CSE 546: Reinforcement Learning

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Programming Assignment 1 Report

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02/15/2023

1. Deterministic & Stochastic Environments

There are two environments in Assignment 1 - Deterministic and Stochastic Environments.

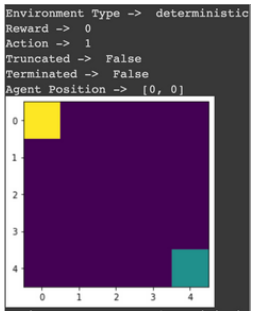
Deterministic Environment: In a deterministic environment the Robot/Agent does all the predefined actions in every episode without any randomness. The agent will always transition to the same next state and previous state as defined.

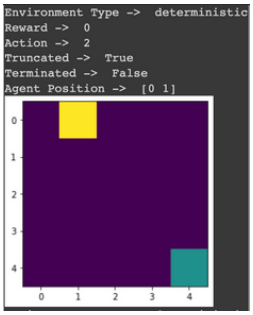
Stochastic Environment: In a stochastic environment, there is an added randomness in the way the Robot/Agent chooses the next step. The agent may transition to different states in different episodes and take distinct steps.

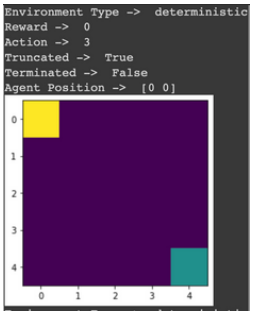
The Environment is a 5x5 grid with 4 rewards set around the grid along with negative rewards. The goal position has a reward of 100. The main objective is for the robot to learn the best and the shortest way to move from the initial position [0,0] to the final goal position. The Robot/Agent has 4 set of actions - Up, Down, Right, Left

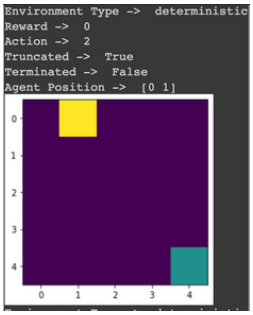
2. Assignment - 1 - Part 1 Graph

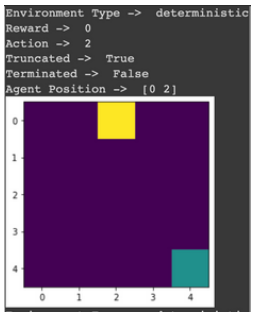
Determinant Environment

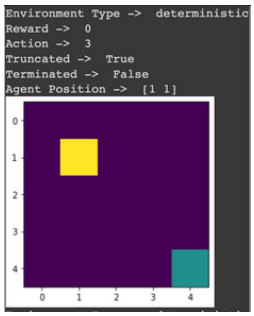


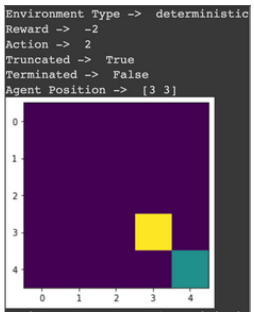


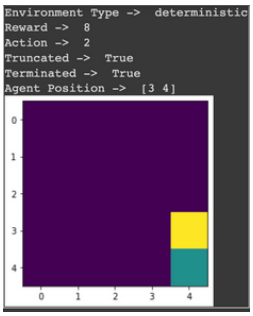




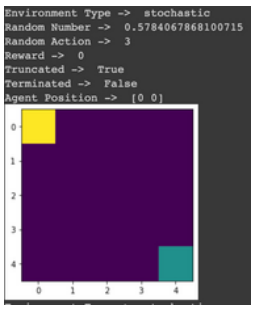


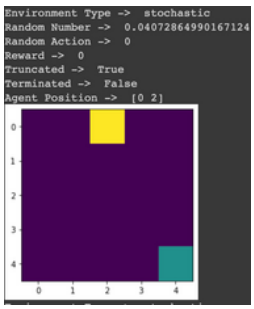


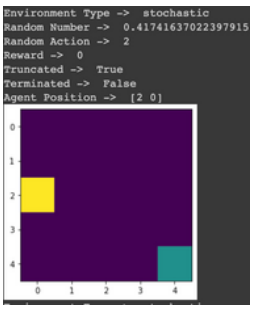


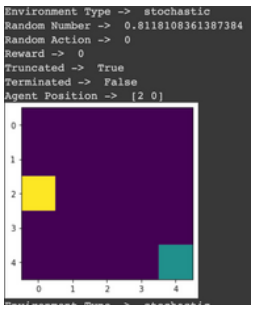


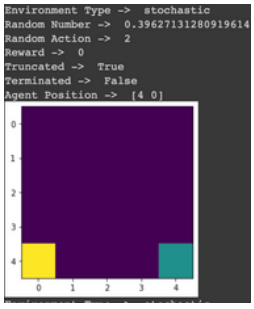
Stochastic Environment

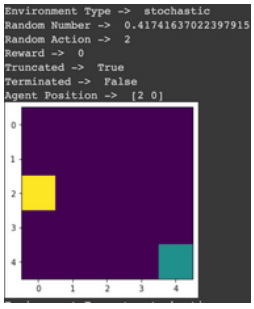


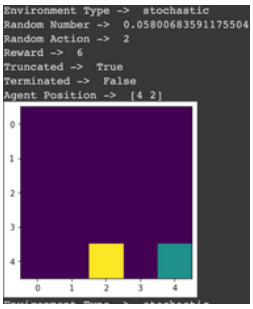


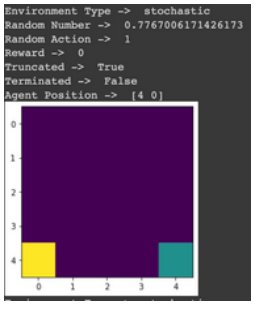


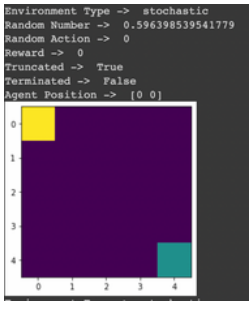


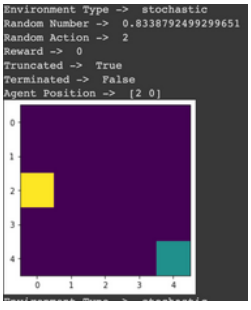


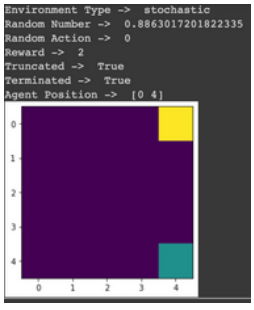












3. Stochastic Environment

The stochastic environment is defined in such a way that the robot will take all the same actions that are defined if the probability is less than 0.9, for a probability of 0.1, the Agent will take a random action that is defined and not the given action.

4. Stochastic and Determinant Differences

Stochastic :

- In a stochastic approach, the environment is not completely known, and it is not accurate.
- Therefore, in the stochastic approach, the next state and reward are unknown and unpredictable.
- The stochastic approach considers the probability of different outcomes at each step.

Determinant :

- In a deterministic environment, the environment is fully known, and the next state and reward are predictable.
- The deterministic approach considers only the best possible outcome at each step.
- This is used in problems where the environment is fully known, and the next state and reward are predictable.

5. Saftey in AI

Safety of reinforcement learning environments can be ensured by:

- Establishing restrictions and boundaries: Specifying the environment's physical limits as well as any limitations that the agent must work inside.
- Monitoring the environment: Keeping an eye on the environment throughout training and deployment for any unusual behaviors.
- Developing and implementing safety controls to prevent the RL agent from performing potentially harmful acts.
- Define a collection of legal acts: In certain circumstances, defining a set of legal actions that the agent is permitted to perform may suffice.