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CSC 4301 (01)–Intro. to Artificial Intelligence

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Pathfinding Project Report

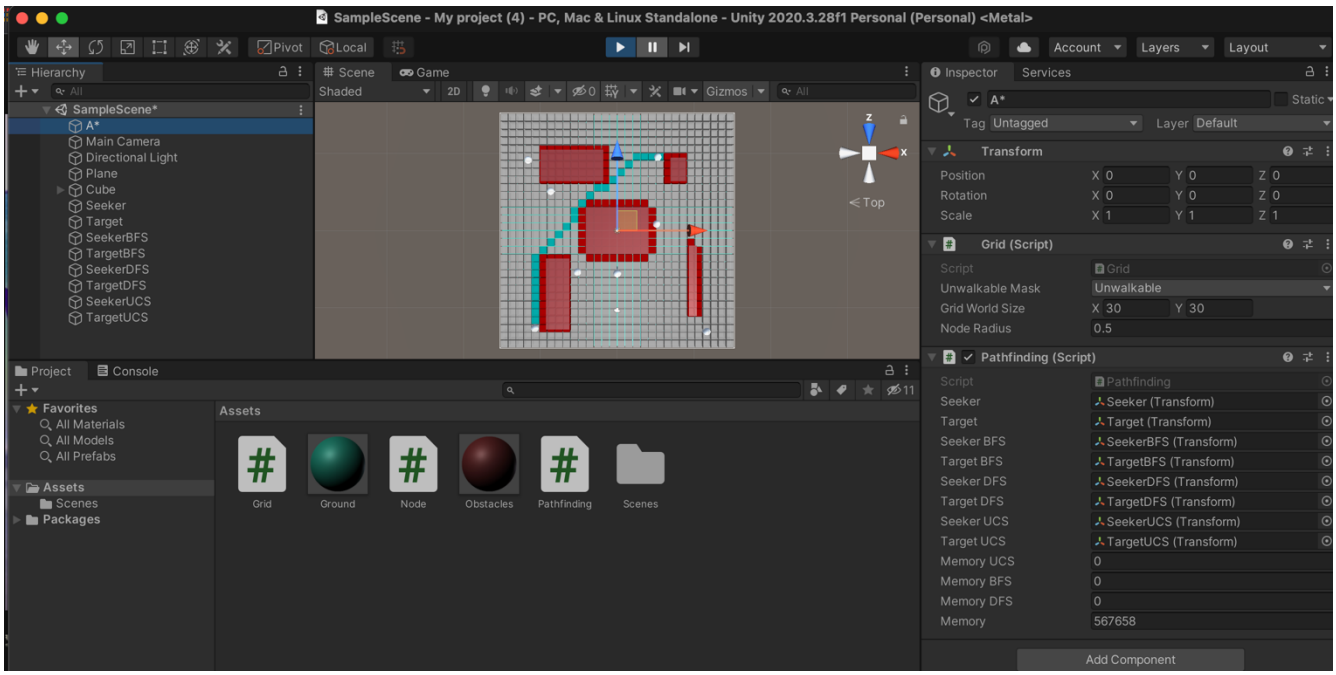
In this project, we needed to try some algorithms (A*, UCS, BFS, DFS) in orders to do the pathfinding. Knowing that normally they don't have the same cost, in this exercise we do not take into consideration the cost as we assume that they all have the same one.

In order to make that project, I started by building an environment in Unity by creating some obstacles that cannot be crossed by the seekers while trying to reach the target. Those obstacles are made to challenge the written algorithm and to show the difference between each of the algorithms that we worked with.

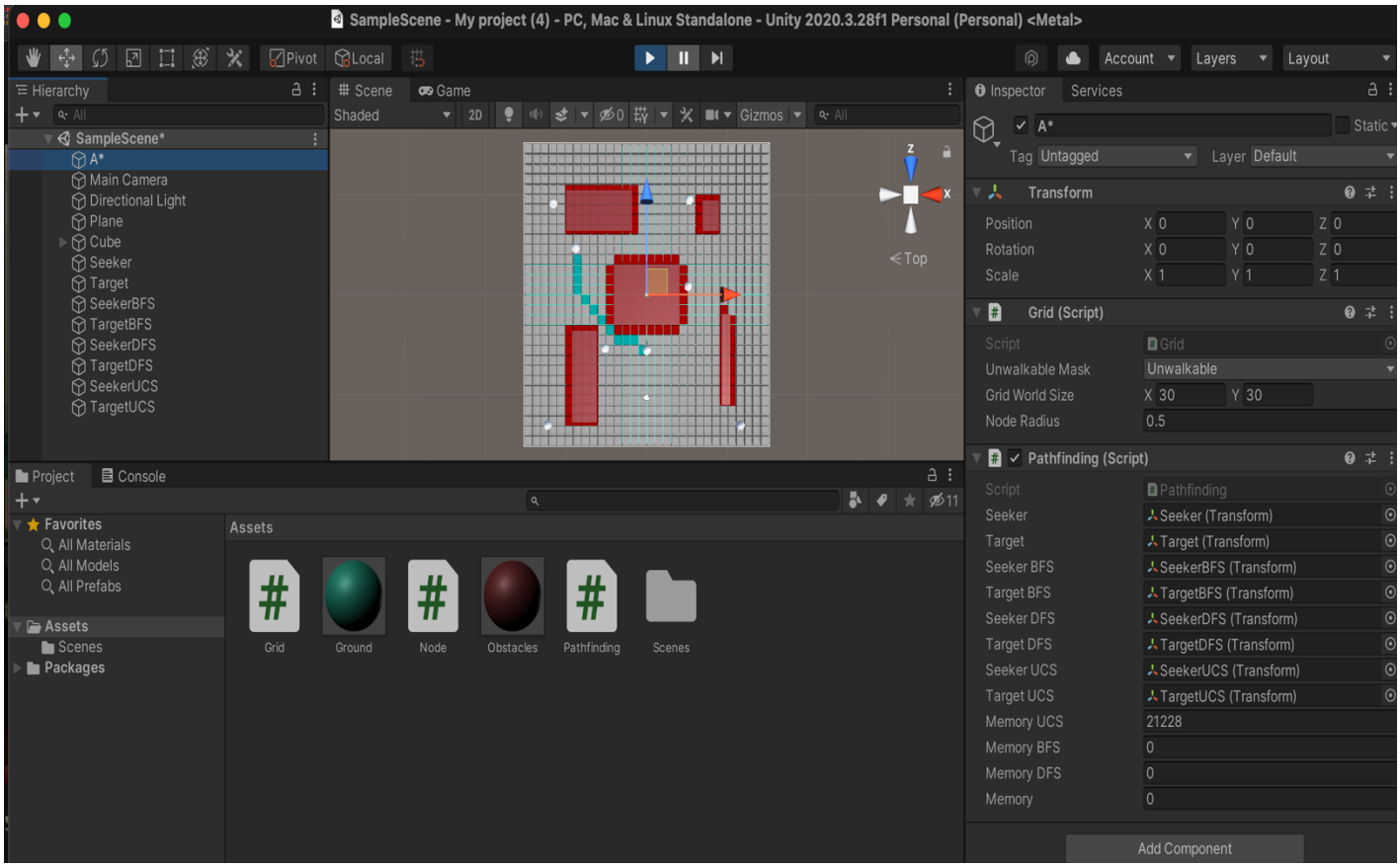
As we may know, the A* algorithm is the best one in performance (efficiency and time) since it can go from a seeker position to a target position in a minimum time and following the shortest path (smallest number of steps). By doing many trials and trying different positions for all the algorithms, we noticed that effectively, A* algorithm is the best algorithm. Followed by BFS that is also efficient. And then, followed by UCS. For an unknown reason, the algorithm I wrote for DFS did not want to work and thus I ignore the efficiency of that algorithm. However, we need to note that we need to take into consideration the position of the seekers and the targets while calculating the time.

Here are some snapshots that show the different paths traced by the algorithms in one of the trials:

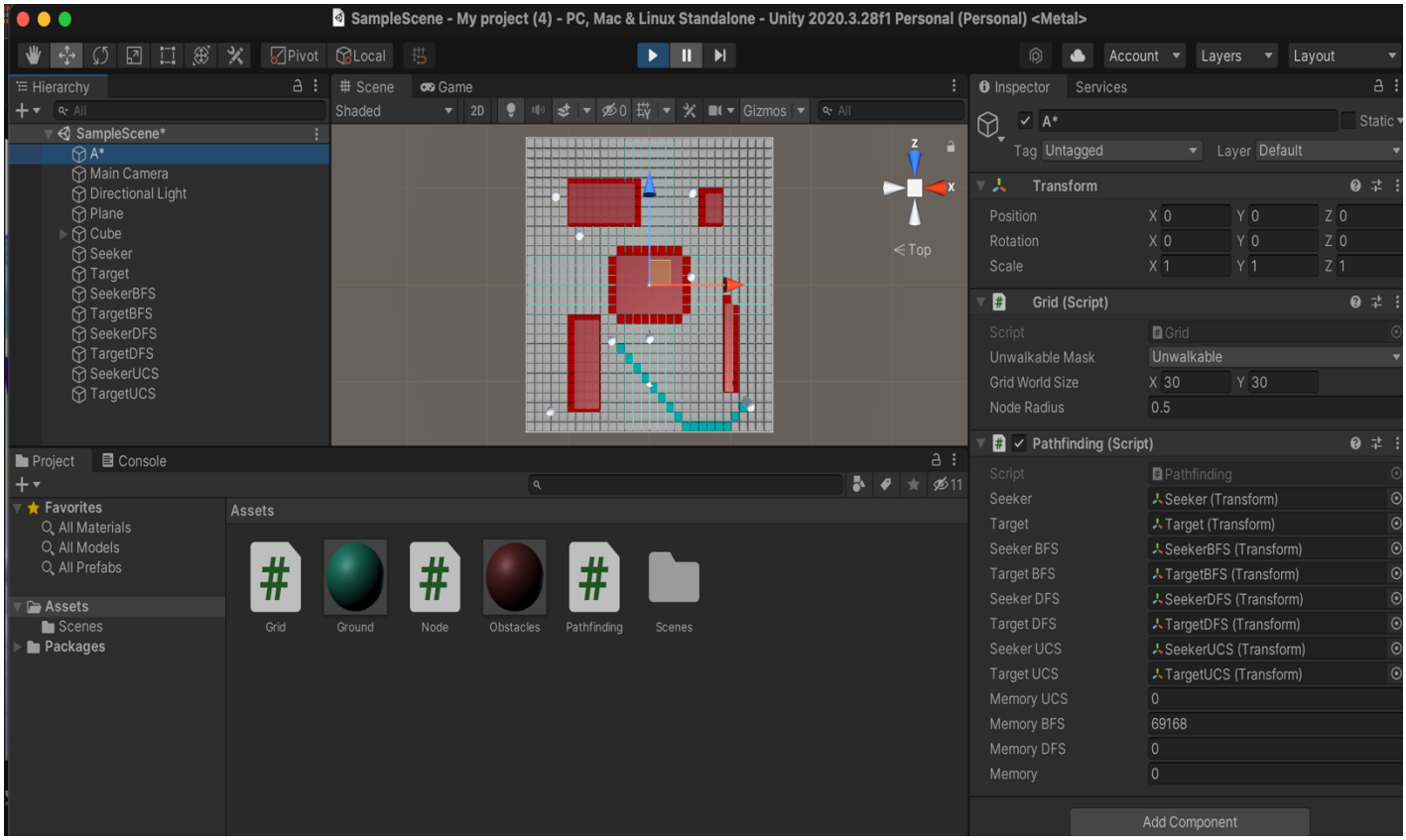
A* algorithm:



UCS algorithm:



BFS algorithm:



Talking about efficiency, we can state that both A* and UCS reach the targets in the minimum number of steps compared to the BFS. BFS and certainly DFS, need to traverse many cells in order to reach their targets.

To sum up, I can say that this exercise made me put into practice everything I have learned in class. It allowed me to visualize the path tracing process resulted from the implementation of the four different algorithms. As a conclusion, I can say that the four algorithms can be the best depending on the positions, the requirements and the plane used. Also, depending on the obstacles, the performance can change. Finally, I would like to give credits to Sebastian Lague for the code that helped in creating the environment in unity and the A* algorithm.