Alexandria University
Faculty of Engineering
Computer and Systems Program

Artificial Intelligence Course
Assigned: Wednesday, November 30, 2022
Due: Monday, December 12, 2022

Assignment 3
Markov Decision Processes

1 Problem Statement

Consider the 3x3 world shown in the following figure:

The agent has four actions Up, Down, Right and Left.
The transition model is: 80% of the time the agent goes in the direction it selects; the rest of the time it moves at right angles to the intended direction. A collision with a wall results in no movement.
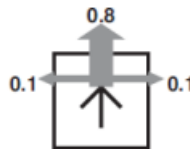
2 Requirements

1. .Implement value iteration for this world for each value of r below:

   - r = 100
   - r = 3
   - r = 0
   - r = -3

2. Use discounted rewards with a discount factor of 0.99

3. Show the policy obtained in each case.

4. Explain intuitively why the value of r leads to each policy.

Alexandria University
Faculty of Engineering
Computer and Systems Program

Artificial Intelligence Course
Assigned: Wednesday, November 30, 2022
Due: Monday, December 12, 2022

3 Bonus

Find the optimal policy for each of the previous cases of r using Policy Iteration algorithm. You may start the algorithm with a randomly generated policy.

4 Notes

- You may use Java, Python or C++ for your implementation.

- You must submit a report showing your algorithms, ideas, results and required questions answers.

- You are encouraged to use google colab notebooks in this assignment and embed both your implementation and report (with the full requirements) in the notebook.

- Copied assignments will be severely penalized.

- You can work in groups of 3 or 4.

Good Luck