ROB 538
Autonomous Agents and Multiagent Systems
Fall 2024
Homework 2: Autonomous Agents
Due Oct 15, 2024 at 11:59 PM

Consider a 5x10 gridworld, as shown in Figure 1. Agents start at a fixed location, as indicated in Figure 1, and have four actions (move in each of the four directions). Agents receive a reward of 20 for capturing either target. In addition, there is reward of -1 for every time step an agent is in this gridworld without capturing a target.

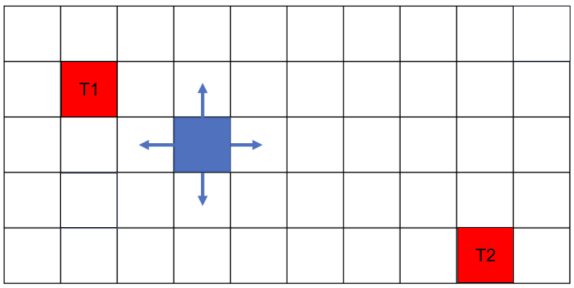


Figure 1: A 5x10 gridworld, with agents in blue and two targets (T1 and T2) in red.

1. We have 1 agent and 1 target (T1) (there is no Agent 2 or Target 2 for now), devise a learning algorithm (neural network or reinforcement learning) that can reach T1. Clearly state all relevant system parameters (inputs, states, outputs, training method, etc.).

2. Now, introduce the second agent (Agent 2) and the second target (T2). For this problem, both agents start at the same location. Each agent receives its own reward based on the target(s) they individually capture. (Agents can occupy the same square in this implementation.) What behavior do you observe now? Do the agents benefit from each other? If so, is that intentional or incidental? Do they cooperate explicitly? Do they cooperate implicitly?

3. Now, create a system-level reward (global reward) that represents the total rewards collected from the two targets (i.e. 0, T1, T2, or T1 + T2). Both agents receive the same reward. What behavior do you observe now? Do the agents benefit from each other? If so, is that intentional or incidental? Do they cooperate explicitly? Do they cooperate implicitly?

The report should be in research paper format, and clearly describe your algorithms, results and analysis. You may use IEEE, AAMAS, or other similar conference standards as a template. Use of LaTeX for writing these papers is encouraged, but not required. Papers should not exceed 10 pages **but may be completed in considerably less space**. Please submit your document as a PDF.