

ECS/DSE-427/627: Multi-Agent Reinforcement

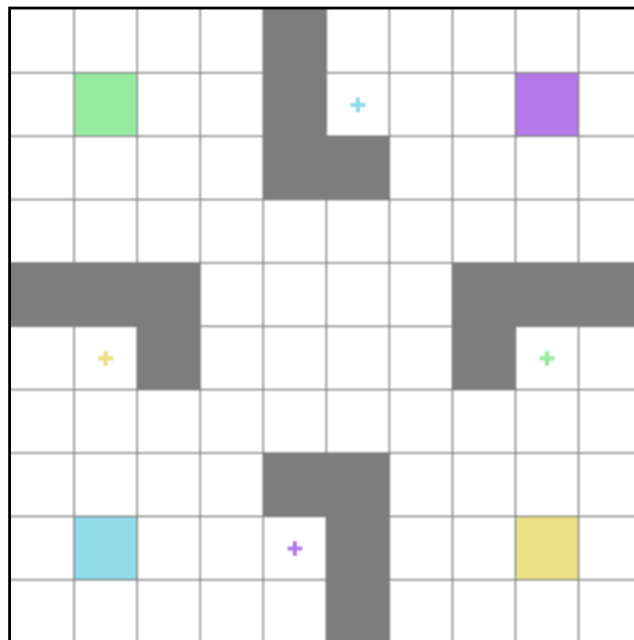
Learning

Assignment-3

Question 1:

(30 marks)

In this assignment, your task is to tackle the *Multi-Agent Path Finding (MAPF)* problem using multi-agent rollouts. This challenge involves navigating multiple agents within a grid world environment. Each agent is assigned a unique start position and a fixed goal location, which it must reach while avoiding obstacles and avoiding collisions with other agents. The MAPF problem is widely studied in multi-agent reinforcement learning due to the constraints that only one agent can occupy any given cell at a time and that agents must avoid colliding with each other. (MAP given below)



Environment Setup:

1. The environment is set up as a grid world that includes:
 - Multiple agents, each starting from a distinct position marked by a coloured cell and each with a specific goal position marked by a coloured plus.

- Obstacles are distributed across the grid, which agents cannot pass through.
- 2. Each agent can perform one of five actions:
 - Move up, down, left, or right.
 - Stay in place, either intentionally or if blocked by an obstacle or another agent.

Reward Structure:

- The system incurs a penalty of -1 for each step taken until all agents reach their respective goal positions. This penalty is applied to incentivize minimizing the total time required for all agents to reach their goals.

Assignment Goal:

Your aim is to develop a multi-agent reinforcement learning strategy that minimizes the overall time required for all agents to reach their destinations. Specifically, you should seek to minimize the maximum time taken by any single agent to reach its goal. You may employ multi-agent rollouts as part of your approach. Once complete, report the minimum time achieved by your solution.

Question 2 (Bonus):

(10 marks)

As a bonus challenge, solve the MAPF problem where each agent's starting position is randomized for every epoch or episode while all other parameters and conditions remain the same.