Autonomous Agents - Assignment 3 Report

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1 Introduction

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2 Method

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2.1 Scoring system

When more than one predator is introduced into the environment, the length of the games alone is no longer a sufficient indicator for the performance of the agents. This is due to the fact that, no matter how long the game lasted, it could have ended either by the predators catching the prey or these colliding into each other. We thus need a more informative measure to evaluate the performance of our algorithms. We were interested in measures having a single dimension, since these ones are the easiest to visualize. Ideally, higher values of such a measure should indicate a better performance of the predators. Furthermore, and no matter which team won the game, shorter games should yield a stronger indication of a better (worse) behaviour for the winning (losing) team.

In order to fulfill these requirements, we introduce here the concept of a game “score”. Let T be the number of steps the game lasted for, and $reward$ the final reward obtained by the predators. We can then define:

$$score = reward \cdot 0.9^{T-1}$$

From the previous definition, it follows that scores are bounded in the interval $[-10, 10]$, with 10 indicating a scenario in which the predators win in a single step, and -10 indicating the case where the predators collide in only one step. For any other score, it is straightforward to calculate the length of the original game:

$$T = \frac{\log |score| - \log 10}{\log 0.9} + 1$$

Figure X shows example values of T from their corresponding score measures, for later reference purposes. Our idea is now to use the average score across many games as the performance measure of our algorithms. If, for instance, the predators catch the prey more often than they collide into each other, the average score will tend to be positive. The same will happen if they, for example, catch the prey quicker on average than they collide into each other.

score	±10	±9	±8	±7	±6	±5	±4	±3	±2	±1	±0.5	±0.25	0
T	1	2	3.12	4.39	5.85	7.58	9.70	12.43	16.28	22.85	29.43	36.01	∞

2.2 State-space encoding

In order to make the presented algorithms converge as fast as possible, we made use of the reduced state-space we devised for the first assignment. However, we had to adapt it to the multi-predator scenario in order to make it work with all cases we will be considering for this assignment. To this end, several ideas needed to be introduced.

First of all, we will extend our original idea for a reduced state-space encoding and use the distances from a certain agant to the rest of them, instead of encoding the positions of every agent on the world. This allows us to use two less variables for the state-space encoding. Furthermore, it is now essential to know which agent "we are", and this needs to be encoded in the state representation somehow. If this information was not encoded, then it would be impossible to distinguish between predators in a multi-predator setting, and the algorithms would not be able to know which predator should be applied a certain action from the usual set {North, South, East, West, Stay}.

3 Results

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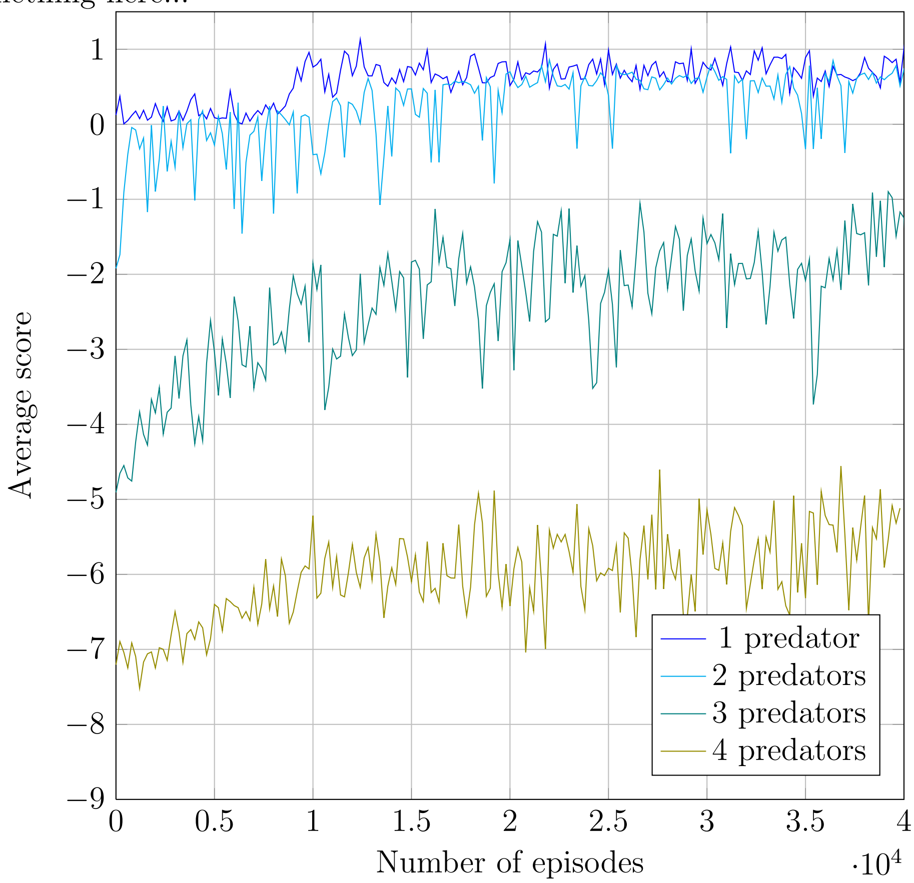

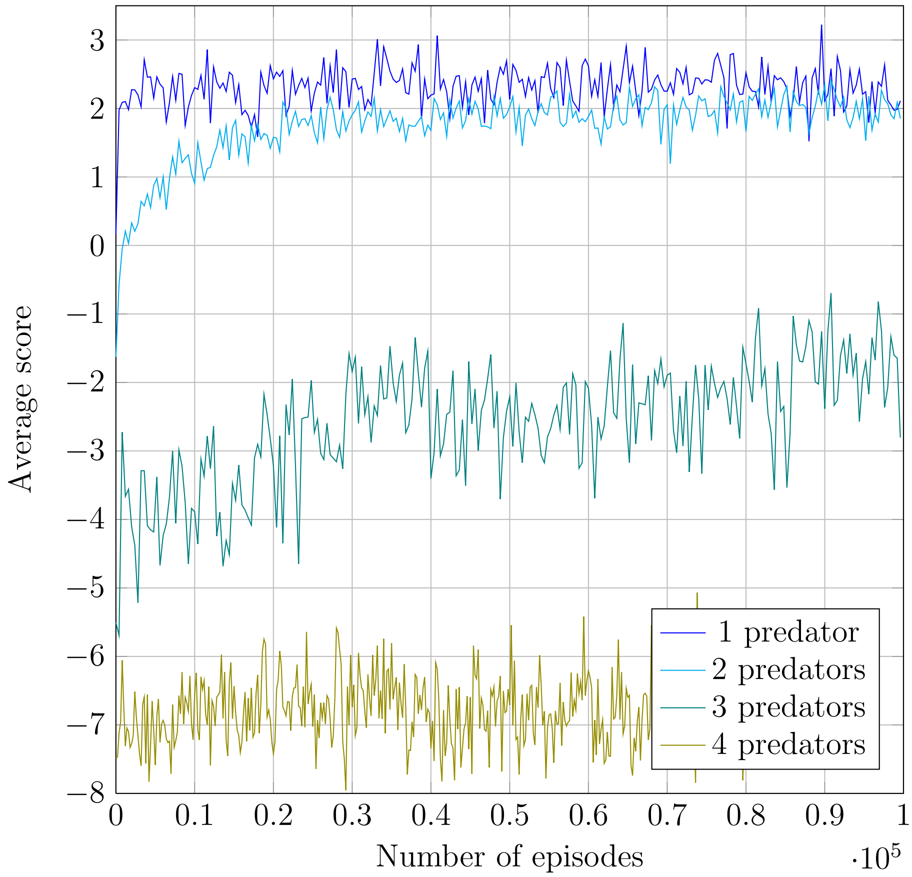

4 Discussion

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5 Conclusion

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References