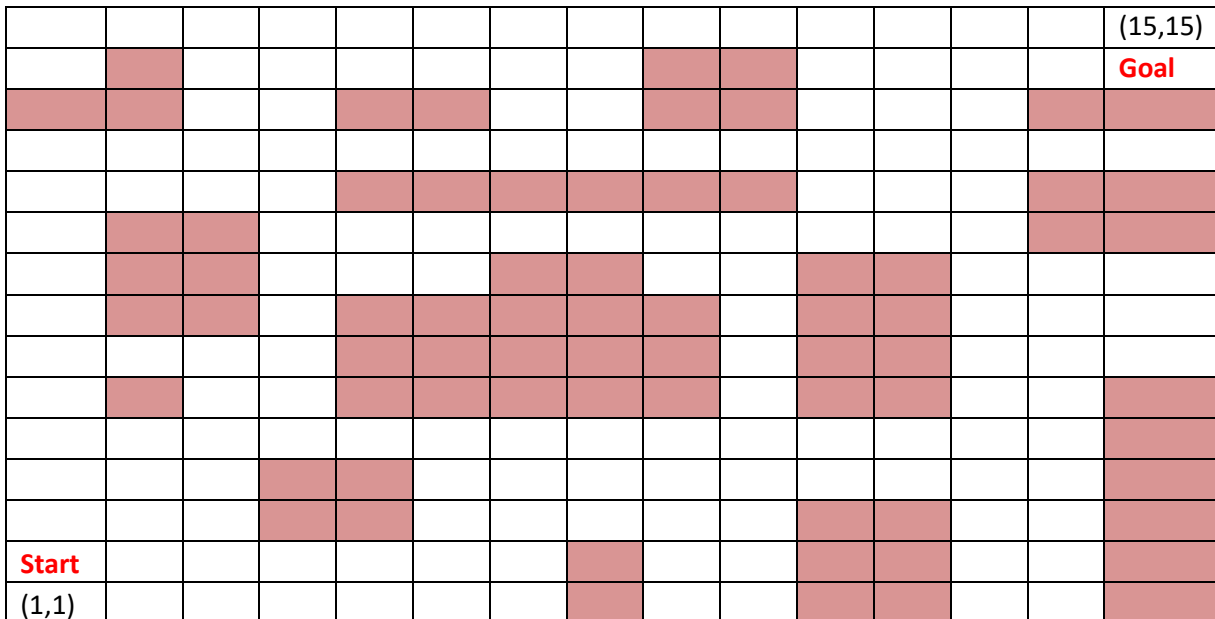


Figure 1: Robot navigation grid of size  $15 \times 15$

## Final Outputs

Your designed system should output the followings:

1. The complete path as well as the traversal if the goal is reachable otherwise mention failure with some solid reasons.
2. The sequence of actions performed to reach the goal.
3. The total cost of the path.
4. A grid that shows the path followed. You do not need graphics for this output.

## Hints

- The grid can be made textually using 1 for obstacles, 0 for empty cells (where the robot can move) and '\*' for path followed.
- For a heuristic-based search algorithm, you can use the Manhattan distance as a heuristic.