Assignment 1: Maze Solver

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1 Environment

The problem defines two types of environments: deterministic and stochastic. In a deterministic environment, the agent will transition to the next state based on the action taken with no uncertainty, but in a stochastic environment, the agent will move to the next state at random with a probability defined by GridEnv. A random number between 0 and 1 is generated, and if it is larger than the set probability for the current action, the agent is moved to the next state; otherwise, the agent remains in the current state.

1.1 Objective

Solve maze by reaching goal state optimally avoiding walls.

1.2 Actions

- Left (a) : Agent moves left when action 'a' is executed
- Right (d) : Agent moves right when action 'd' is executed
- Up (w) : Agent moves upwards when action 'w' is executed
- Down (s) : Agent moves downwards when action 's' is executed

1.3 States

The GridEnv class takes an argument which is a predefined maze that determines the state of the environment. States with a value of 1 are legal positions in which our agent can move, whilst others with a value of 0 are walls that our agent should avoid.

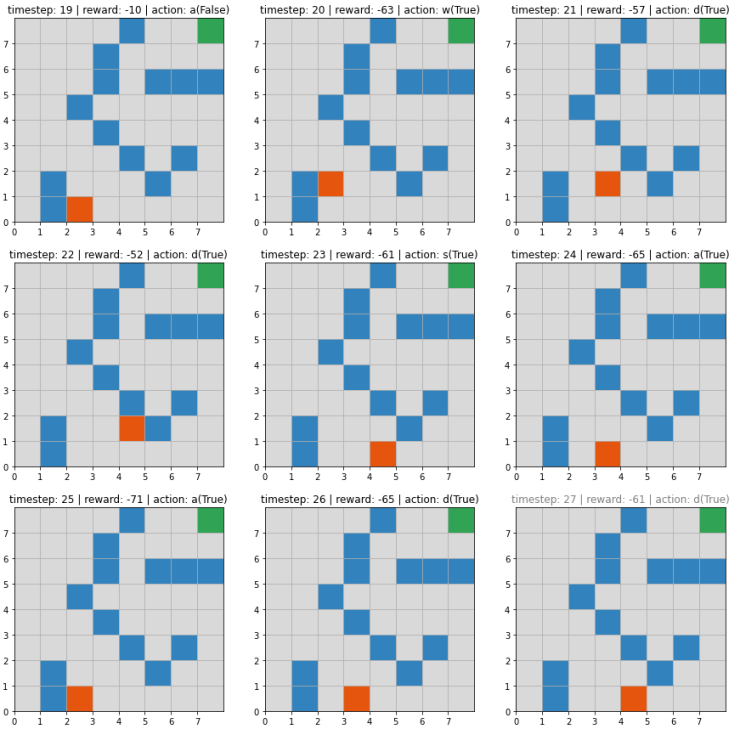
1.4 Rewards

Rewards are given according to the euclidean distance between agent and the goal, farther the agent gets from the goal lesser the reward it gets and vice-versa. The agent will be penalized by the environment for violating state boundaries and colliding with barriers.

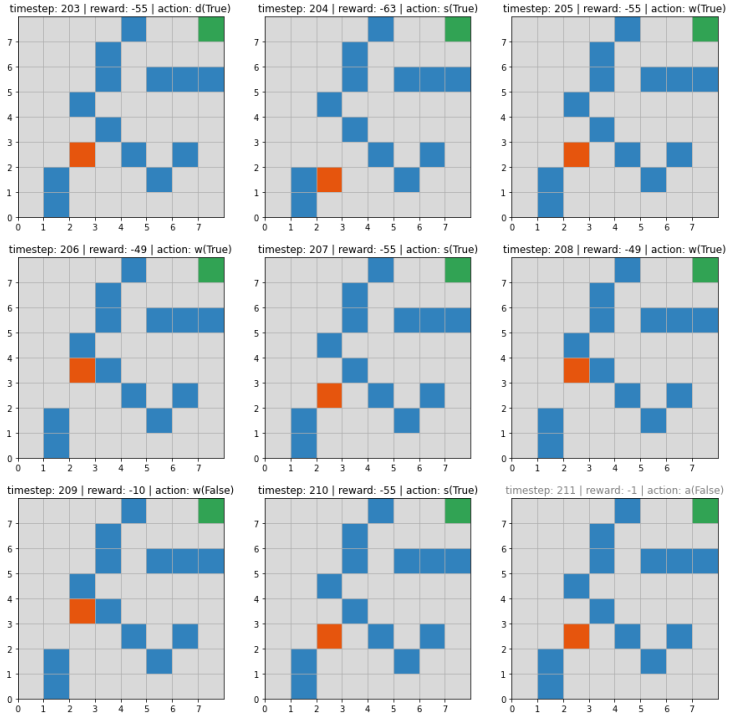
2 Visualizations

Agent is denoted by red green square, goal by green square and maze walls are painted blue

2.1 Deterministic Environment



2.2 Stochastic Environment



3 Safety in AI

Environment will penalize if agent moves to any of the illegal states and eventually it tries to avoid these states. Additionally, we try to restrict our agent to move out of environment bounds by skipping the transitions.