Coding component

In the code and Unity, the “cubes” are the tiles, as they are known in the thesis text.

Before hitting the “Play” button in the Unity environment in order for the AI agent to train, there are a couple of lines needed to be put in the Command Prompt. Firstly, the following command: “cd C:\Users\domin\Unity test project” made it possible to focus on this current directory where the Unity project is stored. Secondly, “venv\Scripts\activate” enables us to make a virtual environment called “venv” in our current directory that will enable us to create an isolated Python virtual environment for the training of one particular AI agent. Finally, the following command: “mlagents-learn config.yaml --run-id=NAME” is what enables us to begin the training of the AI agent in the virtual environment. You have to provide the hyperparameters of the learning process in the “config.yaml” file and the name of the run or iteration in the place of “NAME”.

The “Green_agent.cs” file contains the code for the green agent in all three environments.

The “Red_agent.cs” file contains the code for the red agent in all three environments.

The “Orange_agent.cs” file contains the code for the orange agent in the two environments in which it appears.

The “AI_agent_2x2.cs” file contains the code for the AI agent present in the 2-by-2 tiles environment.

The “AI_agent_3x3.cs” file contains the code for the AI agent present in the 3-by-3 tiles environment.

The “AI_agent_4x4.cs” file contains the code for the AI agent present in the 4-by-4 tiles environment.

For the Unity Project, version 2021.3.11f1 is used, while Python uses version 3.9.13.

This YouTube video was used to learn how to use Unity and ML-Agents:

https://www.youtube.com/watch?v=zPFU30tbyKs&ab_channel=CodeMonkey

This is the documentation for ML-Agents which was also used:

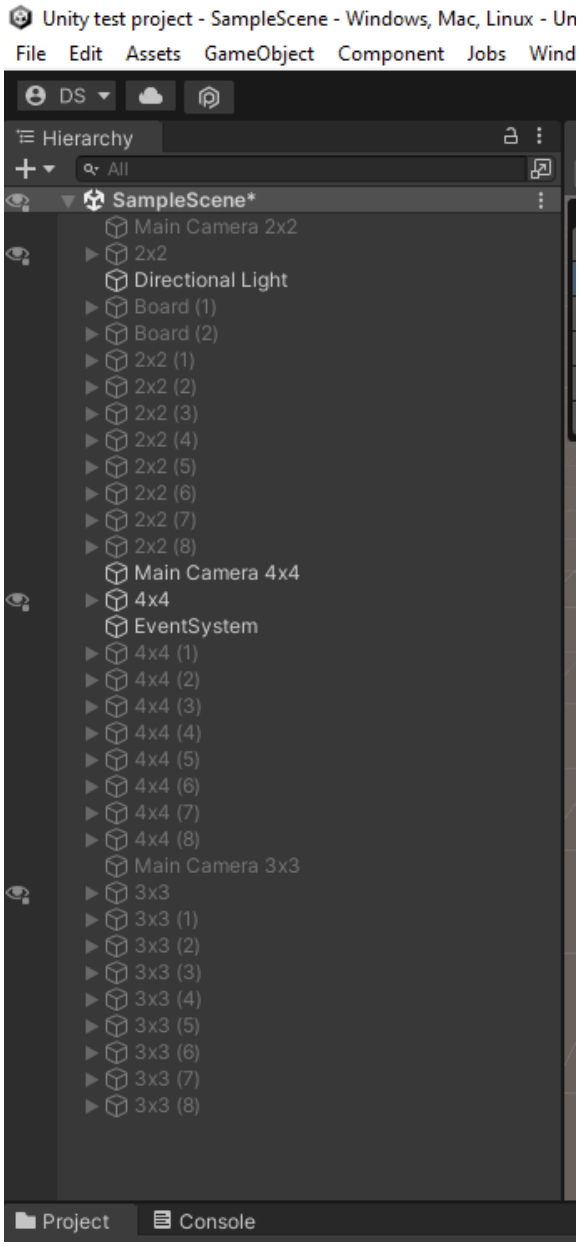
https://github.com/Unity-Technologies/ml-agents

This is the tank texture used to make all the agents:

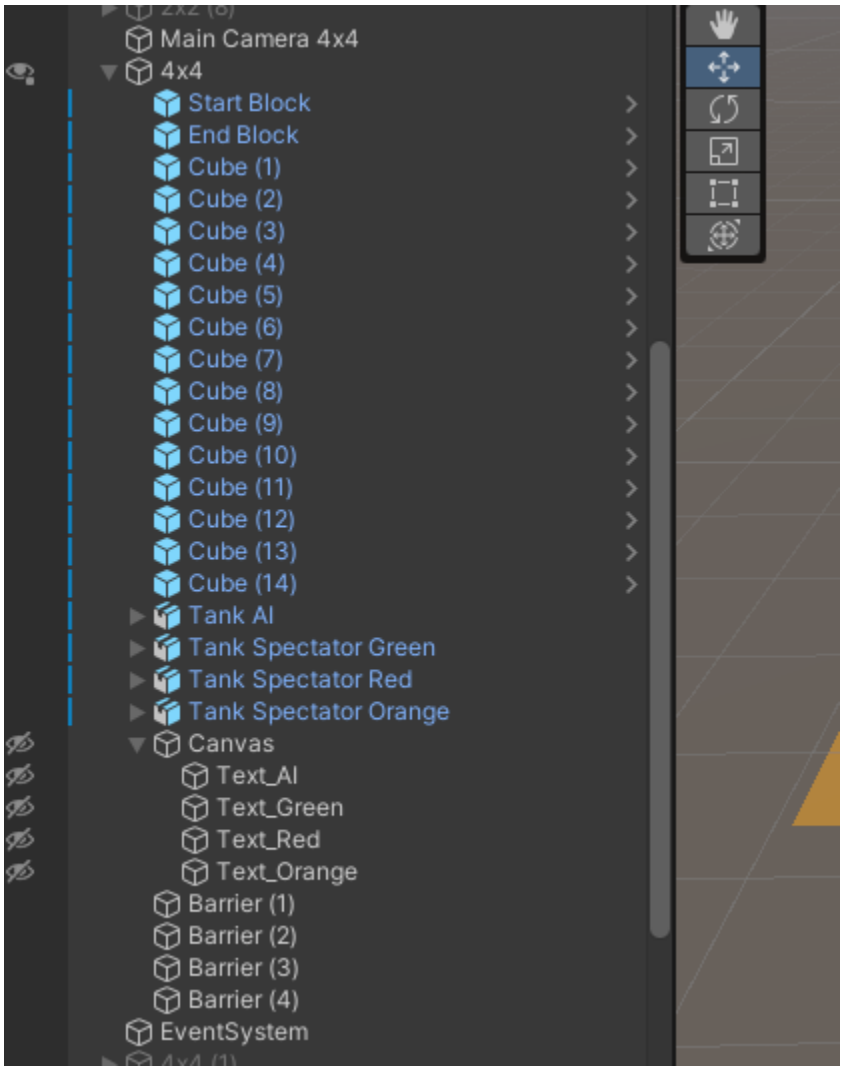
https://sketchfab.com/3d-models/tank-unity-65c6ffa083c6496eb84a0aa3c48d63ad

In the figure above are all the assets used:

- green zone, red zone, orange zone, end/start zone and message materials for the tiles
- the three brains of the AI agents in the three environments: 2x2_try22, 3x3_try6, 4x4_try35; cube asset is for the creation of the tiles
- 6 C# scripts: 3- each one of the three environments has a separate C# script for the AI agent, 3- the C# scripts made for the red, green and orange agent are the same for every environment
- the tank textures
- invisible material for the invisible barriers in the environments



In the figure above there are presented the 3 types of environments and their 8 other duplicates for the training process. There are also 3 cameras for easier visualization.



Inside the environments hierarchy there are all the tiles present as well as all the agents, barriers and text of each agent.