3MD4120: Reinforcement Learning
Individual Assignment

February 2023

1 Description

The goal of this assignment is to apply reinforcement learning methods to a simple game called Text Flappy Bird (TFB). The game is a variation to the well know Flappy Bird in which the player is made with a simple unit-element character as can be seen in Figure 1.

Figure 1: Rendering of the Text Flappy Bird Game.

The environment is already implemented and can be found at the Text Flappy Bird Gym Gitlab page [1]. Instructions on how to use it can also be found at the same repository. There are two available versions of the environment, one that returns as an observation the complete screen render of the game (*TextFlappyBird-screen-v0*) and another one that returns the distance of

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[1] https://gitlab-research.centralesupelec.fr/stergios.christodoulidis/text-flappy-bird-gym

the player from the center of the closest upcoming pipe gap (*TextFlappyBird-v0*) along the two axes (x, y).

Within the scope of this assignment you are asked to implement and compare *two* agents that can solve the *TextFlappyBird-v0* environment. Feel free to use any algorithm that is presented in the book of Sutton and Barto [2].

2 Deliverables

Two deliverables are required for the submission which will both be used for the grading. Firstly, a single python notebook that showcases both of the implemented agents. And secondly, a report that contains a summary and an interpretation of the results. The report should include, plots of the state-value functions, graphs that highlight the differences of the two algorithms, parameter sweeps and discussion. Make sure that you discuss the following points in your report:

1. How did you choose agents for the task?

2. How are the two implemented agents different (e.g. sensitivity to parameters, convergence time, rewards, scores)?

3. How are the two versions of the TFB environment different? What are the main limitations of using the same agent for the *TextFlappyBird-screen-v0*?

4. With an implementation of the original flappy bird game environment[3] available, can the same agents be used?

3 Grading

The grading will be based on the weighting scheme that is presented in the following Table.

Item	Weight
Implementation of First Agent	25%
Implementation of Second Agent	25%
State-Value Function Plots	20%
Performance & Parameter-Sweep Graphs	10%
Discussion	10%

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[2]Reinforcement Learning: An Introduction
[3]https://github.com/Talendar/flappy-bird-gym

4 Submission Details

- The deadline for the submission is on the *31th of March 2023*.

- The submission should be a single 3-page long (max) *.pdf* document with your results and discussion together with a link to a python notebook with your code (e.g., colab, github).

- Please organize the python notebook so that it is easy to follow.

- Make sure that you will add your name in the report as well as in the python notebook.

- Use the Springer Lecture Notes in Computer Science template for your report which you can find here.

- The assignment should be submitted at the course page in edunao.

- This assignment should be completed individually.