Project III Report for COM S 4/5720 Spring 2025: A Q-Learing Implemenation

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***Abstract*— The problem of 3 chasing agents is difficult. These three agents, Tom, Jerry, and Spike, where Spike wants to attack Tom, Jerry wants to attack Spike, and Tom wants to attack Jerry. Not only is this problem being solved, but there is a chance that any action taken may be changed by an unkown probability. This paper details an implementation of Q-Learning as the planning algorithm of choice for these agents, as well as developments made along the way.**

I. INTRODUCTION

It is common for a path seeking problem involving agents to be used when understanding machine learning. Once past the basic understanding of one agent attempting to find the shortest path to a goal, is to introduce a moving goal. One step past that is to include someone to avoid as well. Once all that is met, we are left with the three agent problem. This is a problem in which the three agents, Tom, Jerry, and Spike, attempt to capture each other whilst avoiding obstacles on the map. Each round the map is different, so it needs to allow variance. From these turn, the things to consider are what moves are possible, and that Spike wants to capture Tom, Tom wants to capture Jerry, and Jerry wants to capture Spike. These considerations change the problem from a simplest shortest path algorithm, to one needing more heuristics and understandings of the ”best” path forward. The ultimate goal is to not be captured, but one can easily change the preference of actions based off scoring the winning states. These actions though, may be changed in an unknown probability by the managing algorith. There are 3 changes, keeping the action the same, rotating to the left by 90-degree, and rotating to the right by 90-degree. As such the model must not calculate an algorithm for shortest path, but also one that will be the most likely to succeed given the randomness.

II. ALGORITHMIC DEVELOPMENT

A. Q-Learning

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2) Testing:

III. DISCUSSION

IV. CONCLUSIONS

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