Artificial Intelligence (AI)

Assignment No 3

Total Marks: 10 **Due Date: 12th Dec 2023**

You are given a maze represented as a grid along with the optimal policy for navigating through the maze. The maze contains walls ('W'), an open path ('O'), the start position ('S'), and the goal position ('G'). The optimal policy indicates the best action to take at each state. The agent can move in four directions: north(n), south(s), east(e), and west (w). Each movement has a cost of 1. Reward for goal position ('G') is 10. Take Gama=0.9.

Implement the computation of values using the Bellman equation for the given optimal policy.

Implement a visualization function to display the maze, optimal policy, and computed values of each state.

Test your implementation on different mazes, including mazes with multiple paths, dead-ends, and larger mazes.

Maze Representation

```
[
    ['S', 'O', 'O', 'O', 'W', 'O', 'O', 'O', 'W', 'W'],
    ['O', 'W', 'O', 'W', 'O', 'W', 'O', 'O', 'O', 'O'],
    ['O', 'O', 'O', 'O', 'O', 'O', 'O', 'W', 'W', 'O'],
    ['W', 'W', 'O', 'W', 'W', 'O', 'W', 'O', 'O', 'O'],
    ['O', 'O', 'O', 'O', 'O', 'O', 'O', 'W', 'W', 'O'],
    ['O', 'W', 'O', 'W', 'O', 'W', 'O', 'O', 'O', 'O'],
    ['O', 'O', 'O', 'O', 'O', 'O', 'O', 'W', 'O', 'O'],
    ['W', 'W', 'O', 'W', 'W', 'O', 'W', 'O', 'W', 'O'],
    ['O', 'O', 'O', 'O', 'O', 'O', 'O', 'O', 'G', 'O'],
    ['W', 'W', 'W', 'O', 'O', 'O', 'W', 'W', 'O', 'O']
]
```

Policy representation (Optimal Policy)

```
[
    ['e', 'e', 'e', 's', 'W', 'e', 'e', 'e', 'W', 'W'],
    ['n', 'W', 'n', 'W', 'n', 'W', 'n', 'e', 'e', 'e'],
    ['n', 'n', 'n', 's', 's', 's', 's', 'W', 'W', 's'],
    ['W', 'W', 's', 'W', 'W', 'e', 'W', 's', 's', 's'],
    ['s', 's', 's', 'e', 'e', 'e', 's', 'W', 'W', 's'],
    ['n', 'W', 'n', 'W', 'n', 'W', 's', 'e', 'e', 'e'],
    ['e', 'e', 'e', 's', 's', 's', 's', 'W', 'e', 's'],
    ['W', 'W', 's', 'W', 'W', 's', 'W', 'e', 'W', 'e'],
    ['e', 'e', 'e', 'e', 'e', 'e', 'e', 'e', 'G', 'e'],
    ['W', 'W', 'W', 's', 's', 's', 'W', 'W', 's', 's']
]
```

Note: A quiz and a viva will be conducted after the submission. Failing the viva or quiz will result in zero marks.