

ROB 538  
Autonomous Agents and Multiagent Systems  
Fall 2022  
Homework 2: Autonomous Agents  
Due Oct 11, 2022 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). There are two targets available for agents to capture (T1 or T2). T1 and T2 start in fixed positions in the environment, as indicated in Figure 1, and remain fixed (they do not move). 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.

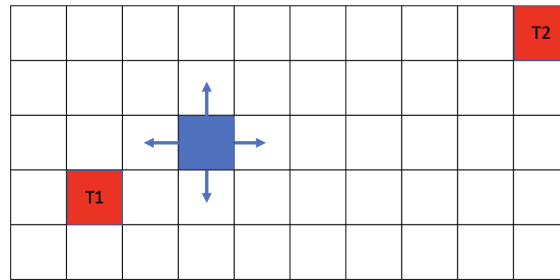


Figure 1: A 5x10 gridworld, with agents in blue and two targets (T1 and T2) in red.

1. Starting off in a gridworld with 1 agent and 1 target (T1), 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 target (T2) and have 2 agents start at the same location and move in this grid. Use the same style of reward for the agents you used in step 1. In other words, each agent receives an individual reward based on the targets they individually capture. 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.